Presentation Types and Session Titles

Abstracts are organized alphabetically by lead author's last name. This is demonstrated by the lead author's name being in all CAPS.

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CO3	Inventory and Monitoring
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P21-02 **BANI, LUCIANO, Dario Massimino, Luciana Bottoni, and Renato Massa** Department of Landscape and Environmental Sciences, University of Milano-Bicocca, Piazza della Scienza 1, I-20126 Milano, Italy (luciano.bani@unimib.it)
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CO18-3 **SHIRLI, BAR-DAVID, David Saltz, Tamar Dayan, and Yehoshua Shkedy** Department of Desert Ecology, Ben Gurion University, Sde Campus 84990, Israel (SB, DS) (bardavid@nature.berkeley.edu)Dept. of Zoology, Tel-Aviv University, Israel (TD)Boqer Science Division, Nature and Parks Authority, Jerusalem, Israel (YS, DS)
PLANNING FOR LANDSCAPE CONNECTIVITY IN ISRAEL USING A SPATIALLY-EXPLICIT MODEL OF A REINTRODUCED PERSIAN FALLOW DEER

CO8-7 **BARRETT, PAUL J** U.S. Fish and Wildlife Service 110 S. Church Street, Suite 3450, Tucson, AZ 85701 (paul_barrett@fws.gov)
ENDANGERED SPECIES RECOVERY PLANNING IN THE 21ST CENTURY: A CASE STUDY USING THE MOUNT GRAHAM RED SQUIRREL (TAMIASCIURUS HUDSONICUS GRAHAMENSIS)

CO20-1 **BASNET, KHADGA** Central Department of Zoology, Tribhuvan University, University Campus, Kirtipur, Kathmandu, Nepal (kbasnet@ntc.net.np)
CROP DEPREDATION BY WILDLIFE: A CHALLENGE IN MANAGING PROTECTED AREAS IN NEPAL

P11-01 **BATÁRY, PÉTER, András Báldi, and Sarolta** Erdős. Hungarian Natural History Museum, Ludovika sq. 2, H-1083 Budapest, Hungary, (batary@nhmus.hu) (PB, SE). Animal Ecology Research Group, Hungarian Academy of Sciences and Hungarian Natural History Museum, Ludovika sq. 2, H-1083 Budapest, Hungary (AB).
THE EFFECT OF LANDSCAPE COMPOSITION AND STRUCTURE ON BIRD ASSEMBLAGES OF INTENSIVELY AND EXTENSIVELY USED GRASSLANDS IN HUNGARY

CO6-2 **BAUER, DANA MARIE and Stephen K. Swallow** Department of Environmental and Natural Resource Economics, University of Rhode Island, 205 Coastal Institute, 1 Greenhouse Road, Kingston, RI 02881 (danabauer@mail.uri.edu)
ECONOMIC CONSEQUENCES OF CONSERVING AMPHIBIAN METAPOPULATIONS WITHIN AREAS OF URBAN SPRAWL

S01-2 **BAXTER, CHARLES and Raphael Sagarin** Hopkins Marine Station of Stanford University, Pacific Grove, CA 93950 (charles.baxter@comcast.net) (CB); Department of Environmental Health Sciences, University of California, Los Angeles 90095-1772 (RS).
FROM ED RICKETTS TO PISCO: LOOKING “FROM THE TIDE POOL TO THE STARS AND THEN BACK TO THE TIDE POOL AGAIN”

CO48-2 **BEAZLEY, KAREN** School for Resource and Environmental Studies, Dalhousie University, Halifax, NS B3H 3J5, Canada (karen.beazley@dal.ca)
SELECTING FOCAL SPECIES IN URBANIZING AREAS WITH INPUT FROM EXPERTS AND LOCAL PEOPLE

CO43-7 **BEDNAREK, ANGELA T.** Earth Institute, Columbia University, Hogan Hall B-19, MC 4501, 2910 Broadway, New York, NY 10027 (atb2101@columbia.edu)
ADAPTIVE ECOSYSTEM MANAGEMENT IN U.S. FEDERAL DAM RELICENSING: CONCEPTIONS AND LIMITATIONS

CO30-1 **BEIER, PAUL, Michael R. Vaughan, Michael J. Conroy, and Howard Quigley** School of Forestry, Northern Arizona University, Flagstaff AZ 86011-5018 (paul.beier@nau.edu) (PB). US Geological Survey Virginia Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061-0321 USA (MRV). US Geological Survey Georgia Cooperative Fish and Wildlife Research Unit, Warnell School of Forest Resources, University of Georgia, Athens, GA 30602 (MJC). Global Carnivore Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, New York 10460 (HQ)
DECONSTRUCTING FLAWED SCIENTIFIC INFERENCES ABOUT THE FLORIDA PANTHER

CO28-5 **BEISSINGER, STEVEN R. and Benjamin H. Becker** Division of Ecosystem Sciences, Department of Environmental Science, Policy and Management, 151 Hilgard Hall #3110, University of California, Berkeley, CA 94720-3110 (beis@nature.berkeley.edu) Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA 94956
COLLAPSE OF FISHERIES CAUSES A THREATENED SEABIRD TO “FISH DOWN THE FOODWEB”

S18-1 **BEJA, PEDRO, and Rita Alcazar** ERENA, Av. Visconde Valmôr, 11-3º, 1000-289 Lisboa, Portugal (pbeja@erena.pt), Liga para a Protecção da Natureza, Estrada do Calhariz de Benfica, 187, 1500-124 Lisboa, Portugal
CHANGING AGRICULTURE AND AMPHIBIAN CONSERVATION IN MEDITERRANEAN LANDSCAPES: CHALLENGES AND PROSPECTS

CO48-8 **BEKESSY, SARAH A., Brendan A. Wintle, Joe Banks, and Michael A. McCarthy** School of Social Science and Planning, RMIT University, GPO Box 2476V, Melbourne, Australia, 3001, (sarah.bekessy@rmit.edu.au) (SAB, JB). School of Botany, University of Melbourne, Victoria, Australia, 3010 (BAW, MAM).
PREDICTIONS OF SPECIES PERSISTENCE AS A TOOL FOR STRATEGIC PLANNING IN THE EXPANDING URBAN FRINGE

CO44-2 **BELFIORE, NATALIA M., Craig Moritz** Museum of Vertebrate Zoology, 3101 VLSB, University of California, Berkeley, CA 94720-3160 (nmb@berkeley.edu).
APPLICATION OF GENOMICS TECHNIQUES TO NON-MODEL ORGANISMS FOR CONSERVATION BIOLOGY: WHAT CAN GOPHERS AND LIZARDS LEARN FROM HUMANS AND FLIES?

S04-5 **BENGSTON, DAVID N. and Yeo-Chang Youn** USDA Forest Service, North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108 (dbengston@fs.fed.us); Lab of Ecological Economics and Forest Policy, Department of Forest Resources, Seoul National University, San 56-1 Shillim-dong, Gwanak-gu, Seoul 151-742, Republic of Korea.
URBAN CONTAINMENT POLICIES AND THE PROTECTION OF NATURAL AREAS: THE CASE OF SEOUL’S GREENBELT

CO24-1 **Nicole Benjamin-Fink, Jim Perry, and John Moriarity** (benj0057@umn.edu)
AMPHIBIAN COMMUNITY COMPOSITION AND LAND USE PATTERN IN EASTERN MINNESOTA

P26-02 **BENNETT, CHANDA E., William Hahn, Jennifer Pastorini, and Luke Dollar** Department of Ecology, Evolution and Environmental Biology, Columbia University, 1200 Amsterdam Avenue, MC 5557, New York, NY 10027 (ceb61@columbia.edu) (CEB, WH); Center for Environmental Research and Conservation (CERC), Columbia University, 1200 Amsterdam Avenue, New York, NY 10027 (JP); Nicholas School of the Environment and Earth Sciences, Duke University, Durham, NC 27708 (LD).
PHYLOGENY OF THE MALAGASY RING-TAILED MOGOOSE (GALIDIA ELEGANS) FROM MTDNA SEQUENCE ANALYSIS

P29-02 **BERGALLO, HELENA G. and Carlos E.L. Esbérard** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 20559-900, Rio de Janeiro, RJ, Brazil, (bergallo@uerj.br) (HGB). Projeto Morcegos Urbanos, Fundação RioZoo, Quinta da Boa Vista s.no., 20940-040, Rio de Janeiro, RJ, Brazil (CELE).
BATS IN AN URBAN PARK IN RIO DE JANEIRO CITY, SOUTHEASTERN BRAZIL

CO6-3 **BERGER, KIM** Wildlife Conservation Society, PO Box 340, Moose, WY 83012 (kberger@wcs.org)
CARNIVORE-LIVESTOCK CONFLICTS: MAKING ECONOMIC SENSE OF SUBSIDIZED PREDATOR CONTROL

S03-6 **BERGER, JOEL** Teton Field Office, Wildlife Conservation Society, PO Box 340, Moose, WY 83012 (jberger@wcs.org)
ANIMAL BEHAVIOR MAY REVEAL ECOLOGICAL RECOVERY -- DO POLICY MAKERS REALLY CARE?

CO17-3 **BERTILSSON, MARIA** Department of Botany, Stockholm University, SE-106 91 Stockholm, Sweden (Maria.Bertilsson@botan.su.se)
POPULATION VIABILITY ANALYSIS AND EXTINCTION RECORDS OF THE RARE PERENNIAL HERB VICIA PISIFORMIS

CO39-1 **BHAGWAT, SHONIL A.** The Natural History Museum, Cromwell Road, London, SW7 5BD, UK (S.Bhagwat@nhm.ac.uk)
WHAT CAN A BIRD'S EYE VIEW TELL US THAT A BUG'S EYE VIEW DOESN'T? BIODIVERSITY CONSERVATION IN SACRED GROVES OF THE WESTERN GHATS IN INDIA

P34-01 **BIEN, WALTER F., Michael Zolkewitz, and James R. Spotila** Department of Bioscience and Biotechnology, Drexel University, 32nd and Chestnut Streets, Philadelphia, PA 19104 (zolk@drexel.edu)
A MODEL FOR RECLAIMING SEVERELY DISTURBED UPLAND AREAS IN THE NEW JERSEY PINELANDS

CO45-2 **BIERWAGEN, G. BRITTA** Donald Bren School of Environmental Science & Mangagement, University of California, Santa Barbara, CA 93106 (bierwagen.britta@epa.gov) Global Change Research Program, U.S. EPA (MC 8601N), 1200 Pennsylvania Ave. NW, Washington, D.C. 20460
ECOLOGICAL CONNECTIVITY IN URBANIZING LANDSCAPES

P03-01 **BILA-ISIA, INOGWABINI** Wildlife Conservation Society, Forest Elephant Program, Central Africa, Democratic Republic of Congo, via Stephen Blake, WCS, 1700 CT Ave. NW, Ste. 403, Washington DC 20009 (Inogwabini@uuplus.com)
NEST BUILDING IN THE PAN PANISCUS IN THE WESTERNMOST TIP OF THE SALONGA NATIONAL PARK, CENTRAL DEMOCRATIC REPUBLIC OF CONGO

CO47-8 **BINO, GILAD, Sameh Darawshi, Aderet Reich Solomon, Noam Levin and Salit Kark** Dept. of Ecology, Systematics and Evolution, The Institute of Life Sciences, The Hebrew University of Jerusalem, Jerusalem 91904, Israel (binog@pob.huji.ac.il)
URBAN BIRD DIVERSITY ALONG A GREEN CORRIDOR IN JERUSALEM: AN ANALYSIS USING REMOTE SENSING AND GIS APPROACHES

CO30-2 **BISHOP, MELANIE J. and Charles H. Peterson** University of North Carolina at Chapel Hill, Institute of Marine Sciences, 3431 Arendell St, Morehead City, NC, 28557 USA (mbishop@email.unc.edu)
ECOLOGICAL MONITORING TO DETECT IMPACTS OF BEACH NOURISHMENT: CURRENT STATE OF PLAY AND RECOMMENDATIONS FOR IMPROVEMENT

CO52-6 **BISHOP, DAVID C. and Carola A. Haas** Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (dabishop@vt.edu)
USING MOVEMENT BEHAVIOR TO DETERMINE PROTECTION AREAS FOR FLORIDA BOG FROGS

P12-03 **BISHOP, MARY ANNE and Sean P. Powers** Prince William Sound Science Center, P.O. Box 705, Cordova, AK 99574 USA, (MAB) (mbishop@pwssc.gen.ak.us). University of South Alabama & Dauphin Island Sea Lab, 101 Bienville Blvd., Dauphin Island, AL 36528 (SPP)
CONSERVATION OF SUB-ARCTIC TIDAL FLATS: COPPER RIVER DELTA ALASKA

S02-2 **BLAIR, ROBERT B.** Department of Fisheries, Wildlife, and Conservation Biology (blairrb@umn.edu)
URBAN SPRAWL AND ITS EFFECTS ON BIRDS: INVASION, EXTINCTION AND HOMOGENIZATION

P05-02 **BLEISCH, WILLIAM, Xie Yan, Weijie Deng, Mike Harding, Sung Wang, and Yingyi Zhang** Institute of Zoology, Chinese Academy of Sciences, 25 Beisihuanxilu, Beijing, China (YX, SW) Ecology, Land and People 33 Upland Road, Ipswich, Suffolk, IP6 9JY UK (MH) Fauna and Flora International China Programme, 95 Xinxiang, 25 Beisihuanxilu, Beijing, China (YZ, WB) (bill.bleisch@fauna-flora.org)
A BIODIVERSITY STRATEGY AND ACTION PLAN FOR A CHINESE MUNICIPALITY

P06-01 **BLOMQUIST, SEAN M., Michael J. Sredl, and Daniel A. Cox** Nongame Branch, Arizona Game and Fish Department, Phoenix, AZ 85023 (sean.blomquist@umit.maine.edu) (SMB, MJS, DAC), Department of Wildlife Ecology, University of Maine, 5755 Nutting Hall, Orono, ME 04469 (SMB)
CONSERVATION AND MANAGEMENT OF CHIRICAHUA LEOPARD FROGS IN THE BUCKSKIN HILLS

P34-02 **BOCK, JANE, LINDA KENNEDY, Kristin Bishop, Carl Bock, and Zach Jones** EE Biology Department, BC Box 334, University of Colorado, Boulder, CO 80309, USA. (bock@colorado.edu); Appleton-Whittell Research Ranch, National Audubon Society, Box 44, Elgin AZ 85611 (LK). Research Ranch Foundation, Box 633, Sonoita AZ 85637 (JB). EE Biology Department, Box 334, University of Colorado, Boulder CO 80309 (KB, JB, CB, ZJ).
THE IMPACTS OF THE RYAN FIRE ON GRAZED VS UNGRAZED LAND IN SOUTHEASTERN ARIZONA

CO32-4 **BOCKARIE, ANNE TODD, Dennis Burton, Christina Czarnecki, Amanda Bryant, Jessica Hulitt, Luke Bourassa, and Fran Lawn** Philadelphia University, School of Science and Health, 4201 Henry Ave, Philadelphia, PA 19144-5494, USA, (BockarieA@philau.edu) (ATB, CC, AB, JH, LB). The Schuylkill Center for Environmental Education, 8480 Hagy's Mill Road, Philadelphia, PA, 19128, USA (DB, FL).
MANAGING INVASIVE EARTHWORMS TO RESTORE AN URBAN FOREST SITE

P29-03 **BOGAN, DANIEL and Roland Kays** New York State Museum, Research and Collections, 3140 CEC, Albany, NY 12230 (DBogan@mail.nysed.gov)
ECOLOGICAL TRAP DYNAMICS WITHIN A COYOTE POPULATION OF A FRAGMENTED FOREST PRESERVE

P07-01 **BOHENSKY, ERIN and Albert van Jaarsveld** Centre for Environmental Studies, Geography Building Room 2 -1. University of Pretoria 0002, Pretoria, South Africa, (erin@sun.ac.za), Faculty of Science, University of Stellenbosch, Private Bag X1, Stellenbosch, 7602 South Africa
WATER MANAGEMENT AND CONSERVATION IN A SOUTHERN AFRICAN RIVER BASIN: A SCENARIO PLANNING APPROACH TO UNCERTAINTY

P24-03 **BOITANI, LUIGI and Valeria Salvatori** Institute of Applied Ecology, Via L. Spallanzani 32, IT – 00161 Rome(v.salvatori@ieaitaly.org) (VS). Dept. of Animal and Human Biology, University of Rome "La Sapienza", Viale dell'Università 32, IT – 00185 Rome (LB).
CONSERVATION OF LARGE CARNIVORES IN THE CARPATHIAN MOUNTAINS:A GEOGRAPHICAL ANALYSIS OF ENVIRONMENTAL SUITABILITY, DAMAGE AND PROTECTED AREAS

CO43-1 **BOITANI, LUIGI, Alessandra Falcucci, and Luigi Maiorano** Department of Animal and Human Biology, University of Rome "La Sapienza", viale dell'Università 32, 00185 Rome, Italy, (LB, AF, LM), (luigi.boitani@uniroma1.it) College of Natural Resources, University of Idaho, Moscow, Idaho, USA (AF, LM)
ITALIAN PROTECTED AREAS AND THEIR EFFICIENCY IN THE CONSERVATION OF VERTEBRATES: EFFECTS OF SCALE AND PLANNING UNIT SIZE

CO41-7 **BOLGER, DOUGLAS T., Michael A. Patten, and Eric L. Walters** Environmental Studies Program, HB6182, Dartmouth College, Hanover NH 03755 USA (DTB, ELW) (dbolger@dartmouth.edu). Sutton Avian Research Center, University of Oklahoma, PO Box 2007, Bartlesville OK 74005 (MAP).
VARIATION IN TOP-DOWN CONTROL OF AVIAN REPRODUCTIVE SUCCESS ACROSS AN URBAN FRAGMENTATION GRADIENT

S20-10 **BONACIC, CRISTIAN** Fauna Australis, Av. Vicuña Mackenna 4860, Macul Santiago,Chile (Bonacic@puc.cl)
CONFLICT RESOLUTION BETWEEN TWO WILD ENDANGERED UNGULATES AND INDIGENOUS PEOPLE IN THE ANDEAN MOUNTAINS OF NORTHERN CHILE

CO16-1 **BONTADINA, FABIO, Adrian Britschgi, and Alex Theiler** Conservation Biology, Zoological Institute, University of Berne, Baltzerstrasse 6, CH-3012 Berne, Switzerland (fabio.bontadina@swild.ch) (FB, AB). SWILD, Urban Ecology & Wildlife Research, Wuhrstrasse 12, CH-8003 Zurich, Switzerland (FB, AB). Swiss Bat Conservation, Geneva & Zurich, Switzerland (FB, AT).
USE OF AN ARTIFICIAL HEDGEROW AS FLIGHT PATH BY AN ENDANGERED BAT SPECIES: A FIELD EXPERIMENT AND ITS IMPLICATIONS FOR CONSERVATION

S20-9 **BORDINO, PABLO** Fundacion AquaMarina-CECM, Calle 307 N 560, (7165) Villa Gesell, Buenos Aires, Argentina.(bordino@aquamarina.org)
DOLPHINS, SEA LIONS AND FISHERMEN SURVIVAL ALONG THE BUENOS AIRES COAST, ARGENTINA

CO31-4 **BOUZAT, JUAN L., Jeremy D. Ross, Allan D. Arndt, Roger F. C. Smith, and Jeff A. Johnson** Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403, (jbouzat@bgnet.bgsu.edu) (JLB, JDR).Department of Biology, University College of the Fraser Valley, British Columbia, Canada (ADA). Department of Zoology, Brandon University, Manitoba, Canada (RFCS). Museum of Zoology, University of Michigan, Ann Arbor, MI 48109 (JAJ)
DEMOGRAPHIC AND GENETIC EVIDENCE SUGGEST RE-EVALUATING THE CONSERVATION STATUS OF THE GREATER PRAIRIE CHICKEN, TYMPANUCHUS CUPIDO

CO22-1 **BOWMAN, REED, Stephan J. Schoech, and Glen E. Woolfenden** Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33862 (rbowman@archbold-station.org) (RB, GEW). Dept. Biology, University of Memphis, Memphis, TN 38152(SJS).
URBANIZATION INFLUENCES TIMING OF BREEDING IN BIRDS: INTERACTIONS BETWEEN FOOD AND STRESS ON REPRODUCTION

P01-01 **BOYCE, JENNIFER** NOAA Restoration Center, 501 West Ocean Blvd., Suite 4470, Long Beach, CA 90802, 562-980-4086 (Jennifer.Boyce@noaa.gov)
RESTORING BALANCE: REMOVING THE BLACK RAT FROM ANACAPA ISLAND

S06-10 **BRASH, ALEXANDER** Natural Resources Group City of New York, Parks & Recreation, 1234 Fifth Avenue New York, N.Y. 10029 (Alex.Brash@parks.nyc.gov)
URBAN PARKS AS BIOTIC FONTS

CO36-1 **BRASHARES, JUSTIN S. and Moses K. Sam** Conservation Biology Group, Cambridge University, Cambridge, UK (JSB), (jsb58@cam.ac.uk) Ghana Wildlife Division, Accra, Ghana (MKS)
CASCADING TO COLLAPSE IN GHANA: INDIRECT IMPACTS OF OVER-HUNTING ON VERTEBRATE COMMUNITIES

CO41-6 **BROADHURST, Linda M. and Andrew G. Young** CSIRO Plant Industry, PO Box 1600 Canberra ACT 2601 Australia (Linda.Broadhurst@csiro.au)
ECOLOGICAL AND GENETIC CONSTRAINTS ON POPULATION PERSISTENCE IN ACACIA DEALBATA (MIMOSACEAE)

CO50-2 **BROMLEY, CASSITY, Seth P.D. Riley, Piper L. Roby, Jeffrey A. Sikich, Catherine M. Schoonmaker, and Raymond M. Sauvajot** Santa Monica Mountains National Recreation Area. 401 W Hillcrest, Thousand Oaks, CA 91360 (Cassity_Bromley@nps.gov)
A MANGE EPIDEMIC AND ANTICOAGULANT EXPOSURE IN URBAN BOBCATS IN SOUTHERN CALIFORNIA

P27-02 **BROOK, LAURO** St. John's University, Jamaica, N.Y. 11439. (laurob@stjohns.edu)
ANNUAL PATTERNS OF WATERFOWL DIVERSITY AND ABUNDANCE AT SUBURBAN PONDS AND LAKES ON LONG ISLAND, NEW YORK: IMPACT OF WINTER FREEZE

CO20-8 **BROOKS, THOMAS, John Pilgrim, Ana Rodrigues, and Mike Hoffmann** Center for Applied Biodiversity Science, Conservation International, 1919 M St NW Suite 600, Washington DC 20036 (t.brooks@conservation.org)
CIVIL CONFLICT, BIODIVERSITY, AND CONSERVATION

P23-01 **BROWN, MICHELLE L. and Timothy H. Tear** The Nature Conservancy, 200 Broadway, Suite 301, Troy, New York, 12180 (michelle_brown@tnc.org)
EVALUATING THE ROLE OF INVENTORY AND RESTORATION AS CONSERVATION STRATEGIES: SETTING LOCAL PRIORITIES FROM REGIONAL-SCALE CONSERVATION ASSESSMENTS

P20-01 **BROWN, LESLEY, Liza Agudelo, and Bill Varettoni** Sustainable Development and Conservation Biology, 1204 Biology-Psychology Building, University of Maryland, College Park, MD, 20742. (lakenutrients@yahoo.com)
PRACTICAL ATTENUATION OF EUTROPHICATION IN DEVELOPING NATIONS: DECENTRALIZED WASTEWATER TREATMENT, DETERGENT COMPOSITION AND AGRICULTURAL BEST MANAGEMENT

CO28-1 **BRUMBAUGH, DANIEL R., Kenneth Broad, Robert Cowen, Craig P. Dahlgren, Rob DeSalle, Alastair R. Harborne, Alan Hastings, Katherine E. Holmes, Carrie V. Kappel, Philip Kramer, Urmila Malvadkar, Saundra McLaughlin, John McManus, Fiorenza Micheli, Peter J. Mu** American Museum of Natural History, Center for Biodiversity and Conservation, Central Park West at 79th Street, New York, NY 10024-5192, USA (brumba@amnh.org; DRB, RD, KEH); University of Miami (KB, RC, PK, SM, JM, DBO, LTM); Caribbean Marine Research Center (CPD); University of Exeter, School of Biological Sciences (ARH, PJM); University of California-Davis (AH, UM); Stanford University, Hopkins Marine Station (CVK, FM, SRP); Resources for the Future (JNS); University of Arizona (RWS)
A SEASCAPE APPROACH TO STUDYING AND MODELING NETWORKS OF MARINE PROTECTED AREAS IN CORAL REEF ECOSYSTEMS

S20-8 **BUCHORI, DAMAYANTI, David Ardhian, Bandung Sahari, Akhmad Rizali1, and Shinta Puspitasari** 1 Center for Conservation and Insect Studies (CCIS) and Wildlife Trust Alliance, Komplek Perumahan IPB Alam Sinar Sari, Jl. Kecipir I Blok A No. 33, Cibeureum, Darmaga, Bogor 16610 West Java,Indonesia (kpkai@indo.net.id) (DB,BS,AR. SP) Department of Plant Pests and Diseases, Faculty of Agriculture, Bogor Agricultural University-IPB Campus Dramaga, Bogor 16680 Indonesia (DB) Wildlife Trust Alliance, New York (DB,BS,AR,SP) Nastari Foundation, Jalan Daya Prakarsa no 5, Sindangbarang, Bogor,16610 Indonesia (DA)
FEEDING AN INCREASINGLY URBAN POPULATION: INTENSIFICATION OF AGRICULTURE, BIODIVERSITY LOSS, AND AGRICULTURAL PEST EXPLOSIONS ON FARMS

CO24-2 **BUHLMANN, KURT A.** Conservation International-Center for Applied Biodiversity Science, 1919 M Street NW, Washington, DC 20036 USA and University of Georgia's Savannah River Ecology Laboratory, Aiken, South Carolina 29802. (kbuhlmann@earthlink.net)
CONCEPTUALIZING A GLOBAL, MULTI-FACETED CONSERVATION PLAN FOR TORTOISES AND FRESHWATER TURTLES

P05-03 **BUOT, INOCENCIO JR. and Katsuhiro Osumi** Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Banos, College, 4031 Laguna, Philippines (iebuot@yahoo.com) (IB). Kansai Research Center, Forestry and Forest Products Research Institute, Nagai-Kyutarou 68, Momoyama, Fushimi, Kyoto 612-0855, Japan (KO)
ECOSYSTEM LANDSCAPE MONITORING ON MOUNT AKIKI, CORDILLERA MOUNTAIN RANGE, PHILIPPINES

CO44-9 **BURBIDGE, MARYANN L., Allan J. Baker, Rogan M. Colbourne, and Hugh A. Robertson** Centre for Biodiversity and Conservation Biology, Royal Ontario Museum (ROM), 100 Queens Park, Toronto, ON M5S 2C6 Canada (maryannb@rom.on.ca) (MLB, AJB), Department of Zoology, University of Toronto, 25 Harbord St., Toronto, ON M5S 3G5 Canada (MLB, AJB), Science and Research Unit, Department of Conservation (DoC), P.O. Box 10-420 Wellington New Zealand (RCM, HAR)
PHYLOGENETIC DISTINCTNESS AND POPULATION STRUCTURE ARE CONDUCIVE TO THE DEFINITION OF CONSERVATION MANAGEMENT UNITS WITHIN NEW ZEALAND BROWN KIWI (APTERYX SPP.)

P26-03 **BURBIDGE, MARYANN L.** Centre for Biodiversity and Conservation Biology, Royal Ontario Museum (ROM), 100 Queens Park, Toronto, ON M5S 2C6 Canada & Department of Zoology, University of Toronto, 25 Harbord St., Toronto, ON M5S 3G5 Canada
BRIDGING THE GAP FROM SCIENTIST TO SCIENTIST TO MANAGER: AN EXAMPLE FROM THE KIWI RECOVERY PROGRAMME

S06-3 **BURGER, JOANNA, Michael Gochfeld, and Sheila Shukla** Division of Life Sciences, 604 Allison Road, Piscataway, NJ 08854 (burger@biology.rutgers.edu). Michael Gochfeld, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ Sheila Shukla,Division of Life Sciences, 604 Allison Road, Piscataway, NJ 08854
USING COMMON TERNS (STERNA HIRUNDO) AS BIOINDICATORS OF LEVELS OF METALS

S13-4 **BURGESS, N., J. Lovett, Q. Luke, R. Gereau, L.A. Hansen, J. Fjelds, N. Cordeiro, E. Nashanda, F. Kilahama, N. Doggart, and S. Mashauri** UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). (neil.burgess@wwfus.org). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC (NB). Centre for Ecology, Law and Policy, Environment Department, University of York, York YO10 5DD, UK (JL). National Museums of Kenya (QL). Missouri Botanical Garden (RG), Zoological Museum (LAH, JF). Department of Biological Sciences (M/C 066), University of Illinois at Chicago, (NC). Tanzania Wildlife Research Institute (NC). Forest and Beekeeping Division, Ministry of Natural Resources and Tourism (FK, EN, SM). Tanzania Forest Conservation Group (NG)
THE BIOLOGICAL IMPORTANCE OF THE EASTERN ARC MOUNTAINS OF TANZANIA AND KENYA

S13-1 **BURGESS, NEIL, Taylor Ricketts, and Andrew Balmford** UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). (neil.burgess@wwfus.org). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC (NB, TR). Conservation Biology Group, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK (AB)
CORRELATION BETWEEN HIGH POPULATION DENSITY AND BIODIVERSITY IN AFRICAN FORESTED REGIONS

CO22-2 **BURKE, DAWN M., Erica Nol, Judith Phillips, and Wendy Dunford** Southern Science and Information Unit, Ontario Ministry of Natural Resources, 659 Exeter Rd., London, ON, N6E 1L3 (dawn.burke@mnr.gov.on.ca). Biology Department, Trent University, Peterborough, ON, K9J 7B8 (EN). Watershed Ecosystems Graduate Program, Trent University, Peterborough, ON, K9J 7B8 (JP). Species at Risk Branch, Canadian Wildlife Service, 351 St. Joseph Blvd., Hull, Quebec, Canada, K1A 0H3 (WD).
EFFECTS OF HOUSING DEVELOPMENTS ON BREEDING SUCCESS OF FOREST BIRDS

CO5-3 **BURKE, LAURETTA and Jon Maidens** World Resources Institute, 10 G Street, NE, Washington, DC 20002 (lauretta@wri.org)
REEFS AT RISK IN THE CARIBBEAN - USE OF GIS AND REMOTE SENSING TO EVALUATE HUMAN PRESSURE ON CORAL REEFS

P09-02 **BURKE, R.L.** Department of Biology, Hofstra University, Hempstead, NY,11549 (biorlb@hofstra.edu)
TERRAPIN CONSERVATION IN A NATIONAL PARK IN NYC: WHAT IS NATIVE AND WHAT SHOULD BE PROTECTED?

CO16-2 **BURNS, CATHERINE E., Oswald J. Schmitz, and Kevin M. Johnston** Yale University, Department of Ecology and Evolutionary Biology (CEB), and School of Forestry and Environmental Studies (OJS, KMJ); 370 Prospect Street, New Haven, CT 06511 (catherine.burns@yale.edu)
GLOBAL CLIMATE CHANGE AND MAMMALIAN SPECIES DIVERSITY IN U.S. NATIONAL PARKS

CO18-4 **BUSTAMANTE, JAVIER and Javier Seoane** Spatial Ecology Group. Dept. Applied Biology. Estación Biológica de Doñana, CSIC. Avda. María Luisa s/n, 41013,Sevilla, Spain (jbustamante@ebd.csic.es)
STATISTICAL MODELS OUTPERFORM EXPERTS PREDICTING BIRD DISTRIBUTION: ARE GAP PROJECTS MISSING SOMETHING?

CO24-3 **BUSTEED, GARY T., Seth P. D. Riley, Lee Kats, Tom Vandergone, Rosi Dagit, Cassity Bromley, Piper Roby, Cathy Schoonmaker, Lena Lee, Brian Westerhouse, Jeff Sikich, and Robert Fisher** National Park Service—Santa Monica Mountains National Recreation Area, 401 West Hillcrest Dr. Thousand Oaks, California 91360 (gary_busteed@nps.gov.) (GTB, SPDR, PR, CS, LL, BW, JS), Pepperdine University, Malibu California (LK, TV), Resource Conservation District of the Santa Monica Mountains, Topanga Canyon, CA (RD), U.S. Geological Survey-Biological Resources Division, San Diego CA. (RF)
URBAN IMPACTS ON TERRESTRIAL AND AQUATIC REPTILE AND AMPHIBIAN COMMUNITIES IN SOUTHERN CALIFORNIA

CO36-2 **BYNUM, NORA and Claire Hemingway** Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th St.,NY,NY 10024 (NB) (nbynum@amnh.org). Missouri Botanical Garden, Box 299, St. Louis, MO 63166 (CH)
CONSERVATION IMPLICATIONS OF PRIMATE RESPONSES TO SEASONALITY

P03-02 **CADENA-SALGADO, MARTÍN and David Valenzuela Galván** Departamento de Ecología y Conservación de los Recursos Naturales, Centro de Educación Ambiental e Investigación Sierra de Huautla, Universidad Autónoma del Estado de Morelos. Av. Universidad No. 1001, Col. Chamilpa, Cuernavaca, Morelos, México, CP 62210. (cadenamartin@hotmail.com)
CONSERVATION OF RODENT COMMUNITIES IN A MEXICAN TROPICAL DRY FOREST: EFFECTS OF VEGETATION DISTURBANCE AND CLIMATIC SEASONALITY

P08-01 **CALLMANDER, Martin W., George E. Schatz, Trisha Consiglio, and Porter P. Lowry II** University of Neuchatel, Laboratoire de Botanique Evolutive, Case Postale 2, 2007 NEUCHATEL,Switzerland. (callmander@unine.ch). Missouri Botanical Garden, P.O. Box 299, 63166-0299 St. Louis, MO. Département de Systématique et Evolution, Muséum national d'Histoire naturelle, 16, rue Buffon, 75005 Paris, France.
APPLICATION OF IUCN CRITERIA AND RED LIST CATEGORIES AND ASSESSMENT OF PRIORITY AREAS FOR PLANT CONSERVATION IN MADAGASCAR: A CASE STUDY WITH THE FAMILY PANDANACEAE

CO2-1 **CAMERON, ALISON, Chris D. Thomas,Rhys E. Green, Michel Bakkenes, Linda J. Beaumont, Yvonne C. Collingham, Barend F. N. Erasmus, Marinez Ferreira de Siqueira, Alan Grainger, Lee Hannah, Lesley Hughes, Brian Huntley, Albert S. van Jaarsveld, Guy F. Midgley**, Centre for Biodiversity and Conservation, School of Biology, University of Leeds, Leeds, LS2 9JT, UK (CDT.) (bgyaca@leeds.ac.uk). Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, UK. (REG). National Institute of Public Health and Environment, P.O. Box 1, 3720 BA Bilthoven, the Netherlands (MB). Department of Biological Sciences, Macquarie University, North Ryde, 2109, NSW, Australia (LJB, LH). University of Durham, School of Biological and Biomedical Sciences, UK (YCC). Animal, Plant and Environmental Sciences, University of the Witwatersrand, South Africa(BFNE). Centro de Referência em Informação Ambiental, Brazil (MFS). School of Geography, University of Leeds, UK (AG and OLP). Center for Applied Biodiversity Science, Conservation International (LH). University of Durham (BH). Department of Zoology, University of Stellenbosch (ASJ); Climate Change Research Group, Kirstenbosch Research Centre, (GFM). Universidad Nacional Autónoma de México (MAO), University of Kansas (ATP.); James Cook University (SEW).
EXTINCTION RISK FROM CLIMATE CHANGE

P04-01 **CANONICO, GABRIELLE C. and Michele Thieme** University of Maryland, Graduate Program in Sustainable Development and Conservation Biology, College Park, MD(GCC) (canonico@wam.umd.edu). World Wildlife Fund, Conservation Science Office, 1250 24th St., NW, Washington, DC (MT).
POTENTIAL IMPACTS OF INTRODUCED TILAPIA (FAMILY: CICHLIDAE) ON NATIVE BIODIVERSITY

CO8-6 **CARROLL, CARLOS** Klamath Ctr for Conservation Research, Orleans, CA 95556 (carlos@sisqtel.net)
CONTRASTING SCALES OF POPULATION DYNAMICS INFORM RECOVERY STRATEGIES FOR WOLF, LYNX, AND MARTEN IN THE NORTHERN APPALACHIANS REGION

S09-1 **CATTERALL, CARLA** Environmental Sciences, Griffith University, Nathan, Qld. 4111, AUSTRALIA. (c.catterall@griffith.edu.au)
RESPONSE GUILDS OF FAUNAL ASSEMBLAGES AND URBAN HABITAT MOSAICS: A PERSPECTIVE FROM EASTERN AUSTRALIA

CO25-2 **CEBALLOS, GERARDO, Paul R. Ehrlich, Gretchen C. Daily, Jorge Soberón, Irma Salazar, and John P. Fay** Instituto de Ecologia, UNAM, Apdo. Postal 70-275, Mexico D.F. 04510, Mexico. (gceballo@miranda.ecologia.unam.mx) (GC, JS, IS). Center for Conservation Biology, Department of Biological Sciences, Stanford University, Palo Alto, CA 94305-5020.
GLOBAL MAMMAL CONSERVATION PRIORITIES: WHAT MUST WE MANAGE?

CO44-7 **CEGELSKI, CHRISTINE C., Madison S. Powell, and Matthew R. Campbell** University of Idaho & Idaho Department of Fish and Game, 1800 Trout. Rd., Eagle, ID 83616 (ccegelski@idfg.state.id.us); CC),University of Idaho,Center for Salmonid and Freshwater Species at Risk, Hagerman, ID 88332 (MP)Idaho Department of Fish and Game, 1800 Trout Rd., Eagle, ID 83616 (MC)
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CO52-8 **CHALMERS, REBECCA and Cynthia S. Loftin** USGS-BRD Maine Cooperative Fish and Wildlife Research Unit, 5755 Nutting Hall, University of Maine, Orono, ME 04469-5755 (rebecca_chalmers@umit.maine.edu)
MODELING FOUR-TOED SALAMANDER (HEMIDACTYLIUM SCUTATUM) NESTING HABITAT

CO31-1 **CHAN, KAI M. A. and Gretchen C. Daily** Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, CA 94305 (kaichan@stanford.edu).
PREDICTING THE EFFECTS OF LANDSCAPE MANAGEMENT ON TROPICAL COUNTRYSIDE BIODIVERSITY

S09-4 **PARKER, TOMMY S. and CHARLES H. NILON** Department of Fisheries and Wildlife Sciences, 302 Anheuser-Busch Natural Resources Building, University of Missouri-Columbia, Columbia, MO 65211-7240, (tsp62e@mizzou.edu)
COMPARATIVE STUDY OF NATIVE AND EXOTIC URBAN GRAY SQUIRREL POPULATIONS

CO13-1 **CHUAHAN, DEVENDRA S.** Wildlife Institute of India, PO Box 18, GPO Chandrabani, Dehra Dun 248001, India (devendra@wii.gov.in)
MANAGING LEOPARD (PANTHERA PARDUS) POPULATION IN HUMAN MODIFIED LANDSCAPE IN HIMALAYAS: IS IT POSSIBLE?

CO30-3 **CHEN, YOUPING, Hao Wang, Shiwei Jiang, Lianjun Zhao, and Junzhong Huang** WangLang National Nature Reserve,No.88 South Street,Pingwu County, Sichuan, 622550, China (scwlnrt@my-public.sc.cninfo.net) (YC,SJ,LZ,JH) Mailbox #1, College of Life Science, Peking University, Beijing, 100871, China.(HW)
BRIDGING MONITORING AND MANAGEMENT: EXPERIENCES OF MONITORING WILD PANDA IN WANGLANG NATURE RESERVE, SICHUAN, CHINA

CO44-8 **CHEN, XIAO-YONG, Hui-ping Lu, Xin Zhang, and Dong Zhang** Department of Environmental Sciences, East China Normal University, 3663 Zhongshan R (N.), Shanghai 200062, P. R. China, (xychen@des.ecnu.edu.cn)
GENETIC VARIATION OF THE THREATENED SPECIES HEPTACODIUM MICONIOIDES (CAPRIFOLIACEAE): IMPLICATIONS FOR CONSERVATION

P08-02 **CHOW, JEFFERY and Laura Snook** Center for International Forestry Research, P.O. Box 6596 JKPWB, Jakarta 10065, Indonesia (LS). Resources for the Future, 1616 P Street NW, Suite 600, Washington, DC 20036 (chow@rff.org)(JC)
SUSTAINING MAHOGANY FORESTRY: REGENERATION WITHIN ANTHROPOGENIC CANOPY GAPS IN THE SUBTROPICAL MOIST FORESTS OF BELIZE

CO23-1 **CHRISTEN, CATHERINE A. and Peter Leimgruber** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (christenc@crc.si.edu).
WINDOW FROM THE SKY: THE IMPACT OF SATELLITE MONITORING ON CONSERVATION OF NATURAL RESOURCES

P29-04 **CHUNG, CLAUDIA and Jessica Amanzo** Departamento de Mastozoología, Museo de Historia Natural,Universidad Nacional Mayor de San Marcos, Av. Arenales 1256, Jesús Maria, Ap. 14-0434, Lima, Perú (claudia_luciac@yahoo.com)
THE ANDEAN BEAR IN THE NORTH OF PERU: ESTIMATE DISTRIBUTION AND THREATENS

CO11-1 **CLARK, J. ALAN** University of Washington, Department of Biology, Box 351800, Seattle, WA 98195-1800 (alanc@u.washington.edu)
A DOUBLE EDGE TO ENVIRONMENTAL CITIZEN SUITS?

S14-7 **CLARKE, SHELLEY and Murdoch McAllister** National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan, 5-7-1 Shimizu-Orido, Shizuoka 424-8633, Japan (sclarke@fra.affrc.go.jp) (SC) Renewable Resources Assessment Group, Department of Environmental Science and Technology, Imperial College London, SW7 2AZ (MM)
PROBABILISTIC METHODS FOR HANDLING MISSING DATA AND CONVERSION FACTORS IN TRADE DATASETS: AN EXAMPLE FROM THE ASIAN SHARK FIN TRADE

S16-6 **CLAYTON, LYNN and E.J. Milner-Gulland** WILDCRU, Dept of Zoology, U of Oxford, UK. (LC) Reader in Conservation Science, Renewable Resources Assessment Group, Dept of Environmental Science and Technology, Faculty of Life Sciences, South Kensington Campus, Imperial College London, SW7 2AZ, UK (e.j.milner-gulland@imperial.ac.uk)
THE TRADE IN TWO ENDEMIC WILD PIG SPECIES IN NORTH SULAWESI

CO46-5 **CLYNICK, BRIANNA** Centre for Research on Ecological Impacts of Coastal Cities, Marine Ecology Laboratories A11, University of Sydney, NSW 2006, Australia (bclynick@bio.usyd.edu.au)
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P33-01 **COHEN, JONATHAN B. and James D. Fraser** Department of Fisheries and Wildlife Sciences, Virginia Tech University, Blacksburg, VA 24061-0321 (jocohen1@vt.edu)
FACTORS LIMITING PIPING PLOVER NESTING PAIR DENSITY IN NEW YORK

P23-02 **COLES, CHRISTOPHER F., Gavin Stewart, and Andrew S. Pullin** Centre for Evidence–Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK, (c.f.coles@bham.ac.uk)
DOES ROTATIONAL BURNING OF UK SUB–MONTANE, DRY DWARF–SHRUB HEATH MAINTAIN VEGETATION DIVERSITY? USING AN EVIDENCE–BASED FRAMEWORK FOR DECISION SUPPORT

S07-4 **COLLINGE, SHARON K.** Associate Professor Dept. of Ecology and Evolutionary Biology and Environmental Studies Program 334 UCB, University of Colorado Boulder, CO 80309-0334 (Sharon.Collinge@colorado.edu)
PLAGUE AND PRAIRIE DOGS: CONFLICTS BETWEEN CONSERVATION AND PUBLIC HEALTH

S07-1 **COLWELL, RITA** Distinguished University Professor, University of Maryland at College Park and Johns Hopkins, Bloomberg School of Public Health
GLOBAL INFECTIOUS DISEASES, WATER AND HUMAN HEALTH

S10-7 **COOK, ROBERT A. and William B. Karesh** Wildlife Health Sciences, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (rcook@wcs.org)
PEOPLE, POODLES, PIGS AND PRIMATES (OF THE NON-HUMAN KIND)- THE POTENTIAL FOR ONE HEALTH THROUGH PUBLIC-PRIVATE PARTNERSHIPS

CO41-8 **CORDEIRO, NORBERT** University of Illinois at Chicago, Department of Biological Sciences (m/c 066),845 W Taylor St, Chicago, IL 60607. Tanzania Wildlife Research Institute, PO Box 661, Arusha, Tanzania (ncorde1@uic.edu)
CHANGES IN BIRD COMMUNITIES IN FOREST FRAGMENTS OF A THREATENED AFRICAN ECOSYSTEM

P05-04 **CORTES-BURNS, HELEN and Sahotra Sarkar** Biodiversity and Biocultural Conservation Laboratory, Section of Integrative Biology, University of Texas at Austin, Waggener Hall 316, Austin, TX 78712 -1180 (h_cortesburns@mail.utexas.edu)
PRIORITIZING MARINE SITES FOR CONSERVATION: AN ANALYSIS OF THE NORTHERN GULF OF MEXICO

CO39-2 **SMITH, COURTLAND M. and Douglas G. Wachob** Teton Science School, Conservation Research Center, P.O. Box 68 Kelly, WY 83011 (court.smith@tetonscience.org)
THE EFFECTS OF HUMAN RESIDENTIAL DEVELOPMENT ON AVIAN COMMUNITIES ALONG THE SNAKE RIVER RIPARIAN CORRIDOR IN JACKSON HOLE, WY, USA

P01-02 **CRAINE, IAN and Mart Gross** Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, Ontario, Canada, M5S 3G5 (IC,MG) (crainei@zoo.utoronto.ca)
INTRODUCED CHINOOK SALMON NATURALIZING IN LAKE ONTARIO: FACTORS CONTRIBUTING TO SUCCESS AND IMPACTS ON STREAM ECOSYSTEMS

P27-03 **CRAMPTON, LISA H., William S. Longland, and M. Peacock** Ecology, Evolution and Conservation Biology, University of Nevada Reno, Reno NV 89557 (crampton@unr.nevada.edu)
FACTORS INFLUENCING THE DISTRIBUTION AND ABUNDANCE OF PHAINOPEPLAS (PHAINOPEPLA NITENS, AVES), IN SOUTHERN NEVADA: IS DESERT MISTLETOE NECESSARY BUT NOT SUFFICIENT?

S12-7 **CRONE, NIELS and David S. Wilkie** Conservation International, 1919 M Street, NW, Suite 600, Washington, D.C. 20036 (NC) (niels.crone@conservation.org), Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10468 (DW)
MAKING CONSERVATION COST-EFFECTIVE: DEVELOPING SYSTEMS TO ACCOUNT FOR CONSERVATION SPENDING

CO47-7 **CROOKS, KEVIN R., Andrew V. Suarez and Douglas T. Bolger.** Dept of Fishery and Wildlife Biology, Colorado State University, Ft. Collins, CO 80525 (kcrooks@cnr.colostate.edu) (KRC). School of Integrative Biology, Departments of Entomology and Animal Biology, University of Illinois, Urbana, IL 61801, (AVS). Environmental Studies Program, HB6182, Dartmouth College, Hanover, NH. 03755 (DTB).
AVIAN ASSEMBLAGES ALONG A GRADIENT OF URBANIZATION IN A HIGHLY FRAGMENTED LANDSCAPE

S19-4 **CROWLEY HELEN, Frank Hawkins, David Meyers, and Joanna Durbin** Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (HC,DM)(hcrowley@wcs.org). Conservation International Madagascar, BP 5178, Antananarivo, Madagascar (FH). Durrell Wildlife Conservation Trust, BP 8511, Antananarivo 101, Madagascar (JD)
WHAT DO WE REALLY NEED TO CONSERVE THE BIODIVERSITY OF MADAGASCAR

P33-02 **CSUTI, BLAIR, David W. Hays, Lisa A. Shipley, Rodney D. Sayler, Ken I. Warheit, Rachel Lamson, Jan Steele, Robert D. Westra, Tara B. Davila, Michael Illig, Patricia Swenson, Lisa Harrenstien, Nicole Siegel, Beau A. Patterson, Harriet L. Allen, Tom C. McCa** Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501 (DWH, KIW, BAP, HLA, TCM). Department of Natural Resource Sciences, Washington State University, Pullman, WA 99164 (LAS, RDS, RDW, TAB, NS, BE). Oregon Zoo, 4001 SW Canyon Road, Portland, OR 97221 (csutib@metro.dst.or.us) (RL, JS, MI, PS, LH, BC, DJS). Northwest Trek Wildlife Park, 11610 Trek Drive E, Eatonville, WA 98328 (EC).
RECOVERY OF THE COLUMBIA BASIN PYGMY RABBIT (;BRACHYLAGUS IDAHOENSIS;) IN WASHINGTON STATE, USA

S20-5 **CULLEN, L. IPÊ** Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance, C.P 31. Teodoro Sampaio, SP. 19280 Brazil (Lcullen@stetnet.com.br)
JAGUAR AS LANDSCAPE DETECTIVES FOR THE ATLANTIC FOREST, BRAZIL

CO1-1 **CULVER, DAVID C. and Diane S. Pavek** Department of Biology, American University, 4400 Massachusetts Ave., NW, Washington DC 20016 (DCC). National Capital Region, National Park Service, 4598 MacArthur Blvd. NW, Washington, DC 20007 (DSP). (dculver@american.edu)
PROTECTING UNIQUE GROUNDWATER AMPHIPODS IN ROCK CREEK PARK, WASHINGTON, DC

CO49-6 **CURTIN, CHARLES** Arid Lands Project, Box 29, Animas, NM. 88020, (ccurtin@earthlink.net)
INTEGRATION OF SCIENCE AND LOCAL KNOWLEDGE: LANDSCAPE LEVEL CONSERVATION, SCIENCE, AND THE SOCIO-ECONOMIC CONTEXT

CO53-8 **CURTIS, JANELLE M.** Project Seahorse, Department of Biology, McGill University, 1205 Dr. Penfied Avenue, Montreal, Quebec, H3A 1B1 (janelle.curtis@mail.mcgill.ca).
PREDICTING POPULATION-LEVEL RESPONSES TO GENERIC CONSERVATION STRATEGIES FOR SEAHORSES

S04-1 **CZECH, BRIAN** Virginia Polytechnic Institute and State University, Northern Virginia Center, 1021 Prince Street, Alexandria, Virginia 22314 (brianczech@juno.com)
URBANIZATION AS A THREAT TO BIODIVERSITY: NICHE BREADTH, TROPHIC THEORY, AND ECONOMIC GEOGRAPHY

CO53-6 **D'AGROSA, CATERINA, Andrew J. Read, Patrick N. Halpin, and Martin A. Hall** Duke University Marine Lab, 135 Duke Marine Lab Rd., Beaufort, NC 28516 (cdagrosa@wcs.org) (CD, AJR); Nicholas School of the Environment and Earth Sciences, Box 90328, Duke University, Durham, NC, 27708 (PNH); Inter-American Tropical Tuna Commission, 8604 La Jolla Shores Dr., La Jolla, CA, 92037 (MAH); Wildlife Conservation Society, Marine Program
REDUCING THE ECOLOGICAL COST OF THE U.S. ATLANTIC PELAGIC SWORDFISH LONGLINE FLEET: TOOLS FOR INCORPORATING SPATIAL DISTRIBUTION INTO TIME-AREA CLOSURE DESIGN

CO46-6 **DAHANUKAR, NEELESH, Rupesh Raut, Sanjay Kharat, Mandar Paingankar, and Mukul Mahabaleshwarkar** RANWA, C – 26 / 1, Ketan Heights, Kothrud, Pune – 411038, India, (neeleshdahanukar@rediffmail.com) (ND, RR, MP, MM). Department of Zoology, Abasaheb Garware College, Pune – 411004, India (SK)
A NEED FOR SYSTEMATIC APPROACH TOWARDS CONSERVATION OF FISH IN THE WESTERN GHATS OF INDIA

P34-03 **DALL'AGLIO-HOLVORCEM, CHRISTIANE, Suzane M.F. Souza, Everton G. Costa, and F. Benedetti** Departamento Técnico-Científico, Fundação José Pedro de Oliveira, Campinas, SP, 13084-830, Brazil, (fjpodtc@hotmail.com)
ECOLOGICAL RESTORATION OF AN EDGE STRIP AT THE SANTA GENEBRA FOREST RESERVE (CAMPINAS, BRAZIL): MONITORING OF ARBOREAL SPECIES OVER A TWO-YEAR PERIOD

P20-02 **DALZEN, ROBYN, Marianne Dunn, Kim Bonine, and John Reid** BP Conservation Programme, 1919 M Street NW Ste 600, Washington, DC 20036 USA (RD); BP Conservation Programme, BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA UK (MD); Conservation Strategy Fund, 303 Potrero St. 42-301, Santa Cruz, CA 95060, (KB, JR).
THE ROLE OF STUDENT-LED RESEARCH IN BUILDING THE CAPACITY OF THE NEXT GENERATION OF CONSERVATION PRACTITIONERS

S06-8 **DANOFF-BURG, JAMES A., Elizabeth Nichols, and Fred Koontz** Department of Ecology, Evolution, and Environmental Biology, Columbia University, 1200 Amsterdam Ave, MC 5557, New York, NY, 10027, (jd363@columbia.edu); Department of Ecology, Evolution, and Environmental Biology, Columbia University, 1200 Amsterdam Ave, MC 5557, New York, NY, 10027. Wildlife Trust, 61 Route 9W, Palisades, NY 10964
FROM DUNG BEETLES TO PARASITIC WASPS: KEEPING INSECTS IN THE METROPOLITAN MIX

P26-05 **DANTAS, GISELE P.M, Patrícia. J. Faria, Fausto P. Campos, Joaquim B. Olinto, and Joao S. Morgante** Instituto de Biologia, Universidade de Sao Paulo, Rua do Matao, 277, Sao Paulo, Brazil 05508-090 (giselebio@yahoo.com.br) (GPMD, PJF, JSM); Fundaçao Florestal Rua do Horto, 931 Sao Paulo, Brazil 02377-000 (FCP). Centro de Estudos Tecnologicos do Mar e da Terra, Universidade do Vale do Itajai, Rua Uruguai, 458 C.P. 360, Itajai, Santa Catarina, Brazil (JBO)
GENETIC VARIABILITY OF *LARUS DOMINICANUS* AND YOUR IMPLICATIONS FOR CONSERVATION

CO48-5 **DAVENPORT, TIM R.B.** Wildlife Conservation Society P.O. Box 1475, Mbeya, TANZANIA (trbd@atma.co.tz)
WHERE THE ARCS MEET THE RIFT: BIOGEOGRAPHY, OUTLIERS AND CONSERVATION IN TANZANIA'S SOUTHERN HIGHLANDS

P32-02 **MACHAGA, SOPHY J., Alfred A. Massawe, and Tim R.B. Davenport** Wildlife Conservation Society, P.O. Box. 1475, Mbeya, TANZANIA, (trbd@atma.co.tz)
MEDICINE, MEAT AND MAHOGANY: UNDERSTANDING NATURAL RESOURCE USE ON MT RUNGWE, SOUTHWESTERN TANZANIA

CO50-7 **DAVIDSON, CARLOS, Michael Benard, H. Bradley Shaffer, Louise Rollins-Smith, and John M. Parker** Dept of Environmental Studies, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6001 (CD) (cdavidson@csus.edu) Center for Population Biology, University of California, Davis, CA 95616 (MB) Section of Evolution and Ecology, and Center for Population Biology, University of California, Davis, CA 95616 (HBS) Department of Microbiology and Immunology, Vanderbilt University, Nashville, TN 37232-2363 (LR) Office of Laboratory Animal Care, University of California, Berkeley, CA 94720-7150(JP)
THE EFFECTS OF LOW DOSES OF PESTICIDES ON FROG SUSCEPTIBILITY TO CHYTRID FUNGUS

P09-03 **DAVIS, CAROLYN M.** National Park Service, National Natural Landmarks Program, 791 Baltimore St, Gettysburg, PA (carolyn_davis@nps.gov)
THE NATIONAL NATURAL LANDMARKS PROGRAM IN THE NORTHEAST UNITED STATES; ENCOURAGING CONSERVATION AMONGST URBAN LANDSCAPES

CO19-4 **DECANDIDO, ROBERT, Adrianna A. Muir, and Margaret B. Gargiullo** The City College of the City University of New York, Department of Biology, New York, NY 10031 (rdcny@earthlink.net). Graduate Group in Ecology, University of California at Davis, CA 95616. Natural Resources Group of the City of New York, Department of Parks and Recreation, 1234 Fifth Avenue, New York, NY 10029
THE HISTORICAL AND EXTANT FLORA OF NEW YORK CITY, CA. 1850-PRESENT: IMPLICATIONS FOR CONSERVATION OF NATIVE PLANT SPECIES

CO23-5 **DEHGAN, ALEX** Coalition Provisional Authority (Baghdad) and U.S. Department of State, 2201 C Street, NW, Washington, DC 20009 (dehgana@orha.centcom.mil)
THE STATUS OF CONSERVATION BIOLOGY AND SCIENCE IN IRAQ

CO31-6 **DELGADO, MARTA, José Guerreiro, and Rita Alcazar** Faculdade de Ciências da Universidade de Lisboa, Campo Grande, Edificio C5 1749-016 Lisboa Portugal(marta_delgado@mail.pt)(MD, JG). Liga para a Protecção da Natureza, Estrada do Calhariz de Benfica 187, 1500 Lisboa Portugal(RA).
PLANNING ECOTOURISM IN THE SPECIAL PROTECTION AREA OF CASTRO VERDE, PORTUGAL

CO37-4 **DELLASALA, DOMINICK, Jack Williams, Cindy Deacon Williams, and Jerry F. Franklin** World Wildlife Fund; 116 Lithia Way, Ashland, OR 97520 (dellasal@wwfks.org), Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520 (JW), Headwaters, 84 4th St., Ashland, OR 97520 (CDW), University of Washington, College of Forest Resources, Seattle, WA 98195 (JF)
BEYOND SMOKE AND MIRRORS: A SYNTHESIS OF FIRE POLICY AND SCIENCE

P29-08 **MPUNGA, NOAH E. and Daniela DeLuca** Wildlife Conservation Society (WCS), P.O. Box 1475, Mbeya, TANZANIA (dwdl@atma.co.tz)
CARNIVORE COMMUNITIES IN TWO MONTANE FORESTS IN SOUTHERN TANZANIA: INVENTORY AND ETHNOMAMMALOGY IN SITES OF DIFFERING MANAGEMENT REGIMES

S13-2 **DEO, KUJIRAKWINJA, Isaiah Owiunji, and Helga Rainer** Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (DK, IO) (deokujirak@yahoo.fr). International Gorilla Conservation Programme, PO Box 10950, Kampala, Uganda (HR)
TRANSBOUNDARY COLLABORATION TO ENSURE BETTER CONSERVATION IN THE GREATER VIRUNGA LANDSCAPE

S05_7 **DEPHILIP, MICHELE** The Nature Conservancy, Great Lakes Program, 8 S. Michigan Avenue, Suite 2301, Chicago, IL (mdephilip@tnc.org)
FLOW PROTECTION FOR NORTH AMERICAN GREAT LAKES ECOSYSTEMS

CO33-1 **DEW, J. LAWRENCE and Paul Butler** Dept. ESPM, Div. I.B., 201 Wellman Hall, University of California, Berkeley, CA 94720-3112 (ldew@rarecenter.org) (JLD). Rare 1840 Wilson Blvd, Ste 402, Arlington, VA 22201 USA (PB)
STRATEGIC METHODS FOR TROPICAL CONSERVATION THROUGH COMMUNITY OUTREACH

P06-02 **Baldwin, Robert F., PHILLIP G. DEMAYNADIER and Aram J.K. Calhoun.** Baldwin, Robert F., PHILLIP G. DEMAYNADIER and Aram J.K. Calhoun. Program in Ecology and Environmental Science, 5722 Deering Hall, University of Maine, Orono, ME 04473(RFB) (rob_Baldwin@umenfa.maine.edu) 207-581-2972, Department of Plant, Soil and Environmental Sciences, University of Maine (AJKC), Endangered Species Program, Maine Department of Inland Fisheries and Wildlife, 650 State St., Bangor, Maine 04401 (PGD).
PRIORITIZING CONSERVATION ACTION FOR POOL-BREEDING AMPHIBIANS USING A LANDSCAPE-SCALE THREAT ANALYSIS

CO14-3 **DIAMOND, DAVID D., Taisia Gordon, C. Diane True, Walter E. Foster, and Hollis Mehl** Missouri Resource Assessment Partnership, University of Missouri, 4200 New Haven Road, Columbia, MO 65201 (diamondd@missouri.edu) (DDD, TG, CDT). US EPA Region 7, 901 N 5th, Kansas City, KS (WEF, HM).
IDENTIFICATION AND MAPPING OF CRITICAL ECOSYSTEMS IN THE LOWER MIDWESTERN USA

P11-02 **DIDIER, KARL A. and William F. Porter** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (KAD), (kdidier@wcs.org)
TEMPORAL DYNAMICS OF FORESTS ON TIMBERLAND IN NORTHERN NEW YORK STATE, 1968-1993

CO47-4 **DIEHL, ROBERT H.** University of Southern Mississippi, Department of Biological Sciences, 118 College Drive [5018], Hattiesburg, MS 39406-0001 (robert.diehl@usm.edu)
RADAR OBSERVATIONS QUANTIFY THE IMPORTANCE OF SUBURBAN HABITAT TO MIGRATORY BIRDS

CO7-8 **DILLEY, THOMAS and Judith Antpin** Chicago Metropolitan Initiative Coordinator, U.S.D.A. Forest Service, Northeastern Area, State and Private Forestry, 1033 University Place Suite 360, Evanston IL 60201(tdilley@fs.fed.us)(TD) Public Affairs Specialist, USDA Forest Service11 Campus Blvd., Suire 200 Newtown square, PA 19073
THE CITY OF CHICAGO VS. THE ASIAN LONGHORNED BEETLE: A BLUEPRINT FOR SUCCESSFUL RESPONSE BY LOCAL, STATE AND FEDERAL AUTHORITIES TO AN INVASIVE PEST EMERGENCY IN A MAJOR METROPOLITAN AREA

S22-4 **DINERSTEIN, ERIC, John Morrison, and Adam Tomasek** World Wildlife Fund US (Eric Dinerstein@wwfus.org)
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S07-5 **DOBSON, ANDY and Juliet Pulliam** Princeton University
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P05-05 **DOHERTY, DEIRDRE A.** John Muir Institute of the Environment, University of California, Davis, CA 95616 (dadoherty@ucdavis.edu)
HUNTING PREFERENCES, PATTERNS AND PRESSURE IN CENTRAL AMERICA

CO21-7 **DONALDSON, JOHN** Kirstenbosch Research Centre, National Botanical Institute, P/Bag X7, Cape Town, South Africa (donaldson@nbi.ac.za)
AN ASSESSMENT OF EXTINCTION RISK DUE TO THE COLLAPSE OF POLLINATOR MUTUALISMS IN AFRICAN CYCADS

CO26-1 **DONALDSON, JOHN** Kirstenbosch Research Centre (donaldson@nbi.ac.za)
AN EVALUATION OF THE COSTS AND BENEFITS OF CONSERVATION FARMING IN BIODIVERSITY HOTSPOTS IN SOUTH AFRICA

CO48-6 **DONOHUE, MARY J., Peter Rappa, and Elizabeth Kumabe Maynard** University of Hawaii Sea Grant College Program, 2525 Correa Rd., Honolulu, HI, 96822 (donohuem@hawaii.edu)
HANAUMA BAY: SUCCESSFUL MANAGEMENT OF A SMALL URBAN MARINE PROTECTED AREA (MPA)

P09-04 **DOOLING, SARAH, Ken Yocom, Gregory Simon, William Webb, and Jack DeLap** Department of Urban Design and Planning, Box 355740, University of Washington, Seattle, WA 98195-5740 (sdooling@u.washington.edu); Program on the Built Environment, CAUP, University of Washington, Seattle, WA 98195 (KY); Geography Department, University of Washington, Seattle WA 98195 (GS); College of Forest Resources, University of Washington, Seattle, WA 98195 (WW, JD). All participants are NSF funded IGERT-URBAN ECOLOGY Fellows
THE HISTORY OF URBAN PARK DEVELOPMENT IN SEATTLE 1900-2000: AN EMERGENT PHENOMENON?

S08-7 **DORFMAN, DANIEL, Michael Beck, and Zach Ferdaña** The Nature Conservancy Marine Initiative, Center for Ocean Health, Long Marine Lab, 100 Shafer Road, Santa Cruz, CA, 95060, (ddorfman@tnc.org) (DSD, MB); The Nature Conservancy Northwest Division, 217 Pine St, Suite 1100, Seattle, WA 98101(ZF) .
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CO53-2 **DOUKAKIS, PHAEDRA, Mananjo Jonahson, Bemahafaly Jean de Dieu Randriamanantsoa, Volanirina Ramahery, and Andrew Cooke** The Pew Institute for Ocean Science, University of Miami, 126 East 56th Street, NY,NY 10022 (pdoukakis@rsmas.miami.edu)(PD); Wildlife Conservation Society Madagascar, Villa Ifanomezantsoa, Lot II A 78 D Soavimbahoaka, BP 8500 Antananarivo 101 (MJ, BJD, VR, AC)
APPROACHES TO MARINE CONSERVATION IN ANTONGIL BAY, MADAGASCAR

CO49-5 **DOVIE, DELALI B.K.** Restoration and Conservation Biology Research Group, School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Wits 2050, Johannesburg, South Africa (delali@biology.wits.ac.za)
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CO53-1 **DREW, JOSHUA A.** Boston University Marine Program, Marine Biological Laboratory 7 MBL St. Woods Hole, MA (jdrew@bu.edu)
TRADITIONAL ECOLOGICAL KNOWLEDGE AND ITS APPLICATION TO MARINE BIOLOGY

CO21-5 **DRISCOLL, MELISSA A., John P. Loegering, and Vernon B. Cardwell** Conservation Biology Program, 180 McNeal Hall, 1985 Buford Ave., University of Minnesota, St. Paul, MN, 55108 (dris0037@umn.edu)(MAD, JPL); Fisheries, Wildlife and Conservation Biology, University of Minnesota, St. Paul, MN 55108 and Natural Resources, 2900 University Avenue, University of Minnesota, Crookston, MN 56716-5001 (JPL). Agronomy and Plant Genetics, 411 Borlaug Hall, 1991 Upper Buford Circle, University of Minnesota, St. Paul, MN 55108-6026 (VBC).
ACCOMMODATING NESTING BIRDS IN CATTLE PASTURES IN SOUTHEAST MINNESOTA

P05-06 **DROEGE, MARY, Marc Lapin, Kathy Doyle, and James Graves** The Nature Conservancy, Southern Lake Champlain Valley, 115 Main Road, West Haven, VT 05743 (MD) (mdroege@tnc.org). Champlain Valley Clayplain Forest Project, 239 Cider Mill Road, Cornwall, VT 05753 (ML). Green Mountain College, Department of Science, 1 College Circle, Poultney, VT 05764 (KD, JG)
CLAYPLAIN AND FLOODPLAIN FOREST RESTORATION PLANNING IN THE HUBBARDTON AND LOWER POULTNEY RIVER WATERSHEDS, VERMONT AND NEW YORK, USA

CO5-1 **DUDLEY, JOSEPH P.** Intellibridge Corporation, 1101 30th Street, NW Suite 100B, Washington DC 20007, Institute of Arctic Biology, University of Alaska Fairbanks, Department of Earth Sciences, The University of Alaska Museum (fnjpd@uaf.edu)
BIOSECURITY AND OPEN-SOURCE INFORMATION TECHNOLOGY: A NEW APPROACH TO THE GLOBAL MONITORING AND SURVEILLANCE OF EMERGING DISEASES, ZOONOSES, AND INVASIVE SPECIES

CO54-6 **DURANT, SARAH, Ray Hilborn, Meggan Craft, and Sultana Bashir** (cheetah@habari.co.tz) Zoological Society of London, Regent's Park, London, NW1 4 RY, UK (SD and SB), Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (SD and SB), Tanzania Wildlife Research Institute, Box 661, Arusha, Tanzania (SD, SB and MC), Department of Ecology, Evolution, and Behavior, University of Minnesota, 1987 Upper Buford Circle, St. Paul, MN 55108 (MC), School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, WA 98195 (RH)
LONG TERM TRENDS IN CARNIVORES IN THE SERENGETI NATIONAL PARK, TANZANIA

S19-3 **DURBIN, JOANNA, Helen Crowley, Guy Suzon Ramangason, Lisa Gaylord, Koto Bernard, and Lanto Andriamampianina** Durrell Wildlife Conservation Trust, BP 8511, Antananarivo 101, Madagascar (JD) (joanna.durbin@durrell.org). Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (HC,LA). National Association for the Management of Protected Areas, Ambatobe, Antananarivo 101, Madagascar (GSR). USAID, 6th Floor Tour Zital Zone Industriel Taloumis Ankorondrano Madagascar (LG). Ministry of Environment, Ampandrianomby, Antananarivo 101, Madagascar (KB)
CONSERVATION SUCCESSES AND LESSONS LEARNED IN MADAGASCAR

S12_3 **DUTTON, IAN M., P. Kareiva, Z. Lu, R. Mullen, S. O'Connor, and D. Salzer** Conservation Measures Group, The Nature Conservancy, 5410 Grosvenor Lane Bethesda, Suite 130, MD 20814 (idutton@tnc.org)(ID, DS), TNC Pacific Western Conservation Region, 4722 Latona Ave NE Seattle WA 98105 (PK), WWF Conservation Measures and Audit Programme, 39 Stoke Gabriel Rd., Galmpton Brixham Devon TQ5 0NQ UK (SO), CI China Program, College of Life Sciences Peking University, Beijing 100871, China (LZ)
STAKEHOLDER AND AUDITOR PERSPECTIVES ON CONSERVATION AUDITING: A CASE STUDY OF THE TNC CHINA PROGRAM

CO18-6 **EARLY, REGAN, Chris D. Thomas, and Atte Moilanen** School of Biology, University of Leeds, Leeds, LS2 9JT, UK (bgyrie@leeds.ac.uk) (RE, CDT); Department of Ecology and Systematics, Division of Population Biology, PO Box 17, SF-00014, University of Helsinki, FINLAND (AM)
THE DEVELOPMENT OF POPULATION-BASED CONSERVATION STRATEGIES AT LARGE SCALES

P14-01 **EARNHARDT, JOANNE, M., Michael Wilson, Anne Pusey, Steven D. Thompson, and Elizabeth V.Lonsdorf** Department of Conservation and Science, Lincoln Park Zoo, 2001 N. Clark St., Chicago, IL 60614 (Joanne@lpzoo.org) (JME, SDT, EVL); and Jane Goodall Institute and University of Minnesota, St. Paul, MN (MW, AP)
POPULATION HABITAT VIABILITY ANALYSIS (PHVA) FOR THE GOMBE STREAM NATIONAL PARK (GSNP) CHIMPANZEE POPULATION

S11-2 **EHRENFELD, DAVID** Department of Ecology, Evolution, and Natural Resources Cook College, Rutgers University (dehrenfeld@aesop.rutgers.edu)
GENETIC ENGINEERING IS NOT A PROMISING TOOL FOR SPECIES CONSERVATION

CO17-7 **EHRLÉN, JOHAN and Hannah Östergård** Department of Botany,Stockholm University, SE-106 91 Stockholm, Sweden (ehrlen@botan.su.se)
CAN WE TRUST THE PREDICTIONS OF POPULATION VIABILITY ANALYSES? - AN EMPIRICAL ASSESSMENT

S16-7 **ELKAN, PAUL, Moukassa Antoine, Sarah Elkan, and Germaine Mavah** Wildlife Conservation Society, B.P.14537 Brazzaville, REPUBLIC OF CONGO (pelkan@wcs.org)
DEMOGRAPHIC BOOMS, PROTEIN CONSUMPTION, AND IMPLICATIONS FOR WILDLIFE MANAGEMENT IN LOGGING CONCESSIONS, NORTHERN REPUBLIC OF CONGO

S09-3 **ELMQVIST, THOMAS** Dept of Systems Ecology, Stockholm University,Sweden (thomase@ecology.su.se)
BIODIVERSITY AND ECOSYSTEM SERVICES ALONG RURAL-URBAN GRADIENTS

P27-04 **ELPHICK, CHRIS, C. Gjerdrum, and M. Rubega** Department of Ecology and Evolutionary Biology, University of Connecticut, 75 N. Eagleville Rd., Storrs, CT 06268 (elphick@uconn.edu)
DOES "LIGHT POLLUTION" AFFECT BREEDING BY BEACH NESTING BIRDS?

CO24-5 **ELRON, ELDAD, Sarig Gafny, and Avital Gasith** Institute for Nature Conservation Research (INCR), Faculty of Life Sciences, Tel-Aviv University, Tel-Aviv 69978, Israel (eldad@post.tau.ac.il)
WHERE HAVE THE GREEN TOADS GONE? ALARMING POPULATION DECLINE OR VARIABLE RECRUITMENT?

S12-10 **ERVIN, JAMISON, Jeff Parrish, Dan Salzer, Doria Gordon, and Tim Tear** Conservation Measures Group, The Nature Conservancy (jamie_ervin@tnc.org) (JE); Director of Conservation Planning, Global Priorities Group, The Nature Conservancy (JP): Conservation Measures Manager, The Nature Conservancy (DS): The Nature Conservancy DG: The Nature Conservancy - Eastern New York Chapter (TT)
TNC'S SYSTEM FOR DETERMINING CONSERVATION STATUS OF ECOREGIONS

S15-7 **ESSELMAN, PETER C.** School of Natural Resources and Environment University of Michigan Ann Arbor, MI 48109 (esselman@umich.edu)
ADEQUACY OF THE CURRENT PROTECTED AREAS NETWORK FOR THE CONSERVATION OF AQUATIC TARGETS IN SOUTHERN BELIZE

CO14-4 **EVANS, JEFFREY S. and Melanie A. Murphy** USDA Forest Service - Rocky Mountain Research Station. 1221 S. Main St. Moscow, Idaho 83843 (jevans02@fs.fed.us) (J.E.)Schoool of Biological Sciences, Department of Biology – Washington State University. Pullman, Washington 99163 (M.M.)
INTEGRATING MULTISCALE ANALYSIS AND BIOPHYSICAL MODELLING TO OPTIMIZE ECOLOGICAL RELATIONSHIPS IN SPATIAL MODELS

CO5-6 **EVANS OGDEN, LESLEY J. and Kathy Martin** Centre for Applied Conservation Research, Department of Forest Sciences, University of British Columbia, 2424 Main Mall, Vancouver, BC, Canada V6T 1Z4 (lesleyje@interchange.ubc.ca)
PHYSIOLOGICAL INSIGHTS INTO HABITAT QUALITY AT A HIGH ELEVATION MIGRATORY STOPOVER SITE

S16-1 **EVES, HEATHER and Natalie D. Bailey** Bushmeat Crisis Task Force, 8403 Colesville Road, Suite 710. Silver Spring, MD 20910 (HEves@bushmeat.org)
CONSERVATION AND DEVELOPMENT: OVERVIEW OF THE CONTRIBUTION OF URBAN MARKETS TO THE DEMISE OF TROPICAL FOREST WILDLIFE

S01-1 **EZCURRA, EXEQUIEL** Instituto Nacional de Ecologia, Av. Periferico Sur 5000, Delegacion Coyoacan, 04530 Mexico, D.F., Mexico (eezcurra@ine.gob.mx)
BINATIONAL SCIENCE AND CONSERVATION IN BAJA AND THE SEA OF CORTEZ

S16-3 **FA, JOHN E. and Lise Albrechtsen** Durrell Wildlife Conservation Trust, La Augres Manor Rue, Trinity, Jersey JE3 5BP, English Channel Islands, UK (jfa@durrell.org) (JEF) WildCRU, Department of Zoology, University of Oxford, Oxford OX1 3PS, UK (LA)
WHEN GRAZING COWS CAN BENEFIT WILDLIFE: A CASE FOR BIOKO ISLAND

S15-3 **FAGAN, WILLIAM F.** Dept. of Biology, University of Maryland, College Park, MD, 20742 (bfagan@glue.umd.edu)
INCORPORATING POPULATION FRAGMENTATION AND CONNECTIVITY CONSIDERATIONS INTO FRESHWATER RESERVE DESIGN

P34-04 **FANG, WEI, Fuhua Chen, and Zhongyi Yang** State Key Laboratory for Biological Control, Sun Yat-Sen University, Guangzhou 510275, China, (FC, ZY). Biology Department, Long Island University-Brooklyn Campus, 1 University Plaza, Brooklyn, NY 11201 (WF) (wei.fang@liu.edu)
MECHANISMS OF HEAVY METAL TOLERANCE OF *SESBANIA ROSTRATA*, A N-FIXING ANNUAL PLANT, TO CADMIUM AND COPPER

CO6-4 **FARRELL, TRACY A. and Paul Houlihan** School for Field Studies, 10 Federal Street, Salem, MA 01970 (tfarrell@fieldstudies.org)
PLANNING FOR CONSERVATION: A COMMUNITY-BASED APPROACH

P13-01 **FAUST, LISA J., and Patricia Valcarcel** Department of Conservation and Science, Lincoln Park Zoo, 2001 N. Clark St., Chicago, IL 60614 (lfaust@lpzoo.org) (LF, PV); and Ecology and Evolution Group, University of Illinois at Chicago, 845 W. Taylor, Chicago, IL 60607 (LF)
MEASURING ENVIRONMENTAL AND DEMOGRAPHIC STOCHASTICITY IN DEMOGRAPHIC RATES OF SMALL POPULATIONS

S09-5 **FERNANDEZ-JURICIC, ESTEBAN** Department of Biological Sciences, California State University Long Beach, Peterson Hall 1-109, 1250 Bellflower Blvd., Long Beach, CA 90840 (efernand@csulb.edu)
AVIAN CONSERVATION IN FRAGMENTED URBAN LANDSCAPES: THE EFFECTS OF SECONDARY FRAGMENTATION THROUGH HUMAN DISTURBANCE

CO10-2 **FERNANDO, P., Vidya T.N.C, Linda S.G. Ng, Peter Schickler, and Don J. Melnick**. Center for Environmental Research and Conservation, Columbia University, 1200 Amsterdam Avenue, New York, NY 10025 (PF, LSGN, PS, DJM), Wildlife Trust, New York, USA (PF), Centre for Ecological Sciences, Indian Institute of Science, Malleshwaram, Bangalore 560012, India (TNCV), American Museum of Natural History, New York (PS) (pf133@columbia.edu)
PHYLOGEOGRAPHY AND CONSERVATION OF THE ASIAN ELEPHANT

CO17-4 **FERSON, SCOTT, W. Troy Tucker, Michael E. Thompson, John P. Lortie, Douglas J. Fort, and Susan Svirsky** Applied Biomathematics, 100 North Country Rd., Setauket, NY 11733 (scott@ramas.com) (WTT, SF). Woodlot Alternatives, Inc., 30 Park Drive, Topsham, ME 04086 (MET, JPL). Fort Environmental Laboratories, 1414 South Sangre Road, Stillwater, OK 74074 (DJF). US EPA New England, 1 Congress St., Boston, MA 02114 (SS)
EXTINCTION RISK IN A WOOD FROG (RANA SYLVATICA) METAPOPULATION UNDER ENVIRONMENTAL CONTAMINATION BY PCBS

CO6-5 **FIELD, SCOTT A., Andrew J. Tyre, Niclas Jonzen, Jonathan Rhodes, Michael McCarthy, Brendan Wintle and Hugh P. Possingham** The Ecology Centre, University of Queensland, St Lucia, 4072, Queensland, Australia (scott.field@adelaide.edu.au); School of Natural Resource Sciences, University of Nebraska-Lincoln,Lincoln, NE 68583-0819 (AT); Department of Ecology, Lund University, SE-221 00 Lund, Sweden (NJ); The Ecology Centre, University of Queensland, St Lucia, 4072, Australia (JR); School of Botany, University of Melbourne, Parkville, VIC 3010, Australia (MM); School of Botany, University of Melbourne, Parkville, VIC 3010, Australia (BW); The Ecology Centre, University of Queensland, St Lucia, 4072, Queensland, Australia (HP)
MINIMIZING THE COST OF THREATENED SPECIES MANAGEMENT: CAN ERROR RATES BE OPTIMIZED?

CO48-7 **FILARDI, CHRISTOPHER E. and Catherine E. Smith** Department of Ornithology, American Museum of Natural History, Central Park West at 79th Street, NY, NY 10024-5192 (filardi@amnh.org)
CONSERVING INSULAR DIVERSITY ACROSS AN ARCHIPELAGO: DEFINING AREAS OF GENETIC ENDEMISM FOR SOLOMON ISLAND BIRDS

CO50-3 **FIORELLO, CHRISTINE V. and Andrew J. Noss** Center for Environmental Research and Conservation, 1200 Amsterdam Ave., Columbia University, NY, NY 10027 (fiorelloc@mail.vetmed.ufl.edu) (CVF). Wildlife Conservation Society Field Veterinary Program (CVF) and Latin America Program (AJN), 4424 NW 13 St., A2, Gainesville, FL 32609.
DEMOGRAPHICS, ECOLOGY, AND SEROSURVEY OF DOMESTIC DOGS IN THE ISOSO OF BOLIVIA

CO14-5 **FISCHER, JOERN and David B. Lindenmayer** Centre for Resource and Environmental Studies, The Australian National University, Canberra ACT 0200, Australia (joern@cres.anu.edu.au)
EXPANDING THE FRAGMENTATION PARADIGM: INSIGHTS FROM TWO STUDIES ON REPTILES IN HEAVILY MODIFIED AUSTRALIAN LANDSCAPES

S05-4 **FLANNERY, MICHAEL S.** Senior Environmental Scientist, Southwest Florida Water Management District, 2379 Broad St., Brooksville, FL. 34604-6899 (sid.flannery@swfwmd.state.fl.us)
A PERCENT-OF-FLOW APPROACH FOR REGULATING WITHDRAWALS AND MAINTAINING FLOW REGIMES IN UNIMPOUNDED RIVERS IN SOUTHWEST FLORIDA

CO3-7 **FLEISHMAN, ERICA, Ralph Mac Nally, and Dennis Murphy** Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, CA 94305 USA (EF) (efleish@stanford.edu). Australian Centre for Biodiversity: Analysis, Policy and Management, School of Biological Sciences, Monash University 3800, Australia (RM). Department of Biology / 314, University of Nevada, Reno, NV 89557(DM)
INFLUENCE OF SCALE OF SAMPLING ON DETECTION OF RELATIONSHIPS BETWEEN INVASIVE PLANTS AND DIVERSITY PATTERNS OF PLANTS AND BUTTERFLIES

P10-02 **FORD, MARY E. and Alan R. Berkowitz** Institute of Ecosystem Studies, Education Program, Box R, Millbrook, NY 12545 (FordM@ecostudies.org) (MEF and AB)
LINKING ECOLOGICAL LITERACY AND CONSERVATION BIOLOGY USING URBAN SCHOOLYARDS AND COMMUNITY GARDENS AS ECOSYSTEMS OF STUDY

CO25-3 **FOUFOPOULOS, JOHANNES and Gregory Mayer** School of Natural Resources and Environment, Dana Hall, 430 E. University, University of Michigan, Ann Arbor, MI 48109-1115 (jfoufop@umich.edu). Dept of Biological Sciences, University of Wisconsin-Parkside, Kenosha, WI 53141 (GM).
TURNOVER OF PASSERINE BIRDS ON MEDITERRANEAN ISLANDS

CO17-6 **FOX, SAMANTHA, Caitlin Mitchell, Jonathan G. Luly, and Jenny Maclean** School of Tropical Biology, James Cook University, Townsville, Queensland 4811, Australia, (SF, CM), (Samantha.Fox@jcu.edu.au). Tropical Environmental Science and Geography Department, James Cook University, Townsville, Queensland 4811, Australia (JGL). Tolga Bat Rescue and Research Inc., PO Box 685, Atherton, Queensland 4883, Australia (JM).
UNDERSTANDING THE DEMOGRAPHICS OF A 'VULNERABLE' FLYING-FOX SPECIES

P22-01 **FRANKEL, MICHELLE A., William S. Seegar, M. Blake Henke, and Jack Cibor** Earthspan, 1450 S. Rolling Rd., Baltimore, MD (michellefrankel@earthlink.net) (MAF, MBH, JC). U.S. Army, Research Development and Engineering Command, Aberdeen Proving Ground, MD 21010 (WSS).
EDUCATING URBAN YOUTH ABOUT CONSERVATION RESEARCH AND TECHNOLOGY

S15-4 **FRISSELL, CHRISTOPHER A.** The Pacific Rivers Council, PMB 219, 1 Second Ave E., Suite C, Polson, MT 59860 (hanfris@digisys.net)
AQUATIC INTEGRITY AREAS FOR WATERSHEDS AND RIVER SEGMENTS: MAPPING THE US PART OF THE YELLOWSTONE TO YUKON BIOREGION

P01-03 **FRY, TRICIA L. and R. Scott Lutz** University of Wisconsin-Madison, 226 Russell Labs, 1630 Linden Dr., Madison, WI 53706. (tfry@wisc.edu)
SPATIAL DISTRIBUTION AND ABUNDANCE OF RED IMPORTED FIRE ANTS (RIFA) IN RELATION TO DISTURBANCE

CO9-1 **FULLER, T. and Sahotra Sarkar** University of Texas at Austin, 1 University Station, Austin, TX 78712 (tfuller@mail.utexas.edu)
THE MAINTENANCE OF CONNECTIVITY IN CONSERVATION AREA NETWORKS: GRAPH-THEORETIC PROTOCOLS

P08-03 **FUREDI, MARY ANN and James B. McGraw** West Virginia University, Department of Biology, P. O. Box 6057, Morgantown, WV 26506, USA, (mafuredi@aol.com)
CAUSES AND CONSEQUENCES OF BROWSING BY WHITE-TAILED DEER ON AMERICAN GINSENG

CO30-4 **GAMUI, BANAK** GAMUI, BANAK. Wildlife Conservation Society-PNG Program, P.O.Box 277, Goroka, EHP, PNG (bgamui@global.net.pg)
SCIENTIFIC RESEARCH AS A TOOL IN MOBILIZING LOCAL COMMUNITIES FOR BIODIVERSITY CONSERVATION

CO38-1 **GEI, VIDIRO and Debra Wright** Wildlife Conservation Society-PNG Program, P.O.Box 277, Goroka, Eastern Highlands Province, Papua New Guinea (VG, DW) (vgei@global.net.pg)
AN INTERACTIVE KEY TO THE FLORA OF CRATER MOUNTAIN BIOLOGICAL RESEARCH STATION (CMBRS), PAPUA NEW GUINEA: AN AID TO RESEARCH AND CONSERVATION PLANNING

P34-05 **GELDERLOOS, ORIN G.** University of Michigan-Dearborn, Department of Natural Sciences, Dearborn, MI 48128-1491 (ogg@umd.umich.edu)
THE RESTORATION ECOLOGY OF JENS JENSEN AT HENRY AND CLARA FORD'S HOME: AFTER 88 YEARS HAS IT ACHIEVED JENSEN'S VISION?

S21-3 **GELLER, GARY N.** Jet Propulsion Laboratory (gary.n.geller@jpl.nasa.gov)
INCREASING ACCESS AND USABILITY OF REMOTE SENSING DATA: A PROTECTED AREA IMAGE ARCHIVE

P29-05 **GELOK, PAUL, Jay Malcolm, Justina C. Ray, and Brian Naylor** Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, Ontario Canada, M5S 3B3 (paul.gelok@utoronto.ca) (PG, JM). Wildlife Conservation Society, Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, ON, Canada M5S 3B3 (JCR). Northeast and Southern Science and Information Sections, Ontario Ministry of Natural Resources, 3301 Trout Lake Road, North Bay, Ontario, P1A 4L7 (BN)
SUMMER HABITAT USE BY AMERICAN MARTENS (MARTES AMERICANA) IN GREAT LAKES-ST. LAWRENCE FORESTS OF ONTARIO

CO49-8 **GEORGE, SHALENE and Kevin R. Crooks** University of Wisconsin-Madison, Department of Wildlife Ecology, 226 Russell Labs, 1630 Linden drive, Madison, WI 53706 (shalenegeo@yahoo.com) Colorado State University, Department of Fishery and Wildlife Biology, 115 Wagar, Fort Collins, CO 80523
THE EFFECTS OF RECREATION ON LARGE MAMMALS IN AN URBAN NATURE RESERVE

P08-04 **GEORGES HERBERT, CHEKUIMO TAGNE, Kunin Williams Edwards, Pocock Michael, and Aston Rebecca** (1)C.B.C.S, P. O. Box 8047 Yaounde-Cameroon (azpa01@yahoo.com), (2)2Faculty of Biological Sciences, School of Biology, Centre for Biodiversity and Conservation, Leeds University, Leeds LS2 9JT, UK.
FRACTAL PATTERNS IN SPECIES DISTRIBUTIONS OF SOME BRITISH SCARCE PLANTS

S15-2 **GERGEL, SARAH** Sarah E. Gergel, Assistant Professor Department of Forest Sciences and Centre for Applied Conservation Research 3008 - 2424 Main Mall University of British Columbia Vancouver, B.C. Canada V6T 1Z4 (sarah.gergel@ubc.ca)
PROTECTING WATER BY CONSERVING LAND: THE IMPORTANCE OF SPATIAL ARRANGEMENT IN INFLUENCING ECOSYSTEM PROCESSES

S18-2 **GIBBS, JAMES P., David A. Steen, and W. Gregory Shriver** Addresses:State University of New York College of Environmental Science and Forestry, 250 Illick Hall, Syracuse, New York 13210, 315/470-6764; FAX 315/470-6934; email: jpgibbs@syr.edu
ROAD MORTALITY AND THE DEMOGRAPHY OF TURTLES

CO12-4 **GILLESPIE, THOMAS R. and Colin A. Chapman** Department of Zoology, University of Florida, Gainesville, FL 32611 (TRG, CAC) (tgillespie@zoo.ufl.edu). Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (CAC).
FOREST FRAGMENTATION ALTERS PARASITE DYNAMICS IN AFRICAN PRIMATE POPULATIONS

P21-03 **GILMAN, ROBERT TUCKER, Robin A. Abell, and Christopher E. Williams** Conservation Science Program, World Wildlife Fund - US, 1250 24th Street NW, Washington, DC 20037 (RTG and RAA) (tucker.gilman@wwfus.org), World Wildlife Fund - US, 1250 24th Street NW, Washington, DC 20037, (CEW)
ARE BIODIVERSITY CONSERVATION OBJECTIVES UNDERREPRESENTED IN INTEGRATED RIVER BASIN MANAGEMENT?

S10-3 **GINSBERG, JOSHUA R., Linda Krueger, and Endi Zhang** Wildlife Conservation Society, 2300 Southern Boulevard, Bronx NY 10406-1099 (jginsberg@wcs.org)
WILDLIFE TRADE AND EMERGING DISEASES-SHORT AND POTENTIAL LONG TERM IMPACTS ON CHINESE DEMAND FOR WILDLIFE PRODUCTS: AN OPPORTUNITY FOR CONSERVATION?

S13-6 **GITHIRU, MWANGI, Norbert Cordeiro, and William Olupot** Luc Lens Laboratory of Animal Ecology, Department of Biology, University of Antwerp, Universiteitsplein 1, B-2610 Wilrijk, Belgium (MG) (mwangi.githiru@ua.ac.be). Department of Biological Sciences (M/C 066), University of Illinois at Chicago, 845 West Taylor Street, Chicago, IL 60607-7020,(NC). Tanzania Wildlife Research Institute, PO Box 661, Arusha, Tanzania (NC). Institute of Tropical Forest Conservation, P.O. Box 44, Kabale, Uganda (WO). Ghent University, Department of Biology, Terrestrial Ecology Unit, Ledeganckstraat 35, B-9000 Ghent, Belgium (LL).
THE PROBLEM OF FOREST FRAGMENTS AND EDGES: EVIDENCE FROM THREE EAST AFRICAN MOUNTAINS

P34-06 **GLENN, MARIAN, Saadia Usman, and Frances E. Hoffman** Biology Department, Seton Hall University, South Orange, NJ 07079 (MG & SU) (glennmar@shu.edu) and Office of Smart Growth, Department of Community Affairs, 101 S Broad St, PO Box 204, Trenton, NJ 08625 (FEH)
BROWNFIELD REDEVELOPMENT IS KEY TO LAND CONSERVATION IN NEW JERSEY

CO35-1 **GLENNON, MICHALE J. and William F. Porter** Wildlife Conservation Society, Adirondack Communities and Conservation Program, 7 Brandy Brook Ave, #204, Saranac Lake, NY 12983 (MJG)(mglennon@wcs.org) State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210 (WFP)
EFFECTS OF LAND USE MANAGEMENT ON BIOTIC INTEGRITY IN THE ADIRONDACK PARK, NEW YORK

CO42-6 **GOETZ, SCOTT, Claire Jantz, and Patrick Jantz** The Woods Hole Research Center, PO Box 296, Woods Hole, MA 02543-0296 (sgoetz@whrc.org)
EXURBAN SPRAWL, THE LOSS OF RESOURCE LANDS, AND FOREST VULNERABILITY ASSESSMENT WITHIN THE CHESAPEAKE BAY WATERSHED

S04-7 **GOETZ, EDWARD** Humphrey Institute of Public Affairs University of Minnesota 301 - Nineteenth Avenue South Minneapolis, MN 55455 (egoetz@hhh.umn.edu)
THE BIG TENT OF GROWTH MANAGEMENT: SMART GROWTH AS A MOVEMENT

CO11-2 **GOLDSTEIN, BRUCE EVAN** Department of Urban Affairs and Planning, Virginia Tech, Blacksburg, VA 24060 (brugo@vt.edu)
DUELING VISIONS OF SCIENCE AND SOCIETY WITHIN A HABITAT CONSERVATION PLAN

CO16-3 **GOMPPER, MATTHEW E. and H. Mundy Hackett** Dept. of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO., 65203 (gompperm@missouri.edu)
THE LONG-TERM, RANGE-WIDE DECLINE OF A ONCE HYPER-ABUNDANT CARNIVORA: THE EASTERN SPOTTED SKUNK

P05-07 **GONZÁLEZ-ABRAHAM, ANTALIA, Sophie Calmé, and Birgit Schmook** El Colegio de la Frontera Sur, Avenida Centenario Km 5.5, AP 424, Chetumal, Quintana Roo, Mexico (antalyag@hotmail.com).
DO FOREST ACTIVITIES AND WILDLIFE CONSERVATION MATCH? THE EXAMPLE OF THE RURAL COMMUNITY OF CAOBAS, QUINTANA ROO, SOUTHERN MEXICO

P27-05 **GONZALEZ-OREJA, JOSE ANTONIO and Arturo Andres De la Fuente Diaz Ordaz** Departamento de Quimica y Biologia, Escuela de Ciencias, Universidad de las Americas Puebla, 72820 Puebla, Mexico (jgonzorj@mail.udlap.mx)
MODELING BIRD SPECIES RICHNESS IN URBAN PARKS. A CASE STUDY IN THE CITY OF PUEBLA (MEXICO)

CO13-3 **GOOD, THOMAS P., Katie Barnas, Douglas M. Marsh, Brad A. Ryan, and Edmundo Casillas** Conservation Biology Division, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112 (TPG, KB)(tom.good@noaa.gov). Fish Ecology Division, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112 (DMM, BAA, EC)
CONSERVATION AT THE CROSSROADS: ESTIMATING THE EFFECTS OF PREDATION BY PISCIVOROUS BIRDS ON ENDANGERED AND THREATENED SALMONIDS IN THE COLUMBIA RIVER

CO18-5 **GOOD, TATJANA, Claire Kremen, Michelle Zjhra, Steven Phillips, and Robert Schapire** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544, (tcgood@princeton.edu) (TG, CK). Department of Biology, Georgia Southern University Statesboro, GA 30460 (MZ). AT&T Labs – Research, 180 Park Avenue, Florham Park, NJ 07932 (SP). Department of Computer Science, Princeton University, Princeton, NJ 08544 (RS)
HOW MUSEUM COLLECTIONS CAN AID CONSERVATION EFFORTS: A STATUS ASSESSMENT OF COLEA

CO7-2 **GOODELL, KAREN** Department of Ecology and Evolution, State University of New York, Stony Brook, NY 11794 (kgoodell@life.bio.sunysb.edu)
INVASIVE PLANTS DISRUPT POLLINATOR SERVICES THROUGH ALTERING POLLINATOR COMMUNITY COMPOSITION

CO8-2 **GOODRICH, JOHN and Dale Miquelle** Wildlife Conservation Society/Hornocker Wildlife Institute, 2023 Stadium Drive Suite 1a, Bozeman, MT 59715 (tiger372@yahoo.com)
TRANSLOCATION OF AMUR (SIBERIAN) TIGERS TO ALLEVIATE TIGER-HUMAN CONFLICTS

CO50-4 **GOTTDENKER, NICOLE, Luis Padilla, Diego Santiago-Alarcon, Jane Merkel, Mary Duncan, Tim Walsh, Gustavo Jimenez, R. Eric Miller, and Patricia G. Parker** Charles Darwin Research Station, Puerto Ayora, Galapagos, ECUADOR (ngottdenker@earthlink.net)(NG, GJ). Saint Louis Zoo, One Government Drive, Saint Louis Mo 63110 (NG, LP, JM, MD, NG, TW, RM, PP). University of Missouri – St. Louis, Department of Biology, 8001 Natural Bridge Road, St. Louis MO 63121 (PP, DA)
URBAN WILDLIFE OF THE GALAPAGOS ARCHIPELAGO: ROCK DOVES (COLUMBA LIVIA), DISEASE, AND CONSERVATION OF NATIVE GALAPAGOS AVIFAUNA

S23-6 **GRAHAM, CATHERINE** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794 (cgraham@life.bio.sunysb.edu)
INCORPORATING HABITAT ALTERATION AND SPECIES SPECIFIC INFORMATION INTO ENVIRONMENTAL NICHE MODELS

CO29-1 **GRAND, JOANNA and Mark J. Mello** Graduate Program in Organismic and Evolutionary Biology and Department of Natural Resources Conservation, Holdsworth Natural Resources Center, University of Massachusetts, Amherst, MA 01003-9285 (jgrand@forwild.umass.edu)(JG), Lloyd Center for Environmental Studies, 430 Potomska Road, South Dartmouth, MA 02748 (MJM).
A MULTI-SCALE ANALYSIS OF SPECIES-ENVIRONMENT RELATIONSHIPS: RARE MOTHS IN A PITCH PINE-SCRUB OAK COMMUNITY

P25-03 **GRANT, EVAN H.C., Robin E. Jung, and Priya Nanjappa** USGS-PWRC, 12100 Beech Forest Rd., Laurel, MD 20708 (ehgrant@usgs.gov)
"HOW ARE THE FROGS DOING?": THE ARMI APPROACH

P05-08 **GRANTHAM, HEDLEY S., Andrew J. Beattie, and Robert L. Pressey** Key Centre for Biodiversity and Bioresources, Macquarie University, North Ryde, Sydney, 2109, Australia (HSG, AJB), (hgrantha@rna.bio.mq.edu.au.) Department of Environment and Conservation, PO Box 402, Armidale, 2350, Australia (RLP).
BIODIVERSITY SURROGATES: DO THEY WORK?

P10-03 **GRAWE, LARISA R. and Derek T. DeSantis** Yale Outdoor Education Center, P.O. Box 208216, New Haven, CT 06520 (larisa@aya.yale.edu)
ACHIEVING EDUCATIONAL OBJECTIVES AT THE YALE OUTDOOR EDUCATION CENTER: THE CONSTRUCTION OF AN INNOVATIVE NATURE TRAIL AND SUPPLEMENTAL EDUCATIONAL MATERIALS

CO27-3 **GRAY, ELIZABETH, Jesse Langdon, Peter Dunwiddie, David Rolph, Mark Goering, and Peter Skidmore** The Nature Conservancy, 217 Pine Street, Suite 1100, Seattle, WA 98101 (egray@tnc.org).
STRATEGIC PLANNING: SETTING CONSERVATION PRIORITIES ACROSS THE LANDSCAPE

CO26-3 **GREEN, DAVID M.** Redpath Museum. McGill University, Montreal, Quebec H3A 2K6 Canada (david.m.green@mcgill.ca)
DESIGNATABLE UNITS FOR SPECIES STATUS ASSESSMENT AND PROTECTION

CO5-5 **GREENLEAF, SARAH S. and Claire Kremen** Department of Ecology and Evolutionary Biology, Princeton University, Princeton NJ 08544 (sarahs@princeton.edu)
WILD BEES ENHANCE POLLINATION BY HONEY BEES

S06-2 **GROFFMAN, PETER M., Patrick J. Bohlen, Timothy J. Fahey, Melany C. Fisk, Esteban Suarez, and Holly A. Ewing** Institute of Ecosystem Studies, Box AB, Millbrook, NY 12545 (groffmanp@ecostudies.org) (PMG, HAE), MacArthur Agro-ecology Research Center, Archbold Biological Station, 300 Buck Island Ranch Rd., Lake Placid, FL 33852 USA (PJB), Cornell University, Department of Natural Resources, Ithaca, NY 14853 USA (TJF, ES), Appalachian State University, Department of Biology, Boone, NC 28608 (MCF).
INVASION OF FOREST SOILS BY EXOTIC EARTHWORMS

CO4-1 **GROS PAULE M., Gerardo R. Camilo, and Cheryl S. Asa** Research Department, Saint Louis Zoo, One Government Drive, St. Louis MO 63110 (Paule@cal.net) (PMG). Biology Department, Saint Louis University, 3907 Laclede Ave, St. Louis, MO 63103 (GRC). Research Department, Saint Louis Zoo, One Government Drive, St. Louis MO 63110 (CSA).
EFFECT OF INDIGENOUS LAND USE ON MAMMAL POPULATIONS IN A CENTRAL AMERICAN RAIN FOREST

CO36-3 **GROVES, CRAIG and Eric Atkinson** Wildlife Conservation Society, 2023 Stadium Drive Suite 1-A, Bozeman, MT 59715 (cgroves@wcs.org)
NFLUENCE OF TIMBER HARVEST ON SMALL MAMMAL AND AMPHIBIAN COMMUNITIES IN OLD GROWTH CEDAR-HEMLOCK FORESTS OF THE NORTHERN ROCKY MOUNTAINS, U.S.

P20-03 **GUILBEAUX, MICHAEL** Locally Managed Marine Area Network (mike@conservationpractice.org)
A NETWORK OF LOCALLY MANAGED MARINE AREAS (LMMAS) AS A STRATEGY TO ADDRESS COASTAL CONSERVATION THROUGH SOCIO-POLITICAL CONNECTIVITY

P03-03 **GUILHERME TROVATI, ROBERTO, Claudia Bueno de Campos, and Bernardo Alves de Brito** ROBERTO GUILHERME TROVATI Laboratório de Ecologia Animal / LEA – ESALQ / USP, Av. Pádua Dias, 11, Caixa Postal 9 – CEP 13418-900, Piracicaba – SP (gtrovati@ig.com.br)
DIET OF THE SYMPATRIC CARNIVORES (MAMMALIAN, CARNIVORE) IN CENTRAL REGION IN TOCANTINS BRAZIL

S16-8 **GUMAL, MELVIN** Wildlife Conservation Society, 7 Jalan Ridgeway, Kuching 93200, Sarawak, MALAYSIA (mgumal@wcs.org)
BANNING COMMERCIAL WILDLIFE TRADE IN SARAWAK, MALAYSIA

CO4-2 **GUNAWARDENE, M.D., D.K. Weerakoon, E. Wickramanayake, H.K. Janaka, L.K.A. Jayasinghe, and P. Fernando** Southern Sri Lanka Elephant Research Project, Tissamaharama, Sri Lanka (MDG, DKW, EW, HKJ, LKAJ, RARP, PF). University of Colombo, Colombo, Sri Lanka (DKW). Conservation Science Program, World Wildlife Fund-US, Washington, D.C. 20037 (EW). Wildlife Trust, New York (PF). (pf133@columbia)
HABITATS OUTSIDE PROTECTED AREAS: CAN ELEPHANTS BE CONSERVED WITHOUT THEM?

P03-04 **GUTHRIE, CARLA G.** Section of Integrative Biology, Patterson Laboratories, University of Texas, Austin, TX 78712 (cguthrie@mail.utexas.edu)
IMPACTS OF FOREST REGENERATION ON A LIGHT–GAP DEPENDENT INVERTEBRATE COMMUNITY

CO22-8 **HADIDIAN, JOHN and Seth Riley** The Humane Society of the United States, 2100 L St. NW, Washington, DC 20037 (jhadidian@hsus.org), Wildlife Ecologist Santa Monica Mountains National Recreation Area, 401 W. Hillcrest Dr., Thousand Oaks, CA 91630, 805-370-2358
URBAN WILDLIFE IN THE UNITED STATES: HISTORY, STATUS, TRENDS AND PROJECTIONS

CO26-2 **HAJAGOS, JANOS G.** Department of Ecology and Evolution Stony Brook University Stony Brook, NY 11794 (jhajagos@life.bio.sunysb.edu)
DISTRIBUTION-FREE MONTE CARLO FOR POPULATION VIABILITY ANALYSIS

S05-5 **HALL, GREENEVILLE B. and Clifford P. Neubauer** Department of Resource Management, St. Johns River Water Management District, 4049 Reid Street, Palatka, Florida 32177 (shall@sjrwmd.com)
MINIMUM FLOWS AND LEVELS: A BASIN-WIDE APPROACH TO PROTECTING NATURAL FLOW VARIABILITY

S18-3 **HALLIDAY, TIM** (International Director, DAPTF), Department of Biological Sciences, The Open University, Milton Keynes, MK7 6AA, UK. (t.r.halliday@open.ac.uk)
CAN HUMANS AND AMPHIBIANS COEXIST?

CO2-2 **HALPERN, BENJAMIN S., Chris R. Pyke, Helen E. Fox, J. Chris Haney, Martin A. Schlaepfer, and Patricia Zaradic** National Center for Ecological Analysis and Synthesis, 735 State St., Santa Barbara, CA 93101(halpern@nceas.ucsb.edu) (BSH, CRP). Hawaii Institute of Marine Biology, University of Hawaii, PO Box 1346, Kaneohe, HI, 96744 (HEF), Defenders of Wildlife, 1130 17th St. NW, Washington, DC, 20036 (JCH). Department of Integrative Biology, 1 University Station C0930, University of Texas, Austin, TX, 78712 (MAS). Stroud Water Research Center, 970 Spencer Rd., Avondale, PA, 19311 (PZ).
GAPS AND MISMATCHES OF GLOBAL CONSERVATION SPENDING

CO17-2 **HANCOCK, PENELOPE A., E.J. Milner-Gulland, and Matthew J. Keeling** Renewable Resources Assessment Group, Department of Environmental Science and Technology, Royal School of Mines, South Kensington Campus, Imperial College, London, SW7 2AZ, UK. (PAH, EJMG) (p.hancock@imperial.ac.uk) Dept of Biological Sciences & Institute of Mathematics, University of Warwick, Gibbet Hill Rd, Coventry, CV4 7AL, UK (MJK)
SPATIO-TEMPORAL DYNAMICS OF THE BEARDED PIG (SUS BARBATUS)

CO24-6 **HANEY, J. CHRISTOPHER and Jason A. Lydic** Defenders of Wildlife, 1130 17th Street, NW, Washington, DC 20036-4604 (JCH) (chaney@defenders.org). Department of Biology, Edinboro University, Edinboro, Pennsylvania 16444 (JAL)
POWER REQUIREMENTS AND ALTERNATIVE STUDY DESIGNS FOR GAUGING NO IMPACT FROM PRESCRIBED FIRE ON WOODLAND SALAMANDERS IN THE SOUTHERN APPALACHIANS

CO42-1 **HANSEN, LARA, Jennifer Biringer, and Jennifer Hoffman** WWF, Climate Change Program, 1250 24th Street NW, Washington DC 20037 (lara.hansen@wwfus.org) (lh) WWF, Forest Program, 1250 24th Street NW, Washington DC 20037 (JB)Interdisciplinary Arts & Sciences, Environmental Science Program, University of Washington, Tacoma, 1900 Commerce Street, Mailstop #358436, Tacoma, WA 98402-3100 (JH)
CONSERVATION RESPONSES TO CLIMATE CHANGE

S06-9 **HARRIS, REBECCA, Florina Tseng, Mark Pokras, and Scott Newman** Center for Conservation Medicine, Wildlife Medicine Building, Tufts University School of Veterinary Medicine, North Grafton, MA 01536 (becky.harris@tufts.edu) (RH, FT, MP) Wildlife Trust, 61 Route 9W, Palisades, New York 10964 (SN)
SEANET: A CITIZEN-SCIENTIST COLLABORATIVE TO MONITOR THE ECOLOGICAL HEALTH OF SEABIRDS

CO52-3 **HART, KRISTEN M., Tim L. King, Larry B. Crowder, Carole C. McIvor, and Colleen R. Callahan** Duke University, Nicholas School of the Environment and Earth Sciences Marine Laboratory, 135 Duke Marine Lab Road, Beaufort, NC 28516 (kristen.hart@duke.edu), (KMH, LBC), U.S. Geological Survey, Biological Resources Division, Leetown Science Center, 11700 Leetown Road, Kearneysville, WV 25430 (TLK); U.S. Geological Survey, Biological Resources Division, Center for Coastal and Watershed Studies, 600 Fourth St. South, St. Petersburg, FL 33701 (CCM); U.S. Geological Survey, Biological Resources Division, Leetown Science Center, 11700 Leetown Road, Kearneysville, WV 25430 (CC)
INTEGRATING ECOLOGY AND GENETICS TO DEFINE AND CONSERVE DISTINCT POPULATIONS OF DIAMONDBACK TERRAPINS (MALACLEMYS TERRAPIN)

CO17-1 **HARVESON, PATRICIA M., Roel R. Lopez, Nova J. Silvy, and Philip A. Frank** Department of Wildlife and Fisheries Sciences, Texas A&M University, 2258 TAMU, College Station, TX 77843 (harveson@tamu.edu) (PMH, RRL, NJS). U.S. Fish and Wildlife Service, National Key Deer Refuge, Big Pine Key, FL 33043 USA (PAF).
SOURCE-SINK DYNAMICS OF FLORIDA KEY DEER ON BIG PINE KEY, FLORIDA

P13-03 **HARVESON, LOUIS A. and R. William Adams** Department of Naural Resource Management, P.O. Box C-16, Sul Ross State University, Alpine, TX 79832 (harveson@sulross.edu)
EVALUATING THE IMPACTS OF MOUNTAIN LION ON PREY IN A MULTI-PREY SYSTEM

CO1-8 **HASTINGS, BUFFY A., Richard L. Knight, and Wendell C. Gilgert** Graduate Degree Program in Ecology, Department of Forest, Rangeland, & Watershed Stewardship, Colorado State University, Fort Collins, CO 80523 (hastings@cnr.colostate.edu) (BAH, RLK). United States Department of Agriculture, Natural Resources Conservation Service, California State Office, 430 G Street #4164, Davis, CA 95616 (WCG).
CONSERVATION VALUE OF CLUSTERED HOUSING DEVELOPMENTS

S08-2 **HASTINGS, ALAN** Dept. of Environemntal Science and Policy, Univ. of California, Davis, CA 95616 (amhastings@ucdavis.edu)
SIMPLE MODELS FOR MULTIPLE GOALS OF MARINE RESERVES

CO44-3 **HATCH, LEILA T., Steven M. Bogdanowicz, Christopher W. Clark, and Richard G. Harrison** Department of Ecology and Evolutionary Biology, Corson Hall, Cornell University, Ithaca, NY 14853-2701 USA (LTH, RGH, SMB), (lth5@cornell.edu); Bioacoustics Research Program, Cornell Laboratory of Ornithology, 159 Sapsucker Woods Road, Ithaca, NY 14850-1999 (LTH, CWC).
MALE GENES AND MALE SONGS: FIN WHALES AS A CASE STUDY FOR INTEGRATING GENETIC AND ACOUSTIC DATA IN DEFINING BALEEN WHALE STOCKS

CO39-5 **HAUGAASEN, TORBJØRN and Carlos A. Peres** University of East Anglia, Centre for ecology, evolution and conservation, Norwich, Norfolk, NR4 7TJ, United Kingdom (TH&CP)(T.Haugaasen@uea.ac.uk)
SEASONAL DYNAMICS, STRUCTURE AND COMPOSITION OF A HIGHLY HETEROGENEOUS AMAZONIAN FOREST LANDSCAPE: IMPLICATIONS FOR RESERVE DESIGN

S19-6 **RAONINTSOA, PAUL, Frank Hawkins, Jean-Philippe Randrianatoandro, David Meyers, and Charles Rakotondrainibe** Conservation International Madagascar, BP 5178, Antananarivo, Madagascar (FH). Ministry of Environment and Water and Forests, BP 243, Antananarivo 101, Madagascar (PR, JPR)(dgforets@wanadoo.mg). Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (DM). National Association for the Management of Protected Areas, Ambatobe, Antananarivo, Madagascar (CR).
CONSERVATION PRIORITY-SETTING OVER MULTIPLE LANDSCAPES IN MADAGASCAR

CO42-8 **HAZARIKA, ARUP KUMAR, A. Dutta, and P. Sarkar** Post Graduate Department of Zoology, Cotton College, Guwahati-781001, Assam (India); (hazarikacotton@sify.com), Department of Zoology, Gauhati University, Guwahati-781014, Assam (India), Department of Zoology, Gauhati University, Guwahati-781014, Assam (India)
ECOLOGICAL MONITORING OF WORLD FAMOUS KAZIRANGA NATIONAL PARK (INDIA) WITH SPECIAL REFERENCE TO COSERVATION STRATEGIES OF RHINOCEROS UNICORNIS

CO33-2 **HEADY, LAURA T. and Gretchen Stevens** Hudsonia Ltd., PO Box 5000, Annandale, NY 12504 (heady@bard.edu)
TRAINING LOCAL DECISION-MAKERS: A HABITAT APPROACH TO BIODIVERSITY CONSERVATION IN THE HUDSON VALLEY

CO3-5 **HEATON, JILL S., Mary E. Cablk, and Rich Inman** University of Redlands, 1200 E. Colton Ave, Redlands, CA 92373 (jill_heaton@redlands.edu) (JH), Desert Research Institute, 2215 Raggio Parkway, Reno, NV 89512, University of Redlands, 1200 E. Colton Ave, Redlands, CA 92373 (MC, CAF)
THE EFFICACY AND RELIABILITY OF DOGS TO LOCATE DESERT TORTOISES UNDER NATURAL CONDITIONS

P09-05 **HEDBLOM, MARCUS and Bo Soderstrom** Department of Conservation Biology, SLU, P. O. Box 7002, SE-750 07 Uppsala, SWEDEN (marcus.hedblom@nvb.slu.se)
DETECTING THRESHOLD LEVELS OF URBAN FORESTS IN SWEDEN USING GIS

P05-09 **HEDEMARK, MICHAEL and Arlyne Johnson** Wildlife Conservation Society- Lao PDR Program,PO Box 6712,Vientiane Laos (mhedemark@WCS.org)
IMPLICATIONS OF HUMAN USE PATTERNS ON MANAGEMENT OF PROTECTED AREAS IN LAO PDR

CO4-3 **HEDGES, SIMON, Martin J. Tyson, Arnold F. Sitompul, Margaret F. Kinnaird, Donny Gunaryadi, and Aslan Baco** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10468 (SH, MJT, MFK) (simonhedges@wildlife-net.freeserve.co.uk). Warnell School of Forest Resources, The University of Georgia, Athens 30602 (AFS). Wildlife Conservation Society Indonesia Program, P.O. Box 311, Bogor 16003, Indonesia (DG, AB).
THE CONTINUING DECLINE OF ASIAN ELEPHANTS IN INDONESIA'S LAMPUNG PROVINCE: HOW LONG TO EXTINCTION?

CO8-5 **HEINEN, JOEL T.** Florida International University, Department of Environmental Studies, 11200 SW 8 Street, ECS 345, Miami, FL 33199 (heinenj@fiu.edu)
POPULATION STRUCTURE AND A RE-INTRODUCTION PROPOSAL FOR ASIATIC BUFFALO IN NEPAL

S08-4 **HEPPELL, SELINA and Leah Gerber** Oregon State University, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331 (Selina.Heppell@oregonstate.edu) Arizona State University, School of Life Sciences, College & University Dr., Tempe, AZ 85287
ONTOGENETIC SHIFTS AND MARINE RESERVE PLANNING: LIFE HISTORY MATTERS!

P27-06 **HERNANDEZ, DANIEL E.** Department of Ecology, Evolution and Natural Resources, Cook College, Rutgers University, 14 College Farm Rd., New Brunswick, NJ 08901 (captdan@rci.rutgers.edu)
FORAGING DYNAMICS OF MIGRATORY WADERS RELATIVE TO PREY DENSITY

P24-04 **HERNANDEZ, PILAR, Marie-Josee Fortin, Ferenc Csillag, and Lawrence Master** Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, ON, Canada (PH, MJF) (phernandez@zoo.utoronto.ca); Department of Geography, University of Toronto, 3359 Mississauga Road, Mississauga, ON, Canada (FC); NatureServe, 11 Avenue de Lafayette, Boston, MA (LM)
INCLUDING SPATIAL ARRANGEMENT OF HABITATS TO DERIVE SPECIES DISTRIBUTION MODELS FOR CONSERVATION

S18-4 **HERO, JEAN-MARC, Donna Hazell, Simon Hodgkison, and Damian White** School of Environmental and Applied Sciences, Griffith University Gold Coast Campus, PMB 50 Gold Coast Mail Centre, Queensland, Australia. (m.hero@griffith.edu.au) Centre for Resource and Environmental Studies. Australian National University, ACT
WINNERS AND LOSERS: THE IMPACTS OF MODIFYING NATURAL LANDSCAPES ON AMPHIBIAN AND REPTILE ASSEMBLAGES IN EASTERN AUSTRALIA

P04-02 **HETT, ANNE KATHRIN, Leonardo Congiu, Lorenzo Zane, and Arne Ludwig** Institute for Zoo and Wildlife Research, Department of Evolutionary Genetics, 10315 Berlin, Germany (hett@izw-berlin.de) (AKH; AL); Dipartimento di Biologia, Sezione di Biologia Evolutiva, Università di Ferrara, 44100 Ferrara, Italy (LC); Dipartimento di Biologia, Sezione di Genetica, Università degli studi di Padova, 35121 Padova, Italy (LZ).
CONSERVATION GENETICS OF THE ADRIATIC STURGEON

CO27-4 **HIGGINS, MARK and Kalle Ruokolainen** Nicholas School of the Environment and Earth Sciences, Duke University, Box 90328, Durham, NC 27708 USA (MH) (mah21@duke.edu) Department of Biology, University of Turku, FIN-20014 Turku, Finland (KR).
RAPID TROPICAL FOREST INVENTORY: A COMPARISON OF TECHNIQUES USING INVENTORY DATA FROM WESTERN AMAZONIA

S23-5 **HIJMANS, ROBERT J. and Catherine Graham** Museum of Vertebrate Zoology University of California 3101 Valley Life Sciences Building Berkeley, CA (rhijmans@berkeley.edu) RJH Department of Ecology and Evolution State University of New York (CG)
MAPPING SPECIES RICHNESS: CAN ECOLOGICAL NICHE MODELS CORRECT FOR SAMPLING BIAS?

S15-6 **HILDERBRAND, ROBERT and Jeffrey Kershner** University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD 21532 (hilderbrand@al.umces.edu) (RH); USDA Forest Service Fish and Aquatic Ecology Unit, Department of Aquatic, Watershed, and Earth Resources, Utah State University, Logan, Utah, 84322 (JK).
RESERVE DESIGN ISSUES FOR PROTECTING CUTTHROAT TROUT AND AQUATIC BIODIVERSITY IN THE BONNEVILLE BASIN

CO32-5 **HOARE, JOANNE M. and Nicola J. Nelson** School of Biological Sciences, Victoria University of Wellington, P O Box 600, Wellington, New Zealand (joanne.hoare@vuw.ac.nz)
NEW ZEALAND LIZARDS DO NOT RESPOND TO PREDATOR SCENT CUES

CO32-6 **HOCHULI, DIETER F., Lauren M. McIntosh, and Fiona J. Christie** Institute of Wildlife Research, School of Biological Sciences, Heydon-Laurence Building (A08), The University of Sydney, N.S.W. 2006, Australia. (dieter@bio.usyd.edu.au)
EFFECTS OF URBANIZATION ON DOMINANT AND INVASIVE PLANT SPECIES IN SYDNEY, AUSTRALIA: WHAT ROLES DO NATURAL ENEMIES AND NUTRIENT ENRICHMENT PLAY?

S12-8 **HOCKINGS, MARC** School of Natural and Rural Systems Management, University of Queensland (m.hockings@uq.edu.au)
DETERMINING MANAGEMENT EFFECTIVENESS: AN INTERNATIONAL PERSPECTIVE

CO1-6 **HODGSON, PATRICIA, Kris French, and Richard Major** Institute for Conservation Biology, University of Wollongong, Wollongong NSW 2522, Australia (PRH, KF), (prh09@uow.edu.au), Australian Museum, 6 College St, Sydney NSW 2010, Australia (RM)
THE CONSERVATION VALUE OF REMNANTS TO BIRD BIODIVERSITY IN AN AUSTRALIAN URBAN LANDSCAPE

CO15-2 **HOEBEE, SUSAN E., Sonia Angelone, and Rolf Holderegger** Section of Ecological Genetics, WSL Swiss Federal Research Institute, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland (susan.hoebee@wsl.ch)
MATE AVAILABILITY ASSESSED THROUGH STUDIES OF SELF-INCOMPATIBILITY IN THE WILD PEAR (PYRUS PYRASTER)

CO25-6 **HOEKSTRA, JONATHAN M., Timothy Boucher, and Carter Roberts** The Nature Conservancy, 217 Pine Street, Suite 1100, Seattle, WA 98101 (JH) (jhoekstra@tnc.org); The Nature Conservancy, 4245 N. Fairfax Dr., Arlington, VA 22203 (TB); World Wildlife Fund, 1250 24th Street NW, Washington, DC 20037 (CR)
HOW MUCH HABITAT IS THERE? A GLOBAL ASSESSMENT OF HABITAT LOSS AND PROTECTION

CO13-6 **HOFFMANN, MICHAEL, Mike Parr, Eric Dinerstein, Leon Bennun, and Thomas Brooks** Center for Applied Biodiversity Science, Conservation International, Washington, DC 20036 (MH, TB) (m.hoffmann@conservation.org); American Bird Conservancy, 1834 Jefferson Place, NW, Washington, DC 20036 (MP); Conservation Science Program, World Wildlife Fund-US, 1250 24th St NW, Washington DC, (ED); BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, United Kingdom (LB)
PRIORITIES-WITHIN-PRIORITIES: TARGETING THE TIPS OF THE CONSERVATION ICEBERGS

P09-06 **HOGLE, INGRID B., Joshua H. Viers, James F. Quinn, Mark W. Schwartz, Becky Waegell, and Kaylene Keller** Information Center for the Environment, University of California-Davis, One Shields Avenue, Davis, CA 95616 (ibhogle@mindspring.com) (IBH, JHV, JFQ). Cosumnes River Preserve, 13501 Franklin Blvd, Galt, CA 95632 (BW). Jones & Stokes Associates, 2600 V Street, Sacramento, CA 95818 (KK).
SPATIAL ANALYSIS OF PERENNIAL PEPPERWEED INFESTATION IN A SEASONAL FLOODPLAIN

P25-04 **HOKE, PETER** Conservation International, Rapid Assessment Program, 1919 M ST. NW STE. 600, Washington, DC 20036 (p.hoke@conservation.org)
EASY ACCESS: FACILITATING THE USE OF RAPID ASSESSMENT PROGRAM SURVEY DATA ONLINE

P26-06 **HOLDEREGGER ROLF, Urs Arnold, Christoph Düggelin, Felix Gugerli, Sabine Brodbeck, Sonia Angelone, Peter Rotach, and Susan E. Hoebee** Section of Ecological Genetics, WSL Swiss Federal Research Institute, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland (rolf.holderegger@wsl.ch) (RH, UA, CD, FG, SB, SA, SEH). Department of Forest Sciences, Swiss Institute of Technology ETH, Rämistrasse 101, CH-8092 Zurich, Switzerland (UA, CD, PR)
HOW DO ISOLATION AND POPULATION SIZE AFFECT MATING PATTERNS AND GENE FLOW IN A SCATTERED TEMPERATE FOREST TREE? THE CASE OF *SORBUS TORMINALIS*

CO22-6 **HOLDSWORTH, ANDREW R., Lee E. Frelich, and Peter B. Reich** Conservation Biology Graduate Program, University of Minnesota, 1530 N. Cleveland Ave. St. Paul, MN 55108 (ARH) (hold0094@umn.edu), Department of Forest Resources, 1530 N. Cleveland Ave. St. Paul, MN 55108 (LEF, PBR)
THE EFFECT OF DEER EXCLUSION ON PLANT COMMUNITIES IN A SUBURBAN FOREST FRAGMENT

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THE USE OF AGRICULTURAL LAND BY HEADSTARTED JUVENILE WOOD TURTLES (GLYPTEMMYS INSCULPTA)

CO20-3 **HOLMES, CHRISTOPHER M., Patricia Wright, Karen Kramer, Timothy Keitt, and Steig Johnson** Institute for the Conservation of Tropical Environments, Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (CMH, PW, SJ)(christopher.holmes@stonybrook.edu). Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (KK). Section of Integrative Biology, University of Texas, Austin, TX 78712 USA (TK)
UNDERSTANDING DYNAMICS OF HUMAN RESOURCE-USE AND THEIR EFFECTS ON RAINFOREST CONSERVATION IN MADAGASCAR: PRILIMINARY RESULTS FROM RANOMAFANA NATIONAL PARK

P06-04 **HOMAN, REBECCA N., Bryan S. Windmiller, and J. Michael Reed** Department of Biology, Tufts University, Medford, MA, 02155 (RNH - homanr@denison.edu); Hyla Ecological Services, P.O. Box 182, Lincoln, MA, 01773 (BSW), Department of Biology, Tufts University, Medford, MA, 02155 (JMR)
DEMOGRAPHIC CLUES ABOUT DIFFERENCES IN THE RELATIVE VULNERABILITIES OF TWO SYMPATRIC AMBYSTOMA SPECIES

P25-05 **HOOD, CRAIG S. and Lauren E. Nolfo** Department of Biological Sciences, Loyola University, New Orleans, LA 70118 (chood@loyno.edu) (CSH). Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 (LEN)
CHALLENGES OF INVENTORY AND MONITORING MAMMALS OF JEAN LAFITTE NATIONAL PARK – HISTORIC & ONGOING URBAN IMPACTS

P25-06 **HOOKER, YURI** Departamento de Ecología, Museo de Historia Natural, Universidad Mayor de San Marcos, Av. Arenales 1256, Jesús Maria, Ap. 14-0434, Lima, Perú.(hookery@yahoo.com)
DISTRIBUTION OF THE LABRIDAE FAMILY IN THE PERUVIAN COAST AND ITS VARIATION DURING "EL NIÑO"

P02-01 **HOPTON, H. MYVONWYNN, Neil Pederson, and Nicole Davi** Tree-Rig Lab, Lamont Doherty Earth Observatory, Columbia University, PO Box 1000, 61 Route 9W, Palisades, NY 10964 (hmh11@columbia.edu) (HMH, NP, ND).
CLIMATE SENSITIVITY OF ATLANTIC WHITE CEDAR FROM MARYLAND TO MAINE

S21-6 **HORNING, NED** Center for Biodiversity and Conservation American Museum of Natural History Central Park West at 79th Street New York, NY 10024 (horning@amnh.org)
USING REMOTE SENSING DATA TO IMPROVE CONSERVATION PRIORITIES: FINDING THE DATA YOU NEED WHEN THE DATA YOU WANT CANNOT BE ACQUIRED

P30-1 **CHOWDHURY, AMIR** Institute for Environment and Development Studies, 5/12-15, Eastern view (5th floor), 50, D.I.T Extension Road, Dhaka-1000, Bangladesh. (iedsfoeb@accesstel.net)
AQUATIC ECOLOGY: BANGLADESH PERSPECTIVE

CO33-3 **HOSTETLER, MARK and Kara Youngentob** Department of Wildlife Ecology & Conservation, University of Florida, PO Box 110430, Gainesville, FL 32611-0430 (MH, KY) (hostetlerm@wec.ufl.edu)
URBAN "GREEN" DEVELOPMENTS AND NATURAL RESOURCE CONSERVATION: CAN WE TRULY CREATE SUSTAINABLE COMMUNITIES?

CO8-8 **HOUGHTON, LAWRENCE M., Jonathan B. Cohen, and James D. Fraser** Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (houghton@vt.edu)
PIPING PLOVER POPULATION REGULATION ON A REBUILT BARRIER ISLAND

P12-04 **HOULIHAN, PAUL, Tracy A. Farrell, Francisco Ollervides, and Christopher L. Dyer** School for Field Studies, 10 Federal Street, Salem, MA 01970 (phoulihan@fieldstudies.org)
USING AN ECOSYSTEM APPROACH TO CONSERVE MARINE RESOURCES IN MAGDALENA BAY, BAJA MEXICO

CO49-4 **HOYT, REGINALD** Forest Partners International, 302 Poplar Road, Flourtown, PA 19031, (conscoop@aol.com)
DIFFERENTIAL IMPACTS OF THE WILDLIFE HARVEST AND TRADE IN RURAL LIBERIA, WEST AFRICA

CO34-1 **HUNDERTMARK, KRIS J., Tim J. Wacher, Osama B. Mohammed, and Robert L. Hammond** King Khalid Wildlife Research Centre, National Commission for Wildlife Conservation and Development, PO Box 61681, Riyadh 11575, Kingdom of Saudi Arabia, and Conservation Programmes, Zoological Society of London, Regent's Park, London NW1 4RY (kris.hundertmark@zsl.org)
PHYLOGEOGRAPHY AND TAXONOMY OF MIDDLE EASTERN GAZELLES

CO48-4 **HURLEY, PATRICK T.** Environmental Studies Program, University of Oregon, 10 Pacific Hall, Eugene, OR 97403 (phurley@uoregon.edu)
LOCAL RESISTANCE TO CONSERVATION PLANNING: 'CONSPIRACY THEORY' AND NATURAL HERITAGE 2020 IN NEVADA COUNTY, CALIFORNIA

CO30-6 **INMAN, R. M., K. H. Inman, and C. R. Groves** Wildlife Conservation Society, 2023 Staduim Drive, Suite 1A, Bozeman, Montana 59715 (binman@wcs.org)
WOLVERINES IN GREATER YELLOWSTONE

CO17-5 **ISAAC, NICK J.B., Carmen Bessa-Gomes, Richard Pettifor, and Guy C. Cowlishaw** Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK (nick.isaac@ioz.ac.uk) (NI, CBG, RP, GC) Mathematical Eco-Evolution Unit,Laboratoire d'Ecologie (UMR 7625), Ecole Normale Supérieure, 46 rue d'Ulm, 75230 Paris Cedex 05, France (CBG)
DYNAMICS OF PRIMATE RESPONSES TO HABITAT DISTURBANCE

P10-04 **JACOBSON, SUSAN, Julie Morris, J. Scott Sanders, Eugene N. Wiley, Franklin Percival, and Robert Bennetts** Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL (jacobsons@wec.ufl.edu) Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL (JM) Florida Fish and Wildlife Conservation Commission, Tallahassee, FL (SS). Florida Fish and Wildlife Conservation Commission, Tallahassee, FL(EW), Franklin Percival, USGS Florida Cooperative Fish and Wildlife Research Unit, Gainesville, FL (FP), USGS Center for Aquatic Resources Studies, Gainesville, FL (RB)
UNDERSTANDING, MEASURING, AND BREAKING DOWN BARRIERS TO IMPLEMENTATION OF AN ADAPTIVE MANAGEMENT PROGRAM IN FLORIDA

P01-04 **JACOBSON, KARI A.** Conservation Biology Graduate Program, University of Minnesota, 199 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (jacobska@umn.edu)
NON-NATIVE PLANT INVASIONS IN RESTORED PRAIRIES: HOW ARE THEY MITIGATED OR AIDED BY NATIVE FUNCTIONAL GROUP DIVERSITY AND DISTURBANCE?

CO52-1 **JAMES, STACY, Edward Little, and Raymond Semlitsch** Division of Biological Sciences, University of Missouri, Columbia, MO 65211 (smj21b@mizzou.edu) (SJ,RS) USGS Columbia Environmental Research Center (EL)
RESPONSES OF TWO AMPHIBIAN SPECIES TO CHRONIC CADMIUM EXPOSURE AS TADPOLES IN AQUATIC OUTDOOR MESOCOSMS

CO33-4 **JOHNS, DAVID M.** (Johnsd@pdx.edu) The Wildlands Project; and School of Government, Portland State University, PO Box 751, Portland, OR 97207
MYTH AND MOBILIZATION: THE URGENCY FOR MORE EFFECTIVE OUTREACH AND RECENT LESSONS FROM BIO AND SOCIAL PSYCHOLOGY

CO16-5 **JOHNSON, ARLYNE, Chanthavy Vongkhamheng, and Michael Hedemark** Wildlife Conservation Society, Box 6712, Vientiane, Lao PDR; (ajohnson@wcs.org)
STATUS OF TIGERS, PREY, AND HUMAN-CARNIVORE CONFLICT IN THE NAM ET - PHOU LOUEY NPA, LAO PDR

CO20-4 **JOHNSON, STEIG E., Jean-Philippe Puyravaud, Felix Ratelolahy, Ravalison, Patricia C. Wright, Tim H. Keitt, Karen L. Kramer, and Christopher M. Holmes** Institute for the Conservation of Tropical Environments, SBS Building, 5th Floor, Stony Brook University, Stony Brook, NY 11794 (SEJ, J-PP, PCW, CMH) (steig.johnson@stonybrook.edu). Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (SEJ, PCW, KLK, CMH). Centre de Formation International pour la Valorisation de la Biodiversité, BP 33, Ranomafana, Ifanadiana 312, Madagascar (J-PP, FR, R). Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712 (THK)
BIODIVERSITY AND ANTHROPOGENIC DISTURBANCE AT RANOMAFANA NATIONAL PARK, MADAGASCAR

S19-1 **JOLLY, ALISON and Richard Jolly** Department of Biology and Environmental Sciences, Sussex University, The Old Brewery House, Southover High Street, Lewes BN7 1HX, UK, (AJ: ajolly@sussex.ac.uk). Institute for Development Studies, University of Sussex, mail as above (RJ)
SAVING MADAGASCAR'S BIODIVERSITY: WHO BENEFITS AND WHO PAYS? A BRIEF HISTORY

CO34-2 **JONES, MENNA, David Paetkau, Eli Geffen, and Craig Moritz** Department of Zoology and Entomology, University of Queensland, Queensland 4072, Australia (Menna.Jones@utas.edu.au) (MJ, DP, CM). Institute for Nature Conservation Research, Tel Aviv University, Ramar Aviv 69978, Israel, (EG).
GENETIC DIVERSITY, POPULATION STRUCTURE AND THE CURRENT CANCER EPIDEMIC IN TASMANIAN DEVILS

P25-07 **JOSEPH, LIANA N, Chris Wilcox, Stephen Garnett, Stephen Williams, and Hugh Possingham** School of Life Science, University of Queensland, St Lucia, AUSTRALIA 4072 (LN, CW, HP); Conservation Services, Queensland Parks and Wildlife Service, Northern Region, P.O.Box 2066, Cairns, AUSTRALIA 4870 (SG); Rainforest CRC, School of Tropical Biology, James Cook University, Townsville, AUSTRALIA 4811 (SW) (l.joseph@zen.uq.edu.au)
OPTIMAL MONITORING STRATEGIES FOR LISTING THREATENED SPECIES

CO43-2 **JUSTUS, JAMES, Sahotra Sarkar, Chris Kelley, Justin Garson, and Trevon Fuller** Biodiversity and Biocultural Conservation Laboratory, University of Texas at Austin, 1 University Station #C3500 Austin, TX 78712 –1180 (justus.phil@mail.utexas.edu)
EFFECTIVENESS OF ENVIRONMENTAL SURROGATES FOR THE SELECTION OF CONSERVATION AREA NETWORKS

S13-7 **KAHINDO, CHARLES, John Bates, and Rauri Bowie** Makerere University, Institute of Environment and Natural Resources, Kampala, Uganda (CK) (ckahindo@yahoo.com). Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago, IL (JB). Department of Zoology, University of Stellenbosch, Private Bag XI, Matieland 7602, South Africa (RB).
IMPORTANCE OF GENETICS IN UNDERSTANDING AND MANAGING BIODIVERSITY ON ISOLATED AFRICAN MOUNTAINS: CASE STUDIES FROM THE ALBERTINE RIFT AND EASTERN ARC

CO1-2 **KAPLAN, DAVID A.** Natural Resources Group, City of New York Department of Parks and Recreation, 1234 Fifth Avenue, Rm. 113, New York, NY 10029 (david.kaplan@parks.nyc.gov)
URBAN HABITAT RESTORATION: THE BRONX RIVER CEMENT PLANT PROJECT

S13-10 **KAPLIN, BETH, Shedrack Mashauri, and Michel Masozera** Antioch New England Graduate School, Keene, NH (BK) (bkaplin@antiochne.edu). East Usambara Biosphere Reserve, PO Box 5869, Tanga, Tanzania (SM). Wildlife Conservation Society, Kigali, Rwanda (MM).
MITIGATION INITIATIVES TO ENHANCE EFFECTIVENESS OF CONSERVATION IN AFRICAN BIODIVERSITY HOTSPOTS

CO54-4 **KAR GUPTA, KABERI** Department of Anthropology, Arizona State University, Tempe, AZ 85287-2402 (kaberi@asu.edu)
CONSERVATION, DISTURBANCE AND SOCIAL STRUCTURE IN A NOCTURNAL PROSIMIAN PRIMATE, SLENDER LORIS (LORIS TARDIGRADUS)

CO55-1 **KARANTH, ULLAS, Praveen Bhargav, and Sanjay Gubbi** Wildlife Conservation Society, 2300, Southern Boulevard, Bronx, NY-10460 (ukaranth@wcs.org) (UK). Wildlife First, 1235 (First Floor), 26A Main Road, Jayanagar 4th T Block, Bangalore-560 041, India (PB). Centre for Wildlife Studies, 26-2, Aga Abbas Ali Road (Apt: 403), Bangalore-560 042, India (SG).
SHOT DOWN BY FRIENDLY FIRE: ECOLOGICAL CONSEQUENCES OF WORLD BANK-GEF CONSERVATION INTERVENTIONS IN NAGARAHOLE, INDIA

S10-1 **KARESH, WILLIAM B. and Patricia Reed** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (wkaresh@wcs.org)
EBOLA AT THE HUMAN / WILDLIFE INTERFACE: GREAT APES, SURVEILLANCE AND 'WIN-WIN' OPPORTUNITIES FOR PUBLIC AND WILDLIFE HEALTH

CO7-3 **KARK, SALIT and Daniel Sol** Dept. of Evolution, Systematics and Ecology, The Institute of Life Sciences, The Hebrew University of Jerusalem, Jerusalem 91904, Israel (SK)(salit@cc.huji.ac.il). Center for Ecological Research and Forestry Applications (CREAF) UAB, Universitat de Barcelona 08193 Barcelona, Spain (DS).
BIRD INTRODUCTIONS: PATTERNS OF SUCCESS AND FAILURE ACROSS CONVERGENT CLIMATE REGIONS

CO47-3 **KARUBIAN, JORDAN** UCLA (jordank@ucla.edu)
CONSERVATION AND BASIC BIOLOGY OF THE LONG-WATTLED UMBRELLABIRD IN THE ECUADORIAN CHOCO

CO46-1 **KASANGAKI, AVENTINO, Lauren J. Chapman, and John Balirwa** (aventinok@yahoo.com) Institute of Tropical Forest Conservation, Mabarara University of Science & Technology, P O Box 44 Kabale Uganda. University of Florida, Department of Zoology, 223 Bartram Hall, Gainesville, FL 32611-8525 (LJC) Fisheries Resources Research Institute P O Box 343, Jinja Uganda (JB)
FISH FAUNA OF AN AFROMONTANE FOREST: IMPLICATIONS FOR CONSERVATION

CO43-3 **KATTAN, GUSTAVO, Carolina Murcia, Carlos Valderrama, Olga Lucia Hernandez, and Vladimir Rojas** Wildlife Conservation Society, Colombia Program, AA 15527, Cali, COLOMBIA (GK, CM, CV, VR), (gkattan@wcs.org), World Wildlife Fund-Colombia, Cra 35 4A-25, Cali, Colombia (OLH)
DESIGNING A REGIONAL SYSTEM OF PROTECTED AREAS IN A HIGHLY FRAGMENTED LANDSCAPE

CO20-5 **KEITT, TIMOTHY H., Wendy Gordon, Christopher M. Holmes, and Patricia C. Wright** Section of Integrative Biology, University of Texas, Austin, TX 78712 (THK, WG)(tkeitt@mail.utexas.edu). Institute for the Conservation of Tropical Environments, Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (CMH, PCW)
MODELING DYNAMICS OF HUMAN RESOURCE USE AND THEIR EFFECTS ON RAINFOREST CONSERVATION IN MADAGASCAR: OVERVIEW OF PACKARD RESEARCH AND MODELING APPROACHES

CO15-8 **KELLY, MORGAN W. and Judith M. Rhymer** Department of Wildlife Ecology, University of Maine, Orono, ME 04469 (MWK, JMR) (Morgan_Kelly@umit.maine.edu)
CONSERVATION GENETICS OF TWO RARE FRESHWATER MUSSEL SPECIES IN MAINE: THE TIDEWATER MUCKET (LEPTODEA OCHRACEA) AND YELLOW LAMPMUSSEL (LAMPSILS CARIOSA)

CO19-1 **KELLY, MARCELLA J., Andrew J. Noss, Hilary B. Camblos, and Damián I. Rumiz** Department of Fisheries and Wildlife Sciences, 210B Cheatham Hall, Virginia Tech, Blacksburg, VA 24061-0321 (MJK, HBC) (makelly2@vt.edu). Wildlife Conservation Society-Bolivia, calle Pocherena 122, Casilla 6272, Santa Cruz, Bolivia (AJN, DIR).
SYMPATRIC PUMAS AND JAGUARS: DATA FROM CAMERA TRAPPING IN BOLIVIA AND BELIZE

CO39-6 **KELLY, DANIEL S., Peter Leimgruber, and Christen Wemmer** Conservation and Research Center, Smithsonian National Zoological Park, Front Royal, VA 22630 (kellyd@crc.si.edu).
SEASONAL HABITAT USE OF ASIAN ELEPHANTS IN TWO PROTECTED AREAS IN MYANMAR

CO40-5 **KELLY, JAY F.** Graduate Program in Ecology and Evolution, Rutgers University, Plant Physiology Bldg., 1 College Farm Road, New Brunswick, NJ 08901(jaybird@eden.rutgers.edu). New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, P.O. Box 404, Trenton, NJ 08625-0404.
THE RESTORATION OF BACK BEACH HABITATS AND RARE PLANT SPECIES IN NEW JERSEY: ADDRESSING ANTHROPOGENIC CONSTRAINTS AT THE LANDSCAPE LEVEL

P02-02 **KELLY, JAY F.** Graduate Program in Ecology and Evolution, Rutgers University, Plant Physiology Bldg., 1 College Farm Road, New Brunswick, NJ 08901(jaybird@eden.rutgers.edu). New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, P.O. Box 404, Trenton, NJ 08625-0404.
EXPLANATORY SIGNIFICANCE OF SOIL PH IN THE DISTRIBUTION OF PRESENT AND HISTORIC SCHWALBEA AMERICANA POPULATIONS IN NEW JERSEY

CO12-2 **KEMPER, J. TODD and S. Ellen Macdonald** Department of Renewable Resources, 751 General Services Building, University of Alberta, Emdonton, Alberta, Canada, T6G 2H1 (todd.kemper@ualberta.ca)
SHORT AND LONG TERM EFFECTS OF WINTER SEISMIC EXPLORATION ON THE PLANT COMMUNITIES OF A LOW ARCTIC MIGRATORY BIRD SANCTUARY

S12-9 **KENNEDY, ELIZABETH** Conservation International, 1919 M Street, NW, Suite 600, Washington, DC (e.kennedy@conservation.org)
AN OVERVIEW OF THE CHALLENGE OF ASSESSING CONSERVATION STATUS

CO41-3 **KEYSER, PATRICK D., T. Bently Wigley, Carola A. Haas, Petra B. Wood, W. Mark Ford, John W. Edwards, David. C. Guynn, Jr., and Craig Loehle** Forestry Division, MeadWestvaco, PO Box 577, Rupert, WV 25984 (PDK), (pdk2@meadwestvaco.com). NCASI, PO Box 340362, Clemson, SC 29634-0362 (TBW). Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (CAH). WV Coop Fish and Wildlife Research Unit, USGS-BRD, Box 6125, Morgantown, WV 26505-6125 (PBW). USDA Forest Service (WMF). Division of Forestry, West Virginia University (JWE). Department of Forest Resources, Clemson University (DCG). NCASI (CL).
DISTURBANCE AND HABITAT FRAGMENTATION IN EXTENSIVELY FORESTED LANDSCAPES, THE APPALACHIAN LANDSCAPE ECOLOGY PROJECT

S15-5 **KHOURY, MARY, Paul West, Michael Reuter, Ken Lubinski, Catherine McCalvin, Douglas Blodgett, David Braun, Blane Heumann, David DeGeus, and Larry Clemens** The Nature Conservancy, Midwest-Canada Division, 8 S. Michigan Avenue, Suite 2301, Chicago, IL 60603 (mkhoury@tnc.org)(MK); The Nature Conservancy of Wisconsin, 633 W. Main St., Madison, WI, 53703 (PW); The Nature Conservancy of Illinois, 301 SW Adams St., Suite 1007. Peoria, IL 61602 (MR,KL,CM,DBl,DBr); The Nature Conservancy of Missouri, 2800 S. Brentwood Blvd., St. Louis, MO, 63144 (BH); The Nature Conservancy of Iowa, 303 Locust St., Suite 402, Des Moines, IA (DD); The Nature Conservancy,Upper St. Joseph River Office, Peachtree Plaza, 1220 North 200 West, Suite G, Angola, IN 46703 (LC)
DESIGNING CONSERVATION STRATEGIES FOR THE UPPER MISSISSIPPI RIVER: WHAT IS THE RESERVE AND DOES RESERVE DESIGN APPLY?

S07-2 KILPATRICK, A. MARM**, Laura D. Kramer, Peter Daszak, Peter P. Marra, Andrew P. Dobson, Scott R. Campbell, E. Oscar Alleyne.** Consortium for Conservation Medicine at Wildlife Trust, New York. (kilpatrick@conservationmedicine.org)
THE ECOLOBY OF WEST NILE VIRUS ACROSS AN URBANIZING LANDSCAPE

CO10-4 **KIM, MICHAEL H., Candace A. Scott, Juan Carlos Morales, Don J. Melnick, Peter Erb, Colleen O'Ryan, Peter T. Boag, and Peter J. van Coeverden de Groot** Dept. of Biology, Queen's University, Kingston, ON, K7L 3N6, Canada (MHK, CAS, PTB and PJVCDG) (mikekim@biology.queensu.ca); Center for Environmental Research and Conservation, Columbia University, 10027-5557, New York, NY (JCM, DJM); Etosha National Park, Ministry of Environment and Tourism, Namibia (PE); Dept. of Biochemistry, University of Cape Town, Rondebosch, 7700, South Africa (CO)
POPULATION GENETICS OF THE BLACK RHINOCEROS (DICEROS BICORNIS) IN ETOSHA NATIONAL PARK

CO35-3 **KINNAIRD, MARGARET, Yok-Yok Hadiprakarsa, Timothy O'Brien, and Mohamed Iqbal** The Wildlife Conservation Society-Asia Program, 2300 Southern Blvd., Bronx, NY 10460 (MK, TO), The Wildlife Conservation Society-Indonesia Program, Jl. Pangrango 8, Bogor, Indonesia (YYH, MI),(mkinnaird@wcs.org),
EFFECTS OF FOREST FRAGMENTATION ON SUMATRAN HORNBILL COMMUNITIES

P23-03 **KIRSHENBAUM, SHERIL R., Yong Chen, and James A. Wilson** 216 Libby Hall, School of Marine Science, University of Maine, Orono, ME 04469 (sheril_kirshenbaum@umit.maine.edu)
ASSESSMENT AND MANAGEMENT OF THE MAINE SEA CUCUMBER (CUCUMARIA FRONDOSA - A MULTIDISCIPLINARY APPROACH

S06-5 **KIVIAT, ERIK and Tanessa Hartwig** Hudsonia Ltd., P.O. Box 5000, Annandale NY 12504-5000 (kiviat@bard.edu)
INVASIVE MARSH PLANTS AND MANAGEMENT IN THE NEW YORK CITY REGION

S06-12 **KLEMENS, MICHAEL W., Nicholas Miller, and Jennifer Schmitz** Wildlife Conservation Society, Metropolitan Conservation Alliance, 68 Purchase Street, 3rd Floor, Rye, NY 10580; (mca@wcs.org)
WILL BETTER LAND USE DECISIONS PROTECT OUR REGION'S BIODIVERSITY?

P09-07 **KLEPPEL, GARY S.** DEPARTMENT OF BIOLOGICAL SCIENCES, UNIVERSITY AT ALBANY, SUNY, 1400 WASHINGTON AVENUE, ALBANY, NY 12222. Biodiversity, Conservation and Policy Program, Department of Biological Sciences, University at Albany, SUNY, Albany, NY 12222 (RS)(gkleppel@albany.edu)
ECOLOGICAL IMPACTS OF ALTERNATIVE URBAN TYPOLOGIES: THE ROLE OF ECOLOGICAL DESIGN ON RAPIDLY URBANIZING LANDSCAPES

P34-07 **KLOTZ, R. LAWRENCE** Department of Biological Sciences, State University of New York College at Cortland, Cortland, NY 13045 (Klotz@Cortland.edu).
REPRODUCTIVE SUCCESS OF BIRDS IN TWO GRASSLAND HABITATS

CO1-3 **KNIGHT, RICHARD, Grant Benn, Lorraine Gerrans, Barrie A. Low, and Gregg Oelofse** Biodiversity and Conservation Biology Department, University of the Western Cape, Private Bag X17, Bellville 7535 South Africa (RK). GISCOE, Cape Town, South Africa (GB). Department of Environmental Management, City of Cape Town, P.O. Box 16548, Vlaeberg 8018, South Africa (LG, GO). Coastec, Coastal & Environmental Consultants, Rondebosch, South Africa (ABL) (rknight@uwc.ac.za)
THE DEVELOPMENT OF THE CITY OF CAPE TOWN'S BIODIVERSITY NETWORK

S10-5 **KOCK, MICHAEL D. and Richard A. Kock** Wildlife Conservation Society Field Veterinary Program, AU-IBAR PARC, PO Box 30786, Nairobi, Kenya (RAK). PO Box 106 Greyton 7233, South Africa, (mdkock@kingsley.co.za) (MDK)
HUMAN HEALTH AND CONSERVATION: SO-CALLED EMERGING AND RE-EMERGING HUMAN AND ANIMAL DISEASES IN AFRICA-POLITICAL, CULTURAL AND INSTITUTIONAL FACTORS THAT INFLUENCE DISEASE MANAGEMENT AND IMPLICATIONS FOR CONSERVATION AND DEVELOPMENT

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IMPORTANCE OF RESERVES, FRAGMENTS AND PARKS FOR BUTTERFLY CONSERVATION IN A TROPICAL URBAN LANDSCAPE

S06-1 **KOONTZ, FRED, Susan Elbin, and Scott Newman** Wildlife Trust, 61 Route 9W, Palisades, NY 10964 (koontz@wildlifetrust.org)
LIFE IN THE BIG APPLE: BIODIVERSITY CONSERVATION IN THE NEW YORK BIOSCAPE

P09-08 **KOTZE, D. JOHAN and Susanna Lehvävirta** Department of Biological and Environmental Sciences, PO Box 65 (Viikinkaari 1), FIN-00014, University of Helsinki, Finland (johan.kotze@helsinki.fi)
OF SHARP EDGES, HEAVY TRAMPLING AND A LACK OF DEAD AND DECAYING WOOD IN URBAN WOODLANDS – HOW TO CHANGE CITY GREEN SPACE FOR THE BENEFIT OF CARABID SPECIES

CO11-6 **KREMEN, CLAIRE** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ, (ckremen@princeton.edu)
MANAGING ECOSYSTEM SERVICES: WHAT DO WE NEED TO KNOW?

S19-2 **KREMEN, CLAIRE, Alison Cameron, and Chris Raxworthy** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ (ckremen@princeton.edu)(CK) Department of Herpetology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192 (CJR)
CROSS-TAXON BIOGEOGRAPHY - DO CENTERS OF ENDEMISM MATCH UP, AND LESSONS FROM EVOLUTIONARY PROCESSES FOR CONSERVATION

CO7-1 **KREPS, TIMOTHY A., Julie E. Hempstead, and David M. Lodge** Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 (tkreps@nd.edu)
EFFECTS OF BOOM-BUST DYNAMICS OF THE INVASIVE CRAYFISH ORCONECTES RUSTICUS ON SNAIL COMMUNITIES IN NORTHERN WISCONSIN LAKES

P12-05 **KRITZER, JACOB P., Margaret F. Docker, Daniel D. Heath, and Peter F. Sale** Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada N9B 3P4 (kritzer@uwindsor.ca) (JPK, PFS); Great Lakes Institute for Environmental Research, University of Windsor, Windsor, Ontario, Canada N9B 3P4 (MFD, DDH)
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CO47-1 **KROM, SUZANNE, Kathryn Stenberg, Patricia Thompson, and Pam Cahn** Quailcroft Environmental Services, 23022 SE 48th St., Sammamish, WA 98075 (KS, SK), (quailcroft@comcast.net). Washington State Dept. of Fish and Wildlife, 16018 Mill Creek Blvd., Mill Creek, WA 98012, USA (PT). Pam Cahn Consulting, PMB 3365, 10002 Aurora Ave N., Seattle, WA 98133, USA (PC).
CONSERVATION OF THE COASTAL GREAT BLUE HERON (Ardea herodias fannini) IN AN URBANIZING ENVIRONMENT

P20-04 **KÜHL, ALINE, Natalia Balinova, Anna A. Lushchekina, and E.J. Milner-Gulland** Renewable Resources Assessment Group, Department of Environmental Science and Technology, Imperial College, Prince Consort Road, London, SW7 2BP, UK, (aline.kuhl@imperial.ac.uk) (AK, EJM). Kalmyk Institute for Humanities, Russian Academy of Sciences, ul. Ilihkina 8, Elista, 358000, Kalmykia, Russian Federation (NB). Laboratory of Landscape Ecology of Mammals, Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy Prospect, 117071, Moscow, Russian Federation (AAL).
INTERACTIONS BETWEEN THE RAPID DECLINE IN SAIGA ANTELOPE POPULATIONS AND THE COLLAPSE OF RURAL ECONOMIES IN FORMER SOVIET UNION STATES

CO5-7 **KULKARNI, BALASAHEB G., Ashok Jaiswar, and M.R.A.Teaherizadah** The Institute of Science, 15 Madam cama Road, Mumbai 400 032 (balasaheb_k@hotmail.com)
IMPACT OF URBANIZATION AND INDUSTRALIZATION ON COAST OF MUMBAI (BOMBAY): A CASE STUDY FROM WEST COAST OF INDIA

S16-5 **KÜMPEL, NOËLLE F., T. East, E.J. Milner-Gulland, and J.Marcus Rowcliffe** Department of Environmental Science and Technology, Imperial College London, Exhibition Road, London SW7 2AZ, UK (TE, NK & EJMG); Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK (NK & JMR); (noelle.kumpel@ioz.ac.uk)
DETERMINANTS OF URBAN BUSHMEAT CONSUMPTION IN RÍO MUNI, EQUATORIAL GUINEA

CO36-4 **LAMBERT, THOMAS D., Jay R. Malcolm, and Barbara L. Zimmerman** Faculty of Forestry, University of Toronto, Toronto, Ontario, Canada, M5S 3B3 (TDL, JRM) (thomas.lambert@utoronto.ca); Conservation International, Washington, DC (BLZ)
EFFECTS OF SELECTIVE LOGGING ON SMALL MAMMAL COMMUNITIES AND IMPLICATIONS FOR AMAZONIAN CONSERVATION

P33-03 **LANGTIMM, CATHERINE A., Cathy A. Beck, William L. Kendall, and Michael C. Runge** U.S. Geological Survey, Florida Integrated Science Center, Sirenia Project, 412 NE 16th Ave., Gainesville, FL 32601 (CAL, CAB),(Cathy_Langtimm@usgs.gov). U.S. Geological Survey, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, MD 20708 (WLK, MCR)
DIFFERENCES IN MANATEE POPULATION DYNAMICS: FLORIDA ATLANTIC COAST VS. NORTH GULF COAST

P34-08 **LAPIN, MARC, Kathy Doyle, Jim Graves, and Mary Droege** Ecosystem Science and Conservation, 239 Cider Mill Rd., Cornwall, VT 05753 (mlapin@shoreham.net) (ML). 28 South St., Middletown Springs, VT 05757, USA (KD). Green Mountain College, Poultney, VT 05764 (JG). The Nature Conservancy, Southern Lake Champlain Valley Project, 115 Main Rd., West Haven, VT 05743 (MD)
ASSESSING STRESSORS FOR RESTORATION PLANNING, PRIORITIZING, AND IMPLEMENTATION FOR AN EASTERN DECIDUOUS FOREST NATURAL COMMUNITY

S21-2 **LAPORTE, NADINE and Tiffany Lin** The WOODS HOLE RESEARCH CENTER P.O. Box 296 Woods Hole, MA 02543-0296 (nlaporte@whrc.org)
UNDERSTANDING HUMAN IMPACTS

CO5-4 **LARSEN, TROND** Dept. of Ecology & Evolutionary Biology, Princeton University, Princeton, NJ 08544 (tlarsen@princeton.edu)
LINKING PATTERNS, CAUSES AND FUNCTIONAL CONSEQUENCES OF CHANGING BIODIVERSITY

P02-03 **LARSEN, FRANK WUGT** Zoological Museum, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen O, Denmark (fwlarsen@zmuc.ku.dk)
IS THE HIGHER-TAXON APPROACH USEFUL FOR CONTINENTAL PRIORITY-SETTING AND DOES SPATIAL SCALE INFLUENCE THE RESULTS?

CO28-3 **LAVIDES, MARGARITA, Jose Ma. Antonio Bringas, Don Geoff Tabaranza, and Chona May Cunanan** Haribon Foundation for the Conservation of Natural Resources 4F Fil Garcia Tower Kalayaan St Diliman Quezon City Philippines (MNL, JAB, CMC) (lavides@yahoo.com). PAMANA Ka Sa Pilipinas, Cebu City, Philippines (DGT)
THE STATUS OF COMMUNITY–BASED MARINE PROTECTED AREAS IN THE PHILIPPINES: SUCCESSES, EMERGING ISSUES AND FUTURE DIRECTIONS

P08-05 **LE CADRE, SOLENN, Nathalie Machon, and Jacques Moret** UMS 2699 Inventaire et Suivi de la Biodiversité, Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (LCS, NM, JM) (lecadre@mnhn.fr) UMR 5173 CNRS MNHN Conservation des Espèces, Restauration et Suivi des Populations. Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (NM).
SEXUAL REPRODUCTION AND ALLEE EFFECT IN ;ACONITUM NAPELLUS; L. SUBSP. ;LUSITANICUM;, A RARE AND PROTECTED SPECIES IN NORTHERN FRANCE

P31-01 **LEE, TIEN-MING, Malcom Soh, Navjot S. Sodhi, Lian Pin Koh, and Susan Lim** Department of Biological Sciences, National University of Singapore, Blk S2 14 Science Drive 4, Singapore 117543, Singapore. (LTM,MS,NSS,LPK) (g0301210@nus.edu.sg), Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia. (SL)
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P25-09 **LEE, YU MAN, Bruce A. Kingsbury, Jennifer A. Olson, Michael Monfils, Lori G. Sargent, and Peter B. Pearman** Michigan Natural Features Inventory, Michigan State University Extension, Mason Building, P.O. Box 30444, Lansing, MI 48909 (YL, JAO, MM, PBP). Center for Reptile and Amphibian Conservation and Management, Indiana-Purdue University, Fort Wayne, 2101 E. Coliseum Blvd., Fort Wayne, IN 46805 (BAK). Michigan Department of Natural Resources, Wildlife Division, Natural Heritage Program, Mason Building, 4th Floor, P.O. Box 30444, Lansing, MI 48909 (LGS). (leeyu@michigan.gov)
EASTERN MASSASAUGA SURVEYS IN MICHIGAN

P13-04 **LEE, DEREK E., Nadav Nur, William J. Sydeman, Peter Pyle, Kyra L. Mills, and Pete Warzybok** PRBO Conservation Science, Marine Ecology Division, 4990 Shoreline Highway, Stinson Beach, CA 94970, (dlee@prbo.org)
AGE-SPECIFIC DEMOGRAPHY OF CASSIN'S AUKLETS (PTYCHORAMPHUS ALEUTICUS) AT SOUTHEAST FARALLON ISLAND, CALIFORNIA

CO13-2 **LEFER, DANIELLE, James Fraser, and Casey D. Kruse** Dept. of Fisheries and Wildlife, Virginia Tech, Blacksburg, VA 24061 USA (DL, JF) (dlefer@vt.edu). U.S. Army Corps of Engineers, POB 710, Yankton, SD 57078 (CDK).
VARIATION IN PIPING PLOVER FORAGING SITE QUALITY ON THE MISSOURI RIVER

P31-02 **LEFEVRE, KARA L. and F. Helen Rodd** Department of Zoology, University of Toronto, 25 Harbord St., Toronto, ON, M5S 3G5, Canada, (k.lefevre@utoronto.ca).
HABITAT DISTURBANCE AND AVIAN FRUGIVORY: IMPLICATIONS FOR TROPICAL RAINFOREST ECOLOGY

CO35-6 **LEIMGRUBER, PETER, Daniel S. Kelly, Thomas Mueller, and Melissa Songer** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (leimgruberp@crc.si.edu)
FOREST DYNAMICS AND CONSERVATION PRIORITIES IN MYANMAR 1990-2000

P29-09 **LEITE PITMAN, RENATA, George Powell, Dario Cruz, Mario Escobedo, Karen Escobar, Vicente Vilca, and Armando Mendoza** Center for Tropical Conservation/Associacao Pro-carnivoros, Duke University Box 90387, Durham, NC, 27705 (renata.leite@duke.edu), (RLP), AREAS Project - World Wildlife Fund, 1250 24th Street, NW, Washington, DC 20037 USA (RLP, GP, DC, ME, KE, VV, AM)
HABITAT USE AND ACTIVITY OF THE GIANT ARMADILLO (*Priodontes maximus*): PRELIMINARY DATA FROM SOUTHEASTERN PERU

CO38-5 **LEMA, MATHIAS** Tanga Catchment Forest Office, POBox 1449, Tanga,Tanzania (mathiaslema@hotmail.com)
SEED BANK STUDIES REVEAL THE POTENTIAL FOR DISTURBED FOREST PATCHES TO BE DOMINATED BY HERBACEOUS AND GRASS SPECIES IN AN AFRICAN BIODIVERSITY HOTSPOT

CO22-7 **LEPCZYK, CHRISTOPHER A., Anna M. Pidgeon, Volker C. Radeloff, Roger B. Hammer, and Curtis H. Flather** Department of Forest Ecology and Management, University of Wisconsin-Madison, Madison, WI 53706, USA (clepczyk@wisc.edu) (CAL, AMP, VCR); Department of Rural Sociology, University of Wisconsin-Madison, Madison, WI 53706, USA (RBH); USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO 80526, USA (CHF)
THE INFLUENCE OF HOUSING GROWTH ON BIRD COMMUNITIES IN THE NORTHEASTERN U.S.

P27-07 **LERMAN, SUSANNAH B. and Eyal Shochat** Department of Environmental Studies, Antioch New England Graduate School, 40 Avon Street, Keene, NH 03431 (susannah_lerman@antiochne.edu) (SBL), Sutton Avian Research Center, POB 2007, Bartlesville, OK 74005 (ES).
COMPARING BIRD FORAGING BEHAVIOR IN AN URBAN-DESERT LANDSCAPE: CONSERVATION IMPLICATIONS

CO52-9 **LESBARRERES, DAVID, Mike Fowler, Thierry Lodé, and Alain Pagano** Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, University of Helsinki, Finland (DL, david.lesbarreres@helsinki.fi). Integrative Ecology Unit, Department of Biological and Environmental Sciences, University of Helsinki, Finland (MF). Laboratoire d'Écologie Animale, Université d'Angers, Angers, France (TL, AP)
POND RESTORATION FOR AMPHIBIANS: HOW TO COMBINE HIGHWAY CONSTRUCTION AND CONSERVATION BIOLOGY?

S08-8 **LESLIE, HEATHER** Dept. of Zoology,Oregon State University, Corvallis,OR 97331 (leslieh@science.oregonstate.edu)
A TEMPLATE FOR LEARNING AND EVALUATION? A REPORT ON A MARINE CONSERVATION PLANNING DATABASE

CO7-5 **LEUNG, GRACE P.C. and Billy C.H. Hau** Department of Ecology & Biodiversity, The University of Hong Kong, Pokfulam Road, Hong Kong SAR, China (h9907349@hkusua.hku.hk)
THE DANGER OF MAN-MADE SLOPES AS INVASION PLATFORMS FOR ALIEN PLANTS IN HONG KONG, CHINA

CO28-4 **LEVIN, PHILLIP, Elizabeth Holmes, and Kevin Piner** NOAA Fisheries, Northwest Fisheries Science Center, 2725 Montlake Blvd E, Seattle, WA 98112 (phil.levin@noaa.gov)
FISHING-INDUCED PHASE SHIFTS IN A PACIFIC OCEAN FISH ASSEMBLAGE

CO43-4 **LEVIN, NOAM and Avi Shmida** Department of Geography and Human Environment, Tel Aviv University, Israel (levinnoa@post.tau.ac.il) (NL); Rotem-Israel Plant Information Center, Dept. of Evolution, Systematics and Ecology, The Hebrew University, Jerusalem 91904, Israel (NL, AS).
SETTING CONSERVATION PRIORITIES FOR GIVEN GEOGRAPHICAL AREAS IN ISRAEL BASED ON PLANT RICHNESS, SPATIAL EXCLUSIVENESS AND RED LIST CRITERIA

CO52-2 **LEWIS, RICHARD, Herizo Andrianandrasana, Lala Jean Rakotoniaina, Robert Bourou, Hafany Tiandray, and Joanna Durbin** Durrell Wildlife Conservation Trust- Madagascar Programme, BP 8511, Antananarivo 101, Madagascar (richard.lewis@durrell.org)
USING FIRE TO CONTROL FIRE: THE INSTALLATION OF FIREBREAKS TO PROTECT GEOCHELONE YNIPHORA AND ITS HABITAT IN WESTERN MADAGASCAR

P03-05 **LEWIS, DAVID N., James H. Fownes, and Karen B. Searcy** Dept. of Natural Resources Conservation, University of Massachusetts Amherst, Amherst, MA 01003 USA (DNL, JHF), (dnlewis@forwild.umass.edu). Biology Department, University of Massachusetts Amherst, Amherst, MA 01003 (KBS).
DIVERGENT PLANT COMMUNITY TYPES ACROSS STRONG SOIL ACIDITY GRADIENTS ON THE HOLYOKE RANGE, MASSACHUSETTS

CO53-5 **LEWISON, REBECCA, Sloan Freeman, and Larry Crowder** Duke University Marine Laboratory, Nicholas School of the Environment and Earth Sciences, 135 Duke Marine Lab Road, Beaufort, NC 28516 (rebecca.lewison@duke.edu)
QUANTIFYING THE EFFECTS OF FISHERIES ON PROTECTED SPECIES: THE IMPACT OF PELAGIC LONGLINES ON LOGGERHEAD AND LEATHERBACK SEA TURTLES

P10-05 **LI, EVE and Endi Zhang** Wildlife Conservation Society-China Program, C/o East China Normal University, Shanghai 200062, China (evebingli@163.net)
WORKING TO REDUCE WILDLIFE CONSUMPTION IN CHINA- AN OVERVIEW OF ASIA CONSERVATION COMMUNICATION PROGRAM

CO9-2 **LINDBORG, REGINA and Ove Eriksson** Department of Botany, Stockholm University, SE-106 91 Stockholm, Sweden (regina.lindborg@botan.su.se)
HISTORICAL LANDSCAPE CONNECTIVITY DETERMINES PRESENT PLANT SPECIES DIVERSITY

CO55-2 **LING, STEPHEN** Renewable Resources Assessment Group, Env. Science and Tech., Imperial College, RSM Building, Prince Consort Rd, London SW7 2BP, UK (stephen.ling@imperial.ac.uk.)
BIOECONOMIC ANALYSIS OF THE SUSTAINABILITY OF HUNTING

CO29-6 **LISSIGNOL-HUSTE, AURELIE, Slaheddine Selmi, Jean Clobert, and Thierry Boulinier** Laboratoire d'Ecologie, Université Pierre et Marie Curie, CNRS UMR 7625,Bât A, 7ème étage, 7 quai St Bernard, 75252 Paris cedex 05, FRANCE (LHA, JC, TB) (alissign@mail.snv.jussieu.fr.) Département des Sciences de la Vie & de la Terre, Faculté des Sciences de Gabès, Route de Médenine, 6029 Gabès, TUNISIA (SS)
DIVERSITY AND TEMPORAL DYNAMICS OF BIRD SPECIES IN THE SUBURBDS OF PARIS, FRANCE

P33-04 **LITTNAN, CHARLES, Robert Braun, and George Antonelis** MMRP, Pacific Islands Fisheries Science Center, NOAA Fisheries, 2570 Dole St. Honolulu, HI 96822 USA (charles.littnan@noaa.gov)(CL, GA). NMFS Contract Veterinarian (BB)
AT-SEA MOVEMENTS, FORAGING AREAS, AND HABITAT USE OF HAWAIIAN MONK SEALS IN THE MAIN HAWAIIAN ISLANDS

P06-05 **LITZGUS, JACQUELINE and TIMOTHY MOUSSEAU** Department of Biological Sciences, University of South Carolina, Columbia, SC 29208 (litzgus@biol.sc.edu)
HOME RANGE AND SEASONAL ACTIVITY OF THE SPOTTED TURTLE (CLEMMYS GUTTATA): IMPLICATIONS FOR MANAGEMENT OF SOUTHEASTERN POPULATIONS

CO15-6 **LIUKKONEN-ANTTILA, TUIJA, Hannaleena Mäki-Petäys, Osmo Rätti, Pekka Helle, and Markku Orell** University of Oulu, P.O.Box 3000, Fin-90014 University of Oulu, Finland, (Tuija.Liukkonen-Anttila@oulu.fi) (TL-A, HM-P, MO). Arctic Centre, University of Lapland, P.O.Box 122, Fin-96101 Rovaniemi, Finland (OR). Finnish Game and Fisheries Research Institute, Tutkijantie 2, Fin-90570 Oulu, Finland (PH).
NO CLEAR GEOGRAPHIC STRUCTURE IN THE CAPERCAILLIE (TETRAO UROGALLUS) POPULATIONS AT A NATIONAL LEVEL IN FINLAND

P33-05 **LoGIUDICE, KATHLEEN** Union College, Department of Biological Sciences, Schenectady, NY 12308 (logiudik@union.edu)
TOWARD A SYNTHETIC VIEW OF EXTINCTION: EXAMINING THE HISTORY OF A NORTH AMERICAN RODENT

CO4-4 **LONSDORF, ELIZABETH V., Dominic Travis, and Anne E. Pusey** Department of Conservation and Science, Lincoln Park Zoo, Chicago, IL, 60614 (elonsdorf@lpzoo.org)(EVL, DT). Jane Goodall Institute's Center for Primate Studies, Department of Ecology, Evolution and Behavior, St. Paul, MN 55108 (AEP)
GOMBE CHIMPANZEE HEALTH-MONITORING: PAST, PRESENT AND FUTURE

P05-10 **LOPEZ, ROEL R., Philip A. Frank, Nova J. Silvy, and H. Resit Akçakaya** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843-2258 (roel@tamu.edu) (RRL, NJS). U.S. Fish and Wildlife Service, National Key Deer Refuge, Big Pine Key, FL 33043 USA (PAF). Applied Biomathematics, Setauket, NY 11733 (HRA).
INTEGRATING HABITAT MODELS IN CONSERVATION PLANNING: ASSESSING RISK OF URBAN DEVELOPMENT TO THE FLORIDA KEY DEER

CO25-5 **LOUCKS, COLBY J., Taylor H. Ricketts, Marc L. Imhoff, Lahouari Bounoua, John Lamoreux, Tim Boucher, and Jonathan M. Hoekstra** World Wildlife Fund, 1250 Twenty-fourth St. NW, Washington D.C. 20037 (colby.loucks@wwfus.org) (CJL, THR). Department of Biological Sciences, Stanford University, Stanford CA 94305 USA (THR). Biospheric Sciences Branch, NASA's Goddard Space Flight Center, Greenbelt MD 20771 USA (MLI, LB). Earth System Science Interdisciplinary Center, University of Maryland, College Park MD 20742 (LB). 203 Raymond Avenue, University of Virginia, Charlottesville, VA 22903 (JL). Global Priorities Group, The Nature Conservancy, 4245 North Fairfax Drive, Suite 100, Arlington, VA 22203-1606 (TB, JMH)
RELATING HUMAN CONSUMPTION PATTERNS, SPECIES ENDANGERMENT, AND HABITAT PROTECTION: LESSONS FOR GLOBAL CONSERVATION

S22-2 **LOVELAND, THOMAS** (loveland@usgs.gov)
A NATIONAL ASSESSMENT OF THE GEOGRAPHICAL AND ECOLOGICAL CHARACTERISTICS OF THE FEDERAL PUBLIC LAND NETWORK

CO29-3 **LOWE, WINSOR H., Keith H. Nislow, and Douglas T. Bolger** Institute of Ecosystem Studies, PO Box AB, Millbrook, NY 12454 (WHL) (lowew@ecostudies.org). USDA Forest Service Northeastern Research Station, UMASS, Amherst, Massachusetts 01003 (KHN). Environmental Studies Program, Dartmouth College, Hanover, NH 03755 USA (DTB).
STAGE-SPECIFIC AND INTERACTIVE EFFECTS OF SEDIMENTATION AND TROUT ON A HEADWATER STREAM SALAMANDER

CO30-5 **LOWE, ARIANNE, Stephen Dovers, and David Lindenmayer** Centre for Resource and Environmental Studies, Bldg 43, Hancock, Australian National University, Canberra, ACT 0200, Australia (arilowe@cres.anu.edu.au)
TOWARDS IMPROVED THEORY AND PRACTICE IN EVALUATION OF CONSERVATION PROJECTS

P21-05 **Lu, Jacqueline W.T.** Dept. of Ecology, Evolution and Environmental Biology, 1200 Amsterdam Avenue, Columbia University, New York, NY 10027 (jl2071@columbia.edu)
NEW YORK CITY'S STREET TREES AND THEIR RELATIONSHIP TO PATTERNS OF SOCIAL STRATIFICATION

P22-02 **LUCE, DONALD T.** Bell Museum of Natural History, University of Minnesota, 10 Church Street SE, Minneapolis, MN 55455 (lucex001@umn.edu); Carol Strecker, Bell Museum of Natural History; Jane Greenberg, Bell Museum of Natural History; Sonja Welhelm, Forest Resources Department, University of Minnesota
NATURE IN THE CITY: PLANNING A NATIONALLY TRAVELING EXHIBITION TO EXPLORE URBAN BIODIVERSITY

CO51-8 **COLDING, JOHAN, JAKOB LUNDBERG, and Carl Folke** The Beijer Institute of Ecological Economics, Royal Swedish Academy of Sciences, Stockholm, Sweden, Box 5005. Centre for natural resources and the environment, and Department of Systems Ecology, Stockholm University, Sweden, 106 91 Stockholm (Jakob@system.ecology.su.se)
A NEW LOOK AT URBAN GREEN AREAS: IMPLICATIONS FOR PHYSICAL PLANNING AND BIODIVERSITY MANAGEMENT

CO41-5 **LUNDQUIST, CAROLYN J., Simon F. Thrush, Judi E. Hewitt, and Vonda J. Cummings** National Institute of Water and Atmospheric Research (NIWA), PO Box 11-115, Gate 10, Silverdale Road, Hamilton, 2001, Zealand (c.lundquist@niwa.co.nz)
PREDICTING RECOVERY OF ESTUARINE INTERTIDAL COMMUNITIES AFTER HUMAN DISTURBANCE

P23-04 **LYNAM, ANTONY J. and Pimolsri Chalermchai** Border Patrol Police Bureau, Royal Thai Police Office, Phaholyothin Road, Phyathai, Bangkok, THAILAND 10400 (CP). Wildlife Conservation Society – International Programs, 2300 Southern Boulevard, NY 10460-1099. (AJL). (tlynam@wcs.org)
COMBINING SCIENCE AND SECURITY TO PROTECT THAILAND'S TRANSBOUNDARY WILDLIFE

S06-14 **LYNN, WILLIAM S.** Center for Humans and Nature, 109 West 77th Street, Suite 2, New York, NY 10024, (williamlynn@practicalethics.net)
HUMANS AND NATURE TOGETHER: SOUND SCIENCE, SOUND ETHICS

P09-09 **MACDONALD, KRISTI** Ecology and Evolution Program, Rutgers University, 1 College Farm Road, New Brunswick, NJ 08901, (kristim@eden.rutgers.edu)
THE ROLE OF FOREST PROXIMITY AND LAND USE IN MAINTAINING DIVERSITY OF BREEDING SONGBIRDS IN AN URBAN WATERSHED: OPPORTUNITIES FOR URBAN CONSERVATION PLANNING

S12-12 **MACE, GEORGINA M., Andrew Balmford, Peter Crane, and Rhys E. Green** INSTITUTE OF ZOOLOGY (georgina.mace@ioz.ac.uk)
MONITORING WILD NATURE FOR THE WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT 2010 TARGETS

CO40-1 **MACHON, NATHALIE, Bruno Colas, Gérard Hunault, and Jacques Moret** UMS 2699 Inventaire et Suivi de la Biodiversité, Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (NM, GH, JM) machon@mnhn.fr . UMR 5173 CNRS MNHN Conservation des Espèces, Restauration et Suivi des Populations. Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (NM, BC)
RE-ESTABLISHMENT TRIALS IN ENDANGERED PLANTS: THE EXAMPLE OF ARENARIA GRANDIFLORA L., A SPECIES ON THE BRINK OF EXTINCTION IN THE PARISIAN REGION (FRANCE)

CO49-3 **MACK, ANDREW and Paige West** Wildlife Conservation Society PNG Program, Box 277, Goroka, EHP, PAPUA NEW GUINEA, (amack@wcs.org). Department of Anthropology, Barnard College, Columbia University, 3009 Broadway, New York, NY 10027-6598
PRELIMINARY RESULTS OF A STUDY OF HUNTING OFFTAKE IN PAPUA NEW GUINEA: SUMMARY OF WILDLIFE CONSUMPTION

P03-06 **MADDEN, KATHRYN, Rebbeca Sharitz, and Donald Imm** Savannah River Ecology Laboratory-UGA, Drawer E, Aiken, SC, 29801 (madden@srel.edu); Savannah River Ecology Laboratory-UGA, Drawer E, Aiken, SC, 29801; US-Forest Service-Savannah River, PO BOX 16, New Ellenton, SC, 29851
COMPARISON OF VEGETATION AND SOIL COMPOSITION OF SELECT SANDHILL PLANT TES POPULATIONS ON THREE MILITARY INSTALLATIONS

CO45-3 **MAGLE, SETH B. and Kevin R. Crooks** Department of Wildlife Ecology, University of Wisconsin, Madison, WI 53706 (sbmagle@lamar.colostate.edu) (SBM), Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523 (SBM, KRC)
THE PERSISTENCE OF BLACK-TAILED PRAIRIE DOGS IN HABITAT FRAGMENTS ALONG A GRADIENT OF URBANIZATION IN THE COLORADO FRONT RANGE

CO54-10 **MAHABALESHWARKAR, MUKUL, Neelesh Dahanukar, and Erach Bharucha** RANWA, C – 26 / Ketan Heights, Kothrud, Pune – 411038, India (mookool@eth.net) (MM, ND). Bharati Vidyapeeth Institute of Environment Education and Research, Katraj – Dhankawadi, Pune – 411 043, India (EB)
SEASONAL MONITORING OF POPULATION DYNAMICS OF WETLAND BIRDS: CRITICAL APPROACH FOR DESIGNING AND IMPLEMENTING WETLAND MANAGEMENT STRATEGIES

CO25-4 **MALCOLM, JAY R., Canran Liu, Lara Hansen, and Lee Hannah** Faculty of Forestry, University of Toronto, Toronto, ON Canada M5S3B3 (JRM, CL), (jay.malcolm@utoronto.ca). World Wildlife Fund-US, 1250 24th Street, Washington, DC 20037 (LAH). Conservation International 1919 M Street, NW Suite 600, Washington, DC 20036 (LEH).
GLOBAL WARMING AND EXTINCTIONS OF ENDEMIC SPECIES FROM BIODIVERSITY HOTSPOTS

CO27-5 **MANDELIK, YAEL, Tamar Dayan, and Eran Feitelson** Department of Zoology, Tel-Aviv University, Tel-Aviv 69978, Israel (myael@post.tau.ac.il) (YM, TD). Department of Geography, The Hebrew University of Jerusalem, Jerusalem, Israel (EF).
BIODIVERSITY QUANTIFICATION: ARE VEGETATION STRUCTURE AND RICHNESS RELIABLE INDICATORS OF SPECIES RICHNESS IN MEDITERRANEAN ECOSYSTEMS?

P13-05 **MANDUJANO, MARIA C. and Alejandra Garcia Naranjo O-H** Depto. Ecología de la Biodiversidad. Instituto de Ecología. Universidad Nacional Autónoma de México (UNAM). Apdo. Postal 70-275. Mexico 04510 D.F. (AGN, MCM). (mcmandu@miranda.ecologia.unam.mx)
POPULATION ECOLOGY AND ESTABLISHMENT SITES OF ;Lophophora williamsii; (PEYOTE), AN ENDANGERED SPECIES OF CACTACEAE

S14-6 **MANICA, ANDREA and Helen Hendry** Conservation Biology Group, Department of Zoology, University of Cambridge (am315@cam.ac.uk)
THE TRADE IN LIVE REEF FISH IN NORTHERN BORNEO

CO25-7 **MANNE, LISA L., Paul H. Williams, Guy Midgley, Carsten Rahbek, and Lee Hannah** Life Sciences, University of Toronto at Scarborough, 1265 Military Trail, Scarborough, ON M1C 1A4 Canada, (lisa.manne@utoronto.ca) (LLM). Biogeography & Conservation, Natural History Museum, Cromwell Road, London SW7 5BD UK (PHW). National Botanical Institute, P/Bag X7, Claremont, Cape Town 7735 South Africa (GM). Zoological Museum, University of Cophenhagen, Universitetsparken 15, Copenhagen DK-2100, Denmark (CR). Conservation International, 1919 M Street NW, Suite 600, Washington , DC 20036, USA (LH).
SHELF LIFE OF SPECIES-AREA RELATIONS

CO11-3 **MANOLIS, JAMES C., Thomas R. Crow, David C. Zumeta, and Keith M. Wendt** Minnesota Department of Natural Resources and David H. Smith Conservation Research Fellowship Program, 500 Lafayette Rd. St. Paul, MN 55155 (jim.manolis@dnr.state.mn.us) (JCM). USDA Forest Service, 1601 North Kent Street, Arlington, VA 22209 (TRC). Minnesota Forest Resources Council, 2003 Upper Buford Circle, St. Paul, MN 55108 (DCZ). Minnesota Department of Natural Resources, 500 Lafayette Rd. St. Paul, MN 55155 (KMW).
COLLABORATIVE SCIENCE TO ADDRESS CONTENTIOUS ISSUES: A CASE STUDY OF THE MINNESOTA FOREST SPATIAL ANALYSIS PROJECT

CO33-6 **MANOPAWITR, PETCH and Antony J. Lynam** Wildlife Conservation Society – Thailand Program, P.O. Box 170, Laksi, Bangkok 10210 THAILAND; (pmanopawitr@wcs.org)
CONSERVATION TRAINING AND EDUCATION IN THAILAND: OVERVIEW AND THE FUTURE

P01-05 **MANOR, REGEV and David Saltz** Mitrani Department of Desert Ecology, Blaustein Institute for Desert Research, Ben Gurion University, Sde Boker Campus 84990, Israel. (regevm@bgumail.bgu.ac.il)
RESISTANCE OF ARTIFICIAL PINE STANDS TO INVATION BY HOUSE MICE

S02-3**, MICHAEL P., Theo Light, and Julie Lockwood** Dept of biology, CSU Chico, Chico, CA. 95929. (mmarchetti@csuchico.edu) WFCB Dept. UC. Davis. Davis. CA. 95616 WFCB Dept. UC. Davis. Davis. CA. 95616 Ecology, Evolution, and Natural Resources,14 College Farm Road, Rutgers University, New Brunswick, NJ 08824
EFFECTS OF URBANIZATION ON FISH INVATIONS AND EXTINCTIONS IN CALIFORNIA

P20-05 **MARGOLUIS, CHERYL** Yale School of Forestry, 210 Prospect St., New Haven, CT 06511. (Cheryl.Margoluis@yale.edu)
TRAGIC CHOICES & CREATIVE COMPROMISES: MANAGING PROTECTED AREAS WITH HUMAN SETTLEMENTS

S12-4 **MARGOLUIS, RICHARD and Nick Salafsky** Foundations of Success 4109 Maryland Ave Bethesda, MD 20816 (Richard@FOSonline.org)
DEVELOPING AND IMPLEMENTING OPEN STANDARDS FOR THE PRACTICE OF CONSERVATION

P27-08 **MARINI, Miguel Â.** Departamento de Zoologia, Universidade de Brasília, Brasília, DF, Brazil (marini@unb.br)
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S01-4 **MARKAIDA, UNAI, Cesar A. Salinas Zavala, Joshua J.C. Rosenthal, and WILLIAM F. GILLY** Departamento Aprovechamiento y Manejo de Recursos Acuáticos, El Colegio de la Frontera Sur, Unidad Campeche, Colonia Centro, Campeche, Mexico (umarkaida@camp.ecosur.mx) (UM); Ecology Fisheries Program, CIBNOR, La Paz, BCS, Mexico (CASZ); Institute of Neurobiology, University of Puerto Rico, San Juan, Puerto Rico (JJCR); Hopkins Marine Station of Stanford University, Department of Biological Sciences, Pacific Grove, CA 93950, (WFG)
JUMBO SQUID: WHAT IS THE FATE OF THIS MYSTERIOUS PREDATOR AND MAJOR FISHERY IN THE GULF OF CALIFORNIA?

CO53-3 **MARNANE, MICHAEL J., Joni T. Wibowo, Rizya L. Ardiwijaya, Yudi Herdiana, Shinta T. Pardede, Ahmad Mukminin, and Sutris Harianta** Wildlife Conservation Society, Jl. Pangrango No.8, Bogor, Indonesia. (mmarnane@wcs.org)
REDESIGNING CORAL REEF MANAGEMENT TO ACHIEVE GREATER COMMUNITY COMPLIANCE IN KARIMUNJAWA NATIONAL PARK, INDONESIA

CO21-4 **MARTIN, TARA G., Petra M Kuhnert, Kerrie Mengersen, and Hugh P. Possingham** The Ecology Centre,The University of Queensland, St. Lucia 4072 Australia (TGM, PMK, HPP)(Tara.Martin@csiro.au). School of Mathematical and Physical sciences, The University of Newcastle, Callaghan NSW 2308 Australia (KM)
DO EXPERTS KNOW ANYTHING ABOUT BIRDS AND GRAZING? A BAYESIAN APPROACH USING EXPERT OPINION

P11-03 **MARTINEZ, MARINA and Karen V. Root** Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403 (martim@bgnet.bgsu.edu)
PREDICTING HABITAT SUITABILITY AND OCCURRENCE FOR THE CRICKET FROG, (Acris crepitans blanchardi), IN NORTHWEST OHIO

CO2-8 **MARTINO, DIEGO** Department of Geography and Environmental Studies, Carleton University. B349 Loeb Building, 1125 Colonel By Drive, Ottawa, Ontario, K1S 5B6, Canada. (martinodiego@rogers.com)
TEMPORARY AND MOBILE PROTECTED AREAS FOR THE CONSERVATION OF A PALM TREE LANDSCAPE IN URUGUAY

S13-11 **MASHAURI, SHEDRACK, Beth A. Kaplin, William Olupot, Alastair McNeilage, and Elizabeth A. Williamson** East Usambara Biosphere Reserve, PO Box 5869, Tanga, Tanzania (SM) (mashauri@eudoramail.com). Antioch New England Graduate School, Keene, NH USA (BAK). Institute of Tropical Forest Conservation, PO Box 44, Kabale, Uganda (WO, AM). Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (AM). Department of Psychology, University of Stirling, Stirling FK9 4LA, Scotland. UK (EAW).
THE POTENTIAL FOR TOURISM TO PROVIDE INCENTIVES FOR CONSERVATION IN AFRICAN BIODIVERSITY HOTSPOTS

S13-12 **MASOZERA, MICHEL, Delali Dovie, and Mathias Lema** Wildlife Conservation Society, PO Box 1699, Kigali, Rwanda (MM) (mmasozera@wcs.org). Restoration & Conservation Biology Research Group, School of Animal, Plant & Environmental Sciences, University of the Witwatersrand, Wits 2050, Johannesburg, South Africa (DD). Tanga Catchment Forest Office, PO Box 1449, Tanga, Tanzania (ML).
LAW ENFORCEMENT AND CONSERVATION IN AN AFRICAN CONTEXT: ISSUES OF CONSERVING WITHIN AND OUTSIDE PROTECTED AREAS

S17-1 **MASTER, LAWRENCE** NatureServe, 11 Avenue de Lafayette, 5th Floor, Boston, MA 02111 USA, (larry_master@natureserve.org)
INCLUDING INVERTEBRATES IN MAINSTREAM CONSERVATION: BUILD THE DATA AND THEY WILL COME

P04-03 **MATHEWSON, KEVIN** The Ford Foundation, 320 East 43rd Street, New York, NY 10017 (k.mathewson@fordfound.org)
RECENT UNEXPLAINED MASS MORTALITY OF MARINE FAUNA : A LOOK AT OCEAN NUCLEAR WASTE DUMPS AS POSSIBLE SOURCES OF STRESS

P10-06 **MATSUO, PATRICIA MIE and VANESSA BOUCINHA** Both authors: Golden Lion Tamarin Association, Caixa Postal 109.968, Casimiro de Abreu-RJ, Cep 28.860-970, Brazil, (miematsuo@yahoo.com)
TEACHER TRAINING AS A TOOL FOR CONSERVATION OF THE ATLANTIC FOREST AND GOLDEN LION TAMARIN IN BRAZIL

CO4-5 **MATTHEWS, SEAN M., Brenda K. Lackey, Schulyer S. Greenleaf, H. Malia Leithead, Sam H. Ham, John J. Beecham, and Howard B. Quigley** Wildlife Conservation Society, 2023 Stadium Drive Suite 1A, Bozeman, MT 59715 (smatthews@wcs.org) (SMM, HML). Cleveland Metroparks 4101 Fulton Parkway Cleveland, OH 44144 USA (BKL). Department of Resources, Recreation, and Tourism, University of Idaho, P.O. Box 441139, Moscow, ID 83844 (SHH). Department of Fish and Wildlife Resources, P.O. Box 441136, Moscow, ID 83844 USA (SSG). Beringa South, 2723 N. Lakeharbor Ln., Boise, ID 83703 (JJB). Beringa South, 3610 Broadwater Street Suite 111, Bozeman, MT 59718 (HBQ)
PARADIGM SHIFTS IN THE MANAGEMENT OF HUMAN-WILDLIFE CONFLICTS: A CASE STUDY AND ASSESSMENT OF BLACK BEAR MANAGEMENT IN YOSEMITE NATIONAL PARK

P05-11 **MAYFIELD, MICHAEL, Víctor Sánchez-Cordero, and Sahotra Sarkar** Biodiversity and Biocultural Conservation Laboratory, Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712 -1180., (felix@uts.cc.utexas.edu); Departamento de Zoología, Instituto de Biología, UNAM, Aptdo. Postal 70-153, México, D.F. 04510.; Section of Integrative Biology and Department of Philosophy, University of Texas at Austin, Waggener Hall 316, Austin, TX 78712 –1180.
THREE DECADES OF HABITAT LOSS AND FRAGMENTATION IN MEXICO: IMPLICATIONS FOR THE DESIGN OF CONSERVATION AREA NETWORKS

CO54-7 **MCALPINE, CLIVE, Hugh Possingham, John Callaghan, Michiala Bowen, Daniel Lunney, Jonathan Rhodes, David Mitchell, and David Pullar** School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072 (c.mcalpine@uq.edu.au);The Ecology Centre, The University of Queensland, Brisbane, Australia 4072;Australian Koala Foundation, GPO Box 2659, Brisbane, Australia 4001;School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072; New South Wales Department of Environment and Conservation, PO Box 1967, Hurstville, New South Wales, 2220 Australia; School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072;Australian Koala Foundation, GPO Box 2659, Brisbane, Australia 4001; School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072
CONSERVATION AND RESTORATION OF KOALA POPULATIONS IN FRAGMENTED LANDSCAPES (NOOSA, AUSTRALIA)

CO42-2 **MCCANCE, ELIZABETH** School of Natural Resources and Environment, University of Michigan, 430 E. University, Ann Arbor, MI 48109, USA (emccance@umich.edu)
CHICAGO WILDERNESS: A CASE STUDY OF PARTICIPATION IN COLLABORATIVE ECOSYSTEM MANAGEMENT

P33-06 **MCCLEERY, ROBERT, Nova J. Silvy, and Roel R. Lopez** Texas A&M University, Department of Wildlife and Fisheries Sciences. Nagle Hall,2258 TAMU, College Station, TX. (iamnotfunny@yahoo.com.)
URBAN DEVELOPMENT AND THE DECLINE OF THE ENDANGERED KEY LARGO WOODRAT

P24-05 **McCLUSKEY, SHANNON M., Glenn R. VanBlaricom, and Miles G. Logsdon** Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, WA 98195-5020 (ShanMcC@u.washington.edu)(SMM, GRVB). School of Oceanography, University of Washington, Box 355351, Seattle, WA 98195-5020 (MGL). Northwest Fisheries Science Center, NMFS, NOAA, Seattle, WA 98112 (SMM).
SOUTHERN RESIDENT KILLER WHALES AND PACIFIC SALMON: CORRELATIONS THROUGH SPACE AND TIME IN THE INLAND WATERS OF WASHINGTON STATE AND BRITISH COLUMBIA

P25-10 **McCULLOUGH, JENNIFER** Conservation International, Rapid Assessment Program, 1919 M ST. NW STE. 600, Washington, DC 20036 (j.mccullough@conservation.org)
USING RAPID BIODIVERSITY SURVEYS TO QUICKLY BUILD CONSERVATION KNOWLEDGE AND CAPACITY IN GUINEA, WEST AFRICA

S09-6 **MCDONNELL, MARK J. and Kirsten M. Parris** Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne, c/o School of Botany, University of Melbourne, Victoria, 3010, Australia (markmc@unimelb.edu.au)
ATTRACTION OF NATIVE WILDLIFE TO URBAN AREAS, CONFLICT WITH HUMANS, AND IMPLICATIONS FOR CONSERVATION

S17-8 **MCELVANEY, SHANNON** SHANNON MCELVANEY CH2M HILL 19 S. Tejon ST, STE 500, Colorado Springs, CO 80903 (Shannon.McElvaney@ch2m.com)
NEED FOR LANDSCAPE LEVEL MANAGEMENT FOSTERS COLLABORATIVE WORK USING GEOSPATIAL TECHNOLOGIES

CO10-8 **MCFADDEN, KATHERINE W., Matthew E. Gompper, and Juan Carlos Morales** Center for Environmental Research and Conservation, 1200 Amsterdam Avenue, Columbia University, NY, NY 10027 (kwm6@columbia.edu) (KM and JCM). Department of Fisheries and Wildlife Sciences, 302 Anheuser-Busch Natural Resources Building, University of Missouri, Columbia, MO 65211 (MG).
THE GENETIC STRUCTURE OF THE ENDANGERED DWARF CARNIVORES (NASUA NELSONI AND PROCYON PYGMAEUS) OF COZUMEL ISLAND, MEXICO

CO1-4 **MCFREDERICK, QUINN S. and Gretchen LeBuhn** San Francisco State University, Department of Biology, 1600 Holloway Avenue, San Francisco, CA 94132 (quinn@sfsu.edu)
BUMBLEBEES (HYMENOPTERA: APIDAE) IN SAN FRANCISCO'S URBAN PARKS

P13-06 **MCGHEE, JAY D. and Jim M. Berkson** Virginia Polytechnic Institute & State University, Dept. of Fisheries & Wildlife Sciences, Blacksburg, VA 24061-0321 (jamcghe1@vt.edu)
CORRELATION OF WILD TURKEY POULT:HEN RATIOS WITH POPULATION SIZE USING MULTIPLE TIME-SERIES

P03-07 **MCGOWAN, EDWIN M. and William H. Martin** New York – New Jersey Trail Conference, 156 Ramapo Valley Road, Mahwah, NJ 07430 (mcgowan@nynjtc.org) (EMM). Route 3, Box 804, Harpers Ferry, WV 25425, USA (WHM).
ACORNS, RODENTS, AND GYPSY MOTHS: IMPACTS ON RATTLESNAKE REPRODUCTION IN OAK FORESTS

S15-10 **McGRATH, DAVID G. and N. Marcello Crossa** Núcleo de Altos Estudos Amazônicos, Universidade Federal do Pará, Belém, PA, 66.075-900, Brazil; Woods Hole Research Center, 149 Woods Hole Rd., Woods Hole MA 02540 (dmcgrath@amazon.com.br); Instituto de Pesquisa Ambiental da Amazônia, Av. Rui Barbosa 136, Santarém, PA 68.005-080.
INLAND FISHERY RESERVES: DESIGN, MANAGEMENT, AND COMPARISONS WITH CONSERVATION RESERVES

P08-06 **MCGRAW, JAMES B.** Department of Biology, P. O. Box 6057, West Virginia University, Morgantown, WV 26506-6057. (jmcgraw@wvu.edu)
BERRY RIPENING AND HARVEST SEASON IN AMERICAN GINSENG: A RANGE-WIDE ASSESSMENT

P06-06 **MCKAY, JEANNE and Richard A. Griffiths** The Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, Kent CT2 7NS, ENGLAND (J.McKay@kent.ac.uk)
CONSERVATION OF THE AXOLOTL AT LAKE XOCHIMILCO: IS THERE A ROLE FOR CAPTIVE BREEDING PROGRAMS?

CO38-2 **MCKENNA, DAVID** Institute for Conservation Biology and Law, University of Wollongong, NSW, 2522, Australia (djm02@uow.edu.au).
THE BURNING QUESTION: HOW OFTEN SHOULD WE DO IT?

P26-08 **MCMILLAN, AMY M., Mark J. Bagley, and David C. Evers** State University of New York College at Buffalo, Biology Department, 1300 Elmwood Ave., Buffalo, NY 14222 (mcmillam@buffalostate.edu) (AMM). United States Environmental Protection Agency, Cincinnati, OH 45268 USA (MJB). BioDiversity Research Institute, 411 Rt. 1 Suite 1, Falmouth ME 04105 (DCE).
PRELIMINARY ANALYSIS OF COMMON LOON (;GAVIA IMMER;) GENETIC STRUCTURE IN NORTHEAST NORTH AMERICA BASED ON FIVE MICROSATELLITE LOCI

CO13-4 **MCPHEE, M. ELSBETH and Nicholas Freitag McPhee** University of Missouri-St. Louis, Biology, 8001 Natural Bridge Road, St. Louis, MO 63121 (MEM) (mcpheeme@umsl.edu). University of Minnesota Morris, 600 East 4th Street, Morris, MN 56267 (NFM)
APPLICATION OF INDIVIDUAL-BASED MODELING TO ESTIMATION OF POPULATION PERSISTENCE IN THE FACE OF RAPID ENVIRONMENTAL CHANGE

P24-06 **MCSHEA, WILLIAM J., Wang Dajun, Li Seng, Li Ming Fu, and Daniel Guertin** National Zoo's Conservation and Research Center, 1500 Remount Rd., Front Royal, VA 22630, (wmcshea@crc.si.edu) (WJM, DG). North America Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (WJM). Panda Conservation Center, Peking University, Beijing, 100871 PDR China (WD, LS). Wildlife Protection Division, Tangjiahe Panda Reserve, Sichuan. PDR China (LMF).
MEASURING HUMAN-IMPACTS ON MAMMALS IN TANGJIAHE PANDA RESERVE, SICHUAN PROVINCE, CHINA

P34-09 **MELLANDER, KATHRYN and Kim Tripp** GIS Specialist Gateway National Recreation Area (kathryn_mellander@nps.gov); Research Coordinator Gateway National Recreation Area, HQ Building 69, Floyd Bennett Field, Brooklyn, New York 11234
CONFRONTING DYNAMIC ECOSYSTEM CHANGE IN JAMAICA BAY

P26-09 **MENDEZ, MARTIN, Tomas Waller, Patricio A. Micucci, and Juan Carlos Morales** Fundacion Biodiversidad Argentina, San Martin 945 3rd floor #23, Buenos Aires C1004AAS, Argentina (mm1772@comcast.net) (MM, TW, PM). CERC, Columbia University, New York, NY 10027 (JCM)
POPULATION STRUCTURE AND PHYLOGEOGRAPHY OF THE CURIYU BOA IN NORTHERN ARGENTINA: MANAGEMENT IMPLICATIONS

P10-07 **MERKEL, JANE F., Eric Miller, Luis Padilla, Mary Duncan, Nicole Gottdenker, Tim Walsh, Gustavo Jimenez, and Patricia Parker** Saint Louis Zoo, One Government Drive, Saint Louis Mo 63110 (merkel@stlzoo.org). (JFM, EM, LP, MD, NG, TW, PP) University of Missouri – St. Louis, Department of Biology, 8001 Natural Bridge Road, St. Louis MO 63121 (PP). Charles Darwin Research Station, Galapagos (NG, TW, GJ)
CREATING AN EARLY WARNING SYSTEM FOR AVIAN DISEASE ON GALAPAGOS: TRAINING WORKSHOPS FOR DISEASE MONITORING

P10-10 **MERTENS, ANNETTE** Institute of Applied Ecology, Via L. Spallanzani 32, 00161 Roma, Italy. (a.mertens@libero.it)
PUBLIC ATTITUDES TOWARDS A ROMANIAN POPULATION OF HABITUATED BEARS AND THEIR MANAGEMENT

S19-5 **MEYERS, DAVID, Leon Rajaobelina, Ramy Razafindralambo, Bart Minten, Jean-Christophe Carret, and Martin Jenkins** Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (DM: meyersconsult@yahoo.org). Conservation International Madagascar, BP 5178, Antananarivo, Madagascar (LR, RR). Cornell Food and Nutrition Policy Program, Cornell University Ilo program, BP 6317, Antananarivo 101, Madagascar (BM). World Bank, 1818 H St NW, Washington, DC, 20433 (JCC). IUCN-UNEP World Conservation Monitoring Centre, 219 Huntingdon Road, Cambridge CB3 0DL (MJ).
ECONOMICS, FINANCE AND CONSERVATION IN MADAGASCAR

CO2-4 **MEYERSON, LAURA and Robin O'Malley** MEYERSON, LAURA, Robin O'Malley, The H. John Heinz III Center for Science, Economics and the Environment. 1001 Pennsylvania Avenue, NW, Suite 735 South, Washington, DC 2004 (meyerson@heinzctr.org)
WHY SHOULD WE CARE? MONITORING THE CONDITION OF URBAN AND SUBURBAN ECOSYSTEMS IN THE UNITED STATES

S01-5 **MICHELI, FIORENZA, Christopher Costello, Laura Gonzalez, Sergio Guzman del Proo, Sergio Hernandez Vazquez, Salvador Lluch Cota, Bonnie McCay, Enrique Morales Bojorquez, German Ponce Diaz, Mario Ramade Villanueva, and James Wilson** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; D. Bren School of Environmental Science and Management, University of California, Santa Barbara, CA 93106; Integrative Biology, University of Texas, Austin, TX 78712; Escuela Nacional de Ciencias Biológicas, Instituto Politecnico Nacional, México D.F. 09400; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Department of Human Ecology,Rutgers University, New Brunswick, New Jersey 08901; Instituto Nacional de la Pesca, La Paz, BCS 23020, Mexico; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Federacion de Cooperativas Pesqueras “Baja California”, Ensenada, BC 22860, México; School of Marine Sciences, University of Maine, Orono, ME 04469
HUMAN AND BIOPHYSICAL PROCESSES UNDERLYING THE PERFORMANCE OF SMALL-SCALE FISHERIES IN BAJA CALIFORNIA

S08-5 **MICHELI, FIORENZA, Daniel Brumbaugh, Craig P. Dahlgren, Alastair R. Harborne, Kate E. Holmes, Carrie V. Kappel, and Peter J. Mumby** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY 10024,; Perry Institute for Marine Science, Caribbean Marine Research Center, Lee Stocking Island, PO Box 29001 George Town, Exuma, Bahamas; School of Biological Sciences, University of Exeter, Exeter, EX4 4PS, UK; Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY 10024; Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; School of Biological Sciences, University of Exeter, Exeter, EX4 4PS, UK. (micheli@stanford.edu)
VARIATION IN THE STRUCTURE AND FUNCTIONAL DIVERSITY OF CORAL REEF COMMUNITIES ACROSS CARIBBEAN SEASCAPES: IMPLICATIONS FOR MARINE RESERVE NETWORK DESIGN

S06-7 **MICKELSON, JOHN, Fred Koontz, and William Schuster** CIESIN, 61 Rt. 9W, Palisades NY 10964 (jmickels@ciesin.columbia.edu)
DELINEATING DETAILED ECOLOGICAL LAND UNITS IN THE NEW YORK BIOSCAPE USING MULTI-TEMPORAL LANDSAT IMAGERY

CO37-5 **MILLER, NICHOLAS, Michael W. Klemens, and Jennifer Schmitz** Wildlife Conservation Society, Metropolitan Conservation Alliance, 68 Purchase Street, 3rd Floor, Rye, NY 10580; (nmiller@wcs.org)
NEW PATHWAYS TO ACHIEVING CONSERVATION: INTEGRATING BIODIVERSITY CONCEPTS INTO MUNICIPAL LAND USE PLANNING

S10-9 **MILLER, PHILIP S., Robert Lacy, Philip Nyhus, Laura Hungerford, Paul Paquet, and Frances Westley** IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124-8151 (pmiller@cbsg.org)(PM, RL). Department of Conservation Biology, Chicago Zoological Society, Brookfield, IL 60513 (RL). Department of Earth and Environment, Franklin & Marshall College, Lancaster, PA 17604-3003 (PN). Department of Epidemiology and Preventive Medicine, University of Maryland School of Medicine, Howard Hall, Room 135, 660 West Redwood Street, Baltimore, MD 21201 (LH). Faculty of Environmental Design, University of Calgary, Box 150, Meacham, SK, S0K 2V0, CANADA (PP). Faculty of Management, McGill University, 1001 Sherbrooke St. West, Montreal, Quebec, H3A 1G5 CANADA (FW).
CONSIDERING DISEASE DYNAMICS IN WILDLIFE CONSERVATION DECISION-MAKING: AN INTEGRATED META-MODEL APPROACH

S02_7 **MILLER, JAMES** Iowa State University, Ames, IA 50011 (jrmiller@iastate.edu)
BIOTIC HOMOGENIZATION AND THE SCALE OF HUMAN EXPERIENCE

P03-08 **MILLER-RUSHING, ABRAHAM J. and Richard B. Primack** Boston University, Department of Biology, 5 Cummington Street, Boston, MA 02215 (ajmr@bu.edu)
RESPONSE OF FIRST FLOWERING DATE TO TEMPERATURE IN A FLORA OF EASTERN MASSACHUSETTS

CO37-6 **MILLS, APRIL, Vivek Shandas, Kara Whittaker, Tessa Francis, and Jessica Graybill** Department of Urban Design and Planning, Box 355740, Gould Hall, Rm.410, University of Washington Seattle, WA 98195 (amills@u.washington.edu); Division of Ecosystem Science, College of Forest Resources, University of Washington, Seattle, WA 98195; Department of Biology, University of Washington, Seattle, WA 98195; Department of Geography, University of Washington, Seattle, WA 98195.
APPLICABILITY OF "BEST AVAILABLE SCIENCE" TO CRITICAL AREA ORDINANCES IN JURISDICTIONS WITH VARIED LEVELS OF URBANIZATION

S14-2 **MILNER-GULLAND, E.J., D.J. Crookes, and N. Ankudey** Department of Environmental Science and Technology, Imperial College London, Exhibition Road, London SW7 2AZ, UK (DC, EJMG). (e.j.milner-gulland@imperial.ac.uk.)Wildlife Division, Forestry Commission, Ghana (NA).
LONG-RUN MARKET DATA AS AN INDICATOR OF SUSTAINABILITY - A CASE STUDY OF ATWEMONOM MARKET, GHANA

P21-04 **MIRANDA-CASTRO, LEOPOLDO** U.S. Fish & Wildlife Service, Branch of Habitat Restoration, Partners for Fish & Wildlife Program, 4401 N. Fairfax Dr. Rm. 400, Arlington, VA 22203, (Leopoldo_Miranda@fws.gov)
RESTORING SHADE COFFEE PLANTATIONS IN TROPICAL UNITED STATES

P29-06 **MISTRY, SHAHROUKH and Felicie Reid** Biology Department, Westminster College, New Wilmington PA 16172 (mistrys@westminster.edu)
IDENTIFYING AREAS FOR THE CONSERVATION OF INDIAN BATS

CO3-8 **MOIANA, LUCA, Kelly Burnett, Jeff Rodgers, and Sharon Clarke** University of Milano-Bicocca, Department of Environmental and Landscape Sciences, CONSERVATION BIOLOGY UNIT, Piazza della Scienza, 1-20126 Milano, ITALY.(luca_moiana@hotmail.com), Aquatic Lands Interaction Program, USFS, Pacific Northwest Research Station 3200 Jefferson Way Corvallis, OR (KB). Forest Science Department, Oregon State University, 274 Forest Sciences Lab, 97331 Corvallis OR(SC). Oregon Department of Fish and Wildlife, Corvallis Research Lab, 28655 Hwy. 34, 97333 Corvallis, OR (JR)
ASSESSING REPRESENTATIVENESS OF LIFE CYCLE MONITORING BASINS FOR THREATENED OREGON COAST COHO SALMON

P29-07 **MOORE, DON** Wildlife Conservation Society, Prospect Park Zoo, 450 Flatbush Ave, Brooklyn, NY 11225 (dmoore@wcs.org)
REPRODUCTIVE VARIABLES AND SEASONALITY IN PAMPAS DEER (OZOTOCEROS BEZOARTICUS), COMPARED OTHER UNGULATES, WITH COMMENTS ON HOW REPRODUCTIVE SYNCHRONY CAN INFORM CONSERVATION MANAGEMENT

P06-07 **MOORE, ROBIN. D., Henry R. Mushinsky, and Earl. D. McCoy** University of South Florida, College of Arts and Sciences, 4202 East Fowler Avenue, Tampa, Fl 33620 (rmoore@cas.usf.edu)
ENDEMIC OR EPIDEMIC? DISEASE AND THE GOPHER TORTOISE

P26-10 **MORAES-BARROS, NADIA, Cristina Yumi Miyaki, Vera Lúcia de Oliveira, Maria Eugênia Laurito Summa, and João Stenghel Morgante** Laboratorio de Biologia Evolutiva e Conservaçao de Vertebrados, Departamento de Biologia, Instituto de Biociencias da Universidade de Sao Paulo, Rua do Matao 277, 05508-900, Sao Paulo/SP, Brazil (namoraes@ib.usp.br) (NMB, CYM, JSM). DEPAVE - Departamento de Parques e Areas Verdes do Estado de Sao Paulo, Divisao Tecnica de Medicina Veterinaria e Biologia da Fauna (MELS). CEPLAC -Comissão Executiva do Plano da lavoura Cacaueira (VLO).
A FIRST PHYLOGEOGRAPHY AND GENETIC DIVERSITY STUDY OF THE ATLANTIC FOREST ENDEMIC SLOTH, ;BRADYPUS TORQUATUS;, AND THE WIDESPREAD SPECIES ;BRADYPUS VARIEGATUS;

CO45-4 **MORLEY, SARAH A., Jason D. Toft, Karrie M. Hanson, and Todd R. Bennett** Northwest Fisheries Science Center, NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112 (sarah.morley@noaa.gov); (SAM, KMH, TRB). School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA 98195 (JDT).
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P05-12 **MORRIS, JULIE K., Susan K. Jacobson, and Richard Flamm** Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611 (jkmorris@ufl.edu), (JKM and SKJ), Florida Fish and Wildlife Conservation Commission. Florida Marine Research Institute. 100 Eighth Avenue SE. St. Petersburg, FL 33701-5020 (RF)
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P09-10 **MORRISON, JOAN L. and Erin J. Riley** Department of Biology, Trinity College, 300 Summit St., Hartford, CT 06106 (joan.morrison@trincoll.edu)
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CO22-3 **MORTBERG, ULLA and Hans-Georg Wallentinus** Dept. of Land and Water Resources Engineering, Royal Institute of Technology, SE-100 44 Stockholm,Sweden (mortberg@kth.se) (UM),Dept. of Landscape Planning, Swedish University of Agricultural Sciences, Box 7012, 750 07 Uppsala, Sweden (HGW)
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CO9-3 **MUELLER, THOMAS, Kirk A. Olson, Peter Leimgruber, Todd K. Fuller, Martyn G. Murray, and George B. Schaller** Smithsonian National Zoological Park,Conservation and Research Center, Front Royal, VA 22630 (muellert@crc.si.edu). (TM, PL) Department of Natural Resources Conservation, 160 Holdsworth Way, University of Massachusetts, Amherst, MA 01003 (KAO, TKF). Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (GBS). Institute of Cell, Animal and Population Biology, Ashworth Laboratories, University of Edinburgh, West Mains Road, Edinburgh, EH93JT, UK, (MGM)
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P09-11 **MURATET AUDREY, Nathalie Machon, Gérard Arnal, Jacques Moret, and Yoann Faivre** UMS 2699 Inventaire et Suivi de la Biodiversité, Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (muratet@mnhn.fr) UMR 5173 CNRS MNHN Conservation des Espèces, Restauration et Suivi des Populations. Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France .
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CO35-4 **MURCIA, CAROLINA, and Nilsen Lasso** Wildlife Conservation Society, Northern Andes Regional Program, AA 15527, Cali, COLOMBIA (CM)(cmurcia@wcs.org)
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CO15-7 **MURPHY, MELANIE A. and Jeffrey S. Evans** School of Biological Sciences, Department of Biology, Washington State University, Pullman WA, 99163 (mamurphy@wsu.edu) (MAM) USDA Forest Service, Rocky Mountain Research Station, 1221 S. Main, Moscow, Id 83843 USA (JSE)
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P08-07 **MURPHY, HELEN T. and Jon Lovett-Doust** Department of Biology, University of Windsor, Windsor, Ontario, N9B 3P4, Canada, (murph15@uwindsor.ca)
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P27-09 **MUSINA, JOHN and Philip Shaw** Scottish Natural Heritage, 2 Anderson Place, Edinburgh EH6 5NP UK , National Museums of Kenya, Department of Ornithology, P.O. Box 40658, Nairobi, Kenya, (mhornbill@yahoo.com) (JM)
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CO26-4 **MYERS, DAVID H., Resit Akcakaya, and Scott Ferson** Applied Biomathematics, 100 North Country Road, Setauket, New York 11733 (dmyers@ramas.com)
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P33-07 **MYINT, THAN, Khin Maung Zaw, Antony J. Lynam, Alan Rabinowitz, and Saw Tun Khaing** Division of Wildlife and Nature Conservation, Forest Department, Ministry of Forestry, West Gyogone, Insein, Yangon, Myanmar (KMZ). Wildlife Conservation Society – International Programs, 2300 Southern Blvd, Bronx, NY 10460-1099 (wcsmm@mptmail.net.mm) (AJL, AR,TM, STK)
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CO29-5 **NAGY, CHRISTOPHER and William Giuliano** Fordham University, Louis Calder Center Biological Field Station, 53 Whippoorwill Rd., Armonk, NY 10504 (cnagy@fordham.edu)
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CO1-5 **NAICKER, KIRUBEN** Scientific Services;Gauteng Directorate of Nature Conservation;Department of Agriculture, Conservation, Environment and Land Affairs, 73 Market Street, Johannesburg, South Africa; PO Box 8769, Johannesburg, 2000 (kirubenn@gpg.gov.za)
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CO43-5 **NAIDOO, ROBIN** WWF Science Post-Doctoral Fellow, Conservation Science Program, WWF-US, Asuncion, Paraguay (rnaidoo@ualberta.ca) rnaidoo@ualberta.ca
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S13-13 **NAMARA, AGRIPPINA, Alastair McNeilage, and David Hoyle** Institute of Tropical Forest Conservation, PO Box 44, Kabale, Uganda (AN, AM). Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (AM) (mcneilage@aol.com). Wildlife Conservation Society, PO Box 20 Nguti, Cameroon (DH).
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S13-9 **NAMBU, MERCY, David Hoyle, and Andrew Plumptre** Wildlife Conservation Society, Banyang Mbo Wildlife Sanctuary, Box 20, Nguti, SW Province, Cameroon (MN) (Mamafranky@yahoo.com). Cameron-Nigeria Transboundary Surveys Project, Box 437, Limbe, SW Province, Cameroon (MN). Wildlife Conservation Society, PO Box 20 Nguti, Cameroon (DH). Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (AP).
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P26-11 **NARO-MACIEL, EUGENIA, Eduardo Moreira Lima, Jose Henrique Becker, Maria Angela Marcovaldi, and Robert DeSalle** Department of Ecology, Evolution and Environmental Biology, Columbia University/AMNH, 1200 Amsterdam Ave. MC 5557 NY, NY, 10024 USA (en58@columbia.edu), Projeto TAMAR-IBAMA, Almofala, Ceara, Brazil (EML), Projeto TAMAR-IBAMA, Ubatuba, SP, Brazil (JHB), Projeto TAMAR-IBAMA, Praia do Forte, BA, Brazil (MAM), AMNH, Central Park West at 79th St. NY, NY, 10024 USA (RD)
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S17-3 **NASKRECKI, PIOTR** Invertebrate Diversity Initiative, CABS Conservation International at: Museum of Comparative Zoology, Harvard University 26 Oxford Street, Cambridge, MA 02138 (p.naskrecki@conservation.org)
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S20-11 **NAVA, ALESSANDRA** IPÊ – Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance. C.P 31. Teodoro Sampaio. SP. 19280. Brazil. (Alenava@stetnet.com.br)
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S13-8 **NDANGALASI, HENRY JOSEPH and Robert Bitariho** Department of Botany, University of Dar es Salaam, P.O. Box 35060, Dar es Salaam, Tanzania (HJN) (hjndangalasi@yahoo.com). Institute of Tropical Forest Conservation, P.O Box 44 Kabale, Uganda (RB).
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CO38-4 **NELSON, CARA R. and Charles B. Halpern** College of Forest Resources, University of Washington, Box 352100, Seatle, Washington 98195-2100 (crnelson@u.washington.edu)
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S07-3 **NEWMAN, SCOTT, Anton Wolfaardt** Wildlife Trust, 61 Route 9W, Palisades, NY 10471 (SN) (newman@wildlifetrust.org)
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S01-6 **NICHOLS, WALLACE J. and Stephen Delgado** WiLDCOAST International Conservation Team, POB 324, Davenport, CA 95017, and Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118 (wjnichols@wildcoast.net) (WJN); Department of Life Sciences Communication, College of Agriculture & Life Sciences, University of Wisconsin - Madison, 440 Henry Mall, Madison, WI 53706 (SD).
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CO43-6 **NICHOLSON, EMILY, Karin Frank, Wayne A. Rochester, and Hugh P. Possingham** The Ecology Centre, University of Queensland, St Lucia, Queensland 4072, Australia (EN, WAR & HPP) (e.nicholson@zen.uq.edu.au); UFZ, Dept Ecological Modelling, Permoserstrasse 15, 04318 Leipzig, Germany (EN & KF).
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CO38-6 **NICOLÈ, FLORENCE and Florence Tellier** Laboratoire d'Ecologie Alpine, Université Joseph Fourier, CNRS UMR 5553, Bât. D, BP 53, 38041 GRENOBLE CEDEX 9, FRANCE, (florence.nicole@ujf-grenoble.fr)
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S09_7 **NIEMELÄ, JARI, D. Johan Kotze, and Vesa Yli-Pelkonen** Department of Biological and Environmental Sciences, P.O. Box 65, FIN-00014 University of Helsinki, Finland (jari.niemela@helsinki.fi)
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CO9-4 **NILES, LAWRENCE, Peter Winkler, Richard Lathrop, Kathleen Clark, Michael Valent, David Jenkins, Amanda Dey, Gretchen Fowles, Kimberly Korth, Colleen Hatfield, and Joanna Burger** NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625 (larry.niles@dep.state.nj.us) NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625 Rutgers University, New Brunswick, NJ USA 08960 NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625
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P26-12 **NOEL FLORENCE, Florian Kirchner, Denis Couvet, Jacques Moret, and Nathalie Machon** Conservatoire Botanique National du Bassin Parisien, Muséum d'Histoire Naturelle de Paris, 61 rue Buffon, 75005, PARIS, FRANCE (FN, JM, NM) (fnoel@mnhn.fr.) Laboratoire Conservation des espèces, Restauration et Suivi des Populations, UMR5173, 61 rue Buffon, 75005, PARIS, FRANCE (FN, FK, DC, NM).
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CO19-8 **NOSS, ANDREW J., Leonardo Maffei, Marcella J. Kelly, Rosario Arispe, and Kathia Rivero** Wildlife Conservation Society-Bolivia, calle Pocherena 122, Casilla 6272, Santa Cruz, Bolivia, (anoss@wcs.org) (AJN, LM). Department of Fisheries and Wildlife Sciences, 210B Cheatham Hall, Virginia Tech University, Blacksburg, VA 24061-0321, USA (MJK). Museo de Historia Natural Noel Kempff Mercado, Casilla 2489, Santa Cruz, Bolivia (RA, KR)
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CO4-6 **NOVACK, ANTHONY and Martin B. Main** Nez Perce Tribe – Wolf Recovery Program, Box 1922, McCall, ID 83638 (ajnovackrpcv@yahoo.com). SW Florida Research and Education Center, 2686 State Road 29 North, Immokalee, FL 34142-1515
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P25-11 **O'BRIEN, CARRIE J. and William J. McShea** Ecology Center, Utah State, University, UMC 5205, Logan, UT, 84322 (cobrien@cc.usu.edu) (CJO); Smithsonian National Zoological Park, Conservation & Research Center, 1500, Remount Rd, Front Royal, VA 22630 (CJO,WJM). North American Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460, USA (WJM)
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S12-5 **O'CONNOR, SHEILA, David S. Wilkie, and Harry van der Linde** World Wide Fund for Nature, WWF International, Avenue du Mont-Blanc, 1196 – Gland, Switzerland (SO soconnor@wwfint.org), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW), African Wildlife Foundation, 1400 Sixteenth Street, N.W. Suite 120, Washington, D.C. 20036, USA (HvL)
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S13-3 **OATES, JOHN F., Richard A. Bergl, and Roger Fotso** WCS Africa Program, 2300 Southern Boulevard, Bronx, NY (JFO). Hunter College of CUNY, 695 Park Avenue, NY (john.oates@hunter.cuny.edu) (JFO). Anthropology Program, CUNY Graduate Center, 365 Fifth Avenue, NY (RAB). WCS Cameroon, BP 3055 Messa, Yaoundé (RF).
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S11_4 **OBERHAUSER, KAREN S. and Erika R.L. Rivers** Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota, St Paul, MN 55108 (oberh001@umn.edu). Conservation Biology Program, University of Minnesota, St Paul, MN 55108 (ER)
MONARCH BUTTERFLY (DANAUS PLEXIPPUS) LARVAE & BT CORN POLLEN: A REVIEW OF ECOLOGICAL RISK ASSESSMENT FOR A NON-TARGET SPECIES

CO8-4 **O'BRIEN, TIMOTHY, Alireza Jourabchian, Behzad Ragoshai, and Eric Sanderson** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (TO, ES), (tobrien@wcs.org). I.R. Iran Department of Environment, Pardisan Eco Park, Tehran, Iran (AJ, BR)
POPULATION ASSESSMENTS OF ASIATIC CHEETAH AND THEIR PREY IN THE I.R. IRAN

CO19-5 **O'CONNELL, ALLAN F., Andrew T. Gilbert, and Jeff S. Hatfield** U. S. Geological Survey, Patuxent Wildlife Research Center, 11510 American Holly Dr., Laurel, MD 20708-4016 (oconnell@usgs.gov); U. S. Geological Survey, Patuxent Wildlife Research Center, 196 Whitten Rd, Augusta, ME 04330 (ATG); U. S. Geological Survey, Patuxent Wildlife Research Center, 11510 American Holly Dr., Laurel, MD 20708-4016 (JSH)
CONTRIBUTION OF NATURAL HISTORY COLLECTION DATA TO BIODIVERSITY ASSESSMENT IN NATIONAL PARKS

P20-06 **O'CONNOR, CATHERINE M. and Lisa M. Curran** University of Michigan School for Natural Resources and Environment, Dana Building, 430 East University, Ann Arbor, MI 48109 (oconnorc@umich.edu)(CMO). Yale School of Forestry and Environmental Studies and Yale Tropical Resources Institute, Sage Hall, 205 Prospect Street, New Haven, CT 06511 (LMC).
SUBSISTENCE HUNTING, SWIDDEN AGRICULTURE, AND COMMERCIAL LOGGING: IMPLICATIONS FOR LOCAL COMMUNITY LIVELIHOODS AND EQUITABLE RESOURCE MANAGEMENT

CO10-5 **OHNISHI, NAOKI, Takashi Saitoh, Yasuyuki Ishibashi, Eiji Kitahara, Hiroki Kanamori, Nobusuke Nishi, and Toru Oi** Kansai Research Center, Forestry and Forest Products Research Institute, Kyoto, 612-0855, Japan (NO, TO) (bigwest@affrc.go.jp), Field Science Center, Hokkaido University, Sapporo, 060-0811, Japan (TS), Hokkaido Research Center, Forestry and Forest Products Research Institute, Sapporo, 062-8516, Japan (YI), Forestry and Forest Products Research Institute, Tsukuba, 305-8687, Japan (EK), Mountainous Region Research Center, Akagi-town, 690-3405, Japan (HK), Tottori Prefecture Forest Experiment Station, Kawara-town, 680-1203, Japan (NN).
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P05-13 **OKON, DAVID** Korup National Park, PO Box 36, Mundemba, Ndian Division, Cameroon (dtokon62@yahoo.co.uk)
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P09-12 **OLALLA TÁRRAGA, MIGUEL ÁNGEL** Department of Ecology. Faculty of Sciences. Universidad Autónoma de Madrid. Campus de Cantoblanco. Ctra. de Colmenar, km.15. 28049 Madrid (Spain) (miguel.olalla@uam.es)
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S02-1 **OLDEN, JULIAN D. and N. LeRoy Poff** Colorado State University (olden@lamar.colostate.edu)
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CO33-5 **OLDFIELD, RONALD G.** Museum of Zoology, 1109 Geddes Avenue, University of Michigan, Ann Arbor, MI 48109 USA, (roldfiel@umich.edu)
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P13-07 **OLIVIER, THOMAS** Green Creek Paradigms, LLC, 4632 Green Creek Road, Schuyler, VA 22969, (tolivier@cstone.net)
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CO13-5 **OLSSON, OLA** Ola Olsson, Animal Ecology, Lund University, Ecology Building, SE-223 62 Lund, Sweden, (ola.olsson@zooekol.lu.se)
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P25-18 **OLSVIG-WHITTAKER, LINDA S., Talya Oron, and Didi Kaplan** Israel Nature and National Parks Protection Authority, 3 Am Ve Olamo Street, Givat Shaul, Jerusalem 95463, Israel. (Linda.Whittaker@nature-parks.org.il) (LOW, TO, DK)
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CO12-3 **OLUPOT, WILLIAM** Institute of Tropical Forest Conservation, P.O.Box 44, Kabale-Uganda (wolupot@yahoo.com)
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P31-03 **OLVERA, DIANA, VÍCTOR M. RODRÍGUEZ, Mahinda Martínez, and Luis Hernández** Universidad Autónoma de Querétaro, Cerro de las Campanas s/n, Centro Universitario, Querétaro, Qro. C. P. 76010. Méx. (DOV) (olvera_valerio@hotmail.com) (VMRG)
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P10-08 **OMLAND, KRISTIAN S., Stephen C. Trombulak, Julie A. Robinson, Jeffrey J. Lusk, Thomas L. Fleischner, Glenn Brown, and Meg Domroese** Vermont Cooperative Fish & Wildlife Research Unit, Rubenstein School of Environment & Natural Resources, University of Vermont, Burlington VT 05405, (Kristian.Omland@uvm.edu) (KSO). Department of Biology and Program in Environmental Studies, Middlebury College, Middlebury VT 05753 (SCT). Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center, 2400 NASA Road 1, C23, Houston TX 77058 (JAR). Department of Forestry, 008C Agriculture Hall, Oklahoma State University, Stillwater OK 74078 (JJL). Environmental Studies Program, Prescott College (TLF). Environmental Science and Management Program, Capilano College (GB). Center for Biodiversity and Conservation, American Museum of Natural History(MD).
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CO39-3 **ONEAL, AMBER S. and John T. Rotenberry** Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521 (AmberSOneal@aol.com)
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CO25-1 **OOMMEN, MEERA ANNA and Kartik Shanker** MAO - Wildlife Institute of India, Dehradun / Bioscience Department, University of Mysore, Hassan, India. (meera_anna@vsnl.net) KS - Ashoka Trust for Research in Ecology and Environment, No. 659, 5th 'A' Main Road, Hebbal, Bangalore, 560 024, Karnataka, India.
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S22-8 **ORGAN, JOHN F. and Terry B. Johnson** U.S. Fish and Wildlife Service (john_organ@fws.gov) Arizona Game and Fish Department (TBJ)
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S07-8 **OSTFELD, RICHARD S. and Felicia Keesing** Institute of Ecosystem Studies, Millbrook, NY 12545 USA (RSO and FK), (Rostfeld@ecostudies.org); Biology Department, Bard College, Annandale-on-Hudson, NY 12511 (FK)
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CO19-6 **OSTRO, LINDE E.T., Scott C. Silver, and Bart Harmsen** Wildlife Conservation Society, 2300 Southern Blvd, Bronx, NY 10460 (lostro@wcs.org)
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CO6-8 **OTGOID, BATBOLD DORJGURKHEM** Graduate School for Asia Pacific Studies, Ritsumeikan Asia Pacific University, 1-1 Jumonjibaru, Beppu-shi, Oita-ken, 874-8577, Japan (batbodo3@apu.ac.jp)
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P24-07 **PACHECO, VICTOR, Lynne Villalobos, Heidi Quintana, Alicia Vásquez, Irayda Salinas, Daniel Rodríguez, Hamilton Beltrán, Dyana La Rosa, Edith Salas, Juana Suárez, Claudia Torres, Paul Velazco, and Lily Arias** Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado 140434, Lima 14, Perú (vpachecot@unmsm.edu.pe)
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P11-04 **PADOA-SCHIOPPA, EMILIO, Marco Baietto, Renato Massa, and Luciana Bottoni** Universita' degli Studi di Milano-Bicocca, Dipartimento di Scienze dell'Ambiente e del Territorio; Piazza della Scienza 1 - 20126 Milano, ITALY, (emilio.padoaschioppa@unimib.it)
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S20-2 **PADUA, SUZANA** University of Brasilia, IPË-Instituto de Pesquisas Ecológicas (Institute for Ecological Research, and Wildlife Trust Alliance, UnB Colina Bloco G Apto 503, Brasilia, DF, 70910-900, Brazil, (ipe@alternex.com.br)
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CO40-6 **PAGANO, ALAIN, David Lesbarrères, and Thierry Lodé** Ecologie animale, Universite d'Angers, Campus Belle-Beille, 49045 Angers cedex, France (alain.pagano@univ-angers.fr)(AP, TL) Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, PO BOX 65, FIN-00014 University of Helsinki, Finland (DL)
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P05-14 **PAGNI, LEE E., Jordi Honey-Rosés, and Bill Toone** 3022 N. Santa Rita Ave., Tucson, AZ 85719, USA (leeontour@yahoo.com) (LEP). World Wildlife Fund Mexico, Av. Mexico No. 51 Col. Hipodromo, Mexico, D.F. 06100, Mexico (JHR). Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551, USA (BT)
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S21-4 **PAINE, SETH, William Stefanov, and Elizabeth Wentz** 2230 East Monterey Way Phoenix AZ 85016 (sethalpaine1@cox.net) Geological Sciences Arizona State University Tempe AZ 85287 (WS). Geography Department Arizona State University Tempe AZ 85287 (EW)
ESTABLISHING CONSERVATION PRIORITIES FOR THE PHOENIX METROPOLITAN REGION

CO31-3 **PAIRIS, AMBER D. and Jonathan L. Atwood, Ph.D.** Antioch New England Graduate School, 40 Avon Street Keene, NH 03431-3516 (AP and JLA); (amber_pairis@antiochne.edu)
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CO47-5 **PALMINTERI, SUZANNE, Geoff Lipsett-Moore, George Powell, Ulises Alemán, Julio Ccoycosi, Hernán Collado, Catherine Lipsett-Moore, and Ivan Sandoval** World Wildlife Fund-US, 1250 24th Street, NW, Washington, DC 20037 (SP, GLM, GP, UA, CLM) (suzanne.palminteri@wwfus.org). World Wildlife Fund-Peru Program Office, Trinidad Morán 853, Lince, Lima-14, Peru (JC, HC, IS).
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S10-4 **PAPPAIOANOU, MARGUERITE** Centers for Disease Control and Prevention, Atlanta GA, 30333 (mxp1@cdc.gov)
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S22-7 **PARRISH, JEFFREY D., Craig R. Groves, Leo Sotomayor, Jonathan V. Higgins, Wayne Ostlie, and Laura L. Landon** The Nature Conservancy, Global Priorities Group, 3368 West 37th Avenue, Denver, CO 80211 (JP)(jparrish@tnc.org); Wildlife Conservation Society, 2023 Stadium Drive Suite 1-A, Bozeman MT 59715 (CG), The Nature Conservancy, Global Priorities Group, 4245 N. Fairfax Drive, Arlington VA 22203 (LS, JH, WO, LL)
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CO47-2 **PARSONS, HOLLY M., Richard Major, and Kristine French** Institute for Conservation Biology, School of Biological Sciences, University of Wollongong, Wollongong, New South Wales 2522, Australia; (hmp04@uow.edu.au); (HMP, KF). Terrestrial Ecology, Division of Earth & Environmental Sciences, Australian Museum, 6 College Street, Sydney, New South Wales 2010, Australia (RM).
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P12-06 **PARSONS, E.C.M. and C. Howard** School of Life Sciences, Heriot-Watt University, Edinburgh, Scotland (CH). Department of Environmental Science and Policy, David King Building, George Mason University, 4400 University Drive, Fairfax, Virginia 22030-4444 (ecm-parsons@earthlink.net) (ECMP).
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CO45-8 **PATWARDHAN, ANKUR A., Mukul Mahabaleshwarkar, Kapil Sahasrabuddhe, Neelesh Dahanukar, Rupesh Raut, Anuja Damle, Janhavi Kale, and Utkarsh Ghate** Abasaheb Garware College, Pune - 411004, Maharashtra, India. (ankur_patwardhan@vsnl.net) (AAP, AD, JK).RANWA (Research and Action in Natural Wealth Administration) C- 26/1 Ketan heights, Kothrud, Pune- 411038, Maharashtra, India. (MM, KS, ND, RR, UG)
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S07-6 **PATZ, JONATHAN** Johns Hopkins Bloomberg School of Public Health (jpatz@jhsph.edu)
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S02-4 **PAUCHARD, ANÍBAL, Lohengrin Cavieres, Alicia Marticorena, Alejandra Jiménez, and Ramiro Bustamante** Facultad de Ciencias Forestales, Universidad de Concepción, Casilla 160-C, Concepción, Chile, (pauchard@udec.cl)(AP). Departamento de Botánica. Universidad de Concepción, Casilla 160-C, Concepción, Chile (LC, AM, AJ). Departamento de Ecología, Facultad de Ciencias, Universidad de Chile, Santiago, Chile (RB).
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CO45-1 **PAULIN, JOSEPH B.** Program in Ecology and Evolution, 80 Nichol Avenue, Rutgers, the State University of New Jersey, New Brunswick, NJ 08901 (jpaulin@eden.rutgers.edu).
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CO44-4 **PEACOCK, MARY M. and Amy L. Harig** Biological Resources Research Center, Department of Biology, University of Nevada, Reno, Nevada 89557 (mpeacock@unr.nevada.edu) (MP); Trout Unlimited, TU/BLM Program, Longmont, Colorado 80501 (AH)
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CO54-5 **PEACOCK, ELIZABETH, David L. Garshelis, and Kimberly Titus** Program in Ecology, Evolution and Conservation Biology, Mailstop 314, University of Nevada – Reno 89507 (EP), Minnesota Department of Natural Resources 1201 East Highway 2, Grand Rapids, MN 55744 (DLG), Dr. Kimberly Titus, Division of Wildlife Conservation, Alaska Department of Fish and Game, P.O. Box 25526, Juneau, AK 99802-5526 (KT) (peacock@unr.nevada.edu)
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S11-5 **PEACOCK, ANTHONY** Pest Animal Control Cooperative Research Centre, Canberra, AU.
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S20-1 **PEARL, MARY** Wildlife Trust, P.O. Box 1000 Palisades NY 10964 (pearl@wildlifetrust.org)
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CO50-5 **PEARMAN, PETER B., Trenton W. J. Garner, Monika Straub, and Urs F. Greber** Michigan Natural Features Inventory and Department of Fisheries and Wildlife, 345 Giltner Hall, Michigan State University, East Lansing, Michigan, 48223 (PBP, pearman@msu.edu), Zoologisches Institut, Universitaet Zuerich, Winterthurerstrasse 190, 8057 Zuerich, Switzerland (TWJG, MS, UFG)
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P34-10 **PEARSALL, DOUGLAS R, Donald Tilton, Christopher A. Clampitt, Jack McGowan-Stinski, and Sherri Laier** The Nature Conservancy, Michigan Chapter, 101 E. Grand River, Lansing, MI 48906 (dpearsall@tnc.org) (DRP, SL). Tilton & Associates, 501 Avis Drive, Suite 5C, Ann Arbor, MI 48108 (DT). Michigan Department of Environmental Quality, Geological and Land Management Division, 301 East Louis Glick Highway, Jackson, MI, 49201-1535 (CAC). The Nature Conservancy, West Michigan Program Office, 456 Plymouth Ave. NE, Suite A, Grand Rapids, MI 49505 (JM-S)
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P24-08 **PELLET JEROME, Antoine Guisan, and Nicolas Perrin** Laboratory for Conservation Biology, Department of Ecology and Evolution, Biology Building, University of Lausanne, CH-1015 Lausanne, Switzerland. (jerome.pellet@ie-zea.unil.ch)
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CO48-3 **PENCE, GENEVIEVE Q.K., Doria R. Gordon, Reed F. Noss, and Beatrice Pace-Aldana** The Nature Conservancy, 222 S. Westmonte Drive, Suite 300, Altamonte Springs, FL 32714-4269, (gpence@tnc.org) (GQKP). The Nature Conservancy, University of Florida, Department of Botany, P.O. Box 118526, Gainesville, FL 32611-8526 (DRG). University of Central Florida, Department of Biology, 4000 Central Florida Blvd., Orlando, FL 32816-2368 (RFN). The Nature Conservancy, P.O. Box 630, Babson Park, FL 33827-0630 (BP)
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CO29-4 **PENNINGTON, DERRIC** (penn0107@umn.edu)
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CO19-7 **PENSKAR, MICHAEL R., Edward H. Schools, Peter B. Pearman, Helen D. Enander, Michael A. Kost, and David L. Cuthrell** Michigan Natural Features Inventory, Michigan State University, P.O. Box 30444, Lansing, Mich. 48909-7944 (penskarm@michigan.gov)
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CO10-7 **PERGAMS, OLIVER R. W. and Robert C. Lacy** Dept. of Conservation Biology and The Nature Conservancy Smith Fellows Program, Chicago Zoological Society, Brookfield, IL 60513 (olpergam@brookfieldzoo.org) (ORWP). Dept. of Conservation Biology, Chicago Zoological Society, Brookfield, IL 60513 (RCL).
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CO46-2 **PETERS, BRETT W., Sadie K. Rosenthal, Timothy A. Kreps, and David M. Lodge** Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan 48825 (BWP, (Petersb2@msu.edu) Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 (SKR, TAK, DML)
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S23-2 **PETERSON, A.TOWNSEND, and Monica Papes** Biodiversity Research Center, University of Kansas, Lawrence, Kansas 66045 (town@ku.edu)
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CO11-4 **PFAB, MICHÈLE F.** Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, P.O. Box 8769, Johannesburg, 2000, Gauteng, South Africa (MicheleP@gpg.gov.za)
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P06-08 **PIHA, HENNA, Céline Teplitsky, Anssi Laurila, and Juha Merilä** Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland, (HP)(henna.piha@helsinki.fi). Department of Population Biology, Evolutionary Biology Center, Uppsala University, Uppsala, Sweden (CT). Department of Population Biology, Evolutionary Biology Center, Uppsala University, Uppsala, Sweden (AL). Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland, (JM).
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CO49-7 **PINTEA, LILIAN** University of Minnesota, Conservation Biology Program, 100 Ecology Building,St. Paul, MN 55108 (pint0020@umn.edu)
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P20-08 **PINTO DA SILVA, PATRICIA** NOAA Fisheries, 166 Water Street, Woods Hole, MA 02543, (Patricia.pinto.da.silva@noaa.gov)
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S13-5 **PLUMPTRE, ANDREW, Neil Burgess, Eric Sanderson, Jon Feldjså, Carsten Rahbek, and John Oates** Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (AP) (aplumptre@aol.com). UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC, USA (NB). Zoological Museum, Universitetsparken 15, DK-2100, Copenhagen, Denmark (JF, CR). WCS Africa Program, 2300 Southern Boulevard, Bronx, NY, USA (JO). Hunter College of CUNY, 695 Park Avenue, NY, USA (JO).
THREATS TO CONSERVATION IN THE ALBERTINE RIFT, EASTERN ARC AND CAMEROON-NIGERIA HIGHLANDS

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CO51-6 **PODOLSKY, RICHARD, Jerry Freilich, and Alexander de Sherbinin** Avian Systems, PO Box 732, 31 Main St. Rockport, Maine 04856-0732 (podolsky@att.net) Research & Monitoring Coordinator, Olympic National Park, 600 E. Park Ave.Port Angeles, WA 98362 (JF) CIESIN, Columbia University P.O. Box 1000, Palisades, NY 10964 (AS)
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S07-7 **POKRAS, MARK A.** Tufts University (mark.pokras@tufts.edu)
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CO47-6 **POMPEI, VANESSA and Francesca J. Cuthbert** Conservation Biology Program , University of Minnesota, St. Paul, MN 55108, (pomp0012@umn.edu) (VP); Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota, St. Paul, MN 55108 (FJC)
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CO27-6 **POREJ, DENI** The Nature Conservancy, 6375 Dublin Road, Dublin, OH 43017 (dporej@tnc.org)
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CO54-8 **PORZECANSKI, IGNACIO, Jorge Acosta-Soto, and Mercedes Casciani** School of Natural Resources, U. Florida, Gainesville, FL (IP) (iporzecanski@hotmail.com) PROBIDES, Rocha, Uruguay (JA-S, MC)
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P03-09 **POSA, MARY ROSE C. and Navjot S. Sodhi** Department of Biological Sciences, 14 Science Drive 4, National University of Singapore, Singapore 117543 (MRCP, NSS),(g0203579@nus.edu.sg). Institute of Biology, University of the Philippines, Diliman, Quezon City, Philippines 1101 (MRCP).
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S08-1 **POSSINGHAM, HUGH P.** The Ecology Centre, The University of Queensland, Brisbane, QLD 4072, Australia, (hpossingham@zen.uq.edu.au)
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S20-4 **POWELL, JAMES and Cyndi Taylor** Wildlife Trust, Florida and Katherine Frisch, Florida Marine Research Institute. (powell@wildlifetrust.org)
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S03-2 **POWELL, GEORGE** World Wildlife Fund-US, 1250 24th Street, NW, Washington, DC 20037 (george.powell@wwfus.org)
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P26-04 **POWELL, MADISON S., Christine C. Cegelski, Matthew R. Campbell, Rick Wilkinson, and Steve Brink** Addresses:University of Idaho, Center for Salmonid and Freshwater Species at Risk, Hagerman, ID 88332 USA, (mpowell@uidaho.edu) (MSP). Idaho Department of Fish and Game, Eagle ID 83616 USA (MRC, CCC). Idaho Power, P.O. Box 70, Boise, ID 83702 USA (RW, SB)
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P03-10 **PRIMACK, DANIEL H., Carolyn Imbres, Richard B. Primack, Abraham J. Miller-Rushing, and Peter Del Tredici** Biology Department, Boston University, 5 Cummington Street, Boston, MA 02215 (DHP, CI, RBP, AJMR); Arnold Arboretum of Harvard University, 125 Arborway, Jamaica Plain, MA 02130 (PDT) (primack@bu.edu)
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P03-11 **PRIMACK, RICHARD B., Abraham J. Miller-Rushing, Trevor Lloyd-Evans, and Paul Satzinger** Boston University, Department of Biology, 5 Cummington Street, Boston, MA 02215 (primack@bu.edu) (AJMR, RBP, PS). Manomet Center for Conservation Sciences, 81 Stage Road, P.O. Box 1770, Manomet, MA 02345 (TLE).
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S05-2 **PRINCIPE, MICHAEL A. and Robert Mayer** New York City Department of Environmental Protection, Bureau of Water Supply, 465 Columbus Avenue, Valhalla, NY (mprincipe@dep.nyc.gov).
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CO37-2 **PULLIN, ANDREW S., Teri M. Knight, Christopher F. Coles, and Gavin Stewart** Centre for Evidence-Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK (a.s.pullin@bham.ac.uk)
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CO9-5 **PYARE, SANJAY and Winston P. Smith** Denver Zoological Foundation, 1650 Hole in the Wall Rd, Potomac MT 59823 (sanjay_pyare@hotmail.com) (SP) Pacific Northwest Research Station, Forestry Science Laboratory, Juneau, AK 99801-8545 (WS)
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CO21-8 **PYKE, CHRISTOPHER R. and Jaymee Marty** National Center for Ecological Analysis and Synthesis, 735 State St., Suite 300, Santa Barbara, CA 93101 (pyke@nceas.ucsb.edu); The Nature Conservancy, Cosumnes River Preserve, 13501 Franklin Blvd., Galt, CA 95632
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P14-02 **QUINTANA-ASCENCIO, P F. and E. S. Menges** Department of Biology, University of Central Florida 4000 Central Florida Boulevard, Orlando, FL 32816(pquintan@mail.ucf.edu, PFQA); Archbold Biological Station, 123 Main DRive, Venus FL 33960 (ESM)
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CO14-6 **RADELOFF, VOLKER C., Roger B. Hammer, Susan I. Stewart, Jeremy S. Fried, Jason F. McKeefry, and Sheralyn S. Holcomb** Department of Forest Ecology & Management, University of Wisconsin - Madison, 1630 Linden Drive, Madison, WI 53706 (radeloff@wisc.edu) (VCR, JFM, SSH); Department of Rural Sociology, University of Wisconsin - Madison, 1180 Observatory Drive, Madison, WI 53706 (RBH); North Central Research Station, Forest Service, United States Department of Agriculture, 1033 University Avenue, Suite 360, Evanston, IL 60201 (SIS); Pacific Northwest Forest Inventory and Analysis, Forest Service, United States Department of Agriculture, 620 SW Main, Portland, OR 97205 (JSF).
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CO42-7 **RAHN, MATTHEW, James Diffendorfer, and Holly Doremus** San Diego State University, Department of Biology, 5500 Campanile Drive, San Diego, CA 92182 (mrahn@sciences.sdsu.edu) (MR, JD); University of California, Davis, School of Law, Davis, CA 95616 (HD)
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P33-08 **FERNANDES, ROSAN V. and DENISE M. RAMBALDI** Associação Mico-Leão-Dourado, Caixa Postal 109.968, Casimiro de Abreu, RJ, 28.860-970, Brazil(rambaldi@micoleao.org.br)
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CO6-7 **RAO, MADHU, Than Myint, Than Zaw, and Saw Tun** Wildlife Conservation Society Myanmar Program, Bldg. C-1, Aye Yeikmon 1st Street, Hlaing Township (Ward 3) Yangon, Myanmar. (mrao@wcs.org)
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S19-7 **RASOAMAMPIANINA, VANESSA, Tiana Rahagalala, Evah Andriamboavonjy, Harison Rabarison, Nora Bynum, Eleanor J. Sterling.** Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th St., NY, NY 10024 (VR, NB, EJS) (vanessar@amnh.org). Wildlife Conservation Society, BP8500, Antananarivo 101, Madagascar (TR). Conservation International BP 5178 Antananarivo 101, Madagascar (EA, HR).
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CO7-6 **RATSIMBAZAFY, JONAH, Ravololomanana Noromalala, and Heritiana Ranarivelo** Missouri Botanical Garden, B.P. 3391, 101 Antananarivo, Madagascar (NR); Durrell Wildlife Conservation Trust – Madagascar, B.P. 8511, 101 Antananarivo,Madagascar (JR) Département de Biologie Végétale, Faculté des Sciences, Université d'Antananarivo, Madagascar (HR) (jonah.ratsimbazafy@durrell.org)
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DIVERSITY IS UNEVENLY DISTRIBUTED WITHIN SPECIES

CO3-6 **RAY, JUSTINA C., Neil Dawson, Audrey Magoun, and Geoff Lipsett-Moore** Wildlife Conservation Society, Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, ON, Canada M5S 3B3 (JR) (jray@wcs.org); Ontario Ministry of Natural Resources, Northwest Science & Information, RR#1, 25th Side Road, Thunder Bay, ON, Canada P7C 4T9 (ND); 3680 Non Road, Fairbanks, AK, 99709 (AM); Ontario Parks, 435 James Street, Suite 221D, Thunder Bay, ON, Canada P7E 6S8 (GLM)
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P27-10 **RAZAFIMAHAIMODISON, J.C.** Organismic and Evolutionary Biology, University of Massachusetts at Amherst, AMHERST, MA 01003 (jclaude@bio.umass.edu)
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S11-6 **REGAL, PHILIP J. and Erika R.L. Rivers** Addresses:Department of Ecology, Evolution, and Behavior (PR) and Conservation Biology Program (PR, ER), 100 Ecology Building, University of Minnesota, 1987 Upper Buford Circle, St. Paul, MN 55108 USA, regal001@umn.edu.
BIOPROSPECTING FOR GENETIC FOOL'S GOLD? IMPLICATIONS FOR CONSERVATION BIOLOGY

CO52-4 **REFSNIDER, JEANINE M. and Andrew M. Simons** University of Minnesota, Conservation Biology Program, 100 Ecology, 1987 Upper Buford Circle, St. Paul, MN, 55108 (refsnij@umn.edu)
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CO43-8 **REYERS, BELINDA, Mark Keith, Chris T. Chimimba, and Yolan Friedman** Department of Zoology and Entomology, University of Pretoria, Pretoria, 0002, South Africa (MK), Department of Zoology, University of Stellenbosch, Pvt Bag X1, Stellenbosch, 7602, South Africa (breyers@sun.ac.za) (BR); Mammal Research Institute, Department of Zoology & Entomology, University of Pretoria, Pretoria, 0002, South Africa (CTC); Endangered Wildlife Trust, / CBSG (SSC / IUCN) Southern Africa, Pvt Bag X11, Parkview, 2122, South Africa (YF)
ASSESSING THE CONSERVATION STATUS AND PRIORITY OF SOUTH AFRICAN MAMMALS

P03-12 **REYNOLDS, MARK, Gretchen Lebuhn, Rich Hatfield, Erin Rentz, Ed Conner, and Jessica Cleeves** The Nature Conservancy, 201 Mission Street, 4th Floor, SanFrancisco, CA 94925 (mreynolds@tnc.org) (MR); San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132 (GL, RH, ER, EC, JC).
BIODIVERSITY OF SIERRA NEVADA MEADOWS – LANDSCAPE CONTEXT, HABITAT QUALITY AND ANNUAL VARIATION

CO18-7 **RHODES, JONATHAN R., Thorsten Wiegand, Clive A. McAlpine, and Hugh P. Possingham** School of Geography, Planning and Architecture, The University of Queensland, Brisbane, QLD 4072, Australia (j.rhodes@uq.edu.au) (JRR, CAM). Department of Ecological Modelling, UFZ-Centre for Environmental Research, Permoserstrasse 15, 04318 Leipzig, Germany (TW). The Ecology Centre, The University of Queensland, Brisbane, QLD 4072, Australia (HPP).
IDENTIFYING ATTRACTIVE SINKS USING PRESENCE/ABSENCE DATA: A CASE STUDY FOR THE KOALA

CO42-3 **RICH, TERRELL D., Aaron L. Holmes, Mary M. Rowland, and Michael J. Wisdom** U. S. Fish and Wildlife Service, 1387 S. Vinnell Way, Boise, ID 83709 (terry_rich@fws.gov) (TDR). PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970 (ALH). U. S. Forest Service, Pacific Northwest Research Station, 1401 Gekeler Lane, La Grande, OR 97850 (MMR, MJW).
GREATER SAGE-GROUSE AS AN UMBRELLA SPECIES IN THE INTERIOR COLUMBIA BASIN, USA

CO25-8 **RICKETTS, TAYLOR H., Marc L. Imhoff, Lahouari Bounoua, Colby J. Loucks, Robert Harriss, and William T. Lawrence** World Wildlife Fund, 1250 Twenty-fourth St. NW, Washington D.C. 20037 (taylor.ricketts@wwfus.org)(THR, CJL). Department of Biological Sciences, Stanford University, Stanford CA 94305 (TR). NASA's Goddard Space Flight Center, Greenbelt MD 20771 (MLI, LB). University of Maryland, College Park MD 20742 (LB). National Center for Atmospheric Research Foothills Laboratory, 3450 Mitchell Lane, Boulder, CO 80307 (RH) Bowie State University, Bowie, MD 20715 (WL).
THE GEOGRAPHY OF CONSUMPTION: HUMAN APPROPRIATION OF NPP

CO44-5 **RILEY, SETH P.D., John Pollinger, Raymond M. Sauvajot, Eric C. York, Cassity Bromley, Todd K. Fuller, and Robert K. Wayne** Santa Monica Mountains National Recreation Area, 401 W. Hillcrest Drive, Thousand Oaks, CA 91360 (SPDR, RMS, ECY, CB) (seth_riley@nps.gov); Department of Organismic Biology, Ecology, and Evolution, University of California, Los Angeles, CA 90095 (SPDR, JP, RMS, RKW); Department of Natural Resources Conservation, Holdsworth Natural Resources Center, 160 Holdsworth Way, University of Massachusetts, Amherst, Massachusetts 01003 (TKF).
FREEWAY REDUCES GENE FLOW IN WIDE-RANGING MAMMALIAN CARNIVORES

P09-14 **ROBINSON, W. DOUGLAS, B. Graeme Lockaby, Daowei Zhang, Jack W. Feminella, Josh McDaniel, and Jeffrey A. Stratford** Dept. of Fisheries and Wildlife, 104 Nash Hall, Oregon State Univ., Corvallis, OR 97330 (douglas.robinson@oregonstate.edu) (WDR); School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849, USA (BGL, DZ, JWF, JM, JAS).
A MULTIDISCIPLINARY INVESTIGATION OF URBANIZATION IN THE SOUTHEASTERN UNITED STATES: THE WEST GEORGIA PROJECT

P09-13 **ROBINSON, TARA R., W. Douglas Robinson, George R. Angehr, Lisa J. Petit, Daniel R. Petit, and Jeffrey D. Brawn** Oregon State University, Dept of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331 (tara.robinson@oregonstate.edu) (TR, WDR); Smithsonian Tropical Research Institute, Unit 0948, APO AA 34002 (GRA); Smithsonian Institution Migratory Bird Center, National Zoological Park, Washington, D.C. 20008 and National; Park Service, Cuyahoga Valley National Park, 15610 Vaughn Road, Breckville, OH 44141 (LJP); Cleveland Metroparks, 4401 Fulton Parkway, Cleveland, OH 44144 (DRP); University of Illinois, Urbana-Champaign Department of Animal Biology, 113 Shelford Vivarium, 606 E. Healey Street, Champaign, IL 61820 (JDB)
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S16-2 **ROBINSON, J. G. and Elizabeth L. Bennett** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460-1099, tel: (718) 741-8190, (liz@lizbennett.org)
CAPACITY OF DIFFERENT TROPICAL ECOSYSTEMS TO SUSTAIN COMMERCIAL WILDLIFE HARVESTS

S21-5 **ROBINSON, JULIE A., Serge Andréfouët, Jennifer Gebelein, S. Alan Spraggins, Marco Noordeloos, Edmund P. Green, Lauretta Burke, Frank Muller-Karger, Gene Feldman, and Norman Kuring** Earth Sciences & Image Analysis Laboratory, Johnson Space Center, Houston, TX 77058 (julie.a.robinson1@jsc.nasa.gov) (JAR, SAS). UR Coreus - Institut de Recherche pour le Developpement, BP A5, 98848 Noumea cedex, New Caledonia (SA). Department of International Relations, Florida International University, Miami, FL 33199 (JG). ReefBase, World Fish Center, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Malaysia Penang, Malaysia (MN). United Nations Environment Programme-World Conservation Monitoring Centre, 219 Huntingdon Road, Cambridge CB3 0DL, UK (EPG). World Resources Institute, 10 G Street NE, Washington, DC 20002 (LB, JM). Institute for Marine Remote Sensing, University of South Florida, 140 7th Ave South, St. Petersburg, FL 33701 (FM-K). Goddard Space Flight Center, Greenbelt, MD 20770 (GF, NK). Center for Coastal Monitoring and Assessment, NOAA National Ocean Service, 1305 East-West Highway, Silver Spring, MD 20910 (RPS).
GLOBAL MAPS OF CORAL REEFS—ASSEMBLING A GLOBAL DATASET, MAKING THE MAPS, AND MAKING SURE THAT THEY ARE ACCESSIBLE AND CONTRIBUTE TO CONSERVATION NEEDS

S17-7 **ROBLE, STEVEN M.** Virginia Department of Conservation and Recreation, Division of Natural Heritage, 217 Governor Street, Richmond, Virginia 23219 (sroble@dcr.state.va.us)
INVERTEBRATE CONSERVATION IN PRACTICE: LESSONS FROM VIRGINIA

P29-10 **ROCHA, FLÁVIA SOUZA, Fernando P. Rodrigues, and Claudio B. Valladares Pádua** IPÊ, Instituto de Pesquisas Ecológicas, Passeio Pica-Pau, 4, Vila São Paulo, 19280-000, Teodoro Sampaio, SP, Brazil (FSR, CBVP) (flarocha@uol.com.br.), Depto. de Zootecnia, Melhoramento Genético Animal, FCAV, UNESP, Jaboticabal, SP, Brazil (FPR).
DIFFERENTIAL RESPONSES OF MARSUPIALS TO THE FRAGMENTED LANDSCAPE OF THE PONTAL DO PARANAPANEMA REGION, SP, BRAZIL

P25-12 **ROCHA, CARLOS F.D., Helena G. Bergallo, Monique Van Sluys, Maria A. S. Alves, and Carlos E. Jamel** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 200559-900, Rio de Janeiro, RJ, Brazil, and Instituto Biomas, Rua Sonia Angel Jones 5, Recreio dos Bandeirantes, Rio de Janeiro, Rj, 22785-470, RJ, Brazil. (cfdrocha@uerj.br)
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S10-2 **ROCKE, TONIE E., F. Joshua Dein, and Milton Friend** USGS National Wildlife Health Center, 6006 Schroeder Rd., Madison, WI 53711 (tonie_rocke@usgs.gov)
THE INTERNATIONAL TRADE IN WILDLIFE: DISEASE AND CONSERVATION ISSUES

CO23-6 **RODRIGUES, ANA S. L., Sandy J. Andelman, Mohamed I. Bakarr, Luigi Boitani, Thomas M. Brooks, Richard M. Cowling, Lincoln D. C. Fishpool, Gustavo A. B. da Fonseca, Kevin J. Gaston, Michael Hoffmann, Janice S. Long, Pablo A. Marquet, John D. Pilgrim, Robert** Center for Applied Biodiversity Science, Conservation International, Washington, DC 20036 (a.rodrigues@conservation.org) (ASLR, TMB, GABF, MH, JDP, RWW). National Center for Ecological Analysis & Synthesis, University of California, Santa Barbara, Santa Barbara, California 93101 (SA). World Agroforestry Centre, Gigiri Nairobi, Kenya (MIB). Dipartimento di Biologia Animale e dell'Uomo, Università di Roma "La Sapienza", 00185 Rome, Italy (LB). Terrestrial Ecology Research Unit, Department of Botany, University of Port Elizabeth, Port Elizabeth 6000, South Africa (RMC). BirdLife International, Cambridge CB3 0NA, UK (LDCF). Departmento de Zoologia, Universidade Federal de Minas Gerais, Belo Horizonte 31270, Brazil (GABF). Biodiversity & Macroecology Group, Department of Animal & Plant Sciences, University of Sheffield, Sheffield S10 2TN, UK (KJG). IUCN-SSC/CI-CABS Biodiversity Assessment Unit, c/o Center for Applied Biodiversity Science, Conservation International, Washington DC 20036 (JSL, WS, SNS). Center for Advanced Studies in Ecology and Biodiversity and Departamento de Ecología, Facultad de Ciencias Biológicas, Pontificia Universidad Católica de Chile, Casilla 114-D, Santiago, Chile (PAM). New South Wales Department of Environment and Conservation, Armidale NSW 2350, Australia (RLP). Department of Fish and Wildlife Resources, University of Idaho, Moscow, Idaho 83844 (JS). Avian Demography Unit, Department of Statistical Sciences, University of Cape Town, Rondebosch 7701, South Africa (LGU). 194W Hill Street, Walcha, NSW 2354, Australia (MEJW). Institute of Zoology, Chinese Academy of Sciences, Beijing 100080, China (XY).
GLOBAL GAP ANALYSIS: ASSESSING THE EFFECTIVENESS OF THE GLOBAL NETWORK OF PROTECTED AREAS IN REPRESENTING SPECIES DIVERSITY

P26-13 **RODRIGUES, FERNANDO P., Flávia S. Rocha, and Sergio R. Matioli** Departamento de Biologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão 277, CEP 05422-970, Cidade Universitária, São Paulo, Brasil, (pacheco_rodrigues@hotmail.com) (FPR, SRM). Instituto de Pesquisas Ecológicas – IPÊ, Teodoro Sampaio, SP, Brasil (FSR).
GENETIC DIFFERENTIATION OF THE WOOLLY MOUSE OPOSSUM (*MICOUREUS TRAVASSOSI*) IN ATLÂNTIC FOREST FRAGMENTS

S20-7 **RODRIGUEZ, JON PAUL and Kathryn M. Rodríguez-Clark** Centro de Ecología, Instituto Venezolano de Investigaciones Científicas and Wildlife Trust Alliance, Apdo. 21827, Caracas 1020-A, Venezuela, (jonpaul@ivic.ve jonpaul@ivic.ve)
FROM HABITAT TO URBAN CENTERS IN LATIN AMERICA AND ON THROUGH THE MIAMI GATEWAY: THE ILLEGAL TRADE IN NEOTROPICAL WILDLIFE

CO20-2 **RODRÍGUEZ-CLARK, KATHRYN M., María Cellamare, Rachel A. Neugarten, Romina Acevedo, René Ayala, José Manuel Briceño, Mayne Cacique, Francoise Cavada, Carlos Fajardo, Ana Cecilia García, Juan Pablo Gassman, Consuelo Hernández, Pablo Antonio Millán, Adriana** Instituto Venezolano de Investigaciones Científicas, Centro de Ecología, Apartado 21827, Caracas 1020-A Venezuela, (kmrc@ivic.ve) (KMRC, JPR). Universidad del Oriente, Departamento de Ciencias, Boca del Rio, Isla Margarita, 6301 Venezuela (MC, RA, MC, FC, CF, ACG, JPG, AM, EP, AT). Columbia University, Department of Ecology, Evolution, and Environmental Biology, 10th Floor Schermerhorn Extension, 1200 Amsterdam Avenue, New York, NY 10027 (RN). Provita, Apartado 47552, Caracas 1041-A, Venezuela (KMRC, RA, JMB, CH, PAM, JPR, IZ).
OPTIMAL INVESTMENT IN ENVIRONMENTAL EDUCATION: THE EFFECT OF TWO INTERVENTIONS ON KNOWLEDGE AND ATTITUDES IN VENEZUELAN CHILDREN TOWARD AN ENDEMIC, ENDANGERED PARAKEET

P25-13 **RODRÍGUEZ-CLARK, KATHRYN M., Pedro D. Vernet, and Ángel J. Gómez** Grupo de Trabajo en Tortugas Marinas del Estado Nueva Esparta, Provita, Apartado 47552, Caracas 1041-A, Venezuela, (tortuga@gttmne.org) (PDV, AJG). Instituto Venezolano de Investigaciones Científicas, Centro de Ecología, Apartado 21827, Caracas 1020-A Venezuela (KMRC).
TWO TURTLES WITH ONE STONE: THE IMPORTANCE OF A VOLUNTEER NETWORK FOR SEA TURTLE CONSERVATION AND RESEARCH ON MARGARITA ISLAND, VENEZUELA

P06-09 **RODRIGUEZ-PRIETO, IÑAKI and Esteban Fernandez-Juricic** Departamento de Ecologia Evolutiva, Museo Nacional de Ciencias Naturales, CSIC, Jose Gutierrez Abascal 2, 28006 Madrid, Spain, (ikrodpri@wanadoo.es) (IRP). Department of Biological Sciences, California State University-Long Beach, Peterson Hall 1-109, 1250 Bellflower Blvd., Long Beach, CA 90840 (EFJ).
ASSESSING AND PREDICTING THE EFFECTS OF RECREATIONAL ACTIVITIES ON THE ENDEMIC AND VULNERABLE IBERIAN FROG (*RANA IBERICA*) THROUGH POPULATION AND INDIVIDUAL LEVEL APPROACHES

CO45-6 **ROGNER, JOHN, Bruce Boyd, and Elizabeth McCance** Field Supervisor (JR) Fish and Wildlife Service 1250 South Grove Ave., Suite 103 Barrington, IL 60010 (john_rogner@fws.gov) Executive Director (BB) The Nature Conservancy - Illinois Chapter, Director of Conservation Programs (EM) Chicago Wilderness 8 S. Michigan, Suite 900 Chicago, IL 60603
CHICAGO WILDERNESS: A MODEL FOR CONSERVATION IN AN URBANIZING WORLD

CO34-3 **ROSENBAUM, HOWARD C., Matt, Leslie, Scott Glaberman, Tom Jefferson, Tim Collins, Gianna Minton, Vic Peddemors, and Rob Baldwin** International Conservation and Conservation Genetics Program, The Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (hrosenbaum@wcs.org) and American Museum of Natural History, 79th St. and CPW, New York, NY 11024 (HCR, ML). Department of Ecology, Evolution, and Behavior, Yale University, New Haven, CT 06520 (SG). Southwest Fisheries Science Center, NOAA-NMFS, PO Box 271, La Jolla, CA 92038 (TJ). Oman Whale and Dolphin Research Group, PO Box 2531, CPO 111, Muscat, Oman (TC, GM, RB). School of Biology, University of Durban-Westville, P. Bag X54001, Durban 4000 South Africa (VP). University of London, University Marine Biological Station Millport, Isle of Cumbrae, Scotland, KA28 OEG (GM).
DETECTING SPECIES-LEVEL CONSERVATION UNITS AND PHYLOGENETIC RELATIONSHIPS AMONG HUMPBACK DOLPHINS: IMPLICATIONS FOR CONSERVATION AND MANAGEMENT

CO40-2 **ROSENTHAL, SADIE K., Samantha S. Stevens, and David M. Lodge** Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 (srosenth@nd.edu)
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CO41-4 **ROSSON, JR., JAMES F.** USDA Forest Service, 4700 Old Kingston Pike, Knoxville, TN 37919 (jrosson@fs.fed.us)
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P06-10 **ROTHERMEL, BETSIE B.** Division of Biological Sciences, University of Missouri, 105 Tucker Hall, Columbia, MO 65211 (rothermel@srel.edu)
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P05-16 **ROTHLEY, KRISTINA D. and Charlene Rae** Simon Fraser University School of Resource and Environmental Management, 8888 University Drive, Shrum Classroom Building Burnaby, BC, V5A 1S6, Canada (krothley@sfu.ca)
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P09-15 **ROUSSEAU, JOSÉE, Jean-Pierre Savard, and Rodger Titman** Macdonald Campus, McGill University, 21111 Lakeshore, Ste-Anne-de-Bellevue, Quebec, H9X 3V9, Canada, (josee.rousseau@mail.mcgill.ca) (JR, RT). Canadian Wildlife Service, Environment Canada, 1141 route de l'Église, Box 10100, 8e étage, Sainte-Foy, Quebec, G1V 4H5, Canada.
AVIAN DIVERSITY, ASSEMBLAGES AND USE OF VEGETATION IN AN URBAN ECOSYSTEM

S14-4 **ROWCLIFFE, MARCUS, Emmanuel de Merode, Kes Hillman-Smith, Katherine Homewood, Richard Pettifor, and Guy Cowlishaw** Institute of Zoology, ZSL, London NW1 4RY, UK; *Department of Anthropology, University College London, UK (marcus.rowcliffe@ioz.ac.uk)
LINKAGES BETWEEN THE URBAN BUSHMEAT TRADE AND PROTECTED AREA EFFICACY IN NORTHEASTERN DEMOCRATIC REPUBLIC OF CONGO

P11-05 **RUDALEVIGE, ALLISON and John Rotenberry** Biology Department, University of California, Riverside, California 92507 (Flur@MSN.com)
RAPTOR HABITAT RELATIONSHIPS IN AN URBANIZING LANDSCAPE

CO10-6 **RUDNICK, JAMIE T., Katzner, E. Bragin, O.E. Rhodes, Jr., and J.A. Dewoody** Dept. of Forestry & Natural Resources, Purdue University, 195 Marsteller St., West Lafayette, IN 47907 (jrudnick@fnr.purdue.edu) (JR, OER, JAD); Dept. of Environmental Science & Technology, Imperial College - South Kensington Campus, Exhibition Road, London, SW7 2AZ, UK (TK).
NON-INVASIVE MONITORING OF AN IMPERIAL EAGLE POPULATION IN KAZAKHSTAN

CO36-5 **RUEDAS, L. A., L. J. Dizney, J. J. P. Veerman, G. Lafferiere, and P. D. Jones** Department of Biology (LAR, LJD, PDJ) and Museum of Vertebrate Biology (LAR); Portland State University; Science Building II, Room 232B; 1719 SW 10th Avenue; P. O. Box 751; Portland, OR 97207–0751 (ruedas@pdx.edu). Department of Mathematics and Statistics; Newberger Hall; Portland State University; PO Box 751; Portland Oregon 97207–0751 (JJPV, GL).
MESOSCALE POPULATION CYCLING IN URBAN PARKS' SMALL MAMMAL FAUNA: INFLUENCE OF DISEASE LOAD ON POPULATION ECOLOGY AND CONSERVATION IMPLICATIONS

CO19-2 **RUMIZ, DAMIAN I., Andrew J. Noss, and Romoaldo Peña** Wildlife Conservation Society Latin America Program, Casilla 6272, Santa Cruz, Bolivia (drumiz@wcs.org drumiz@wcs.org)
CAMERA TRAPPING GIANT ARMADILLOS IN THE DRY FORESTS OF SANTA CRUZ, BOLIVIA

CO3-1 **RUSSELL, KIMBERLY NORRIS, Martin T. Do, and Norman I. Platnick** Division of Invertebrate Zoology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024; (krussell@amnh.org); 212 769 5659
INTRODUCING SPIDA-WEB: AN AUTOMATED IDENTIFICATION SYSTEM FOR BIOLOGICAL SPECIES

CO34-4 **RUSSELLO, MICHAEL, Eugene Gladyshev, Dale Miquelle, and Adalgisa Caccone** Department of Ecology and Evolutionary Biology, Yale University, 21 Sachem Street, New Haven, CT 06511, (michael.russello@yale.edu) (MR, EG, AC). Russian Far East Program, Wildlife Conservation Society, New York, NY (DM).
POTENTIAL GENETIC CONSEQUENCES OF A RECENT BOTTLENECK IN THE AMUR TIGER OF THE RUSSIAN FAR EAST

P29-11 **RUTH, TONI K., Douglas W. Smith, Mark A. Haroldson, Polly C. Buotte, Charles C. Schwartz, Howard B. Quigley, Steve Cherry, Kerry M. Murphy, Dan Tyers, and Kevin Frey** Hornocker Wildlife Institute/Wildlife Conservation Society, 2023 Stadium Drive, Suite 1A, Bozeman, MT 59715 (truth@wcs.org) (TKR, PCB, HBQ). Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, Mammoth, WY 89210 (DWS, KMM). United States Geological Survey, Interagency Grizzly Bear Team, Forestry Sciences Lab, Montana State University, Bozeman, MT 59717 (MAH, CCS). Department of Mathematical Sciences, Montana State University, Bozeman, MT 59717 (SC). United States Forest Service, Gardiner, MT 59030 (DT). Montana Department of Fish, Wildlife and Parks, Montana State University, Bozeman, MT 59717 (KF).
LARGE CARNIVORE RESPONSE TO RECREATIONAL BIG GAME HUNTING ALONG YELLOWSTONE NATIONAL PARK'S NORTHERN BOUNDARY

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SPECIES AND PIXELS: INTRODUCING A NEW MODEL TO LINK BIOLOGICAL AND REMOTE SENSING DATA

CO32-1 **SADIGHI,KAY, Frank Lowenstein, Douglas Feick, and Jay Hestbeck** The Nature Conservancy, P.O. Box 268, Sheffield, MA 01257, (ksadighi@tnc.org)(KS,DF,FL)
ANALYSIS OF NON-NATIVE PLANT INVASIONS OF A LANDSCAPE-SCALE SITE

S09-8 **SADLER, JON P., Emma C. Small and Mark Telfer** School of Geography, Earth and Environmental Sciences, The University of Birmingham (j.p.sadler@bham.ac.uk) (JPS) + (ECS) UK Headquarters, The RSPB United Kingdom (MT)
THE CONSERVATION OF CARABID SPECIES ASSEMBLAGES IN URBAN ENVIRONMENTS: IS HABITAT QUALITY IMPORTANT?

S01-3 **SÁENZ-ARROYO, ANDREA, Callum M. Roberts, Jorge Torre, Micheline Cariño-Olvera, and Roberto R. Enríquez-Andrade** Environment Department, University of York, York, YO10 5DD, UK (asaenz@cobi.org.mx) (ASA, CMR); Comunidad y Biodiversidad A.C., Bahía de Bacochibampo, S/N Colonia Lomas de Cortés, Guaymas, 85450, Sonora, México (ASA, JT); Universidad Autónoma de Baja California Sur, Área Interdisciplinaria de Ciencias Sociales, Apartado Posta 19 -B, La Paz, 23080 Baja California Sur, México (MCO); Universidad Autónoma de Baja California, Facultad de Ciencias Marinas, Apartado Postal 453, Ensenada, 22870, Baja California, México (RREA).
RAPIDLY SHIFTING BASELINES AMONG FISHERS OF THE SEA OF CORTEZ

P28-01 **SAGATA, KATAYO** Wildlife Conservation Society Papua New Guinea Program, P. O. Box 277, Goroka EHP, Papua New Guinea. (ksagata@global.net.pg)
EFFECT OF SMALL-SCALE DISTURBANCE ON SPECIES DIVERSITY AND DENSITY ON TWIG-NESTING ANTS IN TROPICAL FOREST LITTER

P28-02 **SAHARI, BANDUNG, Heri Tabadepu, Christian H. Schulze, and Damayanti Buchori** HERI TABADEPU and Bandung Sahari: Center for Conservation and Insect Studies (Wildlife Trust Alliance) , Perum. Alam Sinar Sari, Jl Kecipir II No 30 Bogor, Indonesia, Graduate student of Bogor Agricultural University (bandung_27@yahoo.com); CHRISTIAN H SCHULZE: Department of Animal Ecology I, University of Bayreuth, D-95440 Bayreuth, Germany; DAMAYANTI BUCHORI: Bogor Agricultural University, Jl Kamper, Kampus IPB Darmaga, Bogor, Indonesia
A PRELIMINARY STUDY OF THE EFFECTS OF LANDUSE AND FOREST DISTURBANCE ON BUTTERFLY DIVERSITY AT MOUNT SALAK, JAVA (INDONESIA)

S12-2 **SALAFSKY, NICK and Richard Margoluis** Foundations of Success (FOS), 4109 Maryland Avenue, Bethesda MD 20816 (Nick@FOSonline.org)
A COMPARISON OF MONITORING AND EVALUATION SYSTEMS ACROSS CONSERVATION ORGANIZATIONS

P33-09 **SANDERS, SUZANNE and James B. McGraw** Department of Biology, Box 6057, West Virginia University, Morgantown, West Virginia 26506-6057 (ssander2@wvu.edu).
ECOLOGICAL GENETICS OF A THREATENED PLANT: VARIATION IN PLASTICITY AND IMPLICATIONS FOR RESTORATION

CO35-2 **SANDERSON, ERIC W.** Wildlife Conservation Society, 2300 Southern Blvd., Bronx NY 10460 (esanderson@wcs.org).
THE MANNAHATTA PROJECT: HISTORICAL ECOLOGY TO SPUR CONSERVATION IN AN URBAN CONTEXT

S12-1 **SANJAYAN, M.** The Nature Conservancy 4245 N Fairfax Drive Arlington, VA 22201 (msanjayan@tnc.org)
WHY MEASURES MATTER

P01-06 **SANTOS, ADILSON ROQUE dos, Helena Bergallo, and Carlos Frederico D. Rocha** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 20559-900, Rio de Janeiro, RJ, Brazil, (bergallo@uerj.br) (HGB, CFDR). Diretoria de Projetos da Fundação Parques e Jardins, Praça da República s.no., Campo de Santana, 20211-350, Rio de Janeiro, RJ, Brazil (ARS).
NATIVE AND EXOTIC PLANTS IN URBAN LANDSCAPE GARDENING IN RIO DE JANEIRO CITY, BRAZIL

CO23-4 **SATERSON, KATHRYN** Duke Center for Environmental Solutions, Box 90328, Duke University, Durham , NC 27705 (saterson@duke.edu)
HOW IS THE PRECAUTIONARY PRINCIPLE USED IN CONSERVATION POLICIES IN THE US AND EUROPE - AND DOES IT MATTER FOR BIOLOGICAL DIVERSITY?

P26-14 **SATKOSKI, JESSICA A., Carel Van Schaik, Noviar Andayani, Don J. Melnick, and Jatna Supriatna** Department of Anthropology, Columbia University (jas491@columbia.edu) (JAS); New York Consortium for Evolutionary Primatology (JS, DJM); Anthropologisches Institut, Universiat Zurich, Switzerland (CS); Pusat Studi Biodiversitas dan Konservasi, University of Indonesia, Indonesia (NA); Center for Environmental Research and Conservation, Columbia University (DJM); Department of Evolution, Ecology and Environmental Biology, Columbia University (DJM); Conservation International, Jl. Taman Margasatwa 61, Indonesia (JS)
AN UNSTABLE EVOLUTIONARY STRATEGY AMONG ORANGUTAN MALES IN SUMATRA?

P26-15 **SAUNDERS, BRENDA L., Stephen Atkinson, Peter T. Boag, and Peter J. van Coeverden de Groot** Department of Biology, Queen's University, Kingston, Ontario, Canada (saunderb@biology.queensu.ca) (BLS, PTB, PJvCdG). Department of Sustainable Development, Nunavut Canada (SA).
AGE-SPECIFIC REPRODUCTIVE SUCCESS IN POLAR BEARS AND IMPLICATIONS FOR SUSTAINABLE HARVEST MANAGEMENT

P09-16 **SAUTER, ANNETTE, Reed Bowman, and Karin Schiegg** Universität Zürich, Zoologisches Institut, Winterthurerstrasse 190, 8057 Zürich, Switzerland, (asauter@zool.unizh.ch) (AS, KS). Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33862 (AS, RB)
GOOD START, BAD CONDITIONS? GROWTH AND SURVIVAL IN SUBURBAN FLORIDA SCRUB-JAY NESTLINGS

P24-09 **SCHILLING, EMILY GAENZLE, Cynthia S. Loftin, and Alex D. Huryn** Ecology and Environmental Sciences Program, Department of Wildlife Ecology, 5755 Nutting Hall, University of Maine, Orono, ME 04469-5755 (emily.schilling@umit.maine.edu) (EGS). Maine Fish and Wildlife Cooperative Research Unit, Department of Wildlife Ecology, 5755 Nutting Hall, University of Maine, Orono, ME 04469-5755 (CSL). A230 Bevill Building, Box 870206, Department of Biological Sciences, University of Alabama Tuscaloosa, AL 35487 (ADH).
LANDSCAPE ATTRIBUTES OF FISHLESS LAKES IN MAINE

CO32-2 **SCHLAEPFER, MARTIN A., Bernd Blossey, Michael C. Runge, and Paul W. Sherman** Department of Integrative Biology, 1 University Station C0930, University of Texas at Austin, Austin TX 78712 (mas50@mail.utexas.edu) (MAS). Department of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853-3001 (BB). US Geological Survey, Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, MD 20708-4017 (MCR). Dept of Neurobiology and Behavior, Mudd Hall, Cornell University, Ithaca, NY 14853-2702 (PWS).
INTRODUCED SPECIES, EVOLUTIONARY TRAPS, AND EVOLUTIONARY RELEASES

CO15-4 **SCHLAG, ERIN M., Maile Neel, and Marla McIntosh** Marine Estuarine and Environmental Sciences Program, University of Maryland, College Park, MD 20742 (eschlag@umd.edu) (EMS). Department of Natural Resource Sciences and Landscape Architecture, University of Maryland, College Park, MD 20742 (MN, MM)
GENETIC DIVERSITY OF MARYLAND-GROWN AMERICAN GINSENG (PANAX QUINQUEFOLIUS)

P08-08 **SCHLÜTER, EVEROSE and J. Michael Reed** Tufts Institute of the Environment, Tufts University, Medford, MA 02155 (everose.schluter@tufts.edu)(ES); Department of Biology, Tufts University, Medford, MA 02155 (JMR)
THE ROLE OF COARSE WOODY DEBRIS IN MAINTAINING FOREST MOSS COMMUNITIES

P23-06 **SCHMIDT, GERALD** Institut fuer Ethnologie, Kultur- und, Sozialanthropologie, Universitaetsstr. 7,1010 Vienna, Austria (and/or) Institut für Ökologie und Naturschutz, Althanstr. 14, A-1090 Vienna, Austria, (gerald.schmidt@univie.ac.at)
"POSITIVE ECOLOGY:" FROM CONSERVATION BIOLOGY TO A SCIENCE OF ECOLOGICALLY AND HUMANLY "GOOD LIVES"

S18-6 **SCHMIDT, BENEDIKT R., Flavio Zanini, and Jerome Pellet** KARCH, Naturhistorisches Museum, Bernastrasse 15, 3005 Bern, Switzerland (FZ, BRS); GECOS, EPFL, Lausanne, Switzerland (FZ); LBC, University of Lausanne, Lausanne, Switzerland (JP); Zoology Institute, University of Zurich, Zurich, Switzerland (BS) (benedikt.schmidt@unine.ch)
URBANIZATION AND ITS EFFECTS ON AMPHIBIANS: GEOGRAPHIC VARIATION AND VARIATION AMONG SPECIES

S06-4 **SCHUSTER, WILLIAM** Black Rock Forest Consortium, 129 Continental Road, Cornwall, NY 12518 USA (blackrock@ldeo.columbia.edu)
LONG-TERM TRENDS IN FOREST REGENERATION AT BLACK ROCK FOREST, CORNWALL, NEW YORK

S02-8 **SCHWARTZ, MARK W.** Department of Environmental Science & Policy University of California mwschwartz@ucdavis.edu
CAN RARE PLANTS PERSIST IN THE URBAN ENVIRONMENT?

P24-10 **SCHWEIZER, DANIELLA and Paula Henry** CONS Program, Department of Biology, University of Maryland, College Park, MD 20742-4415 (danimar_1999@yahoo.com) (SD). USGS - Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, Maryland 20708-4017 (PH).
GIS ASSESSMENT OF MAIN TERRAPIN TURTLES NESTING AREAS IN NEED OF PROTECTION IN THE CHESAPEAKE BAY, MARYLAND

CO28-6 **SECORD, DAVID** University of Washington, Tacoma, Environmental Science Program, 1900 Commerce Street, Box 358436, Tacoma, WA 98402-3100 (dave@u.washington.edu)
PESTS AT SEA AND METHODS FROM LAND: A CONSERVATION PERSPECTIVE ON MARINE BIOLOGICAL CONTROL

CO9-6 **ŞEKERCIOĞLU, ÇAĞAN HAKKI, Gretchen C. Daily, Paul R. Ehrlich, Scott Loarie, and Viviana Ruiz-Gutierrez** Stanford University Center for Conservation Biology, (cagan@stanford.edu) (CHS, GCD, PRE, SL); Universidad Nacional de Costa Rica, Costa Rica (VRG)
SURVIVAL OF TROPICAL FOREST BIRDS IN ARGICULTURAL COUNTRYSIDE

S15-9 **SEMLITSCH, RAYMOND D. and Tracy A. G. Rittenhouse** Division of Biological Sciences, University of Missouri, Columbia, MO 65211(SemlitschR@missouri.edu)
FRESHWATER RESERVE DESIGN FOR AMPHIBIANS

S11-7 **SENDASHONGA, CYRIE, Ryan Hill**. Addresses:Secretariat of the Convention on Biological Diversity, Suite 300 – 393 St. Jacques Street, Montreal, Quebec, Canada H2Y 1N9, (cyrie.sendashonga@biodiv.org)
THE CARTAGENA PROTOCOL ON BIOSAFETY – AN INTERNATIONAL INSTRUMENT FOR PROTECTION OF BIODIVERSITY FROM POTENTIAL ADVERSE EFFECTS OF GENETICALLY MODIFIED ORGANISMS.

S22-6 **SHAFFER, MARK L.** SHAFFER, MARK L. Doris Duke Charitable Foundation, 650 Fifth Avenue, 19th Floor, New York, NY (mshaffer@ddcf.org).
ESSENTIAL PRINCIPLES FOR BUILDING A CONSERVATION ESTATE IN THE UNITED STATES

P05-17 **SHAM, ASFAR** Zanzibar youth promotion centre (ZYPC) and my contact address is as follows: PO BOX 989, TEL 025 747 423264 OR 434190, ZANZIBAR, TANZANIA (asfarniho51@hotmail.com)
CONSERVATION OF PEMBA FLYING FOX CONSERVATION PROJECT

CO39-4 **SHANAS, URI, Yunes Abu Galyun, Mohammed AlShamlih, Fares Khoury, Shacham Mittler, Khaled Nassar, Idan Shapira, Danny Simon, Hatem Sultan, Elad Topel, Dalit Ucitel, and Yaron Ziv** Department of Evolutionary and Environmental Biology, University of Haifa, Israel (US, SM, IS), Department of Biology, University of Haifa-Oranim, Israel (US), Hashemite University, Zarka, Jordan (YA, FK, MA), Friends of the Earth Middle East, Jordan (KN, HS). Department of Zoology, Tel Aviv University, Tel Aviv, Israel (DS), Department of Biology, Ben Gurion University, Beer Sheva, Israel (ET, YZ), Arava Institute for Environmental Studies, Kibbutz Ketura, Israel (US, DU). (shanas@research.haifa.ac.il)
BIODIVERSITY ACROSS THE ISRAELI – JORDANIAN BORDER

CO34-5 **SHANKER, KARTIK, R.K. Aggarwal, J. Ramadevi, B.C. Choudhury, and L. Singh** Ashoka Trust for Research in Ecology and Environment, No. 659, 5th 'A' Main Road, Hebbal, Bangalore, 560 024, Karnataka, India (kartik@atree.org)(KS) Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad 500007. India. (RKA, JR, LS) Wildlife Institute of IndiaPO Box 18, Chandrabani, Dehradun 248001. India (BCC, KS)
INDIA - THE CRADLE OF THE WORLD'S OLIVE RIDLEY TURTLES LEPIDOCHELYS OLIVACEA: PHYLOGEOGRAPHY AND IMPLICATIONS FOR CONSERVATION THEORY

P29-12 **SHAPIRA, IDAN, Hatem Tamimi, and Uri Shanas** Department of Evolutionary and Environmental Biology, Faculty of Sciences and Sciences Education, University of Haifa, 31905, Mount Carmel, Israel, (the_pwr@keh.co.il) (IS, US). Friends of the Earth Middle East, Oman, Jordan (HT). Department of biology, Faculty of Sciences and Sciences Education, University of Haifa, Oranim, Kiryat Tiv'on, 36006, Israel (US).
DIRECT AND INDIRECT EFFECTS OF AGRICULTURE: GIVING-UP DENSITIES AND ACTIVITY OF SOUTHERN ARAVA VALLEY GERBILS

CO26-6 **SHARMA, SUBRAT and Surendra P. Singh** G.B. Plant Institute of Himalayan Environment & Development, Kosi-Katarmal, Almora 263643 INDIA (subrats@rediffmail.com) Department of Botany, Kumaun University, Nainital, India (SPS)
SURVIVAL OF BROWN-OAK FORESTS IN THE HIMALAYA ON THE FACE OF GLOBAL CLIMATE CHANGE COUPLED WITH ANTHROPOGENIC FACTORS

CO9-7 **SHRESTHA, MAHENDRA K., James L. D. Smith, and Bhim B. Gurung** Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota, 200 Hodson Hall, 1980 Folwell Ave., St. Paul, MN 55108 (shres002@umn.edu). Department of National Parks and Wildlife Conservation, Kathmandu, Nepal (MKS)
HABITAT REQUIREMENTS FOR TIGERS IN A LANDSCAPE: IMPLICATIONS FOR RESERVE DESIGN AND CORRIDORS

CO54-1 **SIEX, KIRSTIN S.** Wildlife Conservation Society, Africa Program, 2300 Southern Blvd., Bronx, N.Y. 10460 (ksiex@wcs.org)
HABITAT DESTRUCTION, POPULATION COMPRESSION AND OVERBROWSING BY THE ZANZIBAR RED COLOBUS MONKEY PROCOLOBUS KIRKII

P31-04 **SILAYO, DOS SANTOS ARISTARICKY and Dino Andrew Oisso** Department of Forest Engineering, Sokoine University of Agriculture, P.O. Box 3012, Morogoro, Tanzania (dsilayo@yahoo.co.uk) (DAS), Swedish Biodiversity Centre, Uppsala University, Sweden (DAO).
THE EFFECT OF CHARCOAL PRODUCTION ON TREE AND SHRUB SPECIES DIVERSITY IN MIOMBO WOODLANDS, EASTERN TANZANIA

CO5-2 **SIMMONS, TREY, Yong Cao, and Charles P. Hawkins** AWER Department and The Ecology Center, Utah State University, Logan, Utah 84322-5210 (micajah@cc.usu.edu)
PREDICTIVE MODELING OF MACROINVERTEBRATE COMMUNITY COMPOSITION: ASSESSING THE IMPACT OF GRAZING ON THE BIOLOGICAL INTEGRITY OF STREAMS IN THE WESTERN U.S.

CO55-4 **SINCLAIR, J. ROSS, Greyd Sokame, and Andrew L. Mack** Wildlife Conservation Society Papua New Guinea Program, PO Box 277, Goroka, Papua New Guinea, (rsinclair@global.net.pg).
THE USE OF WILDLIFE FOR CULTURAL PURPOSES IN PAPUA NEW GUINEA

S18-7 **SINSCH, ULRICH** Institute of Integrated Sciences, Dep. Biology, University of Koblenz-Landau, Universitaetsstr. 1, D-56070 Koblenz, Germany (sinsch@uni-koblenz.de)
DO GRAVEL PITS COMPENSATE FOR THE LOSS OF RIPARIAN FLOOD PLAINS? A 15-YEARS CASE STUDY ON CENTRAL EUROPEAN NATTERJACK TOADS (B. CALAMITA)

CO55-9 **SITATI, NOAH W. and Matthew J. Walpole** WWF East Africa Regional Programme Office, Box 62440-00200, Nairobi, Kenya (n_wasilwa@hotmail.com) (NWS), Durrell Institute of Conservation & Ecology (DICE), University of Kent, Canterbury, Kent CT2 7NS, UK (NWS, MJW).
COMMUNITY-BASED HUMAN-ELEPHANT CONFLICT MITIGATION IN TRANSMARA DISTRICT, KENYA

CO17-8 **SKARPAAS, OLAV** The Pennsylvania State University, 208 Mueller Lab, University Park, PA 16802, (skarpaas@psu.edu)
POPULATION VIABILITY ANALYSIS USING SCIENTIFIC COLLECTIONS: DEALING WITH UNCERTAINTY

CO48-1 **SMITH, ROBERT J., Ara Mondajem, Cebisile N. Magagula, Themba Mahlaba, and Ian R. Swingland** Durrell Institute of Conservation & Ecology, University of Kent, Canterbury, Kent CT2 7NS, United Kingdom (R.J.Smith@kent.ac.uk) (RJS), Department of Biological Sciences, University of Swaziland, Private Bag 4, Kwaluseni, Swaziland, (AM), Department of Biological Sciences, University of Swaziland,Private Bag 4,Kwaluseni,Swaziland,(CNM)Department of Biological Sciences, University of Swaziland,Private Bag 4,Kwaluseni,Swaziland,(TM)Durrell Institute of Conservation & Ecology,University of Kent,Canterbury, Kent CT2 7NS,United Kingdom,(IRS)
CONSERVATION PLANNING AND POPULATION VIABILITY: PROBLEMS OF USING PRESENCE/ABSENCE DATA TO PROTECT THE MAMMALS OF SWAZILAND

P12-07 **SMITH, KATHERINE F. and William J. McClintock** University of California Santa Barbara, Ecology, Evolution and Marine Biology, Santa Barbara, CA 93106-9610(k_smith@lifesci.ucsb.edu)
ENVIRONMENTAL CHANGE AND THE DYNAMICS OF BARENTS SEA HARP SEAL MIGRATIONS: IMPLICATIONS OF SEA-ICE, REGIONAL FISH ABUNDANCE, AND POTENTIAL LINKS TO HARBOR SEAL EPIDEMICS

P26-16 **SMITH, THOMAS B., Ryan Calsbeek, and Sassan Saatchi** Center for Tropical Research, Institute of the Environment, Box 951496, University of California Los Angeles, CA 90095 (tbsmith@ucla.edu) (TBS, RC, SS). Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109 (SS).
MICRO-EVOLUTIONARY CONSEQUENCES OF HUMAN DISTURBANCE IN A RAINFOREST BIRD SPECIES FROM CENTRAL AFRICA

CO22-5 **SNEP, ROBBERT P.H., Wim Timmermans, Paul F.M. Opdam, and Robert G.M. Kwak** Alterra - Green World Research. Wageningen University & Researchcentre. P.O. Box 47, 6700 AA Wageningen, the Netherlands. (www.groenemetropolen.nl) (Robbert.Snep@wur.nl)
APPLYING URBAN LANDSCAPE ECOLOGY IN MULTI-LANDUSE CASES IN THE HIGHLY POPULATED NETHERLANDS

P26-17 **SNODGRASS, JOEL W., Martin Roberge, and John M. Morgan** Department of Biological Sciences, Towson University, 8000 York Road, Towson, MD 21252 (jsnodgrass@towson.edu) (JWS). Department of Geography and Environmental Planning, Towson University, 8000 York Road, Towson, MD 21252 (MMR, JM).
RELATIONSHIPS BETWEEN REMOTELY SENSED LAND COVER DATA AND STREAM HYDROLOGY IN AN URBAN METROPOLITIAN AREA

S04-3 **SNYDER, STEPHANIE and Robert Haight** USDA Forest Service, North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108. (stephaniesnyder@fs.fed.us)
OPTIMIZATION DECISION TOOLS TO SUPPORT METROPOLITAN OPEN SPACE DECISIONS

CO51-2 **SODERSTROM, BO and Marcus Hedblom** Department of Conservation Biology, SLU, PO Box 7002, SE.750 07 Uppsala, Sweden (bo.soderstrom@nvb.slu.se)
OPTIMAL CORRIDOR QUALITY COUNTERACT BUTTERFLY DISPERSAL

P27-11 **SOH, MALCOLM C.K., Navjot S. Sodhi, Haw Chuan Lim, and Barry W. Brook** Conservation Ecology Laboratory, Department of Biological Sciences, 14 Science Drive 4, Singapore 117543, Singapore (littlegrebe@hotmail.com) (NSS, MCKS, HCL), Key Centre for Tropical Wildlife Management, Northern Territory University, Darwin, NT, 0909, Australia (BWB)
ECOLOGY AND MANAGEMENT OF THE INVASIVE HOUSE CROW, *CORVUS SPLENDENS*, IN SINGAPORE

CO20-7 **SONGER, MELISSA, U Myint Aung, Khaing Khaing Sway, Thida Oo, Peter Leimgruber, and Ruth DeFries** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (M.S., P.L); Chatthin Wildlife Sanctuary Headquarters, Kanbalu, Myanmar (U.M.A., K.K.S., T.O); Department of Geography, University of Maryland, College Park, MD 20742 (R.D. (songerm@crc.si.edu).
HUMAN RESOURCE USE AND PROTECTION AT MYANMAR'S CHATTHIN WILDLIFE SANCTUARY

P01-07 **SPEARMAN, LAUREN A. and Daniel Otte** Rutgers University, Ecology & Evolution Graduate Program, Department of Ecology, Evolution & Natural Resources, 1st Floor, 14 College Farm Road, New Brunswick, NJ 08901-8551 (spearman@eden.rutgers.edu) (LAS). Academy of Natural Sciences, Entomology Department, Center for Systematic Biology and Evolution Division, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103 (DO)
A CASE STUDY IN OVERCOMING THE TAXONOMIC IMPEDIMENT: THE MANTIDS OF SOUTHERN AFRICA

S17-4 **SPECTOR, SACHA** Manager, Invertebrate Conservation Program Center for Biodiversity and Conservation American Museum of Natural History (spector@amnh.org)
ARE INVERTEBRATE FOCAL TAXA FULFILLING THEIR PROMISE?

S11-8 **SPIELMAN, ANDREW** Harvard School of Public Health (aspielma@hsph.harvard.edu)
EPIDEMIOLOGICAL OBSTACLES TO THE SUPPRESSION OF VECTOR-BORNE INFECTIONS BY MEANS OF GENETICALLY MODIFIED MOSQUITOES

CO40-3 **SPORRONG, JILL M. and Craig A. Davis** Oklahoma State University, Zoology Department, 430 Life Sciences West, Stillwater, OK 74078 (sporron@okstate.edu)
HIGH- VERSUS LOW-DIVERSITY GRASSLAND RESTORATIONS: DOES IT MAKE A DIFFERENCE TO GRASSLAND BIRDS?

S04_2 **SQUIRES, ROD** Department of Geography, University of Minnesota, Minneapolis, MN 55455 (squires@umn.edu)
PRESERVING OPEN SPACE IN AND AROUND A METROPOLITAN AREA

CO11-5 **STENBERG, KATHRYN** Quailcroft Environmental Services, 23022 SE 48th St., Sammamish, WA 98075 (quailcroft@comcast.net)
SCIENCE AND POLITICS: WILDLIFE CONSERVATION AT THE LOCAL LEVEL

CO16-6 **STEPHENS, PHILIP A., Olga Zaumyslava, Alexander I. Myslenkov, Evgeny N. Smirnov, Gregory D. Hayward, and Dale G. Miquelle** Department of Zoology and Physiology, University of Wyoming, PO Box 3166, Laramie, WY 82071 (PAS, GDH) (philips@uwyo.edu); Sikhote-Alin State Biosphere Zapovednik, Terney, Terneiski Raion, Primorski Krai, Russia (OZ, AIM, ENS); Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10468 (DGM).
UNGULATE DYNAMICS IN THE RUSSIAN FAR EAST: IMPLICATIONS FOR TIGER CONSERVATION

P25-08 **STEVENS, WENDY J. and Luis A. Ruedas** Portland State University, Biology Department, P.O. Box 751, Portland, OR 97207 (wendys@pdx.edu) (WJS, LAR).
RESEARCH AND MONITORING OF URBAN BIODIVERSITY WITH NON-SPECIALISTS: OUTCOMES FOR CONSERVATION AND SCIENCE EDUCATION, A CASE STUDY

CO1-7 **STEWART, WARRICK I., Richard M. Cowling, Amanda T. Lombard, Derek R. du Preez, and Anthony P. Martin** Biodiversity Conservation Unit, Wildlife and Environment Society of South Africa, 2(b) Lawrence St, Central Hill, Port Elizabeth 6001, South Africa (WIS, ATL) (wessaep@iafrica.com). Terrestrial Ecology Research Unit and Southern African Hotspots Program: Conservation International, Department of Botany, University of Port Elizabeth, PO Box 1600, Port Elizabeth 6000, South Africa (RMC, DRD). Nelson Mandela Metropolitan Municipality, PO Box 11, Port Elizabeth 6000, South Africa (APM).
A CONSERVATION ASSESSMENT AND IMPLEMENTATION STRATEGY FOR THE NELSON MANDELA METROPOLE, CAPE FLORISTIC REGION, SOUTH AFRICA

P23-07 **STEWART, GAVIN, Christopher F. Coles, and Andrew S. Pullin** Centre for Evidence–Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK (GBS, CFC, ASP) (g.b.stewart@bham.ac.uk).
DOES BURNING DEGRADE BLANKET BOG? A SYSTEMATIC REVIEW AND TEST OF THE EVIDENCE–BASED APPROACH

S08-3 **STEWART, ROMOLA and Hugh Possingham** The Ecology Centre, Department of Zoology and Entomology The University of Queensland (rstewart@zen.uq.edu.au)
PLANNING MARINE RESERVE SYSTEMS THAT INTEGRATE CONSERVATION AND SOCIO-ECONOMIC GOALS

S23-1 **STOCKWELL, PHD., DAVID R.B.** University of California, San Diego NPACI/SDSC, MC 0505 9500 Gilman Dr, Bldg 109 La Jolla, CA 92093-0505 (davids@sdsc.edu).
WHYWHERE? – AN ADVANCED SURROGATE-BASED MODELING APPROACH

CO51-3 **STRALBERG, DIANA, Nils Warnock, Nadav Nur, Hildie Spautz, and Gary Page** PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94924 (dstralberg@prbo.org)
MODELING THE EFFECTS OF LANDSCAPE CHANGE ON SOUTH SAN FRANCISCO BAY BIRD COMMUNITIES: AN EVALUATION OF POTENTIAL RESTORATION SCENARIOS

P27-12 **STRALBERG, DIANA, Mark Reynolds, Thomas Gardali, Ryan Burnett, Emily Heaton, Adina Merenlender, Colin Brooks, Gretchen Lebuhn, Geoff Geupel, and Brian Williams** STRALBERG, DIANA, Thomas Gardali, Ryan Burnett, Geoff Geupel, PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970 (dstralberg@prbo.org); Mark Reynolds, The Nature Conservancy, 201 Mission St. 4th Floor, San Francisco, CA 94105; Emily Heaton, University of California, Berkeley, Environmental Science, Policy, and Management, 145 Mulford Hall # 3114, Berkeley, CA 94720-3114; Adina Merenlender, Colin Brooks, University of California, Hopland Research and Extension Center, 4070 University Rd., Hopland, CA 95449; Gretchen Lebuhn, San Francisco State University, Department of Biology, 1600 Holloway Avenue, San Francisco, CA 94132
EFFECTS OF LANDSCAPE CHANGE ON CALIFORNIA OAK WOODLAND BIRD COMMUNITIES

CO22-4 **STRATFORD, JEFFREY A. and W. Douglas Robinson** Department of Biological Sciences, Auburn University, Auburn, AL 36849 (JAS) (stratja@auburn.edu) Department of Fisheries and Wildlife, and Oak Creek Lab of Biology, 104 Nash Hall, Oregon State University, Corvallis, OR 97331(WDR).
DISTRIBUTION OF NEOTROPICAL MIGRATORY BIRD SPECIES ACROSS AN URBANIZING LANDSCAPE

P23-05 **REED, J. MICHAEL, Eric G. Strauss, David A. Krauss, Colleen B. Hitchcock, Eve Spangler, Aaron M. Toffler, Catherine M. O'Connor, and Charles P. Lord** Boston College Biology Department, 355 Higgins Hall, 140 Commonwealth Avenue. Chestnut Hill, MA 02467 (strausse@bc.edu) (EGS, DAK). Tufts University Department of Biology, Dana 218, Medford, MA 02155 (JMR). Boston College Sociology Department, McGuinn Hall 426, 140 Commonwealth Avenue, Chestnut Hill, MA 02467 (ES). The Urban Ecology Institute, 355 Higgins Hall, 140 Commonwealth Avenue, Chestnut Hill, MA 02467 (EGS, CBH, AMT, CMO, CPL).
NATURAL CITIES: LINKING ECOLOGICAL, SOCIAL, AND LEGAL RAPID ASSESSMENTS TO DETERMINE CONSERVATION PRIORITIES IN URBAN AREAS

S11-9 **STRAUSS, STEVEN H. and Scott A. Merkle** Department of Forest Science, Oregon State University, Corvallis 97331; and University of Georgia, Athens 30602 (Steve.Strauss@oregonstate.edu)
GENETIC ENGINEERING (GE) AS A CONSERVATION TOOL: THE CASE FOR TREE BIOTECHNOLOGY

CO9-8 **STREVENS, TANYA and Rob Whelan** Institute for Conservation Biology and Law, School of Biological Sciences, University of Wollongong, NSW 2522, Australia (tcs96@uow.edu.au)
POWERLINE EASEMENTS: THE SCALE OF LANDSCAPE DISSECTION IN COASTAL NEW SOUTH WALES, AUSTRALIA

CO53-9 **STRINDBERG, SAMANTHA, Peter J. Ersts, and Howard C. Rosenbaum** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (SS) (sstrindberg@wcs.org); Wildlife Conservation Society, Marine Program, 2300 Southern Boulevard, Bronx, NY 10468, USA (HCR), American Museum of Natural History, Center for Biodiversity and Conservation, 79th St. and Central Park West, New York, NY 10024, USA (HCR, PE).
DISTRIBUTION AND ABUNDANCE OF HUMPBACK WHALES ON A WINTERING GROUND IN THE SOUTHEASTERN ATLANTIC: A COMPARISON OF ANALYSIS TECHNIQUES USED TO GUIDE CONSERVATION INITIATIVES

P09-17 **STRINDBERG, SAMANTHA** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (sstrindberg@wcs.org).
A COMPARISON OF SURVEYS DESIGNS USED IN LINE TRANSECT SAMPLING

P25-15 **Morgan, David B., Crickette M. Sanz, Jean R. Onononga, and SAMANTHA STRINDBERG** Cambridge University, Department of Biological Anthropology, Downing Street,Cambridge CB2 3DZ, United Kingdom (DBM), Washington University, Department of Anthropology, 1 Brookings Drive, Saint Louis, MO 63130 (CMS), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Blvd., Bronx, NY 10468 (JRO, SS) (sstrindberg@wcs.org).
APE ABUNDANCE AND HABITAT USE IN THE GOUALOUGO TRIANGLE, REPUBLIC OF CONGO: A COMPARISON OF LINE TRANSECT NEST SURVEYS AND DIRECT OBSERVATIONS

P25-16 **STRINGER, MICHAEL, Frank Steimle, and Debbie Dalton** NY/NJ Baykeeper, Bldg. 18, Sandy Hook, Highlands, NJ 07732, US (mstring@mail.umd.edu) (MS and DD); NOAA/NMFS, James J. Howard Marine Sciences Laboratory, 74 Magruder Road, Highlands, NJ 07732, US (FS)
COMMUNITY-BASED OYSTER RESTORATION IN THE NY-NJ HARBOR ESTUARY

CO41-2 **STRITTHOLT, JAMES, Heather Rustigian, and Dominick DellaSala** Conservation Biology Institute, 260 SW Madison Ave., Suite 106, Corvallis, OR 97333 (stritt@consbio.org) (JS, HR). World Wildlife Fund, 116 Lithia Way, Suite 7, Ashland, OR 97520 (DD).
ECOLOGICALLY RESPONSIBLE PLANNING AFTER WILDFIRE: THE BISCUIT FIRE - SISKIYOU NATIONAL FOREST, OREGON, USA

P09-18 **STROH, ESTHER D.** U.S. Geological Survey Northern Prairie Wildlife Research Center, Missouri Field Station, 373 McReynolds Hall, University of Missouri, Columbia, MO 65211.(esther_stroh@usgs.gov).
FINDING DIVERSITY WHERE THERE WAS NONE: INTERSIMPLE SEQUENCE REPEAT MARKERS REVEAL RELATIONSHIPS AMONG RELICT PLANT POPULATIONS WHERE ISOZYMES FAIL

P27-13 **STROHM, KRISTEN M., Gary C. White, and Clait E. Braun** Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523 (kstrohm@cnr.colostate.edu) (KMS, GCW). Grouse Inc, Tucson, AZ 85750, (CEB).
MODELING SAGE GROUSE POPULATION CHANGE: AN ALTERNATIVE TO LEK COUNTS

S20-12 **SUKUMAR, RAMAN** Professor, Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560012, India (RS) (rsuku@ces.iisc.ernet.in); Visiting Professor, South Asia Program, Cornell University, Ithaca, NY 14853 (MR)
WILDLIFE-HUMAN CONFLICTS: ECOLOGICAL AND SOCIAL PERSPECTIVES

CO51-5 **SUNARTO, MAJU BINTANG.HUTAJULU, Duwi Yulipan, Victoberry, Isman Affandi, Wilson Novarino, Asep S. Adikerana, Habib Subagyo, and Frank Lambert** Conservation International Indonesia, Jl. Pejaten Barat No 16A, Kemang, Jakarta 12550, Indonesia (S). Kantor Balai Taman Nasional Bogani-Naniwartabone, Kotamubago, Sulawesi Utara, Indonesia (MBH). Jurusan Biologi FMIPA Universitas Andalas, Kampus Limau Manis Padang,Sumatera Barat 25163, Indonesia (DY, V, IA, WN). BirdLife Indonesia, Jl. Dadali No. 32 Tanah Sareal, Bogor 16161 Indonesia (ASA, FL). Balai Geomatika-BAKOSURTANAL Jl.Raya Jakarta Bogor Km.46, Cibinong 16911, Indonesia (HS). (sunarto@conservation.org)
IMPORTANT BIODIVERSITY AREAS IN TIMBER CONCESSIONS AROUND KERINCI SEBLAT NATIONAL PARK, SUMATRA: MISSING CONSERVATION TARGETS?

P13-08 **SUPUMA, MIRIAM and Debra Wright** Wildlife Conservation Society Papua New Guinea Program, P.O. Box 277, Goroka, EHP, Papua New Guinea. (msupuma@global.net.pg)
PLANT DYNAMICS OF A PAPUA NEW GUINEAN HILL FOREST

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ASSESSMENT OF RISK TO CONSERVATION OF SISKIYOU MOUNTAINS SALAMANDERS IN SOUTHWESTERN OREGON

S22-5 **SVANCARA, LEONA K., Ree Brannon, J. Michael Scott, Craig R. Groves, Reed F. Noss, and Robert L. Pressey** Dept. of Fish and Wildlife, University of Idaho, Moscow, ID 84844 (LKS, RB), (leonab@uidaho.edu). US Geological Survey, University of Idaho, Moscow, ID 83844 (JMS). Wildlife Conservation Society, Bozeman, MT 59715 (CRG). Dept. of Biology, University of Central Florida, Orlando, FL 32816 (RFN). New South Wales National Parks and Wildlife Service, Armidale NSW 2350 Australia (RLP).
HOW MUCH REALLY IS ENOUGH? A REVIEW OF NOMENCLATURE, TARGETS AND THE ARCHITECTURE OF CONSERVATION PLANNING

P31-05 **SWAMY, SAVITHA and Priya Davidar** Salim Ali School of Ecology,Pondicherry University,Pondicherry:605014, Tamil Nadu, INDIA. (savitha_swamy@yahoo.com)
IMPACT OF URBANISATION ON ANT DIVERSITY ALONG AN URBAN GRADIENT

P31-06 **TALBERTH, JOHN and Nejem Raheem** John Talberth and Nejem Raheem are economists with the Ecology and Law Institute, a non-profit consulting organization specializing in natural resource economics, conservation biology, and environmental law. John and Nejem are also Ph.D. candidates in the Department of Economics, University of New Mexico. Author addresses: Ecology and Law Institute, P.O. Box 22488, Santa Fe, New Mexico 87502 (jtalberth@cybermesa.com)
BENEFIT-COST ANALYSIS OF THE DELONG MOUNTAIN TERMINAL PROJECT: A CRITIQUE AND INDEPENDENT ASSESSMENT OF KEY PARAMETERS

S22-3 **TEAR, TIMOTHY H., Paul L. Angermeier, Mark Bryer, Pat Comer, Brian Czech, Chris Iverson, Peter Karieva, Randy Kautz, Laura Landon, David Mehlman, Karen Murphy, Elizabeth Rodrick, Mary Ruckleshaus, J. Michael Scott, and George Wilhere** The Nature Conservancy, Eastern New York Chapter, 200 Broadway, Suite 301, Troy, NY 12180 (ttear@tnc.org), . U.S. Geological Survey, Virginia Tech, Blacksburg, VA 24061-0321 (PLA); The Nature Conservancy, 4245 North Fairfax Dr., Suite 100, Arlington, VA 22203 (MB); NatureServe, 1101 Wilson Blvd., 15th Floor, Arlington, VA 22209 (PC); U. S. Fish and Wildlife Service National Wildlife Refuge System, 4401 N. Fairfax Drive - MS 670, Arlington, VA 22203 (BC); U.S. Forest Service, Cooperative Forestry/International Programs, Washington, DC. (CI); The Nature Conservancy of Washington, 217 Pine Street, Ste 110, Seattle WA 98101 (PK); Florida Fish and Wildlife Conservation Commission, 620 South Meridian Street, Tallahassee, FL 32399-1600 (RK); The Nature Conservancy, 490 Westfield Road, Charlottesville, VA 22901 (LL); The Nature Conservancy, 322 Tyler Road NW, Albuquerque, NM USA 87107 (DM); U.S. Fish and Wildlife Service National Wildlife Refuge System, Anchorage, AK (KM); Washington Department of Fish and Wildlife 600 Capitol Way N., Olympia, WA 98501-1091 (ER, GW); NMFS Northwest Fisheries Science Center, 2725 Montlake Blvd. E, Seattle, WA 98112 (MR); U.S. Geological Survey, University of Idaho, Moscow ID 83844-1141 (JMS).
“HOW MUCH IS ENOUGH” IN CONSERVATION: THE NEED FOR CLEAR THINKING WHEN SETTING CONSERVATION OBJECTIVES

S05-6 **TEAR, LUCINDA M., Jan Cassin, Robert Fuerstenberg, Kelly Whiting, and David St. John** Parametrix, Inc., 5808 Lake Washington Blvd. NE, Suite 200, Kirkland, WA 98033 (LT, JC) (ltear@parametrix.com). King County Department of Natural Resources and Parks, 201 S. Jackson St, Suite 600, Seattle, WA 98104-3855 (RF, KW, DSJ).
MANAGING URBAN STREAMS IN THE FACE OF UNCERTAINTY - CAN WE USE BIOLOGICAL INDICATORS TO ESTABLISH STREAM FLOW TARGETS IN THE PACIFIC NORTHWEST?

P05-18 **THIEME, MICHELE, Bernhard Lehner, and Robin Abell** World Wildlife Fund, 1250 24th St. NW, Washington, DC 20037 (michele.thieme@wwfus.org)
ASSESSING THREATS TO AFRICA’S FRESHWATER ECOREGIONS

CO42-4 **THIRGOOD, SIMON, Anna Mosser, Sebastian Tham, Grant Hopcraft, Ephraim Mwangomo, Titus Mlengeya, Morris Kilewo, John Fryxell, Tony Sinclair, and Markus Borner** Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania (ST,ST,GH,MB) (simonthirgood@fzs.org) Department of Ecology, Evolution & Behavior, University of Minnesota, St. Paul, Minnesota 55108, (AM) Tanzania National Parks, PO Box 3434, Arusha, Tanzania (EM,TM,MK) Department of Zoology, University of Guelph, Ontario N1G 2W1, Canada (JF) Centre for Biodiversity Research, University of British Columbia, Vancouver V6T 1Z4, Canada (TS)
CAN PARKS PROTECT MIGRATORY UNGULATES? THE CASE OF THE SERENGETI WILDEBEEST

CO41-1 **THOMAS, SHELLY L. and Stephen A. Woods** Department of Biological Sciences, University of Maine, Orono, ME 04469 (shelly_thomas@umit.maine.edu).
HARVEST GAP EFFECTS ON CLICK BEETLES (ELATERIDAE: COLEOPTERA) INHABITING COARSE WOODY DEBRIS AND SOIL IN THE ACADIAN FOREST OF MAINE, USA

P32-04 **THOMAS, WILLIAM H.** Montclair State University, The New Jersey School of Conservation, 1 Wapalanne Road, Branchville, New Jersey 07826 (thomasw@mail.montclair.edu)
OUT WITH THE OLD AND IN WITH THE NEW: EVALUATING THE POTENTIAL OF TRADITION FOR CONSERVATION IN TODAY'S WORLD

CO45-7 **THOMPSON, JENNIFER L.** U.S. Fish and Wildlife Service, 2600 SE 98th Avenue, Ste. 100, Portland, Oregon 97266, (Jennifer_Thompson@fws.gov)
A UNIQUE URBAN U.S. FISH AND WILDLIFE SERVICE CONSERVATION PARTNERSHIP IN THE PORTLAND, ORE./VANCOUVER, WASH. AREA

S11-10 **THRESHER, RONALD and Nic Bax** CSIRO Marine Research, Castray Esplanade, Hobart, Tasmania 7001 Australia (Ron.Thresher@csiro.au)
EVALUATION OF GENETIC APPROACHES FOR MANAGING THE IMPACTS OF INVASIVE SPECIES

CO23-3 **THROOP, WILLIAM and Rebecca Purdom** Department of Environmental Studies, Green Mountain College, Poultney, VT 05764 (throopw@greenmtn.edu)
PROTECTING BIODIVERSITY BY PRESERVING WILDERNESS: A RECONSIDERATION

CO24-7 **THURGATE, NICOLE Y** University of New Orleans, Department of Biological Sciences, Lakefront, New Orleans, LA, 70148 (nythurga@uno.edu).
HAVE CANOPY CLOSURE AND COMPETITION CONTRIBUTED TO THE DECLINE OF THE ENDANGERED DUSKY GOPHER FROG (RANA SEVOSA)?

P32-05 **TILTON, MARY K., Jim Berkson, and Michael Vaughan** Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24060 (matilton@vt.edu)
EFFECTIVENESS OF POPULATION RECONSTRUCTION IN ESTIMATING WHITE-TAILED DEER AND BLACK BEAR POPULATIONS

CO51-7 **TODD, STELLA W., Curtis H. Flather, and Debra J. Shields** Metro State College of Denver, Campus Box 22, P.O. Box 173362, Denver, CO 80217-3362 (toddst@mscd.edu) (ST), US Department of Agriculture, Rocky Mountain Research Station, Fort Collins, CO, 80526
SPECIES ENDANGERMENT PATTERN RELATIVE TO MINING ACTIVITIES IN THE CONTERMINOUS UNITED STATES

P13-09 **TOLLEFSON, JENNIFER, Gretchen Stevens, and John Sullivan** Hudsonia Ltd., P.O. Box 5000, Annandale, NY 12504 (tollefson@bard.edu).
BIODIVERSITY ASSESSMENTS AND HABITAT MAPPING: NEW TOOLS FOR PROACTIVE LAND-USE AND CONSERVATION PLANNING

P01-08 **TONIOLO, VIOLA, Diana Stralberg, Gary Page, and Lynne Stenzel** PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970 (dstralberg@prbo.org)
MODELING POTENTIAL IMPACTS OF NON-NATIVE SPARTINA SPREAD ON SHOREBIRD POPULATIONS IN SOUTH SAN FRANCISCO BAY

P01-09 **TOWLE, KEN, L. Normand, Jason Tam, Natalka Iwanycki, Scott Jones, Chris Gerstenkorn, Dan Clayton, and Dena Lewis** Toronto and Region Conservation Authority, 5 Shoreham Drive, Toronto, Ontario M3N 1S4 Canada (Natalie_Iwanycki@TRCA.on.ca) (LN, JT, NI, SJ, CG,DC, DL), Ganaraska Region, and Kawartha Region Conservation Authorities, P.O. Box 328, Port Hope, Ontario L1A 3W4 Canada (KT).
USING GIS MODELLING TO DEFINE A TARGET NATURAL HERITAGE SYSTEM

CO45-5 **TRACEY, JEFF A. and Kevin Crooks** University of Wisconsin-Madison, Department of Widlife Ecology, 209 Russell Labs, 1630 Linden Drive, Madision, WI 53706 (jatracey@wisc.edu) (JAT) Department of Fishery and Wildlife Biology 115 Wagar, Colorado State University, Fort Collins, CO, 80523 (KC)
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P11-06 **TRAVERS, MICHAEL J., Stephen J. Newman, and Ian C. Potter** Centre for Fish and Fisheries Research, Murdoch University, South Street, Perth, WA, 6150, Australia, (mtravers@murdoch.edu.au) (MJT,ICP). Tropical Finfish Research Section, Department of Fisheries, P.O. Box 20, North Beach, WA, 6920, Australia (SJN).
FISH COMMUNITIES OF INSHORE WATERS OF NORTH-WESTERN AUSTRALIA: BIOGEOGRAPHICAL INFORMATION FOR MARINE PROTECTED AREA PLANNING

CO15-3 **TRAVIS, STEVEN, Joanne Baggs, and Joyce Maschinski** USGS National Wetlands Research Center, 700 Cajundome Blvd., Lafayette, Louisiana 70506 (steven_travis@usgs.gov); The Arboretum at Flagstaff, 4001 S. Woody Mountain Rd.,Flagstaff, Arizona 86001 (JB and JM)
THE GHOST OF HYBRIDIZATION PAST: CHARACTERIZING THE THREAT OF GENETIC ASSIMILATION IN THE ENDANGERED ARIZONA CLIFFROSE (PURSHIA SUBINTEGRA)

CO49-1 **TREVES, ADRIAN, Adrian P. Wydeven, and Lisa Naughton-Treves** Adrian Treves, Wildlife Conservation Society, Bronx, NY 10460-1090 (atreves@wcs.org) (AT); Wisconsin Department of Natural Resources, Box 220, Park Falls, WI 54552 (APW); Department of Geography, University of Wisconsin-Madison, 550 North Park. Street, Madison, WI 53706, and the Wildlife Conservation Society-North America, Bronx, NY10460 (LNT)
DEMOGRAPHIC AND LANDSCAPE CORRELATES OF WOLF PREDATION ON DOMESTIC ANIMALS IN THE MIDWESTERN USA

CO7-4 **TROMBULAK, STEPHEN C.** Department of Biology, Middlebury College, Middlebury, VT 05753 (trombulak@middlebury.edu)
CULTURAL AND GEOGRAPHICAL CORRELATES FOR THE ESTABLISHMENT OF EXOTIC GRASSES IN NEW ENGLAND

CO24-4 **TUBERVILLE, TRACEY D., Erin E. Clark, Kurt A. Buhlmann, and J. Whitfield Gibbons** University of Georgia's Savannah River Ecology Laboratory, Aiken, South Carolina 29802 (tuberville@srel.edu) (TDT, EEC, JWG). Conservation International-Center for Applied Biodiversity Science, 1919 M Street NW, Washington, DC 20036 (KAB).
TRANSLOCATION AS A CONSERVATION TOOL: REPATRIATION OF GOPHER TORTOISES (GOPHERUS POLYPHEMUS) TO A FORMERLY OCCUPIED SITE

CO35-5 **TUCKER, W. TROY and H. Resit Akçakaya** Applied Biomathematics, 100 North Country Rd., Setauket, NY 11733 (Troy@ramas.com).
MODELING THE EFFECT OF HUMAN POPULATION ON LAND USE AND SPECIES VIABILITY

CO12-6 **UNDERWOOD, EMMA C. and Caroline E. Christian** Dept. of Environmental Science & Policy, University of California, Davis, CA 95616 (eunderwoodrussell@ucdavis.edu) (ECU). Dept. of Ecology & Evolutionary Biology, University of Santa Cruz, CA 95064 (CEC).
EFFECTS OF PRESCRIBED FIRE AND CATTLE GRAZING ON ANT ASSEMBLAGES IN A BLUE OAK SAVANNA, NORTHERN CALIFORNIA

P29-13 **UTRERAS B.,VICTOR, Eddy Silva, Luis Sandoval C., and Jeffrey P. Jorgenson** Wildlife Conservation Society – Ecuador Program, San Francisco 441 y Mariano Echeverría, P.O. Box 17-21-168, Quito – Ecuador (vmub@wcsecuador.org)
RELATIVE ABUNDANCE OF UNGULATES ALONG A HUMAN ACTIVITY GRADIENT, YASUNÍ NATIONAL PARK, ECUADOR AMAZON

CO12-5 **VALENTINE, LEONIE** School of Tropical Biology, James Cook University, Townsville QLD 4811, Australia (Leonie.Valentine@jcu.edu.au).
RESPONSES OF BIRD ASSEMBLAGES TO MANAGEMENT BURNING OF RIPARIAN VEGETATION IN GRAZED TROPICAL SAVANNA

P29-40 **VALENZUELA-GALVÁN, DAVID and Luis Bernardo Vázquez-Hernández** Departamento de Ecología y Conservación de los Recursos Naturales CEAMISH, UAEM Av. Universidad No. 1001, Col. Chamilpa, Cuernavaca, Morelos, México, CP 62210 Tel. y Fax: (52) (777) 329 7019 - 3306. (dvalen@buzon.uaem.mx) Biodiversity and Macroecology Group Department of Animal and Plant Sciences, University of Sheffield Western Bank, Sheffield S10 2TN, United Kingdom
SETTING PRIORITIES AND OBTAINING OPTIMAL GRID SETS FOR THE CONSERVATION OF MEXICAN CARNIVORES

S20-13 **VALLADARES-PADUA, CLAUDIO** IPÊ – Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance UNB Colina Bloco G Apto 503, 70910-900 Brasilia, DF, Brazil. (cpadua@unb.br cpadua@unb.br)
USING CONSERVATION BIOLOGY RESEARCH TO INFLUENCE HUMAN COMMUNITY SETTLEMENT POLICIES: A SIGN OF HOPE FROM THE PONTAL DO PARANAPANEMA REGION OF BRAZIL

P24-11 **VAN COEVERDEN DE GROOT, PETER, Candace Scott, Tom Foose, Muhammad Agil, Aidi Mohamad, Juan Carlos Morales, Don J. Melnick, and Peter T. Boag** Dept. of Biology, Queen's University, Kingston, ON, K7L 3N6, Canada (PJVCDG, CAS & PTB); (peterj@biology.queensu.ca); IRF Program Office White Oak Conservation Center, 3823 Owens Road, Yulee, Florida 32097 (TF); Department of Reproduction and Obstetrics,Faculty of Veterinary Medicine, Bogor Agricultural University, Jalan Agatis, IPB Campus of Darmaga, Bogor 16680, Indonesia (MA); Suite B-61-12, Megan Phiied Ave 12, Jalan Yapkwan, Kuala Lumpur, Malaysia (AM); and Center for Environmental Research and Conservation, Columbia University, 10027-5557, New York, NY (JCM, DJM)
MICROSATELLITE VARIATION IN THE SUMATRAN RHINO DICERORHINUS SUMATRENSIS

CO53-10 **VANBLARICOM, GLENN R. and Carlos M. Alvarez-Flores** Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, MS 355020, Seattle, Washington 98195-5020 (glennvb@u.washington.edu) (GRVB). Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, 7600 Sand Point Way NE, Seattle, Washington 98115 (CMA-F).
EVALUATION OF FACTORS INFLUENCING RECENT FLUCTUATIONS IN NUMBERS OF SOUTHERN RESIDENT KILLER WHALES OFF WASHINGTON AND BRITISH COLUMBIA

P26-18 **VANCE-BORLAND, KEN, Kelly Burnett, and Sharon Clarke** Department of Forest Science, Oregon State University, Corvallis, OR 97331 (KVB, SC) (ken.vance-borland@oregonstate.edu). USFS Pacific Northwest Research Station, Forestry Sciences Lab, 3200 S.W. Jefferson Way, Corvallis, OR 97331, (KB).
COMPARING 1:24,000- AND 1:100,000-SCALE DIGITAL STREAM DATA FOR THREATENED SALMONID HABITAT ANALYSIS

CO49-2 **VANDEMAN, MICHAEL J.** 221 W. Winton Ave., C300, Hayward, CA 94544-1212 (mjvande@pacbell.net)
THE IMPACTS OF MOUNTAIN BIKING ON WILDLIFE AND PEOPLE -- A REVIEW OF THE LITERATURE

P09-19 **VAN DER REE, RODNEY and Michael McCarthy** Australian Research Centre for Urban Ecology, Care of School of Botany, The University of Melbourne, Victoria 3010, Australia, (rvdr@unimelb.edu.au)
MITIGATING THE BARRIER EFFECT OF ROADS ON FAUNA. ARE WE ASKING THE RIGHT QUESTIONS?

CO2-6 **VAN TEEFFELEN, ASTRID, Mar Cabeza, and Atte Moilanen** Metapopulation Research Group, Department of Biological and Environmental Sciences, PO Box 65 (Viikinkaari 1), 00014 University of Helsinki, Finland (astrid.vanteeffelen@helsinki.fi)
PROBABILITIES, CONNECTIVITY AND HABITAT LOSS: COMPARING RESERVE SELECTION STRATEGIES

P09-20 **VAZQUEZ, LUIS-BERNARDO and Kevin J. Gaston** BIOME. Department of Animal & Plant Sciences. University of Sheffield. Alfred Denny Building, Western Bank. Sheffield S10 2TN. U.K. (l.b.vazquez@shefiield.ac.uk).
PEOPLE AND MAMMALS IN MEXICO: CONSERVATION CONFLICTS AT A NATIONAL SCALE

P24-12 **VENN, STEPHEN J.** Helsinki University, Department of Biological and Environmental Sciences, Faculty of Biosciences, P.O. Box. 65 (Viikinkaari 1), 00014 University of Helsinki, FINLAND (stephen.venn@helsinki.fi)
ECOLOGY IN A MULTIDISCIPLINARY ASSESSMENT OF URBAN GREEN SPACE SYSTEMS ACROSS EUROPE

CO29-2 **VERGARA, CARLOS H., Jerónimo García-Guzmán, and Rena Janice Sánchez-Calanca** Department of Chemistry and Biology, Universidad de las Américas-Puebla, 72820 Santa Catarina Mártir, Puebla, Mexico, (cvergara@mail.udlap.mx)
BIODIVERSITY ASSESSMENT AND CONSERVATION STATUS OF FIVE VEGETATION TYPES IN A MONTANE INTERURBAN AREA OF CENTRAL MEXICO

P25-17 **VIANA, LEONARDO R., Jean C. Santos, Camila E. M. de Sá, Ellen C. Pereira, Felipe V. M. Almeida, Maria S. Ferreira, Mariana P. A. Hilarino, Paloma A. Côrtes, Geraldo W. Fernandes, Ricardo M. Pinto-Coelho , and Salvatore Siciliano** Laboratório de Ecologia Evolutiva de Herbívoros Tropicais, Pós-Graduação em Ecologia, Conservação e Manejo da Vida Silvestre.. Departamento de Biologia Geral. ICB/UFMG. CP: 486. CEP: 30161-970. Belo Horizonte, MG. Brazil (leov39@hotmail.com) (LRV, JCS, CEMS, ECP, FVMA, MSF, MPAH, PAC, GWF, RMPC), Escola Nacional de Saúde Pública/FIOCRUZ Departamento de Endemias Samuel Pessoa, Laboratório de Ecologia, Rua Leopoldo Bulhões, 1480-térreo, Manguinhos, Rio de Janeiro, RJ 21041-210 Brazil (SS)
ENVIRONMENTAL EDUCATION IN MINAS GERAIS, BRAZIL: “PAMPULHA LIMPA 2003” - A CASE STUDY

CO10-1 **VIDYA, T.N.C., Prithiviraj Fernando, Don J. Melnick, and Raman Sukumar** Center for Ecological Sciences, Indian Institute of Science, Bangalore 560 012, India (tncvidya@ces.iisc.ernet.in) (TV, RS), Center for Environmental Research and Conservation, Columbia University, 1200 Amsterdam Avenue, New York, NY 10027 (PF, DJM), Department of Ecology, Evolution and Environmental Biology, Columbia University (DJM).
MOLECULAR GENETIC STRUCTURE AND CONSERVATION OF ASIAN ELEPHANT (ELEPHAS MAXIMUS) POPULATIONS IN INDIA

CO34-6 **VIGNIERI, SACHA, and G. Jim Kenagy** Department of Biology and Burke Museum, University of Washington, Seattle (sachav@u.washington.edu)
UNDERSTANDING CONNECTIVITY IN PATCHY ENVIRONMENTS, LIMITED GENE FLOW AND UNEXPECTED MIGRATION PATTERNS IN THE PACIFIC JUMPING MOUSE Zapus trinotatus

S14-5 **VINCENT, AMANDA C.J., Brian G. Giles, and Allison L. Perry** Project Seahorse, Fisheries Centre, The University of British Columbia, 2204 Main Mall, Vancouver, BC, Canada, V6T 1Z4 (a.vincent@fisheries.ubc.ca) (AV and BG), School of Biological Sciences, University of East Anglia, Norwich, NR4 7TJ, UK (AP)
CONTRIBUTIONS OF URBAN DATA TO ASSESSING SUSTAINABILITY OF GLOBAL SEAHORSE TRADE

P10-11 **VOGLER, DONNA W., Ted Wohnsiedler, and Peter Paluch** State University of New York, College at Oneonta, Oneonta, NY 13820 (DWV) (voglerd@oneonta.edu). Catskills Institute for the Environment, Margaretville, NY (DWV, TW, PP).
SUSTAINABILITY SCIENCE ACROSS THE CATSKILLS: A CASE STUDY CURRICULUM USING VIDEOCONFERNCING

P29-15 **VONGKHAMHENG, CHANTHAVY, Arlyne Johnson, and Michael Hedemark** Wildlife Conservation Society, Box 6712, Vientiane, Lao PDR; (cvongkhamheng@wcs.org)
CONSERVATION OF SMALL CARNIVORES IN LAO PDR: NEW RECORDS ON THE DISTRIBUTION AND ABUNDANCE OF CARNIVORES RELATIVE TO HABITAT AND HUMAN USE

CO7-7 **VON HOLLE, BETSY, Erin Largay, David R. Foster, and Glenn Motzkin** Harvard Forest, Harvard University; PO Box 68, Petersham, MA, 01366 (vonholle@fas.harvard.edu) (BVH, DRF, GM) Yale Forestry, Yale University (EL)
DIFFERENTIAL EFFECTS OF NATURAL AND ANTHROPOGENIC DISTURBANCES ON HABITAT INVASIBILITY

S18-5 **VOS, CLAIRE C.** Alterra, Wageningen UR, Landscape Centre, P.O. Box 47, 6700 AA Wageningen, The Netherlands (claire.vos@wur.nl)
CONSERVATION OF AMPHIBIANS IN INTENSELY USED AGRICULTURAL LANDSCAPES: CORRIDORS INCREASE CONNECTIVITY

CO55-5 **WALKER, NATHALIE** University of Oxford,Queen Elizabeth House, 21 St. Giles, Oxford, OX1 3LA, UK. (nathalie.walker@qeh.ox.ac.uk)
CONSERVATION APPROACHES IN THE ECUADORIAN CHOCO: PROTECTED AREAS VERSUS COMMUNITY FOREST MANAGEMENT

P29-16 **WALLACE, RICHARD L., Katie Dougherty, Stephen Dunkle, Rebecca Hill, Glen Klim, and Alissa White** Ursinus College, P.O. Box 1000 Collegeville, PA 19426 (rwallace@ursinus.edu)
SOCIAL INFLUENCES ON CONSERVATION AND THE ADEQUACY OF U.S. RECOVERY PLANS FOR MARINE MAMMALS

CO54-2 **WALLACH, ARIAN, Moshe Inbar, Michael Scantlebury, and Uri Shanas** Department of Evolutionary and Environmental Biology, University of Haifa, Mount Carmel, Haifa, 31905, Israel (AW, MI, US) (a_w@bezeqint.net) Mammal Research Institute, Department of Zoology and Entomology, University of Pretoria, Pretoria 0002, South Africa (MS). Department of Biology, University of Haifa-Oranim, 36006 Israel (MI, US).
CONSTRAINTS ON ROE DEER REINTRODUCTION IN DRY MEDITERRANEAN HABITATS

CO55-7 **WALPOLE, MATTHEW J., and Robert J. Smith** Durrell Institute of Conservation & Ecology (DICE), University of Kent, Canterbury, Kent CT2 7NS, UK. (m.j.walpole@kent.ac.uk)
PRIVATISATION OR COMMUNITY EMPOWERMENT? CONFLICT, ECONOMICS AND ACCOUNTABILITY IN KENYA'S MASAI MARA

CO3-3 **WANG, HAO, Dajun Wang, Zhi Lu, Youping Chen, Lianjun Zhao, and Wenshi Pan** Mailbox #1, College of Life Science, Peking University, Beijing, 100871, China.(wanghao@pku.edu.cn) (HW,DW,ZL,PW) WangLang National Nature Reserve,No.88 South Street,Pingwu County, Sichuan, 622550, China (YC,LZ)
METHODOLOGY FOR PANDA SURVEY AND MONITORING: INTEGRATING MULTIPLE INDIVIDUAL-DISTINGUISH METHODS

CO8-3 **WANG, DAJUN, Ai Chen, Xiaojian Zhu, Hao Wang, and Wenshi Pan** College of Life Science, Peking University, Beijing 100871, PR China (djwang@pku.edu.cn)
HABITAT UTILIZATION OF WILD GIANT PANDA (AILUROPODA MELANOLEUCA)

P04-04 **WANG, SUSAN, Tom Jagielo, Jack Tagart, Farron Wallace, Glenn VanBlaricom, and David Beauchamp** University of Washington, Washington Cooperative Fish and Wildlife Research Unit, 1122 NE Boat Street, Box 355020, Seattle, Washington 98195 (eyrego@u.washington.edu) (SW, GVB, DB). Washington Department of Fish and Wildlife, 600 Capitol Way N., Olympia, Washington 98501-1091 (TJ, JT, FW).
GROUNDFISH HABITAT ASSOCIATIONS FROM VIDEO SURVEY WITH A SUBMERSIBLE OFF THE WASHINGTON STATE COAST

CO42-5 **WATKINS, G.G.** Iwokrama International Centre for Rain Forest Conservation and Development, 77 High Street, Georgetown, Guyana, South America (gwatkins@iwokrama.org)
CONSERVING THE REMAINING TROPICAL RAIN FOREST – IWOKRAMA AND THE GUIANA SHIELD

CO31-5 **WATSON, JAMES, Robert Whittaker, and Terence Dawson** Biodiversity Research Group, School of Geography and the Environment, University of Oxford, Oxford OX1 3BW United Kingdom (james.watson@geog.ox.ac.uk)
CONSERVATION OF THREATENED BIRDS IN THE FRAGMENTED LITTORAL FORESTS OF SOUTHEASTERN MADAGASCAR

P10-09 **WATTERS, CHRISTINA F. and Roger C. Wood** Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247 (CFW, RCW), (research@wetlandsinstitute.org). Richard Stockton College of New Jersey, Pomona, NJ 08240 (RCW).
TEACHING ABOUT TERRAPINS: LOCAL, REGIONAL, AND INTERNATIONAL COMMUNITY BASED CONSERVATION

CO23-2 **HAYES, DEBORAH, Patricia Manley, Barbara Weber** Associate Deputy Chief for Research and Development, USDA Forest Service, 1 NW Yates Building, 1400 Independence Ave., SW, Washington, DC 20250-1120 (bweber@fs.fed.us)
STATUS, ROLE, AND FUTURE DIRECTIONS OF THE U.S. MAN AND THE BIOSPHERE PROGRAM

CO19-3 **WECKEL, MARK E., William Giuliano, and Scott Silver** Louis Calder Biological Field Station, 53 Whippoorwill Rd., Armonk, New York, 10504 (weckel@fordham.edu) (MEW, WG). Wildlife Conservation Society (WCS), 2300 Southern Blvd., Bronx, NY 10468 (SS).
COCKSCOMB REVISITED: JAGUAR PREDATOR-PREY RELATIONS IN THE COCKSCOMB BASIN WILDLIFE SANCTUARY, BELIZE

CO4-8 **WEERAKOON D.K., E. Wikramanayake, M.D. Gunawardene, H.K. Janaka, L.K.A. Jayasinghe, R.A.R. Perera, and P. Fernando** University of Colombo, Colombo, Sri Lanka (DKW). Conservation Science Program, World Wildlife Fund-US, Washington, D.C. 20037 (EW). Southern Sri Lanka Elephant Research Project, Tissamaharama, Sri Lanka (DKW, EW, MDG, HKJ, LKAJ, RARP, PF). Wildlife Trust, New York (PF). (pf133@columbia.edu)
RANGING BEHAVIOR AND HABITAT USE OF ELEPHANTS IN SRI LANKA: IMPLICATIONS FOR CONSERVATION

P05-19 **WEINBAUM, KAREN, Melinda Laituri, Leonard Usongo, and Zacharie Nzooh** Colorado State University, Dept. of Forestry, Rangeland and Watershed Stewardship #1472, Fort Collins, CO 80521-1472 (weinbaum@cnr.colostate.edu) (KW); Colorado State University, Dept. of Forestry, Rangeland and Watershed Stewardship #1472, Fort Collins, CO 80521-1472 (ML); World Wide Fund For Nature, Cameroon Programme Office, P.O. Box 6776, Yaounde, Cameroon AFRICA (LU); World Wide Fund For Nature, Cameroon Programme Office, P.O. Box 6776, Yaounde, Cameroon AFRICA (ZN)
PRELIMINARY ASSESSMENT OF TRANSBOUNDARY MOVEMENTS OF FOREST ELEPHANTS (*LOXODONTA CYCLOTIS*) IN THE SANGHA TRINATIONAL PARK, CENTRAL AFRICA

S04-4 **WESTPHAL, LYNNE M., Alaka Wali, Douglas F. Stotz, David Soucek, and Jeffrey M. Levengood** USDA Forest Service North Central Research Station, 1033 University Place, suite 360, Evanston IL 60201-3172 (lwestphal@fs.fed.us) (LMW); Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago IL 60605-2496 (AW, DFS); Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, IL 61820 (DS, JML).
BROWNFIELDS REDEVELOPMENT: A HIDDEN OPPORTUNITY FOR CONSERVATION BIOLOGY

CO32-3 **WHARTON, DAN Goncalves da Silva, Anders, Serios-orestis Kolokotronis, and** Dept. of Ecology, Evolution, and Environmental Biology, Columbia University, Schemerhorn Extension, 10th Floor, 1200 Amsterdam Ave, Mail Code 5557, New York, NY 10027 (AGDS; SOK). Wildlife Conservation Society, 830 Fifth Ave, New York, NY 10021 USA (DW, e-mail: dwharton@wcs.org)
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S06-11 **WHITEFORD, RICHARD** Highlands Coalition (Savebios@earthlink.net)
HIGHLANDS PRESERVATION AND ITS BENEFITS TO NEW YORK CITY

CO10-3 **WHITEMAN, NOAH KERNESS and Patricia G. Parker** Department of Biology and International Center for Tropical Ecology, 223 Research Building, 8001 Natural Bridge Road, University of Missouri-St. Louis, St. Louis, Missouri 63121 (nkwf38@studentmail.umsl.edu)
HOST-PARASITE CONSERVATION GENETICS IN THE GALAPAGOS ISLANDS: PRAGMATIC VALUE OF THE FORGOTTEN BOUNTY

P25-19 **WHITTAKER, DANIELLE J.** Department of Anthropology, City University of New York Graduate Center, 365 Fifth Avenue, New York, NY 10016; New York Consortium in Evolutionary Primatology; (djwhittaker@mindspring.com)
STATUS OF KLOSS'S GIBBON POPULATIONS AND HABITATS

S20-6 **WIKRAMANAYAKE, ERIC Balagalle, Suchitra, Kalinga Padmalal, and John Seidensticker** Department of Zoology, The Open University, Nawala, Sri Lanka (SB, KP). Conservation Science Program, World Wildlife Fund, United States, 1250, Twenty-Fourth Street, NW. Washington DC 20037 (eric.wikramanayake@wwfus.org) (EW). Smithsonian's National Zoological Park, 3001 Connecticut Ave. NW, Washington D.C. 20008 (JS).
MESO-CARNIVORES AS URBAN CONSERVATION FLAGSHIPS: THE ROLE OF FISHING CATS IN SRI LANKA'S CITIES

CO18-8 **WILCOX, CHRIS, Ben Cairns, and Hugh Possingham** The Ecology Centre, University of Queensland, Brisbane, Australia 4072 (c.wilcox@uq.edu.au) Department of Mathematics, University of Queensland (BC) Department of Zoology and Entomology, University of Queensland (HP)
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S07-9 **WILCOX, BRUCE** Department of Ecology and Health, John A. Burns School of Medicine, University of Hawai'i at Manoa (daszak@conservationmedicine.org)
ECOHEALTH AND CONSERVATION MEDICINE: EXTENDING OUR UNDERSTANDING OF ECOLOGY, HEALTH AND CONSERVATION.

CO53-4 **WILDER, ROBERT** The Nature Conservancy, Coordinator, Community-Based Restoration Program. 4078 Manchester Avenue, Encinitas, CA 92024 (rwilder@tnc.org)
DEVELOPING DIVERSE COMMUNITY-BASED MARINE AND COASTAL RESTORATION AT THE NATURE CONSERVANCY

S10-8 **WILKIE, S. DAVID, Paul Telfer, and Peter D. Walsh** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW) (dwilkie@wcs.org). Centre International de Recherches Médicales, B. P. 769 , Franceville, Gabon (PT), Department of Ecology and Evolutionary Biology, Guyot Hall, Princeton, University, New Jersey 08540 (PW)
NONHUMAN PRIMATES, BUSHMEAT CONSUMPTION, AND HUMAN DISEASE: IMPACTS, AND IMPLICATIONS FOR ALTERING HUMAN BEHAVIOR

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THE IMPLICATIONS OF INCOME AND PRICE ELASTICITIES OF DEMAND FOR POLICIES DESIGNED TO REGULATE WILDLIFE TRADE

S16-9 **WILKIE, DAVID S. Starkey, P. Malcolm, Kate A. Abernethy, and** Wildlife Conservation Society, Gabon Program B.P. 15115, Libreville, GABON (MS), Station d'Etudes des Gorilles et Chimpanzés B.P. 7847, Libreville, GABON (KA), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW) (dwilkie@wcs.org).
URBAN BUSHMEAT MARKETS AND THEIR IMPACTS ON WILDLIFE POPULATIONS IN GABON

CO21-1 **WILLIAMS, NICHOLAS S.G., John W. Morgan, and Mark J. McDonnell** Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne, South Yarra VIC 3141 and School of Botany, University of Melbourne, VIC 3010, Australia (NSGW, MJM) (nsw@unimelb.edu.au); Department of Botany, La Trobe University, Bundoora, VIC, Australia 3083 (JWM)
INFLUENCE OF PLANT SPECIES ATTRIBUTES AND LANDSCAPE CONTEXT ON THE PROBABILITY OF LOCAL EXTINCTION IN THE ENDANGERED GRASSLANDS OF SOUTHEASTERN AUSTRALIA

CO21-3 **WILLIAMS, NEAL M. and Claire Kremen** Bryn Mawr College, 101 N. Merion Ave. Bryn Mawr, PA 19010 (nwilliam@brynmawr.edu). Princeton University, Princeton NJ 08544 (CK)
LOCAL HABITAT AND LANDSCAPE-LEVEL RESOURCES AFFECT OFFSPRING PRODUCTION BY THE NATIVE BEE OSMIA LIGNARIA IN AN AGRICULTURAL MOSAIC

CO24-8 **WILLIAMS, YVETTE, Michelle Waycott, Christopher Johnson, and Ross Alford** Department of Tropical Biology, James Cook University, Townsville, Australia 4814 (yvette.williams@jcu.edu.au)
DISPERSAL OF RARE AND COMMON MICROHYLID FROGS OF THE WET TROPICS, AUSTRALIA

CO2-7 **WILLIAMS, PAUL, Lee Hannah, Sandy Andelman, Guy Midgley, Miguel Araújo, Greg Hughes, Lisa Manne, Enrique Martinez-Meyer, and Richard Pearson** Biogeography and Conservation Laboratory, The Natural History Museum, Cromwell Road, London SW7 5BD, UK (PW)(worldmap@nhm.ac.uk); Center for Applied Biodiversity Science, Conservation International, 1919 M Street, NW, Washington, DC 20036 (LH);National Center for Ecological Analysis and Synthesis, 735 State Street, Suite 300, Santa Barbara, California 93101-5504 (SA); Climate Change Research Group, Kirstenbosch Research Centre, National Botanical Institute, P/Bag x7, Claremont 7735, Cape Town, South Africa (GM,GH).
PLANNING FOR CLIMATE CHANGE: IDENTIFYING MINIMUM-DISPERSAL CORRIDORS FOR THE CAPE PROTEACEAE

CO46-7 **WILLIAMS, MARY A. and Bruce Vondracek** Conservation Biology Program andMinnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota, 200 Hodson Hall / 1980 Folwell Avenue St. Paul, MN 55108 (williams@umn.edu)
GEOSPATIAL CHARACTERISTICS OF KARST SPRINGS IN SOUTHEAST MINNESOTA

S10-6 **WILLIAMS, ELIZABETH S., Michael W. Miller, and E. Tom Thorne** Department of Veterinary Sciences, University of Wyoming, 1174 Snowy Range Road, Laramie, WY 82070 (storm@uwyo.edu)(ESW). Colorado Division of Wildlife, Wildlife Research Center, 317 W. Prospect, Fort Collins, CO 80526 (MWM). Wyoming Game and Fish Department, 709 University Avenue, Laramie, WY 82072 (ETT).
CHRONIC WASTING DISEASE: IMPLICATIONS FOR WILDLIFE MANAGEMENT AND SUSTAINABLE USE

CO55-6 **WILLIAMS-GUILLEN, KIMBERLY, Cheryl Asa, Gerardo Camilo, Patricia McDaniel, and Orlando Dixon** BOSAWAS Biodiversity Project, Saint Louis Zoo, Colonia Independencia, Casa #238, del Zumen 6 cuadras al sur 20 varas abajo, Managua, Nicaragua (KWG, OD) (kimwilliamsg@yahoo.com). Saint Louis Zoo (CA, PM), 1Government Drive, Saint Louis, MO 63110, USA. Department of Biology, Saint Louis University (GC), 3507 Laclede Ave., Saint Louis, MO 63103. International Center for Tropical Ecology (KWG, PM), Department of Biology, University of Missouri Saint Louis, B216 Benton Hall, 8001 Natural Bridge Rd, Saint Louis, MO 63121.
SUBSISTENCE HUNTING BY MISKITO AND MAYANGNA INDIGENOUS PEOPLE IN BOSAWAS BIOSPHERE RESERVE, NICARAGUA

CO2-5 **WILSON, A. KERRIE, Michael Ian Westphal, Hugh Phillip Possingham, and Jane Elith** The Ecology Centre, The University of Queensland, Brisbane, 4072, Australia(KAW and HPP)(daniel_and_kerrie@yahoo.com), School of Life Sciences, PO Box 874601, Arizona State University, Tempe AZ 85287-4601 (MIW), School of Botany, University of Melbourne, Melbourne, Victoria, 3010, Australia (JE)
SENSITIVITY OF CONSERVATION PLANNING TO UNCERTAINTY ASSOCIATED WITH PREDICTED SPECIES DISTRIBUTION DATA

CO51-4 **WINFREE, RACHAEL, Claire Kremen, and Terry Griswold** Department of Ecology and Evolutionary Biology, Guyot Hall, Princeton University, Princeton, NJ 08544, (rwinfree@princeton.edu) (RW, CK); USDA-ARS Bee Biology & Systematics Laboratory, Utah State University, Logan, UT 84322 (TG)
EFFECT OF AGRICULTURAL AND SUBURBAN DEVELOPMENT ON WILD BEE BIODIVERSITY

CO3-4 **WINTLE, BRENDAN A., Michael A. McCarthy, Scott A. Field, Kirsten M. Parris, and Rodney P. Kavanagh** Department of Botany, University of Melbourne, Victoria, Australia, 3010 (brendanw@unimelb.edu.au) (BAW, KMP). Australian Research Centre for Urban Ecology, University of Melbourne, Victoria, Australia 3010 (MAM). Department of Environmental Biology, University of Adelaide, North Terrace, SA, 5005, Australia (SAF). State Forests of NSW Research and Development Division, PO Box 100 Beecroft, NSW, 2119, Australia (RPK).
A BAYESIAN MODEL OF SITE OCCUPANCY, DETECTABILITY, LOCAL COLONIZATION AND EXTINCTION: MONITORING TRENDS IN MAMMAL, FROG AND BIRD POPULATIONS IN SOUTH EASTERN AUSTRALIA

CO54-9 **WIRES, LINDA R. and Francesca J. Cuthbert** Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota. 200 Hodson Hall, 1980 Folwell Ave. St. Paul, MN 55108-6124 (LRW, FJC) (wires001@umn.edu).
NATURAL WETLAND USE BY FISH-EATING BIRDS AND AQUACULTURE IN MINNESOTA: CONTEXT FOR CONTROVERSY

P27-15 **WITT, JILL and Shaily Menon** Department of Biology, Grand Valley State University, Allendale, MI 49401 (mihelicj@student.gvsu.edu)
CONSERVATION OF THE VULNERABLE BEAUTIFUL NUTHATCH, *SITTA FORMOSA*: A PRELIMINARY ANALYSIS OF SPECIES DISTRIBUTION AND HABITAT REQUIREMENTS

S11-11 **WOLFENBARGER, L. LAREESA, John P. McCarty, Page E. Klug, and Lorelle I. Berkeley** Department of Biology, University of Nebraska at Omaha, Omaha, NE 68182-0040 (lwolfenbarger@mail.unomaha.edu).
THE ROLE OF CONSERVATION SCIENCE IN ASSESSING NON-TARGET EFFECTS OF TRANSGENIC CROPS ON COMMUNITIES AND ECOSYSTEMS

P29-18 **WONG, SARAH and Pascale Sicotte** Department of Anthropology, University of Calgary, 2500 University Drive N.W., Calgary, Alberta, T2N 1N4 Canada. (snpwong@ucalgary.ca).
THE POPULATION STATUS OF *COLOBUS VELLEROSUS* AT THE BOABENG-FIEMA MONKEY SANCTUARY AND SURROUNDING FOREST FRAGMENTS, GHANA

P29-17 **WOOD, ROGER C.** The Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247; Richard Stockton College of New Jersey, Pomona, NJ 08240 USA (roger.wood@stockton.edu).
TERRAPINS AND TRAPS: THE POLITICS OF CONSERVATION

CO21-2 **WOSSINK, ADA, Jaap van Wenum, and Alfons Oude Lansink** Department of Social Sciences, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands and Department of Agricultural and Resource Economics, North Carolina State University, Raleigh NC 27695-8109(AW)(ada_wossink@ncsu.edu) LTO Nederland, P.O. Box 29773, 2502 LT The Hague, The Netherlands (JvW)Department of Social Sciences, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands (AOL)
BIODIVERSITY CONSERVATION IN AGRICULTURAL LANDSCAPES: THE IMPACT OF ARABLE FIELD MANAGEMENT AND FARM-SPECIFIC CONDITIONS ON FLORAL SPECIES

P23-08 **WRIGHT, KATHERINE M., Lori A. Williams, Carola A. Haas, Marcella J. Kelly, and Patrick D. Keyser** Department of Fisheries & Wildlife Sciences (MC 0321), Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 (kwright1@vt.edu) (KW, CH, MK). North Carolina Wildlife Resources Commission, 36 Pearl Street, Black Mountain, NC 28711 (LW). MeadWestvaco Corporation, P.O. Box 577, Rupert, WV 25984 (PK).
MODEL VALIDATION AND IMPROVEMENT USING NEW DATA ON HABITAT CHARACTERISTICS IMPORTANT TO SALAMANDERS

CO20-6 **WRIGHT, R. MICHAEL, Miller, Daniel C., John D. and Catherine T. MacArthur Foundation**, 140 S. Dearborn St., Chicago, IL 60603, USA, rmwright@macfound.org.
COMMUNITIES OF CONSERVATION AND THE CONFLICT OVER PRACTICE

P27-14 **YAP, CHARLOTTE A.M. and Navjot S. Sodhi** Department of Biological Sciences, Science Drive 4, National University of Singapore, Singapore 117543 (g0202200@nus.edu)
EFFECTS OF LOGGING ON AVIAN BREEDING AND MOULTING IN PENINSULAR MALAYSIA

P09-21 **YASUDA, MIKA and FUMITO KOIKE** Graduate School of Environment Science and Technology, Yokohama National University, 79-7 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan (mic.yasuda@kub.biglobe.ne.jp)
BIODIVERSITY ASSESSMENT IN GOLF COURSE:PRELIMINARY EXPERIMENT FOR DETECTING THE IMPACTS OF COURSE MANAGEMENTS BY THE FIELD INVESTIGATION AND HEARING

P09-22 **YLI-PELKONEN, VESA and Jari Niemelä** Department of Biological and Environmental Sciences, P.O. Box 65, FIN-00014 University of Helsinki, Helsinki, Finland, (vesa.yli-pelkonen@helsinki.fi).
INTEGRATING ECOLOGICAL AND SOCIAL SYSTEMS IN URBAN PLANNING AND GREEN SPACE CONSERVATION: FINLAND AS A CASE

P07-02 **YOKOMIZO, HIROYUKI, Patsy Haccou, and Yoh Iwasa** Department of Biology, Faculty of Sciences, Kyushu University, Fukuoka 812-8581, Japan. (yokomizo@bio-math10.biology.kyushu-u.ac.jp) Institute of Biology, Leiden University, PO Box 9516, 2300 RA Leiden, The Netherlands. Department of Biology, Faculty of Sciences, Kyushu University, Fukuoka 812-8581, Japan.
CONSERVATION EFFORT AND ASSESSMENT OF POPULATION SIZE IN FLUCTUATING ENVIRONMENTS

CO40-4 **ZACK, STEVE and Hilary A. Cooke** Wildlife Conservation Society, Portland Office, 219 SW Stark Street, Suite 200, Portland, OR 97204 (szack@wcs.org) Department of Biological Sciences, CW405 Biological Sciences Building, University of Alberta, Edmonton, AB T6G 2E9 CANADA
THE WHOLE DAM STORY: REINTRODUCTION OF AMERICAN BEAVERS AND MIGRATORY SONGBIRD RESPONSE

P34-12 **ZANINI, FLAVIO Dischinger, Christel, and Rodolphe Schlaepfer** Laboratory of Ecosystem Management and Landscape Ecology (GECOS), Swiss Federal Institute of Technology Lausanne (EPFL), 1015 Lausanne (Switzerland) (flavio.zanini@epfl.ch)
SPATIAL SIMULATION OF AN ANTHROPIC LANDSCAPE EVOLUTION; INTEGRATING CELLULAR AUTOMATA, MARKOV CHAIN AND MULTICRITERION METHODS: CASE STUDY IN A SWISS CONTEXT

P01-10 **ZAPATA-RÍOS, GALO, Víctor Utreras B., Eddy Silva, Jeffrey P. Jorgenson, Luis Sandoval, and Javier Vargas** Wildlife Conservation Society – Ecuador Program, San Francisco 441 y Mariano Echeverría, P.O. Box 17-21-168, Quito – Ecuador, (gazr@wcsecuador.org)
INTENSITY AND EXTENT OF HUMAN ACTIVITIES IN YASUNI BIOSPHERE RESERVE, ECUADOR, AND IMPLICATIONS FOR WILDLIFE CONSERVATION

CO46-4 **ZARADIC, PATRICIA and John Jackson** Stroud Water Research Center, 970 Spencer Road, Avondale, PA 19311, (pzaradic@stroudcenter.org)
APPLYING NEURAL NETWORKS TO FRESHWATER CONSERVATION IN THE NEW YORK CITY DRINKING WATER WATERSHED

CO54-3 **ZHANG, LI, Lichao MA, and Limin Feng** Key laboratory for Biodiversity Science and Ecological Engineering, Ministry of Education. Institute of Ecology, Beijing Normal University, Beijing 100875 (azhang@ifaw.org)
THE FLACCIDITY OF NATURE RESERVES- WITH SPECIAL REFERENCE TO ASIAN ELEPHANT IN CHINA

P29-20 **ZHU, XIAOJIAN, Xiaoli Shen, Dajun Wang, Hao Wang, and Wenshi Pan** College of Life Sciences, Peking University, Beijing 100871, People's Republic of China (xjzhu@pku.edu.cn); 8610-62752271 ext 2092
EARLY DEVELOPMENT OF WILD GIANT PANDA (AILUROPODA MELANOLEUCA) CUBS, AND PRELIMINARY COMPARISON WITH CAPTIVE ONES

P29-19 **ZOLKEWITZ, MICHAEL, Walter F. Bien, and James R. Spotila** Department of Bioscience and Biotechnology, Drexel University, 32nd and Chestnut Streets, Philadelphia, PA 19104 (zolk@drexel.edu).
FACTORS CONTRIBUTING TO SUCCESSFUL ESTABLISHMENT OF SCHIZACHYRIUM SCOPARIUM ON AN ABANDONED GRAVEL PIT IN THE NEW JERSEY PINE BARRENS

S04-6 **ZOVANYI, GABOR** Department of Urban Planning, Eastern Washington University, 668 N. Riverpoint Blvd., Spokane, WA 99202-1660 (gzovanyi@mail.ewu.edu); 509-358-2228.
URBAN GROWTH MANAGEMENT AND ECOLOGICAL SUSTAINABILITY: CONFRONTING THE "SMART GROWTH" FALLACY

CO1-1 **CULVER, DAVID C. and Diane S. Pavek** Department of Biology, American University, 4400 Massachusetts Ave., NW, Washington DC 20016 (DCC). National Capital Region, National Park Service, 4598 MacArthur Blvd. NW, Washington, DC 20007 (DSP). (dculver@american.edu)

PROTECTING UNIQUE GROUNDWATER AMPHIPODS IN ROCK CREEK PARK, WASHINGTON, DC

Five species of obligate groundwater Stygobromus amphipods occur in shallow seeps and springs and in the underflow of streams in Rock Creek Park. Two species are endemic to the Rock Creek basin, and one is listed as federally endangered. Species are found commonly in semi-isolated seeps well above the water table, less frequently in the underflow of streams (i.e., hyporheic) that are tributaries of Rock Creek, and rarely in the underflow of Rock Creek itself. Their primary habitat, shallow groundwater seeps, is especially vulnerable to altered runoff, especially due to impervious surfaces, shunting of storm water runoff into streams with consequent clogging of the interstitial habitats, inorganic pollution from runoff from nearby roads, and soil compaction from trails. Established in 1890, Rock Creek Park is one of the oldest National Parks. The Park is a remnant eastern deciduous forest (710 hectares) surrounded by urban development. Detailed information on the distribution of these species has resulted in changes in resource management, including rerouting of storm water runoff and alteration of location of new trails.

CO1-2 **KAPLAN, DAVID A.** Natural Resources Group, City of New York Department of Parks and Recreation, 1234 Fifth Avenue, Rm. 113, New York, NY 10029 (david.kaplan@parks.nyc.gov)

URBAN HABITAT RESTORATION: THE BRONX RIVER CEMENT PLANT PROJECT

In 2001, the City of New York Department of Parks and Recreation's Natural Resources Group (NRG) received $131,000 from the National Oceanic and Atmospheric Administration for habitat restoration at an abandoned concrete factory on the Bronx River. The half-acre project site included an intertidal zone of unconsolidated, silty, organic sediment, with areas underlain by concrete, and adjacent steep slopes containing urban fill and concrete. NRG installed 16,000 ft2 of biodegradable, coconut-fiber "bogmats", planted with 16,000 Spartina alterniflora, into the intertidal zone of the river. Mats were grown in wetland planting beds constructed on site with help from local environmental and community groups, and were secured in the river once dense root mats had established. By September 2002, the Spartina had rooted into the existing substrate and grown to heights of up to four feet, while the high-tide line was thick with high marsh plants. NRG also restored 4,000 ft2 of upland, which was planted with warm-season bunch grasses, native shrubs, and herbaceous plants. The restoration currently provides habitat for estuarine fish and invertebrates and attracts a diverse assemblage of birds. The Cement Plant Project has been instrumental in inspiring community stewardship of the Bronx River in underserved communities of the south Bronx. By providing opportunities for environmental education and activities, the Cement Plant has become a central location for community collaboration of ecological restoration. In the past two years, NRG has worked with over a dozen community-based organizations to develop and implement environmental education curricula and activities at the site.

CO1-3 **KNIGHT, RICHARD, Grant Benn, Lorraine Gerrans, Barrie A. Low, and Gregg Oelofse** Biodiversity and Conservation Biology Department, University of the Western Cape, Private Bag X17, Bellville 7535 South Africa (RK). GISCOE, Cape Town, South Africa (GB). Department of Environmental Management, City of Cape Town, P.O. Box 16548, Vlaeberg 8018, South Africa (LG, GO). Coastec, Coastal & Environmental Consultants, Rondebosch, South Africa (ABL) (rknight@uwc.ac.za)

THE DEVELOPMENT OF THE CITY OF CAPE TOWN'S BIODIVERSITY NETWORK

South Africa is one of twelve "mega-diversity" countries of the world; a situation contributed by it possessing the smallest floral kingdom of the world. One-third of plant species (approximately 3000) of this kingdom lie within the City of Cape Town. Conserving such biodiversity in the face of the development needs of one of the fastest growing metropoles in the world was the unenviable position faced by the City's environmental managers. We identified 738 unconserved natural vegetation remnants from high-resolution aerial photographs. This together with plant species lists for 247 sites formed the basis for a C-Plan analysis to optimize conservation targets within the smallest area possible. This analysis identified an additional 261 sites to complement the 186 sites already in the existing conservation network and ensures that all major vegetation types, ecological processes, including mobile sand dunes and rivers, and some 2355 plants species are conserved. Initial implementation of the network required that biodiversity compatibility maps were prepared which optimized remnant sites in relation to land use patterns surrounding them to ensure maximum sustainability of species within the network. This solution was calculated using a cost-surface path-analysis and has resulted in nineteen corridors and eighteen nodes being prioritized for conservation.

CO1-4 **MCFREDERICK, QUINN S. and Gretchen LeBuhn** San Francisco State University, Department of Biology, 1600 Holloway Avenue, San Francisco, CA 94132 (quinn@sfsu.edu)

BUMBLEBEES (HYMENOPTERA: APIDAE) IN SAN FRANCISCO'S URBAN PARKS

Ecologists have estimated that between 39 % to 50 % of the Earth's surface has been altered for human uses (Vitousek et al. 1997 - 'Human domination of the earth's ecosystems.' Science 277:494-499). As more wild habitats become human-dominated, urban parks become more important as refuges for natural populations. Managing urban parks to maximize biodiversity while providing open space and recreation should be a 'win-win' for conservation. This study investigates what characteristics of urban parks influence bumblebee species richness and abundance. We sampled the bumblebee community in eighteen urban parks and two larger nearby parks. We classified factors that might influence the bumblebee community into two types: 1) local level factors, such as abundance and species richness of flowers, percent of the park that is "natural area," nest site availability, area, and age and 2) landscape level factors, such as density of the surrounding urban matrix and distance to the nearest source population. Of the nine species of bumblebees previously recorded in San Francisco, four persist. Multiple regression analysis revealed that, of the local level park factors, percent "natural area," size, and floral abundance explained a significant amount of the variation found in abundance of bumblebees. Local level variables, including size of the park, did not explain species richness.

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BIODIVERSITY CONSERVATION IN GAUTENG -A FORMER GRASSLAND BIOME NOW A CONCRETE JUNGLE-WOULD SYSTEMATIC CONSERVATION PLANNING RESCUE THE GRASSLANDS!

Gauteng, located high up on the central plateau of Southern Africa, is comprised of the grassland and savanna biomes. Rich in biodiversity, Gauteng is now home to one of the mega cities of Africa - Johannesburg. This industrial heartland sits on a major catchment area with rivers carrying polluted water away into the east and west of southern Africa. Urban sprawl is at the highest level with 16.8 % of the South African population residing in Gauteng. More than 50% of the natural area is lost to development, industrialization, mining and agriculture. Historically, protected areas were designated on an ad hoc basis, creating potential “desert” islands Models of climate change reveal that the remnant grasslands of Gauteng stricken by urban sprawl, pollution and other symptoms of poor environmental planning, are highly threatened by desertification spreading eastwards over the next 20-50 years. Systematic, spatial planning includes an integrative approach encompassing ecological processes, and the resultant spatial land-use plan. Gauteng’s ultimate challenge with all its 7.3 million people, makes a perfect case study as the first integrated urban ecosystem. This paper aims to rediscover a unique place in Africa where lessons learned can improve conservation of our rich African heritage.

CO1-6 **HODGSON, PATRICIA, Kris French, and Richard Major** Institute for Conservation Biology, University of Wollongong, Wollongong NSW 2522, Australia (PRH, KF), (prh09@uow.edu.au), Australian Museum, 6 College St, Sydney NSW 2010, Australia (RM)

THE CONSERVATION VALUE OF REMNANTS TO BIRD BIODIVERSITY IN AN AUSTRALIAN URBAN LANDSCAPE

Small patches of remnant vegetation are often considered to have low conservation value. In urban landscapes their value may increase as they can be the only source of original vegetation. The conservation value of small bushland remnants in an Australian coastal city was assessed by measuring bird community composition, in relation to remnant size and the density of the housing matrix. The bird community of remnants larger than 35 ha or surrounded by mixed density housing was distinct from that of small 1-5 ha remnants and the housing matrix. Small insectivores were responsible for this difference and they appeared to be sensitive to urbanization. To determine if this sensitivity was a reflection of resource availability, the foraging behavior of insectivores in remnants surrounded by a high-density housing matrix was compared with conspecifics inhabiting continuous vegetation. Canopy and shrub foragers showed no difference between habitats, and ground foragers showed no adverse changes. It seems small insectivores are sensitive to other factors in the urban environment. Despite the potential value of small remnants as foraging sources, the overall sensitivity of small insectivores to urbanization suggests that remnants larger than 35 ha and surrounded by mixed density housing have more conservation value to birds.

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A CONSERVATION ASSESSMENT AND IMPLEMENTATION STRATEGY FOR THE NELSON MANDELA METROPOLE, CAPE FLORISTIC REGION, SOUTH AFRICA

The NM MOSS (Nelson Mandela Metropolitan Open Space System) Project resulted in the development of a fine-scale systematic conservation plan and implementation strategy for the Nelson Mandela Metropole, South Africa. The biodiversity of the Metropole is threatened by expanding urbanisation, agriculture, mining, and alien invasive plants. The Cape Action for People and the Environment (C.A.P.E.) Programme identified two vegetation types within the Metropole as priorities requiring urgent conservation attention. Various features were given quantitative conservation targets and the plan was developed in several stages using C-Plan. In addition to the existing reserve system, 22% of the remaining extant habitat is required as protected areas within the planning domain. To facilitate the implementation of this conservation plan, formal endorsement for the development and implementation of the conservation plan was solicited from the inheritor agency, prior to the initiation of the project. Stakeholders were consulted throughout the process to introduce implementation strategies into the conservation planning process. Outcomes of the planning process were integrated into relevant municipal decision-making policies, plans and systems. An implementation plan was developed, in consultation with interested and affected parties, to ensure that areas of high conservation value and vulnerability to habitat loss are secured first. This resulted in a high degree of government, public and private support for this conservation initiative.

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CONSERVATION VALUE OF CLUSTERED HOUSING DEVELOPMENTS

Rural counties in the American West are growing at unprecedented rates. Traditionally exurban lands in Colorado have been subdivided into a grid of parcels ranging from 2 to 16 hectares. This dispersed pattern of development effectively maximizes the individual influence of each home on the land. Clustered housing developments, designed to maximize open space, and minimize edges with development, are assumed to benefit plant and wildlife communities. They have become a popular new alternative for land use planners despite the lack of empirical evidence demonstrating their benefit. Our study examines the conservation value of clustered housing developments, dispersed housing developments, and undeveloped areas in Boulder County, CO using four indicators: 1)densities of human-commensal and human-sensitive songbirds, 2)nest survivorship of ground-nesting birds 3)occurrence of mammalian mesopredators, and 4)percent cover and proportion of native plant species. The patterns we observed across clustered developments, dispersed developments, and undeveloped areas indicate that the biodiversity attributes of clustered housing developments are more similar to those of dispersed housing developments than to those of undeveloped areas. While clustering development may provide an advantage to some sensitive species, it may not be as effective as previously assumed.

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EXTINCTION RISK FROM CLIMATE CHANGE

Climate change over the last ~30 years has produced numerous shifts in species' distributions and abundances 1,2, and has been implicated in one species-level extinction . Using projections of species' distributions for future climate scenarios, we assess extinction risks for sample regions that cover some 20% of the Earth's terrestrial surface. Exploring three approaches in which the estimated probability of extinction shows a power-law relationship with geographical range size, we predict that 15 to 37% of species in our sample of regions and taxa will be "committed to extinction" as a result of mid-range climate warming scenarios for 2050. Taking the average of the three methods and two dispersal scenarios, minimal climate warming scenarios produce lower projections of species committed to extinction (~18%) than mid-range (~24%) and maximum change (~35%) scenarios. These estimates show the importance of rapid implementation of low greenhouse gas emission technologies and C-sequestration strategies.

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GAPS AND MISMATCHES OF GLOBAL CONSERVATION SPENDING

Global conservation organizations are currently setting priorities to guide limited conservation time and money to those areas deemed most important according to a variety of criteria. Shifts in conservation spending, however, have not kept up with these changes in conservation priorities. Here we use data from 2002 to evaluate how expenditures by eight global conservation organizations compares to three existing global priority conservation schemes developed by the World Wildlife Fund (WWF), Conservation International (CI), and Birdlife International (BI). Our analyses account for the purchasing power of dollars spent, past conservation effort, and the political stability in each country. We found that some areas identified as critical for conservation by all three groups are receiving comparatively little conservation money, while other areas that no group identifies as a conservation priority site are receiving relatively large amounts of conservation money. Furthermore, spending by WWF, CI, and BI does not match their own priorities. In particular, the United States receives the vast majority of total conservation dollars, but differences in purchasing power improve equity between countries. We conclude that global conservation organizations will either need to readjust their allocation of funding to their priorities or their priorities to their expenditures.

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FINANCING CONSERVATION IN INDONESIA: AN INVESTIGATION OF CONSERVATION CONCESSIONS AND THEIR POTENTIAL

Conservation concessions are a recent development in the tropics: concession sellers protect natural ecosystems in exchange for a steady stream of structured compensation from conservationists and other investors. Conservation concessions are now under active consideration by several NGOs in Indonesia. The potential for their further implementation in Indonesia is the central subject of this paper. Five core issues are critically examined: (1) competition with existing timber concessions in Indonesian production forests, (2) Government of Indonesia and regulatory support, (3) monitoring systems, (4) local community involvement, and (5) standardising the conservation concession mechanism. The chosen methodology was to conduct a Literature Survey and Elite Interviews. The interviews were conducted with 17 key informants, who represented the Forestry Department, international NGOs, national NGOs, academia, donor agencies, and independent consultancies. The interviews covered the core issues mentioned above, while the Literature Survey focused on the history of conservation concessions and the wider conservation context in Indonesia.

From these studies, the author found: (1) that there are currently several international NGOs who are, or will be, implementing conservation concessions in Indonesia; (2) that the Government of Indonesia, through a Declaration of the Ministry of Forestry, has explicitly expressed support for the conservation concession mechanism, but that more substantial GOI support will be needed,; (3) that a permanent ban on commercial logging remains difficult to realize; (4) that long-term engagement with local communities is perhaps the most important single issue (and that current practice still falls far short of the ideal); (5) that a new monitoring system is essential, involving all stakeholder group many different groups - NGOs, local and central government, Forestry Department, local communities, and academia; (6) and that the standardization of conservation concessions is both unnecessary and undesirable, since the diversity of on-the-ground conditions requires that each concession agreement be uniquely tailored to each concession area.

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WHY SHOULD WE CARE? MONITORING THE CONDITION OF URBAN AND SUBURBAN ECOSYSTEMS IN THE UNITED STATES

Although they occupy less than 2% of the land area of the lower 48 states, cities and suburbs are home to more than 75% of all Americans. Characterized by a great many people living in a small area, much of it covered by a variety of hard surfaces, cities and suburbs nevertheless provide a range of goods and services not unlike those provided by other, more "natural," ecosystems. In fact, 20% of urban and suburban land is forest, farmland, wetlands, or grassland and shrubland; streams run through cities and suburbs, and many cities lie on the coast. It is in this unconventional ecosystem that people interact most often with nature. The Heinz Center's State of the Nation's Ecosystems project has developed a suite of 15 indicators to monitor the condition of urban and suburban ecosystems. Although they continue to evolve, these indicators report on the system dimensions (area, land use change, remnant patches, impervious area, stream bank vegetation), the chemical and physical conditions (nitrate and phosphorous in streams, air quality, chemical contamination, urban heat island), the biological components (species status, non-native species), and human uses (open space, ecosystem services). Feedback on refining these indicators is sought from the conservation community.

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SENSITIVITY OF CONSERVATION PLANNING TO UNCERTAINTY ASSOCIATED WITH PREDICTED SPECIES DISTRIBUTION DATA

Research within the field of conservation planning has focused on the development of theories and tools to design reserve networks that protect biodiversity in an efficient and representative manner. Whilst much progress has been made in this regard, there has been limited assessment of the sensitivity of conservation planning outcomes to uncertainty associated with the datasets used for conservation planning. There may be considerable uncertainty associated with the use of predicted species distribution data, particularly given the variety of approaches available to generate a dataset from such predictions for use in conservation planning. These approaches range from using the probabilistic data directly to using a threshold selected a priori or a posteriori to convert the probabilistic data to presence/absence data. The implications of uncertainty associated with the use of predicted species distribution data for conservation planning are unknown. We assess the sensitivity of conservation planning outcomes to different uses of predicted species distribution data. The resulting reserve networks differed, and had different expected representation of species. The choice of approach will depend on how much risk a conservation planner is willing to tolerate and how much efficiency can be sacrificed.

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PROBABILITIES, CONNECTIVITY AND HABITAT LOSS: COMPARING RESERVE SELECTION STRATEGIES

We assessed the use of probabilities of occurrence in reserve selection, basing probabilities on connectivity measures to account for population dynamics. The used connectivity measures were a species-specific incidence function model measure, and a non-species-specific buffer measure. For all species (i.e. seven bird species in south-west the Netherlands) connectivity measures were found significant. The reserve selection methods included: (i) a simple minimum set proportional coverage approach, based on presence-absence data without taking spatial considerations into account; (ii) an approach with a penalty for boundary length to select qualitatively clustered reserves; and (iii) a dynamic approach that assumed complete habitat loss around the reserves, therefore basing probabilities of occurrence on the set of selected sites only. Solutions from simple reserve selection methods, not incorporating landscape dynamics and/or connectivity, were too small and too scattered to meet the targets for all species. The best results were obtained when spatial population dynamics (through the use of connectivity measures) was incorporated in probability models, combined with a reserve selection method that takes landscape dynamics into account. The use of connectivity measures in predicting species occurrence (so-called 'habitat models') for application in reserve selection is a step towards long-term conservation of species.

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PLANNING FOR CLIMATE CHANGE: IDENTIFYING MINIMUM-DISPERSAL CORRIDORS FOR THE CAPE PROTEACEAE

Climate change poses a challenge to the traditional approach to biodiversity conservation that relies on fixed protected areas, because the changing climate is expected to shift the distribution of suitable areas for many species. At least some species are expected to persist only if they can colonise new areas, and in some cases their dispersal abilities may be very limited. We address this problem by describing a quantitative method for identifying multiple corridors of connectivity through shifting habitat suitabilities that seeks to minimise (1) dispersal demands and then (2) the amount of land area required. We apply the method to Proteaceae mapped on a one-minute grid for the Western Cape of South Africa to supplement the existing protected area. Our goal is to represent each species where possible in at least 35 grid cells (approximately 100 km2) at any one time between 2000 and 2050 despite climate change. Although we demonstrate that it is possible to achieve the goal at reasonable cost, caution will be needed in applying our method to conservation investments until there has been further support or refinement of the climate-change models and of the species' habitat-suitability and dispersal models.

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TEMPORARY AND MOBILE PROTECTED AREAS FOR THE CONSERVATION OF A PALM TREE LANDSCAPE IN URUGUAY

The Butia capitata woodlands in southeastern Uruguay have a density and dimension that makes them unique in the world. This palm tree ecosystem is a complex system in prairie and grasslands, dominated by Butia capitata palms, associated with a low herbs stratum, some shrubs and trees, seasonal flooded areas, and small ponds. The presence of cattle in the region has inhibited recruitment for approximately 300 years. The result is a population of palm trees 250 to 300 years old. Lack of funding and of political interest in conservation, combined with private ownership of the land, resulted in a lack of action towards the protection of this magnificent landscape, which is under risk of disappearing due to the senescence of the palm trees and lack of recruitment. Around the world different approaches have been proposed for conservation in private lands –tax breaks, statutory covenants, easements, private parks. This article introduces and analyzes the pros and cons of using a novel system of temporary and mobile protected areas for landscape conservation. It is concluded that this alternative should be considered a valuable tool in a region where almost 100% of the land is privately owned, and the state has very limited funds.

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INTRODUCING SPIDA-WEB: AN AUTOMATED IDENTIFICATION SYSTEM FOR BIOLOGICAL SPECIES

The most severely limiting factor on our understanding of biodiversity is the lack of experts capable of identifying biological specimens to species. For most groups of organisms, the number of trained systematists is low, and the success rate of non-specialists trying to achieve accurate identifications on their own, is even lower. The situation is worst for relatively small and inconspicuous organisms (i.e., those groups that comprise the bulk of biodiversity). One way to ameliorate this problem is to encapsulate the taxonomic expertise of a specialist in a computerized identification system. We are currently developing an Internet-accessible automated identification system that uses artificial neural networks to make identifications of species based on digital images. We call this system SPIDA-web (SPecies IDentification, Automated and web accessible). We are developing the system to identify two groups of spider species, one defined taxonomically and one geographically. Although the work is not complete, current results indicate that SPIDA will be able to classify images to genus with 95–100% accuracy. Classification to species has proven more problematic due to the paucity of replicate specimens, but when sufficient numbers are available, accuracy falls in the 90–99% range. This technology has the potential to revolutionize biodiversity research.

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VEGETATION DENSITY AND ITS RELATION WITH WATER CONSERVATION IN FOREST LAND OF AYUBIA NATIONAL PARK

Over grazing and deforestation are the most visible among anthropogenic threats to the temperate ecosystem of Hindu Kush-Himalayas. It not only depletes the plant genetic and species resources but also lead to the accelerated runoff of rainwater. The torrent flow of rainwater on the heavily grazed slopes speeds up soil erosion, diminish soil fertility and causes landslides. All these factors reduce water resources in the soil and delimit biological production leading to elevated poverty in the tribal communities. To quantify role of vegetation in conservation of water in natural watersheds, experiments were conducted at Ayubia National Park, Pakistan. Infiltration capacity of three-density zones of the forest i.e. high, moderate and low having a canopy cover of >50%, 30-50% and <30% respectively, were analyzed through the double ring infiltrometer. Analysis of the data revealed that high-density forests had maximum infiltration rate of 36.6 cm/hr, as compared to the zones having moderate density (32.0 cm/hr) or low-density (28.9 cm/hr). Vegetational history of the park shows that degradation of forest cover has been resulted in drying-off of 6 perennial springs in the past 50 whereas the flow of water in existing 17 springs is decreasing gradually. It is concluded that reduction in forest cover cause reduction in infiltration and thereby affect the conservation capacity of watersheds, in water resources.

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METHODOLOGY FOR PANDA SURVEY AND MONITORING: INTEGRATING MULTIPLE INDIVIDUAL-DISTINGUISH METHODS

A new methodology for panda survey and monitoring has been developed, which can be carried out by common nature reserve staffs at low cost. It was applied during the third national panda survey of China, which was completed in 2002 and it has also been used in monitoring the panda population in many panda reserves. It is a counting method that sums up the total number by distinguishing individuals from panda droppings found in the mountains. Radio telemetry results show that average annual homerange of wild panda in Qinling Mountains is 10.62km2 (n = 56), and 95% of the direct distances between any two Panda Location Points from the same individual are shorter than 5.5 Km, which can be used to decide the number of panda individuals in the wild. Length of Bamboo Shoot Fragments (LBSF) was commonly accepted as reflecting individual characters. 2mm has been used as the threshold to distinguish means of LBSF of two panda droppings. We examined this threshold value in Wanglang Nature Reserve, and found it is fit for 95% of the total cases (n=614). By applying this method in monitoring panda population of Wanglang NR, we found panda population there has remained stable in past three years.

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A BAYESIAN MODEL OF SITE OCCUPANCY, DETECTABILITY, LOCAL COLONIZATION AND EXTINCTION: MONITORING TRENDS IN MAMMAL, FROG AND BIRD POPULATIONS IN SOUTH EASTERN AUSTRALIA

Site occupancy (presence/absence) data is a cheap and efficient way to monitor wildlife populations, though it is subject to false negative observation error because few species are detected with absolute certainty during field surveys. False negative observation error may lead to biased inference about population parameters such as local extinction and colonization rates and reduce the power of monitoring studies to detect temporal trends in sites occupancy. In addition, occupancy turnover rates may vary throughout a landscape depending on environmental, anthropogenic and habitat influences. For example, local extinctions may be highest in marginal habitats where populations undergo range contraction. We present a Bayesian model that may be used to model temporal trends in site occupancy that incorporates influences of landscape composition, anthropogenic impacts and habitat attributes on local colonization and extinction. Occupancy estimates are adjusted for false negative observation rates using the zero-inflated binomial (ZIB) model. To illustrate the model, we analyse temporal trends in site occupancy for forest owls, arboreal marsupials, frogs and diurnal birds in south-eastern Australia. Our example highlights the flexibility of Bayesian approaches for incorporating information from previous studies. The model is fitted in freeware Bayesian software (WinBUGS) and model code is available online.

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THE EFFICACY AND RELIABILITY OF DOGS TO LOCATE DESERT TORTOISES UNDER NATURAL CONDITIONS

Federally threatened desert tortoises (Gopherus agassizii) occur throughout the Mojave Desert. Methods for detecting and monitoring desert tortoises are the subject of contentious debates due to high variability in the accuracy of survey results. As a result, population status and trend is unclear. The use of dogs for locating wildlife has been demonstrated by individuals but has been neither rigorously tested nor scientifically documented. We developed a series of experimental trials to test the efficacy and reliability of dogs trained specifically to locate desert tortoises. Dogs were trained on residual scent and then introduced to live, captive animals. The progression from residual scent sources to live animals was assessed. Field trials progressed from controlled training to semi-natural and finally natural conditions in which the use of dogs remained both effective and reliable. In addition, we correlated the dogs' performances with the following environmental factors: wind speed, wind direction, temperature, humidity, and total time worked, to better understand potential boundary working conditions. The implications of this research for tortoise conservation and management are wide ranging and we discuss our results in the context of endangered species management.

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WOLVERINES IN NORTHERN ONTARIO: A COMPARISON OF THREE METHODS FOR MONITORING A LOW-DENSITY SPECIES OVER A VAST, REMOTE AREA

With planning activities underway for large-scale industrial development in the currently roadless region of Ontario north of the 51rst parallel, a major gap in conservation planning is a lack of information on the distribution and conservation status of low-density, potentially vulnerable species. Provincially threatened wolverines (Gulo gulo) occur over vast areas of remote boreal forest and their status traditionally has been monitored solely through fur harvest returns. Over a two-year period, we evaluated the relative merits of two additional techniques: aerial track surveys and systematic collection of indigenous knowledge from northern First Nation communities. In six communities, harvest information collected from 120 interviews showed good correspondence with fur harvest reports. Supplemental information from interviews on historical distributions, relative abundances, and cultural attitudes was modest compared to the extra expense and effort involved. However, aerial surveys yielded more comprehensive and detailed distributional information compared to the other two techniques, and provided additional distributional information from areas such as the James Bay lowlands, where human use has been negligible. We recommend that fur auction returns be supplemented with regular aerial surveys, particularly in light of the diminishing trap effort that is occurring in the region over time.

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INFLUENCE OF SCALE OF SAMPLING ON DETECTION OF RELATIONSHIPS BETWEEN INVASIVE PLANTS AND DIVERSITY PATTERNS OF PLANTS AND BUTTERFLIES

Lack of money and time hampers attempts to monitor the outcome of restoration efforts. Hence, it is useful to determine whether relatively limited spatial and temporal sampling can provide valid inferences about biological responses to variables that are affected by restoration actions. In the Mojave Desert, both invasion of salt-cedar Tamarix ramosissima and human efforts to eradicate salt-cedar have altered vegetational communities and some measures of faunal diversity. We examined whether similar inferences about relationships between plants and butterflies in the Muddy River drainage (Nevada, USA) could have been obtained by using data from a subset of the 85 locations included in the study, by sampling less intensively in time (fewer visits per site), or by sampling over a shorter period of time. We found that similar inferences about the importance of six vegetation-based predictor variables on species richness of butterflies, and about occurrence rates of individual species of butterflies, could be obtained by sampling as few as 10% of sites and by sampling less intensively or extensively in time. Our results suggest that relatively limited data sets may allow us to draw reliable inferences for adaptive management in the context of ecological restoration and rehabilitation.

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ASSESSING REPRESENTATIVENESS OF LIFE CYCLE MONITORING BASINS FOR THREATENED OREGON COAST COHO SALMON

The system of Life Cycle Monitoring Basins (LCMB) is an essential element of the State of Oregon's strategy to recover threatened coho salmon in western Oregon. Landscape conditions and topography within LCMB may influence salmonid production by shaping stream habitat. Knowing the similarity of landscape conditions within LCMB to those found within the four coho salmon Population Monitoring Units (PMU) containing them is critical to evaluating if monitoring results in the LCMB accurately reflect coho salmon abundance in the PMU. The Coastal Landscape Analysis and Modeling Study: 1) described landscape conditions within seven LCMB and all other basins in the PMU; 2) developed methods to assess the representativeness of any basin within the PMU using dissimilarity measures and cluster analysis; 3) applied these methods to determine the representativeness of LCMB relative to PMU. Results indicated that most LCMB differ from the PMU in which they occur. If new LCMB are added to increase the representativeness of the monitoring system our approach will greatly benefit the selection process and help ensure results are generalizable to the PMU.

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EFFECT OF INDIGENOUS LAND USE ON MAMMAL POPULATIONS IN A CENTRAL AMERICAN RAIN FOREST

Inventories and population estimates conducted in BOSAWAS Biosphere Reserve, Nicaragua, established the foremost importance of this protected area for the conservation of large and medium-sized mammals, including the Baird's Tapir Tapirus bairdii and the Central American Spider Monkey Ateles geoffroyii. BOSAWAS is possibly the last refuge for the Giant Anteater Myrmacophaga tridactilus in Central America, and may contain a viable population of jaguars Panthera onca. We investigated whether this exceptional biodiversity is related to the spatially explicit land use practiced in the reserve. In BOSAWAS crops are grown in 'agricultural areas' beside indigenous villages. Hunting and gathering occur both in the 'agricultural areas' and farther away in 'hunting areas'. Hunting is only occasional in the more remote 'conservation area'. We found that mammals occurred in all land-use areas. Relative density, expressed by the number of track sets per kilometer, was lower in the agricultural areas only for jaguars. The number of tracks per set, a possible measure of mammal activity, increased with increasing human activity for the medium-sized species most hunted. Species of greater conservation concern showed the opposite relationship. Light hunting and spatial separation of human activities may contribute to maintaining high diversity of larger mammals in Central America.

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HABITATS OUTSIDE PROTECTED AREAS: CAN ELEPHANTS BE CONSERVED WITHOUT THEM?

In Sri Lanka as in the rest of Asia, a large proportion of elephant range lies in habitat outside protected areas. Due to rapidly increasing human populations and consequent 'development' such habitats are coming under increasing threat. The main problem confronting elephant conservation in Asia and especially Sri Lanka is the human-elephant conflict, which occurs almost exclusively outside protected areas. The main strategy for elephant conservation and mitigation of human-elephant conflict has been exclusion of elephants from habitats outside protected areas, by translocation into protected areas. This approach aims to prevent conflict between humans and elephants by their spatial segregation through barriers such as electric fences. However, this strategy has had limited success in mitigating the conflict. Based on studies on the abundance of elephants, resource use and conflict with humans, we argue that habitats outside protected areas are critical for maintaining the current population of elephants, their limitation to protected areas is not practical, and that such attempts may be detrimental to elephant conservation.

Conservation issues concerning mammals; other: Conservation area planning, design and management

CO4-3 **HEDGES, SIMON, Martin J. Tyson, Arnold F. Sitompul, Margaret F. Kinnaird, Donny Gunaryadi, and Aslan Baco** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10468 (SH, MJT, MFK) (simonhedges@wildlife-net.freeserve.co.uk). Warnell School of Forest Resources, The University of Georgia, Athens 30602 (AFS). Wildlife Conservation Society Indonesia Program, P.O. Box 311, Bogor 16003, Indonesia (DG, AB).

THE CONTINUING DECLINE OF ASIAN ELEPHANTS IN INDONESIA'S LAMPUNG PROVINCE: HOW LONG TO EXTINCTION?

In the mid 1980s, Asian elephant populations were believed to persist in 44 populations on the Indonesian island of Sumatra. Twelve of these populations occurred in Lampung Province, but our surveys revealed that only three were extant in 2002. Causal factors underlying this decline include human population growth, changes in land use, and human - elephant conflict. Nevertheless, our surveys in the Province's two national parks, Bukit Barisan Selatan and Way Kambas, produced population estimates of 498 (95% CI=[373, 666]) and 180 (95% CI=[144, 225]) elephants, respectively. Both parks thus contain larger populations than previously reported. A third population was much smaller and may not be viable. These are the first estimates for Southeast Asian elephant populations using rigorous methods, and they suggest that elephant numbers in these parks are of international importance. Unfortunately, while our results indicate that Sumatra's remaining forests may contain larger numbers of elephants than expected, they also suggest that the future for these animals is bleak. Crop raiding by elephants was reported around all three areas in Lampung and the elephant populations are currently threatened by habitat loss and poaching. Local solutions are possible, but will require much greater commitment by all stakeholders.

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GOMBE CHIMPANZEE HEALTH-MONITORING: PAST, PRESENT AND FUTURE

Managers in parks containing chimpanzees perceive that disease outbreaks have been and continue to be significant causes of mortality for chimpanzees. Major epidemics at Gombe National Park include suspected polio in 1966, respiratory diseases in 1968, 1987, 1996, 1999 and 2000 and Sarcoptic mange in 1997. Previous unpublished analysis estimates that epidemics have caused 28 percent of total mortality at Gombe. These outbreaks have led park managers and researchers working in Gombe to conclude that diseases originating from and/or spread by humans pose a substantial risk to the long-term survival of Gombe's chimpanzee population. The study of the chimpanzees at Gombe National Park has spanned over 40 years and all of the behavioral data records are housed at the University of Minnesota. We surveyed these records for health-related data and found non-standardized data, consisting of long-hand notes and journal entries, for the entire period (1960 - 2003). Standardized health data, in the form of checksheets, were found for the period from 1970 – 1987 and 2000 - 2002. We present data on the utility of the various data types for outbreak surveillance and management.

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PARADIGM SHIFTS IN THE MANAGEMENT OF HUMAN-WILDLIFE CONFLICTS: A CASE STUDY AND ASSESSMENT OF BLACK BEAR MANAGEMENT IN YOSEMITE NATIONAL PARK

One traditional aspect of wildlife management that has been reshaped dramatically over the past two decades is the management of human-wildlife conflicts. Management of wildlife involved in conflicts has gone from simple “control programs” to a more integrated, proactive approach. Perhaps none of these flashpoints is more vexing than human-black bear (Ursus amreicanus) conflicts in the intensively used National Parks of the United States. The management of bears in Yosemite National Park relied heavily on reactive management until more proactive measures were outlined in the 1975 Human-Bear Management Plan. Despite these efforts, the number of human-bear conflicts in the recent past focused the need to examine and evaluate the system of human-bear conflicts in the Park. We characterized and investigated components of both the human and bear elements of the Park’s bear management program in an integrated approach between 2000 and 2002. We found Yosemite National Park is aggressively delivering information to visitors about the human-bear conflicts. We also found that human activity, including food resource enrichment and harassment, resulted in deviations from natural bear behavior patterns and food habits. Stronger regulations should be implemented and improvements made to messages used to educate visitors about human-bear conflicts.

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IMPACTS OF SUBSISTENCE HUNTING ON THE FORAGING ECOLOGY OF JAGUAR AND PUMA IN THE MAYA BIOSPHERE RESERVE, GUATEMALA

This study assessed the effects of subsistence hunting on the foraging ecology of jaguar (Panthera onca) and puma (Puma concolor) within the Maya Biosphere Reserve (MBR), Guatemala. Food habits were determined from analysis of 76 jaguar and 145 puma scats collected within hunted and protected areas of the MBR. Diets of jaguar and puma were compared (1) within species between areas with and without hunting to evaluate effects of subsistence hunting, and (2) between species to evaluate resource partitioning between these sympatric carnivores. Origin of predator scat was determined from mitochondrial DNA, diets were identified from prey remnants found within scats. Density of prey was estimated using line-transect sampling. Diets of jaguar and puma did not differ between protected and hunted areas. Jaguar diets were dominated by medium-sized prey, particularly armadillos (Dasypus novemcinctus) and coatis (Nasua nasua). Puma diets were dominated by deer (Odocoileus virginianus and Mazama sp.) and large rodents (Agouti paca and Dasyprocta punctata). Dietary overlap was low between jaguar and puma in both study areas. Jaguar and puma obtained similar contributions from large prey to their respective diets despite changes in the abundance of those prey.

CO4-7 **POCHRON, SHARON, W. Troy Tucker, and Patricia C. Wright** Department of Anthropology, SUNY at Stony Brook, Stony Brook, NY 11794 (spochron@ms.cc.sunysb.edu)(STP) Applied Biomathematics, East Setauket, NY, 11733 (WTT) Department of Anthropology, SUNY at Stony Brook, Stony Brook, NY 11794 (PCW)

DEMOGRAPHY, LIFE HISTORY AND SOCIAL STRUCTURE IN PROPITHECUS EDWARDSI FROM 1986 TO 2000 OF RANOMAFANA NATIONAL PARK, MADAGASCAR

Prosimian lemurs differ fundamentally from anthropoid primates in traits related to social structure. By exploring the demography of the endangered Milne-Edwards sifakas, and comparing it to other well-studied primates, we explore the effect of demographic and life-history factors on social structure. We compare lemur survivorship and fertility patterns to two published composite models: one for New World and another for Old World monkeys. Using longitudinal data collected, we quantify 1) group composition, 2) birth seasonality, 3) interbirth interval, 4) life-table values, and 5) population growth estimates. The mortality, survivorship, and life-expectancy schedules indicate high infant and juvenile mortality. Fertility remains high until death. The intrinsic rate of increase and net reproductive rate indicate a shrinking population. High mortality rather than low fertility causes the population decline. Like New World monkeys, few sifakas survive to reproduce, and those that do, reproduce at a slow rate resembling the Old World pattern. Demography limits the formation of large kin-based groups for sifakas, and survivorship and fertility patterns do not easily permit sifakas to form large same-sexed family groups.

CO4-8 **WEERAKOON D.K., E. Wikramanayake, M.D. Gunawardene, H.K. Janaka, L.K.A. Jayasinghe, R.A.R. Perera, and P. Fernando** University of Colombo, Colombo, Sri Lanka (DKW). Conservation Science Program, World Wildlife Fund-US, Washington, D.C. 20037 (EW). Southern Sri Lanka Elephant Research Project, Tissamaharama, Sri Lanka (DKW, EW, MDG, HKJ, LKAJ, RARP, PF). Wildlife Trust, New York (PF). (pf133@columbia.edu)

RANGING BEHAVIOR AND HABITAT USE OF ELEPHANTS IN SRI LANKA: IMPLICATIONS FOR CONSERVATION

The ranging behavior and habitat use of 18 elephants in north-west and south-east Sri Lanka, was studied using radio-telemetry. Home range extents of males and females ranged from 53.6-346 km2 and 29.6-160.7 km2 respectively. Elephants were not limited to protected areas, had high fidelity to home ranges, and did not undertake long distance migrations. A trend of increasing home range size with increasing fragmentation was observed in elephants ranging in high human-use areas, and cultivation patterns influenced the ranging pattern of some elephant groups. Traditional slash-and-burn cultivation created optimal elephant habitat, and provided critical dry season foraging areas. Elephant management strategy in Sri Lanka as well as many parts of Asia, is largely based on limiting elephants to defined protected areas linked by narrow ‘corridors’, to facilitate long-distance migration. The results of our studies indicate that this strategy is inappropriate for Sri Lanka, in terms of elephant behavior and habitat use. We suggest that a new approach based on managing elephants both inside and outside protected areas, and habitat management in outside areas through the community participation and traditional agricultural methods is a more appropriate model for elephant conservation in Sri Lanka.

CO5-1 **DUDLEY, JOSEPH P.** Intellibridge Corporation, 1101 30th Street, NW Suite 100B, Washington DC 20007, Institute of Arctic Biology, University of Alaska Fairbanks, Department of Earth Sciences, The University of Alaska Museum (fnjpd@uaf.edu)

BIOSECURITY AND OPEN-SOURCE INFORMATION TECHNOLOGY: A NEW APPROACH TO THE GLOBAL MONITORING AND SURVEILLANCE OF EMERGING DISEASES, ZOONOSES, AND INVASIVE SPECIES

Recent experiences with highly pathogenic avian influenza, SARS, and the Ebola virus have demonstrated the need for developing better tools and capabilities for the global surveillance and monitoring of disease outbreaks in wild and domesticated species of plants and animals. There is a collateral need for developing better tools for monitoring and predicting the establishment of invasive species in new habitats, because of the the role that invasive species may have as disease reservoirs or vectors, competitors and/or predators of native species, agricultural pests, and destructive nuisance organisms. To fulfill this need, we have been developing a pilot project for the Animal and Plant Health Inspection Service of the United States Department of Agriculture to use web-based, open-source information technology methods to identify and monitor overseas outbreaks of diseases, agricultural pests, and invasive species that could be threats to agriculture and public health if introduced into the United States through commerce, chance, or misadventure. The demonstrated that open-source information technology methodologies, when coupled with appropriate analytical filtering and information management tools, can provide an important means for developing early warning capabilities and real-time monitoring systems for identifying and monitoring outbreaks of diseases and invasive species world-wide.

CO5-2 **SIMMONS, TREY, Yong Cao, and Charles P. Hawkins** AWER Department and The Ecology Center, Utah State University, Logan, Utah 84322-5210 (micajah@cc.usu.edu)

PREDICTIVE MODELING OF MACROINVERTEBRATE COMMUNITY COMPOSITION: ASSESSING THE IMPACT OF GRAZING ON THE BIOLOGICAL INTEGRITY OF STREAMS IN THE WESTERN U.S.

Stream ecosystems are severely threatened worldwide; consequently, there is great interest in developing reliable methods for quantifying the degree of impairment in streams that are impacted by human activity. Multivariate predictive modeling of macroinvertebrate communities, in which the fraction of expected taxa actually observed is used as a measure of biological integrity, is a powerful and intuitive method for detecting biological impacts to stream ecosystems. In this study, we have used a predictive modeling approach to quantify the impact of livestock grazing on the biological integrity of streams in the western U.S.. Biological and physical data from over 250 reference-quality streams in a 5-state area were used to construct a predictive model that generates probabilities of capture at each stream for all taxa in the data set. We used this model to assess the biological integrity of 80 streams from the same geographic area experiencing different levels of grazing intensity. As a group, grazed streams showed a loss of biological integrity when compared to reference streams; however, there was substantial variability in the magnitude of that loss among streams. These results demonstrate the utility of predictive modeling as a tool for assessing the biological impact of grazing on stream communities.

CO5-3 **BURKE, LAURETTA and Jon Maidens** World Resources Institute, 10 G Street, NE, Washington, DC 20002 (lauretta@wri.org)

REEFS AT RISK IN THE CARIBBEAN - USE OF GIS AND REMOTE SENSING TO EVALUATE HUMAN PRESSURE ON CORAL REEFS

Coral reefs are highly valuable resources in the Caribbean, providing a wide range of goods and services and supporting many economic activities and livelihoods. There is considerable activity in the region focused on assessment and monitoring of coral reefs, but, surprisingly, information is still fairly limited, and not well consolidated. Currently lacking are comprehensive data sets on status of, threats to, and protection of coral reefs for the Wider Caribbean region. The Reefs at Risk in the Caribbean project is a collaborative effort which integrates available information coral reef locations, observed impacts to coral reefs, and changes in condition. The project then attempts to fill in some data gaps through inferential modeling of threats to coral reefs from human activities, including coastal development, pollution and sediment from land-based sources, and overfishing. Data from remote sensing are used to map changes in land cover which feed into a watershed-based analysis of sediment threat. Results show significant differences in level of threat, nature of threat, and coral reef condition across the region. The threat indicators are used as input to an economic valuation of coral reefs where the sustainable value of healthy reefs is compared to the value of degraded reefs.

CO5-4 **LARSEN, TROND** Dept. of Ecology & Evolutionary Biology, Princeton University, Princeton, NJ 08544 (tlarsen@princeton.edu)

LINKING PATTERNS, CAUSES AND FUNCTIONAL CONSEQUENCES OF CHANGING BIODIVERSITY

Ecosystem integrity is maintained by species-driven functional processes, but is threatened by human-induced environmental change. I describe a case study on the response of a diverse dung beetle community to forest fragmentation created by a hydroelectric dam in Venezuela. In contiguous forests, dung beetles bury all available dung, and by doing so perform ecosystem functions which include secondary seed dispersal and nutrient cycling. Beetle species richness, density and biomass decreased with decreasing island area. Species richness was highly nested, with large-bodied species the most extinction-prone. Mainland population size did not predict extinction; instead, mark-recapture experiments showed that large-bodied species emigrate more rapidly from smaller islands. Whole-island howler monkey manipulations confirmed that beetles were more constrained by edge/area than by limiting dung resources. Selective loss of large beetle species caused disproportionately rapid loss of function. Most dung on small islands was never buried, indicating disruption of seed dispersal and other ecosystem processes. Functioning invertebrate populations can require even more area than some large mammals. The first species lost can also be the most functionally important, and remaining species might not compensate. Effective long-term biodiversity conservation requires an integrated approach that links patterns and causes of changing community structure with functional consequences.

CO5-5 **GREENLEAF, SARAH S. and Claire Kremen** Department of Ecology and Evolutionary Biology, Princeton University, Princeton NJ 08544 (sarahs@princeton.edu)

WILD BEES ENHANCE POLLINATION BY HONEY BEES

Ecosystems provide humanity with a myriad of goods and services. Despite the enormous importance of ecosystem services, their underlying ecology often remains poorly understood. Understanding the components and processes that produce ecosystem services is vitally important, as humans continue to change species distributions and inter-species relationships. Pollination is an ecosystem function whose loss or reduction could generate massive ecological failure and significantly diminish the global food supply. Here we report that wild bees make honey bees better sunflower pollinators, by an order of magnitude. Wild bees harass honey bees, altering foraging patterns and producing more sunflower seeds. Our findings show that the loss of wild bee communities results not only in the loss of the pollination services they provide directly to crops, but also in a dramatic reduction of pollination by managed bees, upon which much of modern agriculture depends.

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PHYSIOLOGICAL INSIGHTS INTO HABITAT QUALITY AT A HIGH ELEVATION MIGRATORY STOPOVER SITE

Fuel deposition rate at stopover sites is a crucial factor determining stopover duration, departure fuel load, migration speed, and ultimately survival and reproduction of migratory birds. Few studies have examined high elevation habitats as stopover sites. Increasing human activity threatens these habitats. As sites for refueling, the relative quality of these habitats can be assessed using fattening rates as an index. I am exploring temporal, interspecific, and age differences in fattening at a sub-alpine site in British Columbia. Fattening rates are being assessed by means of plasma metabolite profiling, which assesses refueling rate of an individual from a single capture. In fall 2003, I captured, aged, measured, and blood sampled 222 individuals of six species. Results indicate no age differences in fattening rates, no decline in absolute body mass over time, and increasing fat deposition rates through to the end of migration. Our data suggest that this site provides high quality stopover habitat, and our study is expanding to compare with additional high and low elevation sites. Use of this physiological index provides valuable insights into the importance of subalpine stopover habitats for migratory birds, enabling such sites to be prioritized for conservation.

CO5-7 **KULKARNI, BALASAHEB G., Ashok Jaiswar, and M.R.A.Teaherizadah** The Institute of Science, 15 Madam cama Road, Mumbai 400 032 (balasaheb_k@hotmail.com)

IMPACT OF URBANIZATION AND INDUSTRALIZATION ON COAST OF MUMBAI (BOMBAY): A CASE STUDY FROM WEST COAST OF INDIA

Mumbai was originally cluster of seven islands, is located on west coast of India. Since Mumbai is economical capital of India, it is one of the most populated urban centers with human population of 12 million and plenty industries spread over from main city to suburban areas. Therefore, coastal belt in and around Mumbai receives enormous amount of domestic and industrial effluent resulting in to its deterioration. Some coastal areas in Mumbai are unfertile and many species from it becoming scarce due to increased levels of pollution and management failure. To assess impact of anthropogenic pressure, we measured coastal characteristics with special reference to microbial contamination, diversity indices, population density and biomass of intertidal macro benthos at some coastal areas of Mumbai. The results revealed increasing level of pathogenic bacteria, Coliforms, Eschericha, Vibrio species in coastal waters of selected sites. Shannon diversity and dominance index range recorded was 2.07 to 40 and 0.64 to 0.23 respectively. Simpson's diversity and Pielou's evenness indices did not show much variation. Among macrobenthic community significant density and biomass of gastropods were noted. The data will be helpful as a baseline data for long term monitoring and planning of coastal resources management

CO6-1 **ARROYO, INES** Durrell Institute of Conservation and Ecology (DICE), Department of Anthropology, University of Kent at Canterbury, Canterbury, CT2 7NS, UK. (ines_a@hotmail.com)

A CASE STUDY OF MEXICO IN THE INTERNATIONAL REPTILE SKIN TRADE

Mexico has a major role as importer, manufacturer, producer, and distributor centre of reptile skins from non-native and native species. This study examines the use of reptile skins in the Mexican leather industry, through a combination of documentary research, survey and analytical methods. The use of reptile skins from native and non-native species is a distinctive industry for the Mexican leather and footwear sector. The main manufacturing centres in Mexico of reptile skin products made from both native and non-native species are the cities of Leon, Guanajuato, and Juarez, Chihuahua. Although Mexico has adopted the System for the Conservation, Management and Sustainable Use of Wildlife, the Mexican leather industry still relies on reptile skins from non-native species. In contrast, the smaller numbers of skins used from native species derive from captive breeding schemes that although biologically sustainable, provide no incentive for habitat conservation. Contrary to its objectives of protecting native species, the bans on use of native species has increased the illegal distribution of reptile skins and skin products from native species. Mexico, as a megadiverse country with potential to produce wildlife, could positively encourage conservation through sustainable use of reptile skins from native species.

CO6-2 **BAUER, DANA MARIE and Stephen K. Swallow** Department of Environmental and Natural Resource Economics, University of Rhode Island, 205 Coastal Institute, 1 Greenhouse Road, Kingston, RI 02881 (danabauer@mail.uri.edu)

ECONOMIC CONSEQUENCES OF CONSERVING AMPHIBIAN METAPOPULATIONS WITHIN AREAS OF URBAN SPRAWL

Development affects amphibian populations in two ways: loss of habitat and habitat fragmentation. Regulations that prohibit development activities within wetlands are the primary policy tool for protecting wetland species, including amphibians. This type of policy protects the wetland itself, but results in economic incentives for development to occur in upland areas. For amphibians with complex life histories that depend on wetlands for breeding habitat, uplands for the remainder of their life histories, and which rely on dispersal across the landscape, this loss and fragmentation of habitat can adversely impact the viability of metapopulations. We developed a conceptual framework for examining the economic consequences of restricting residential development at the rural-urban fringe in order to maintain ecologically viable amphibian metapopulations. While tightening restrictions on development may improve amphibian success, they may also result in increased costs to developers in terms of foregone development. We investigate the social costs of alternative land use policies to both developers and supporters of wildlife conservation. While policies that increase wetland buffer size improve the probability of success for amphibians, alternative policies (e.g., zoning restrictions, impact fees, transferable development rights) may provide the same or even better ecological results at a lower cost to society.

CO6-3 **BERGER, KIM** Wildlife Conservation Society, PO Box 340, Moose, WY 83012 (kberger@wcs.org)

CARNIVORE-LIVESTOCK CONFLICTS: MAKING ECONOMIC SENSE OF SUBSIDIZED PREDATOR CONTROL

Despite the ecological importance of carnivores in terrestrial ecosystems, predators have been persecuted worldwide, largely due to conflicts with humans over livestock. Control efforts have been phenomenally successful in terms of the number of carnivores removed; today most species of large carnivore are in global decline. Less well understood, however, are the effects of predator control programs on the viability of the industries they seek to protect. For instance, if predation losses are a primary factor influencing the economic viability of the U.S. sheep industry, and if predator control effectively reduces these losses, then a positive relationship should exist between control efforts and sheep numbers. I tested this prediction with a 60-year data set using multiple regression and hierarchical partitioning to explore potential associations between changes in sheep numbers and factors such as control expenditures, market prices and production costs. Although control efforts were positively correlated with fluctuations in sheep numbers, changes in production costs and market prices explained nearly all (87%) of the model variation between 1939 and 1999. These results suggest that alternative support mechanisms need to be developed if the goal is to maintain a viable livestock industry and not simply to kill carnivores.

CO6-4 **FARRELL, TRACY A. and Paul Houlihan** School for Field Studies, 10 Federal Street, Salem, MA 01970 (tfarrell@fieldstudies.org)

PLANNING FOR CONSERVATION: A COMMUNITY-BASED APPROACH

In the developing tropics, sustainable conservation of natural resources suffers from a lack of well-tested community – based approaches. The School for Field Studies has developed five-year research plans as a means of promoting sustainable development and biological conservation in natural resource dependent communities. These plans incorporate an interdisciplinary and holistic approach integrating the needs, resources and skills of the communities that surround our international field stations. Research plans include a problem statement, research components and projects. Plans were developed using a twelve step process that involves community stakeholders and clients, as well as technical and research advisors. Plans allow SFS to identify, structure, and prioritize biological and social science research and community extension projects according to community defined needs. This paper presents the plans' twelve step development process, structure and selected content- including research and extension projects and assesses potential benefits of five-year plans for other organizations involved in similar work. It further describes how the model applies to allocate organizational and budgetary resources, establish long-term research projects, achieve rapport with client communities, and affect positive change in biological conservation and sustainable development.

CO6-5 **FIELD, SCOTT A., Andrew J. Tyre, Niclas Jonzen, Jonathan Rhodes, Michael McCarthy, Brendan Wintle and Hugh P. Possingham** The Ecology Centre, University of Queensland, St Lucia, 4072, Queensland, Australia (scott.field@adelaide.edu.au); School of Natural Resource Sciences, University of Nebraska-Lincoln,Lincoln, NE 68583-0819 (AT); Department of Ecology, Lund University, SE-221 00 Lund, Sweden (NJ); The Ecology Centre, University of Queensland, St Lucia, 4072, Australia (JR); School of Botany, University of Melbourne, Parkville, VIC 3010, Australia (MM); School of Botany, University of Melbourne, Parkville, VIC 3010, Australia (BW); The Ecology Centre, University of Queensland, St Lucia, 4072, Queensland, Australia (HP)

MINIMIZING THE COST OF THREATENED SPECIES MANAGEMENT: CAN ERROR RATES BE OPTIMIZED?

Decisions based on monitoring data form the cornerstone of effective threatened species management. However, when such data are analysed with frequentist statistics, decisions are prone to potentially costly errors. The convention of fixing alpha at 5 % and accepting the resulting statistical power ignores the fact that the cost of Type II errors (failing to detect a decline) are often greater than that of Type I errors (unnecessarily initiating recovery). A more defensible approach is to set optimal levels of significance and power by formulating the problem in a decision theory framework that accounts for the relative costs of the two kinds of errors. We propose a new method for doing this, by minimizing a function specifying the expected overall cost of monitoring and management. Using a case-study of managing a threatened koala population in eastern Australia, we show that for a species of such high economic value, Type II errors should never be tolerated and therefore monitoring to trigger recovery action is redundant. We identify a narrow range of Type 2:Type 1 error cost ratios for which an optimal alpha-level exists. Our analysis suggests that a Bayesian approach might provide a more logically coherent framework for this problem.

CO6-7 **RAO, MADHU, Than Myint, Than Zaw, and Saw Tun** Wildlife Conservation Society Myanmar Program, Bldg. C-1, Aye Yeikmon 1st Street, Hlaing Township (Ward 3) Yangon, Myanmar. (mrao@wcs.org)

BIOLOGICAL AND SOCIO-ECONOMIC CORRELATES OF HUNTING IN TROPICAL FORESTS ADJOINING THE HKAKABORAZI NATIONAL PARK, NORTH MYANMAR

Hunting for subsistence and trade constitute a major threat to wildlife populations within and beyond protected areas in Myanmar. The study aims to determine the primary drivers of hunting in a forested landscape surrounding the Hkakaborazi National Park in North Myanmar, focusing on the nutritional and economic significance of hunting for local populations and potential impacts on populations of targeted species. We used questionnaires to obtain data on hunting patterns, camera traps and line-transect surveys for track and sign to obtain relative abundance estimates for targeted species. Analyses of meal records indicate that wild meat is a less important dietary component relative to fish and domestic meat from livestock. Wildlife trade is economically significant ranking second highest in terms of average annual income per household. Preferred species such as the tiger (Panthera sp.), otter (Lutra sp.), sambar deer (Cervus sp.) and pangolin (Manis sp.) appear to be less common than non-preferred species such as barking deer (Muntiacus sp.) and wild pig (Sus sp.) in records of actual offtake. Data suggest opportunistic hunting patterns that are independent of CITES restrictions and national wildlife protection laws. The study makes recommendations for strategic conservation investment within the context of biological, socio-economic, and institutional factors driving hunting and trade.

CO6-8 **OTGOID, BATBOLD DORJGURKHEM** Graduate School for Asia Pacific Studies, Ritsumeikan Asia Pacific University, 1-1 Jumonjibaru, Beppu-shi, Oita-ken, 874-8577, Japan (batbodo3@apu.ac.jp)

PROPERTY RIGHTS CONCEPT FOR SUSTAINABLE MANAGEMENT OF GRAZING LANDS IN MONGOLIA

Nomadic herding has existed for centuries, while maintaining natural balance. Traditionally in Mongolia, four seasonal pastures were used by herders, with sufficient reserves for grazing and due consideration for vegetation re-growth and recovery after grazing. Centrally planned economy also played a part in maintaining the land in considerably balanced manner. When Mongolia began the transition to a market-oriented economy in the early 1990s, both the animal husbandry and herders' interests changed radically. Unfortunately, the government was not able to foresee the ecological, economic and social consequences of these changes and formulate policies accordingly. Major challenge lies ahead in harmonizing western notion of property rights with the traditional unwritten "law" for biological resources' use held by nomadic herders under current economic situation. Because the western notion has been developed in compliance with market economy principles when traditional knowledge has been developed in compliance with restrictions set by the way of life practiced over centuries. The latter notion should overcome certain barriers because of new wave of practices brought by the globalization.

CO7-1 **KREPS, TIMOTHY A., Julie E. Hempstead, and David M. Lodge** Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 (tkreps@nd.edu)

EFFECTS OF BOOM-BUST DYNAMICS OF THE INVASIVE CRAYFISH ORCONECTES RUSTICUS ON SNAIL COMMUNITIES IN NORTHERN WISCONSIN LAKES

Rusty crayfish (Orconectes rusticus) have invaded many lakes of the upper Midwest. Laboratory and short-term field experiments show that they displace native crayfish and reduce the diversity and abundance of aquatic plants and invertebrates. However, the long-term stability of such invasions and their food web effects have not been tested. In 2002, we examined the long-term, whole-lake effects of rusty crayfish on snails by re-sampling ten northern Wisconsin lakes that had been sampled in 1987. Lakes were categorized as: low crayfish densities in 1987 and 2002 (n=3); high rusty crayfish densities in 2002 (n=5); and crayfish populations that crashed between 1987 and 2002 (n=2). While snail abundance was unchanged between 1987 and 2002 in low crayfish lakes, snails declined in high rusty lakes. Where rusty crayfish declined, snail diversity and abundance increased, indicating long-term recovery of snails in some lakes. In lakes in which rusty crayfish increased, snails declined most in the habitats most favored by rusty crayfish (cobble and sand with vegetation), while recovery of snails in lakes in which crayfish declined was seen in the least favorable substrate for crayfish (open sand). Thus, at least limited recovery of native communities occurs when the invasive crayfish declines.

CO7-2 **GOODELL, KAREN** Department of Ecology and Evolution, State University of New York, Stony Brook, NY 11794 (kgoodell@life.bio.sunysb.edu)

INVASIVE PLANTS DISRUPT POLLINATOR SERVICES THROUGH ALTERING POLLINATOR COMMUNITY COMPOSITION

The most troublesome invasive exotic plants from a conservation perspective are those that alter ecosystem properties or services in ways that affect many native species. One little-studied ecosystem service potentially affected by plant invasions is pollination. By providing floral resources, invasive plants may alter pollinator abundance, composition, or foraging patterns, disrupting pollination of native plants. Using a comparative approach, I investigated the impacts of a widespread, prolifically flowering, invasive plant, Lythrum salicaria, on pollinators and native plant reproduction in invaded and uninvaded calcareous fens in New Jersey. Invasion by L. salicaria did not increase the abundance of flower-visiting insects, but altered the composition of bees. Large bees were more abundant in invaded sites and small bees were more abundant in uninvaded sites. Although most small bees visited L. salicaria flowers, their densities were explained by flower density of native Pentaphylloides floribunda. Reduced density of native flowers combined with competition from large bees on L. salicaria may have reduced small bee densities. Flowers of native plants had lower densities of flower-visitors in invaded than uninvaded sites. Altered composition of the bee community affected flower-visitation patterns of the whole native plant community, and could cause widespread reproductive declines in L. salicaria-invaded areas.

CO7-3 **KARK, SALIT and Daniel Sol** Dept. of Evolution, Systematics and Ecology, The Institute of Life Sciences, The Hebrew University of Jerusalem, Jerusalem 91904, Israel (SK)(salit@cc.huji.ac.il). Center for Ecological Research and Forestry Applications (CREAF) UAB, Universitat de Barcelona 08193 Barcelona, Spain (DS).

BIRD INTRODUCTIONS: PATTERNS OF SUCCESS AND FAILURE ACROSS CONVERGENT CLIMATE REGIONS

How similar are patterns of success and failure of invasive species introduced into regions that share similar climates? Our study addresses this question by using a natural experimental setting focusing on convergent ecosystems. It is often argued that the Mediterranean Basin is resistant to biological invasions due to its long history of human-driven disturbance. However, this hypothesis has never been tested empirically and is in fact contrary to current ecological theory. Applying a general linear mixed model approach, we test the hypothesis by examining the results of bird introductions into the five convergent Mediterranean ecosystems of the world (the Mediterranean Basin, California, Chile, the South African Cape and Australia). Based on a database of 162 introductions generated for this study, we found that birds introduced into the Mediterranean Basin had significantly higher (rather than lower!) success than those introduced into other regions. The conclusion that the Mediterranean Basin is less resistant to avian invaders remains when differences in the origin of the species are statistically controlled for. Given its relatively low resistance to avian invasions, much more attention should be given to prevent introductions into the Mediterranean Basin, since their potential to succeed and become established is very high.

CO7-4 **TROMBULAK, STEPHEN C.** Department of Biology, Middlebury College, Middlebury, VT 05753 (trombulak@middlebury.edu)

CULTURAL AND GEOGRAPHICAL CORRELATES FOR THE ESTABLISHMENT OF EXOTIC GRASSES IN NEW ENGLAND

Strategies to minimize the invasion of landscapes by exotic species benefit from understanding factors that promote species establishment. I used detailed county-level distributional data on the grasses (Family Poaceae) in the six New England states to investigate the influence of several factors on both the absolute and relative numbers of exotic species recorded, including area, latitude, human populations, roads, and land use. New England contains 342 species of grasses, 153 of which are exotic. Number of exotic species correlates directly with human population size and density, amount and density of major roads, and percent agricultural land, and negatively with area and latitude. Proportion of exotic species correlates directly with human population size and density and density of major roads, and negatively with area and latitude. Multiple linear regression analysis reveals that the absolute number of exotic grasses per county was best predicted by human population size and latitude ($P < 0.001$; $r2 = 0.58$) and the relative number of exotic grasses per county was best predicted by area and human population density ($P < 0.001$; $r2 = 0.19$). This analysis shows that a number of factors promote invasibility, including human populations, roads, and changes in land cover.

CO7-5 **LEUNG, GRACE P.C. and Billy C.H. Hau** Department of Ecology & Biodiversity, The University of Hong Kong, Pokfulam Road, Hong Kong SAR, China (h9907349@hkusua.hku.hk)

THE DANGER OF MAN-MADE SLOPES AS INVASION PLATFORMS FOR ALIEN PLANTS IN HONG KONG, CHINA

Urbanization in the hilly topography of Hong Kong has created over 57,000 sizable man-made slopes, some of which are landscaped by ornamental plants. Because of high disturbances and sparse canopy cover, these landscaped slopes are prone to alien plant invasion. This study aimed to find out the factors contributing to alien species invasion on slopes and whether invasive plants on slopes would pose any threats to adjacent natural vegetation. Over half of the 92 surveyed slopes were adjacent to natural forest or shrubland. One to nine alien species in different degree of abundance were recorded on 79 slopes. The two most common species are Mikania micrantha and Panicum maximum. Simple linear correlation and ANOVA tests showed that the mean percentage cover and mean species richness of the invading alien species were significantly higher on slopes with structurally more complex and diverse plant communities. The former was also significantly higher on older slopes. Six of the eight slopes found inside country parks were invaded by alien species. The results suggest that invasive alien species on man-made slopes adjacent to natural vegetation, especially those in country parks, should be controlled to prevent them from becoming the foci of alien plant invasion.

CO7-6 **RATSIMBAZAFY, JONAH, Ravololomanana Noromalala, and Heritiana Ranarivelo** Missouri Botanical Garden, B.P. 3391, 101 Antananarivo, Madagascar (NR); Durrell Wildlife Conservation Trust – Madagascar, B.P. 8511, 101 Antananarivo,Madagascar (JR) Département de Biologie Végétale, Faculté des Sciences, Université d'Antananarivo, Madagascar (HR) (jonah.ratsimbazafy@durrell.org)

THE EFFECTS OF ALIEN PLANT SPECIES AFTER SEVERE FOREST DAMAGE AFTER A CYCLONE AT MANOMBO FOREST, MADAGASCAR

In 2000, a six-month study investigated the effects of alien plant species following cyclone Gretelle in 1997 at Manombo forest, one of the last remaining eastern lowland rainforests in Madagascar. The invasion of non-endemic species due to opening of the canopy altered species diversity and density. Plant inventories indicated that among the 290 species recorded, seven are considered as invasive non-endemic species. Botanical data were collected in six sites (five degraded sites were one undisturbed site). Two transects totaling 12,000 m2 were established at each site to evaluate abundance and frequency of the selected species within different types of forest. Results showed that five alien plant species constitute threats to the Manombo ecosystem. The study of their biology (natural regeneration, seed dispersion, etc.), phenology, and ecological factors (soil analyses, altitude, canopy cover, etc.) allowed us to rank these species from "high threat" to "low threat" as follows: Clidemia hirta (Melastomaceae); Lantana camara (Verbenaceae); Cecropia peltata (Cercopiaceae); Merremia peltata (Convolvulaceae); and Vernonia sp. (Asteraceae). Currently, an ecological team conducts research on the restoration of the altered forest areas at Manombo to prevent the expansion of these species and to facilitate regeneration of endemic species.

CO7-7 **VON HOLLE, BETSY, Erin Largay, David R. Foster, and Glenn Motzkin** Harvard Forest, Harvard University; PO Box 68, Petersham, MA, 01366 (vonholle@fas.harvard.edu) (BVH, DRF, GM) Yale Forestry, Yale University (EL)

DIFFERENTIAL EFFECTS OF NATURAL AND ANTHROPOGENIC DISTURBANCES ON HABITAT INVASIBILITY

Effects of non-native species are a hazard to global biodiversity, second only to habitat destruction. For informed management decisions, we must determine factors that contribute to ecological resistance to biological invasion. Habitat invasibility to plant invaders was investigated in the highly resistant Cape Cod ecosystem through a field survey of native and nonindigenous plant species cover along gradients of current natural and anthropogenic disturbances. We surveyed 100 transects, each containing 3 field plots (20 x 20m) located perpendicular to and 2, 50 and 100 meters from typical anthropogenic (roads, trails and parking lots) and natural (salt spray and wind) disturbances. Nonnative and native species richness and abundance values decreased linearly with distance from current anthropogenic disturbances. Nonnative species richness and abundance values also decreased linearly with distance from natural disturbances, however native species richness and abundance showed a typical intermediate disturbance response, increasing curvilinearly with distance from coastal bluffs. While there was a trend towards higher nonnative species richness in the anthropogenically-disturbed plots, this was statistically nonsignificant. Native and nonnative species clearly have categorically different responses to natural disturbances and similar responses to anthropogenic disturbances, which suggests that these disturbance types mediate habitat invasibility in distinctive ways.

CO7-8 **DILLEY, THOMAS and Judith Antpin** Chicago Metropolitan Initiative Coordinator, U.S.D.A. Forest Service, Northeastern Area, State and Private Forestry, 1033 University Place Suite 360, Evanston IL 60201(tdilley@fs.fed.us)(TD) Public Affairs Specialist, USDA Forest Service11 Campus Blvd., Suire 200 Newtown square, PA 19073

THE CITY OF CHICAGO VS. THE ASIAN LONGHORNED BEETLE: A BLUEPRINT FOR SUCCESSFUL RESPONSE BY LOCAL, STATE AND FEDERAL AUTHORITIES TO AN INVASIVE PEST EMERGENCY IN A MAJOR METROPOLITAN AREA

An examination of the history of invasive tree pest species in the United States over the last several decades makes it clear that urban and well-populated suburban areas are at the highest risk for invasive tree pest emergencies, and that all communities that meet this profile should be prepared to deal with such an event. This study looked at the responses of key stakeholders to questions related to the city of Chicago's battle against the Asian Longhorned Beetle. Interviewees were asked to respond to questions about their perceptions of how the city managed the Asian Longhorned Beetle invasion in Chicago. There were several factors that were identified critical to this successful program but the top ranking issue was Public Outreach and Media ranking at 65 %. From the beginning of the program the ALB team adopted a policy that allowed for large-scale public and media access to information. This gave the public two avenues of consistent reliable information. The core message was that the city, state and federal government were devoting all available resources to the eradication of ALB in Chicago, and that residents would not be saddled with the cost of removal or restoration.

CO8-1 **BAKER, JASON D., Shawn C. Farry, Margaret Akamine, Thea C. Johanos, and Bradley Ryon** Pacific Islands Fisheries Science Ctr, 2570 Dole St., Honolulu, HI, 96822 (jason.baker@noaa.gov)(JDB,TCJ). Department of Land and Natural Resources 1151 Punchbowl St., Rm 330, Honolulu, HI 96813 (SCF). NOAA Fisheries Pacific Islands Regional Office, 1601 Kapiolani Boulevard, Suite 1110, Honolulu, HI 96814 (MA,BR).

POTENTIAL FACTORS INFLUENCING VITAL RATES OF THE ENDANGERED HAWAIIAN MONK SEAL IN THE MAIN HAWAIIAN ISLANDS

The Hawaiian monk seal is the most endangered marine mammal occurring solely within the United States. Approximately 1,300 individuals remain, mostly in the remote Northwestern Hawaiian Islands, where poor juvenile survival threatens to further reduce abundance. A hopeful development is that monk seals appear to be increasing in number and range in the main Hawaiian Islands (MHI), which may eventually sustain viable subpopulations. However, with 1.2 million human residents and over 6 million visitors annually, monk seals face many challenges in the MHI. This study evaluates vital rates of MHI monk seals and identifies factors which may influence population growth. Estimates of survival and reproduction based on scant available data have large confidence intervals and remain fairly uninformative. These estimates will improve if the population grows and research monitoring increases. In the interim, observations suggest several factors that have potential to influence survival or reproduction. These include disturbance by people on Hawaii's public beaches and waters, injury or mortality from fishing hooks, and exposure to feral and domestic animals, which represent potential disease vectors.

CO8-2 **GOODRICH, JOHN and Dale Miquelle** Wildlife Conservation Society/Hornocker Wildlife Institute, 2023 Stadium Drive Suite 1a, Bozeman, MT 59715 (tiger372@yahoo.com)

TRANSLOCATION OF AMUR (SIBERIAN) TIGERS TO ALLEVIATE TIGER-HUMAN CONFLICTS

Amur tiger-human conflicts often cause mortality of this critically endangered species. We have been working with the Russian Ministry of Natural Resources to resolve conflicts in ways that reduce tiger mortality while protecting citizen's welfare. As part of this program, we translocated 4 problem tigers; 2 (Pt43 and Pt57) were released immediately and 2 (Pt51 and Pt52)following 6-12 months rehabilitation. All were equipped with radio-collars and released 150-400 km from their capture site. Two translocations were successful, i.e., the tigers caused no further conflicts, killed natural prey, and survived their first winter. The first was a female (Pt52) who spent 6 months in captivity before release. She established a territory (614 km2) 75 km from her release site, but was poached 1.1 years later. The second was an orphaned cub(Pt57), about 7 months-old, who was moved 300 km from his capture site after he attacked a logger. He survived >10 months when he slipped his radio-collar. Two translocations were unsuccessful. Both animals moved to areas of high human activity and were killed within one month of release. Rehabilitation and translocation are viable alternatives for resolving tiger-human conflicts and are important tools for managing this small population.

CO8-3 **WANG, DAJUN, Ai Chen, Xiaojian Zhu, Hao Wang, and Wenshi Pan** College of Life Science, Peking University, Beijing 100871, PR China (djwang@pku.edu.cn)

HABITAT UTILIZATION OF WILD GIANT PANDA (AILUROPODA MELANOLEUCA)

This istudy on the giant panda (Ailuropoda melanoleuca) habitat. utilization in Qinling Mountains, China, was conducted at an individual level from year 1989 to 1997, during which 22 pandas were radio-tracked and a total of 5,973 locations were pinpointed in the Xinglongling area of Qinling Mountains. The study resulted in new discovery on panda's movements and home range. Seasonal movements of the Qinling pandas are along the elevation grades. The distance of the daily movements vary drastically between individuals, with an average 414m per day of straight moving distance; The size of panda's home ranges differ significantly between sex, with an average home range of 13.66 km2 for males, 7.69km2 for females and 10.62km2 for all individuals. There are two extreme patterns of habitat utilization in the pandas, concentrated pattern and average pattern. Combining the the habitat utilization data and habitat fragmentation analysis, the carrying capacity of the pandas is estimated to be 640 for Qinling Mountains and 2200 for Minshan Mountains. Given the current habitat is protected efficiently, the carrying capacity of the habitat should not be a limiting factor to the growth of the panda population.

CO8-4 **O'BRIEN, TIMOTHY, Alireza Jourabchian, Behzad Ragoshai, and Eric Sanderson** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (TO, ES), (tobrien@wcs.org). I.R. Iran Department of Environment, Pardisan Eco Park, Tehran, Iran (AJ, BR)

POPULATION ASSESSMENTS OF ASIATIC CHEETAH AND THEIR PREY IN THE I.R. IRAN

The Asiatic cheetah's (Acinonyx jubatus) distribution has been reduced to small subpopulations centered on the Kavir Desert of Iran. Local extinctions have occurred over the past 100 years due to persecution of cheetah and elimination of prey, and today cheetahs persist in approximately 10 locations. We used standardized line transects, point counts and camera trap surveys to examine the distribution and abundance of cheetah, their principal prey (gazelle, Urial sheep and wild goat), and other carnivores in five protected areas. Populations of gazelle are very low in the reserves; goitered gazelle were found only in one reserve and jebeer gazelle populations were under 250 in all but one reserve. Lack of gazelle has forced cheetahs to shift to Urial sheep and wild goats as primary prey. Sheep populations were distributed unevenly throughout the mountains of reserves; density ranged from 0.21 – 10.8/km2. Wild goat distributions also were clumped and density ranged from 0.06 – 5.5/km2. Cheetahs were rare everywhere we looked, with estimated minimum densities of one cheetah/2000 km2. Wolf, leopard, and caracal were as uncommon as cheetah, and we suspect persecution of carnivores is widespread. Recovery of Asiatic cheetah will depend on stopping direct killing of cheetahs and recovery of gazelle populations.

CO8-5 **HEINEN, JOEL T.** Florida International University, Department of Environmental Studies, 11200 SW 8 Street, ECS 345, Miami, FL 33199 (heinenj@fiu.edu)

POPULATION STRUCTURE AND A RE-INTRODUCTION PROPOSAL FOR ASIATIC BUFFALO IN NEPAL

Asiatic buffalo (Bubalus arnee) are critically endangered and all known populations are under threat of extirpation due to habitat loss and introgression with domestic stock. The population in Koshi Tappu Wildlife Reserve (southeastern Nepal) has continuously risen since the area was protected in 1976, but there are local threats including flood-related and highway mortality. In addition, some direct killing is known or suspected due to the species' penchant for raiding crops. Here I consider the growth rate, cow/calf ratio, adult sex ratio, and known sources of mortality from 1976 to 2004, and present a proposal for translocation from Koshi Tappu to other areas in lowland Nepal that have suitable habitat, but from which the species was extirpated. The results suggest that, although the population has grown continuously, it cannot be considered viable for both demographic and environmental reasons. Royal Chitwan National Park in the lowlands of central Nepal offers the best single site for reintroduction within the country. Because Koshi Tappu buffalo have not been under predation pressures for 4 decades, consideration must be given to the numbers and ages of animals included in the founder population.

CO8-6 **CARROLL, CARLOS** Klamath Ctr for Conservation Research, Orleans, CA 95556 (carlos@sisqtel.net)

CONTRASTING SCALES OF POPULATION DYNAMICS INFORM RECOVERY STRATEGIES FOR WOLF, LYNX, AND MARTEN IN THE NORTHERN APPALACHIANS REGION

Carnivore populations within the northeastern U.S. and southeastern Canada inhabit island-like forested landscapes that are isolated from subboreal source habitat to the northwest by agricultural and urban landuse. I used a spatially-explicit population model to assess population structure in the region for three species; wolf, lynx, and marten. Although the model predicts that effective dispersal of wolves from extant populations north of the St. Lawrence valley may be unlikely under future landscape conditions, a reintroduction of wolves to Maine would have a high probability of success. Regional population dynamics for lynx are predicted to be dependent on a large source population in eastern Quebec, which drives cycles in peripheral U.S. populations. Marten population dynamics are predicted to be driven by finer-scale demographic patterns determined by the size and location of landscapes dominated by older conifer forest. To identify priority habitat and linkage areas for a multi-species carnivore recovery strategy, I combined the population model results within a multi-criteria site-selection model. The contrasts between the species in the scale of source-sink dynamics and consequent needs for connectivity illustrate the relevance of island biogeographic and metapopulation concepts whereever regional landscape change impacts persistence of area and dispersal-limited species.

CO8-7 **BARRETT, PAUL J** U.S. Fish and Wildlife Service 110 S. Church Street, Suite 3450, Tucson, AZ 85701 (paul_barrett@fws.gov)

ENDANGERED SPECIES RECOVERY PLANNING IN THE 21ST CENTURY: A CASE STUDY USING THE MOUNT GRAHAM RED SQUIRREL (TAMIASCIURUS HUDSONICUS GRAHAMENSIS)

Recovery planning pursuant to the Endangered Species Act has changed significantly in recent years. A case study of the new planning process using the Mount Graham red squirrel (Tamiasciurus hudsonicus grahamensis) is discussed. The subspecies is restricted to approximately 12,000 acres in the Pinaleño Mountains of Graham County, Arizona. Designated an endangered species on 3 June 1987, the listing concluded the squirrel was endangered because its range and habitat has been reduced and threatened by a number of factors, including the proposed construction of an astrophysical observatory, forest fires, road construction and improvement, and recreational development at high elevations. Furthermore, it was thought the squirrel might suffer through competition with the introduced Abert's or tassel-eared squirrel (Sciurus aberti). In 1993, the Mount Graham Red Squirrel Recovery Plan was finalized. However since that time, catastrophic wildfires have emerged as the greatest threat to the subspecies. In 2001, a new recovery team was convened to revise the recovery plan. The team consists of technical experts from a variety of fields as well as stakeholders with interest in the recovery of the squirrel. Plan revision is underway and will follow new guidelines set forth by the Fish and Wildlife Service and National Marine Fisheries Service.

CO8-8 **HOUGHTON, LAWRENCE M., Jonathan B. Cohen, and James D. Fraser** Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (houghton@vt.edu)

PIPING PLOVER POPULATION REGULATION ON A REBUILT BARRIER ISLAND

Conservation of imperiled organisms requires an understanding of the factors that determine species distribution and abundance. To this end, we studied piping plover (Charadrius melodus) population dynamics and regulation on Westhampton Island, New York, in 1993-2003. Piping plovers colonized a portion of the island after storms formed new nesting and foraging habitat. The population grew to apparent carrying capacity, and then declined as nesting habitat decreased due to development and succession. Piping plover nesting densities were greater on beaches adjacent to protected intertidal flats which harbored abundant prey and densities than on beaches in a reference area not adjacent to such flats. Immigration/emigration was the only density-dependent vital rate. These results suggest that piping plover densities are dictated by the richness of local food resources and that, for each specific level of food abundance, the number of pairs supported by an area is dependent upon the amount of nesting habitat present. We recommend habitat management that creates or maintains wide beaches adjacent to tidal flats. This can be accomplished using the same techniques currently used to nourish beaches for property protection. Predator management will be required to allow rapid population growth in, and emigration from, such areas.

CO9-1 **FULLER, T. and Sahotra Sarkar** University of Texas at Austin, 1 University Station, Austin, TX 78712 (tfuller@mail.utexas.edu)

THE MAINTENANCE OF CONNECTIVITY IN CONSERVATION AREA NETWORKS: GRAPH-THEORETIC PROTOCOLS

Maintaining a viable conservation area network (CAN) often requires adding sites to increase connectivity. We use graph-theoretic techniques to find such sites for CANs in the Eastern Himalayas and Ecuador. To identify sites connecting conservation areas, we score each external site based on: (i) the frequency with which a place-prioritization algorithm selects the site and (ii) its distance from other sites. To identify the highest quality paths, we rescore sites using landscape quality models: (i) the inverse distance to anthropogenically-transformed areas; (ii) distance to existing conservation areas; and (iii) the physical length of the path. We report (i) the number of connected components (Ecuador = 20, Himalayas = 1), (ii) the number of edges that may be removed to fragment the network (Ecuador = 0, Himalayas = 14), and (iii) the number of minimum spanning trees, the smallest sets of connections required to link all conservation areas (Ecuador = 183, Himalayas = 1). In Ecuador, the number of such trees depends on the coarseness of the landscape quality model, ranging from 2 to 183 ($p < 0.001$). Paths connecting conservation areas contain 83 percent fewer sites than the conservation areas in Ecuador but 37 percent more sites in the Himalayas.

CO9-2 **LINDBORG, REGINA and Ove Eriksson** Department of Botany, Stockholm University, SE-106 91 Stockholm, Sweden (regina.lindborg@botan.su.se)

HISTORICAL LANDSCAPE CONNECTIVITY DETERMINES PRESENT PLANT SPECIES DIVERSITY

Transformation of landscapes is considered as one of the main drivers behind species loss, regionally and globally. Theory and empirical studies suggest that landscape structure influences species diversity in many habitats. These effects may be manifested at different spatial scales depending on species response to landscape heterogeneity. A similar, but often neglected, scaling issue concerns the temporal scale of species response to landscape change. In this study we found time-lags of 50-100 years in the response of plant species diversity to changing configuration of habitats in the landscape. When analysing remnants of traditionally managed semi-natural grasslands in Sweden, we found that species diversity was not related to present-day connectivity of the investigated sites, irrespective of spatial scale (3.1 to 12.5 square kilometers). When using maps depicting landscapes 50 and 100 years BP, respectively, strong positive effects of habitat connectivity appeared, at increasing spatial scale for the older landscapes. Analyses of how species diversity relates to present-day landscapes may thus be misleading, and future species loss is expected even if the present landscape is maintained, with implications for development of guiding principles and programmes for conservation.

CO9-3 **MUELLER, THOMAS, Kirk A. Olson, Peter Leimgruber, Todd K. Fuller, Martyn G. Murray, and George B. Schaller** Smithsonian National Zoological Park,Conservation and Research Center, Front Royal, VA 22630 (muellert@crc.si.edu). (TM, PL) Department of Natural Resources Conservation, 160 Holdsworth Way, University of Massachusetts, Amherst, MA 01003 (KAO, TKF). Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (GBS). Institute of Cell, Animal and Population Biology, Ashworth Laboratories, University of Edinburgh, West Mains Road, Edinburgh, EH93JT, UK, (MGM)

MAPPING SEASONAL HABITAT USE OF MIGRATING MONGOLIAN GAZELLES USING SATELLITE-BASED BIOMASS ESTIMATES

Mongolian gazelles (Procapra gutturosa) are nomadic migrants ranging throughout the Mongolian steppe, the largest intact temperate grassland in the world. This adaptation to changing pasture conditions extends well beyond the current protected area system previously established without knowledge on gazelle habitat use and requirements. We hypothesized that seasonal gazelle movements are driven by search for food and related biomass productivity. To test this hypothesis, from 2000 to 2002 we drove four long distance line transects in Mongolia's Eastern Steppes during spring and fall. We combined field data on gazelle distribution and biomass, with Normalized Difference Vegetation Index (NDVI) data. NDVI was calculated using MODIS (Moderate Resolution Imaging Spectroradiometer) data, a sensor onboard the Terra satellite. Biomass indices measured were positively correlated with MODIS NDVI measurements. Gazelle habitat use was primarily restricted to a specific NDVI range. Areas with lower NDVI and low biomass productivity were occupied less than expected by chance. Habitat associations were stronger in the fall than in the spring when food resources begin to decrease in quality. The predictive power of our model was validated and tested with locations of known individuals. Large-scale spatial dynamics and pasture quality are important considerations for reserve design and conservation efforts.

CO9-4 **NILES, LAWRENCE, Peter Winkler, Richard Lathrop, Kathleen Clark, Michael Valent, David Jenkins, Amanda Dey, Gretchen Fowles, Kimberly Korth, Colleen Hatfield, and Joanna Burger** NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625 (larry.niles@dep.state.nj.us) NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625 Rutgers University, New Brunswick, NJ USA 08960 NJ Division of Fish and Wildlife, P.O Box 400, Trenton, NJ 08625

A STATEWIDE PATCH BASED MAPPING SYSTEM OF RARE SPECIES HABITAT

Protection of biodiversity relies on accurate and defensible mapping of important habitat. State based habitat mapping is used for land acquisition, land use regulation, public lands management and resource allocation. Previous rare species mapping in NJ used species locations with buffers. These maps underestimated suitable habitat of species with large home ranges, meta-populations and minimum area requirements. These maps were also flawed because the coarse buffers included 71.4% unsuitable habitat. We created new mapping that applied literature based patch definition criterion to land cover mapping and used animal sightings to value each defined patch. The five-tiered system ranked habitat of over two hundred species. All protocols were developed literately with the help of a peer review group. The original location map valued 28.9%, 12.4% and 34.1% of the state's forest, farms and wetlands respectively while the patch based map valued 71.0%, 38.9% and 68.3% respectively. A second version of the map, released this year incorporated 2000 more E/T sightings and modified protocols for several species but increased the area valued by only 1.4%. By outlining important patches our map can be widely released without endangering individuals thus providing a useful tool for planners to help avoid land development conflicts.

CO9-5 **PYARE, SANJAY and Winston P. Smith** Denver Zoological Foundation, 1650 Hole in the Wall Rd, Potomac MT 59823 (sanjay_pyare@hotmail.com) (SP) Pacific Northwest Research Station, Forestry Science Laboratory, Juneau, AK 99801-8545 (WS)

ANIMAL HOMING AS A CONSERVATION TOOL TO UNDERSTAND FUNCTIONAL HABITAT CONNECTIVITY: THE FLYING SQUIRREL IN SOUTHEAST ALASKA AS A CASE STUDY

Models of habitat connectivity are rarely parameterized and/or validated with data on animal movements in real landscapes. In field conditions, these data are typically difficult to collect and/or are not collected in a way that can adequately inform models and/or support decision-making. Some species, however, exhibit homing when displaced and resulting movement patterns in fragmented landscapes yield data about the permeability and functional connectivity among different landscape elements encountered. In our case study involving northern flying squirrels Glaucomys sabrinus in the Tongass National Forest, Southeast Alaska, replicable homing trials suggested different movement capabilities and movement rates among the dominant elements in this intensively managed landscape: old-growth forest patches, 25-40-yr second growth patches, and clearcuts. These data in turn are critical to the development and validation of spatially explicit models of functional habitat connectivity in Tongass landscapes. We review biases associated with the use of homing and we also review the homing capabilities of many vertebrates – from large carnivores to amphibians, birds, and small mammals – as opportunities to generate and test predictions about functional habitat connectivity at various scales.

CO9-6 **ŞEKERCIOĞLU, ÇAĞAN HAKKI, Gretchen C. Daily, Paul R. Ehrlich, Scott Loarie, and Viviana Ruiz-Gutierrez** Stanford University Center for Conservation Biology, (cagan@stanford.edu) (CHS, GCD, PRE, SL); Universidad Nacional de Costa Rica, Costa Rica (VRG)

SURVIVAL OF TROPICAL FOREST BIRDS IN ARGICULTURAL COUNTRYSIDE

We used radio telemetry to study habitat use, movements, and home ranges of three bird species found in forest and agricultural habitats of southern Costa Rica. We obtained 8120 locations from Turdus assimilis (n = 37), Tangara icterocephala (n = 61), and Catharus aurantiirostris (n = 58), species ranked from most to least forest-dependent. Home range size and movement distance were positively correlated with forest dependence. T. assimilis and T. icterocephala preferred forest fragments, riparian strips and remnant trees, mostly avoided coffee plantations, and moved frequently between suitable habitat patches. Remnant trees and riparian strips covered 1.4% and 4.6% of the land area, respectively, but they made up 9%-49% of T. assimilis and T. icterocephala home ranges, and were especially important in dry season (25%-49%). C. aurantiirostris, an edge/second growth species, was highly sedentary, opportunistic in its habitat preference in wet season, and preferred second growth in dry season. In dry season, home range size for C. aurantiirostris and T. icterocephala increased and for T. assimilis, decreased. Native habitat patches were cooler, more humid, had reduced microclimatic fluctuations, and increased in importance during dry season. Remnant forest patches in countryside provide crucial resources for birds that evolved in forest, but now have to live in an increasingly deforested landscape. Active management of tropical human-dominated ecosystems can significantly increase their capacity to support native bird species.

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HABITAT REQUIREMENTS FOR TIGERS IN A LANDSCAPE: IMPLICATIONS FOR RESERVE DESIGN AND CORRIDORS

Habitat degradation, fragmentation, and human disturbance have restricted tigers (Panthera tigris) to small isolated reserves throughout most of their range. Previous studies indicate a network of suitable corridors connecting metapopulations increases long-term viability. This study recorded tiger presence/absence in Nepal and relate it to habitat variables, prey abundance, human disturbance, and level of land protection to identify information needed to restore degraded habitats and create habitat corridors. Tiger presence and breeding status were determined from sign recorded while quantifying habitat variables in plots across southern lowland forests. Estimates of prey abundance and human disturbance were obtained in the same areas. Data from 744 plots in breeding (271), dispersal (314), and apparently unused (159) habitats were compared. Breeding habitat had high prey abundance and was primarily in protected areas. Tiger sign was recorded from highly degraded habitat with frequent human disturbance indicating dispersal corridors do not have to be prime habitat. Dispersing tigers always used forest cover but often it was highly degraded. Finally, all dispersal habitats were connected to source populations in parks and reserves. Our results indicate forest restoration and management will enhance tiger survival and we provide guidelines for these conservation efforts.

CO9-8 **STREVENS, TANYA and Rob Whelan** Institute for Conservation Biology and Law, School of Biological Sciences, University of Wollongong, NSW 2522, Australia (tcs96@uow.edu.au)

POWERLINE EASEMENTS: THE SCALE OF LANDSCAPE DISSECTION IN COASTAL NEW SOUTH WALES, AUSTRALIA

In eastern Australia, the majority of the human population inhabits coastal regions, so this is where electricity requirement and its associated infrastructure is greatest. The area has a wide variety of threatened animal species and habitats. Powerline easements transect the various habitats in the region. Despite concern about habitat barriers and edge effects, there has been no study in Australia of the total area and location of easements, and therefore potential for disruption of ecological processes. We are using GIS to map the easements in a 5,510km2 region of coastal, south-eastern Australia against layers of environmental data. Of the 199km of 132KV and 330KV easements through national park, state forest and crown lands analysed so far, 1,413ha of forest and woodland habitat has been replaced by easement. With an edge effect of 400m, this would represent 7,960ha of habitat affected. In this part of the region, national parks dominate and there are few easements. The coastal portion contains most of the urban settlement and easements, and significant National Park, State Forest and other natural habitat areas. Ongoing data collection will quantify the magnitude of powerline easement effects across this whole region.

CO10-1 **VIDYA, T.N.C., Prithiviraj Fernando, Don J. Melnick, and Raman Sukumar** Center for Ecological Sciences, Indian Institute of Science, Bangalore 560 012, India (tncvidya@ces.iisc.ernet.in) (TV, RS), Center for Environmental Research and Conservation, Columbia University, 1200 Amsterdam Avenue, New York, NY 10027 (PF, DJM), Department of Ecology, Evolution and Environmental Biology, Columbia University (DJM).

MOLECULAR GENETIC STRUCTURE AND CONSERVATION OF ASIAN ELEPHANT (ELEPHAS MAXIMUS) POPULATIONS IN INDIA

India holds over half the global Asian elephant (Elephas maximus) population, distributed in four geographic areas, southern, central, northern, and northeastern India. Elephants habitat covers approximately one sixth of the total forest area in India, and this, along with the long, complex association between humans and elephants, makes the elephant an ideal flagship and umbrella species for conservation. We examine the population genetic structure of elephants across India by non-invasively sampling animals and amplifying mitochondrial and nuclear microsatellite DNA markers, and discuss the relevance of the findings for their management. Populations in India show overall low mitochondrial diversity and typical levels of microsatellite diversity. Analyses of molecular variance, with both mitochondrial and microsatellite DNA, group southern and central India together, and north and northeastern India together. However, there is sub-structuring within the central-southern group, while the northern and northeastern populations are not differentiated from each other, reflecting the past continuum in habitat. Analyses at a finer spatial scale reveal a possible biogeographic barrier in southern India and evidence of female philopatry and male-mediated gene flow in northeastern India. We discuss the implications of these results for defining population units for conservation.

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PHYLOGEOGRAPHY AND CONSERVATION OF THE ASIAN ELEPHANT

The Asian elephant is recognized as an endangered species and is one of the main flagship species for conservation over much of Asia. It is currently found in 13 states in South and South-east Asia, including the mainland and the islands of Sri Lanka, Sumatra and Borneo. We sequenced a 600 bp fragment of the mitochondrial DNA including the hypervariable left domain of the D-loop for over 750 samples of Asian elephants from across the range (representing all the range country states except China). Our analysis demonstrated a complex evolutionary history for Asian elephants, suggesting repeated isolation in the south during Pleistocene glacial maxima and range expansion and re-colonization during inter-glacial periods. Bornean and Sumatran elephants appear to have been isolated for an extended period of time in their respective islands, and represent separate Evolutionarily Significant Units. Sri Lanka appears to have had more recent genetic exchange via a land-bridge connection with the mainland. The large number of haplotypes found in Sri Lanka as well as the divergence between Sri Lankan and South Indian populations, argue against an anthropogenic cause for the genetic structure observed in Sri Lanka.

CO10-3 **WHITEMAN, NOAH KERNESS and Patricia G. Parker** Department of Biology and International Center for Tropical Ecology, 223 Research Building, 8001 Natural Bridge Road, University of Missouri-St. Louis, St. Louis, Missouri 63121 (nkwf38@studentmail.umsl.edu)

HOST-PARASITE CONSERVATION GENETICS IN THE GALAPAGOS ISLANDS: PRAGMATIC VALUE OF THE FORGOTTEN BOUNTY

Although the fate of host-specific ectoparasites is linked to that of their vertebrate host's, only one of the 5,000 known louse (Phthiraptera) species is on the IUCN's Red List. Here, we offer a novel rationale for parasite conservation. Understanding the historical and contemporary relationships among fragmented vertebrate populations is of paramount importance to managers. Unfortunately, low genetic variability in these taxa often obscures our view of evolutionary processes and patterns. However, generally, molecular evolution and the coalescent process proceed more rapidly in parasites than their hosts. If parasites behave like vertically transmitted alleles, their genealogies can be used to trace the host's evolutionary history. We examined patterns of mtDNA divergence among nine island populations of three phylogenetically independent ectoparasite species of the endangered Galapagos Hawk (Buteo galapagoensis). The parasites differ in their population sizes, host specificity and mobility, and thus in their power as inferential tools. Generally, we found that much more population genetic structure was present in the mtDNA of the parasites relative to the host, to varying degrees. Thus, we have: (1) demonstrated the utility of using parasite genealogies in illuminating host history, and 2) buttressed arguments for parasite conservation by revealing cryptic genetic diversity among their populations.

CO10-4 **KIM, MICHAEL H., Candace A. Scott, Juan Carlos Morales, Don J. Melnick, Peter Erb, Colleen O'Ryan, Peter T. Boag, and Peter J. van Coeverden de Groot** Dept. of Biology, Queen's University, Kingston, ON, K7L 3N6, Canada (MHK, CAS, PTB and PJVCDG) (mikekim@biology.queensu.ca); Center for Environmental Research and Conservation, Columbia University, 10027-5557, New York, NY (JCM, DJM); Etosha National Park, Ministry of Environment and Tourism, Namibia (PE); Dept. of Biochemistry, University of Cape Town, Rondebosch, 7700, South Africa (CO)

POPULATION GENETICS OF THE BLACK RHINOCEROS (DICEROS BICORNIS) IN ETOSHA NATIONAL PARK

Widespread poaching throughout the latter half of the 20th century has led to a marked decline in black rhinoceros (Diceros bicornis) populations; however, some populations of these animals have begun to recover. The largest endemic population of black rhinos are the D.b. bicornis of Etosha National Park, Namibia (N=~450). To assist in the conservation of this population we: 1) characterize microsatellite variability in Etosha National Park and 2) determine if genetic structure exists within this semi-arid 22,270-km2 park. We determined microsatellite polymorphism at 9 dinucleotide loci for 126 individuals. Observed heterozygosity (Ho=0.415) was lower than expected (He=0.464), and lower than previously published reports found in D.b. minor and D.b. michaeli subspecies. In a fixed model analysis using 7 aggregates of individuals, we found some groups were genetically valid, contradicting previous observations that individuals are solitary. For example, individuals sampled from groups 2, 3 and 4 were assigned correctly; however, individuals sampled from putative groups 1, 5, 6 and 7 were not assigned to their subpopulation of origin. Thus, we conclude that 1) a lower amount of genetic variability exists in individuals found in Etosha National Park compared to other subspecies and 2) population genetic structure exists for some clusters assessed.

CO10-5 **OHNISHI, NAOKI, Takashi Saitoh, Yasuyuki Ishibashi, Eiji Kitahara, Hiroki Kanamori, Nobusuke Nishi, and Toru Oi** Kansai Research Center, Forestry and Forest Products Research Institute, Kyoto, 612-0855, Japan (NO, TO) (bigwest@affrc.go.jp), Field Science Center, Hokkaido University, Sapporo, 060-0811, Japan (TS), Hokkaido Research Center, Forestry and Forest Products Research Institute, Sapporo, 062-8516, Japan (YI), Forestry and Forest Products Research Institute, Tsukuba, 305-8687, Japan (EK), Mountainous Region Research Center, Akagi-town, 690-3405, Japan (HK), Tottori Prefecture Forest Experiment Station, Kawara-town, 680-1203, Japan (NN).

POPULATION GENETIC STRUCTURES OF THE ASIAN BLACK BEAR IN JAPAN: A COMPARISON AMONG ISOLATED POPULATIONS AND CONTINUED POPULATIONS

To clarify the degree of gene flow between isolated populations of the Asian Black Bear Ursus thibetanus in western Japan, we compared the genetic structures among four local populations in western and one in central Japan. The characteristics of analyzed populations are as follows, from west to east: Western-Chugoku, Eastern-Chugoku and Western-Northern-Kinki are isolated populations; Eastern-Northern-Kinki is adjacent to W.-N.-Kinki, bounded by a river, and is thought to belong to the western edge of a large population in the middle of Japan; Niigata separates from E.-N.-Kinki by over 300 km and is considered a part of the large central population. DNA was extracted from cells of the bears captured mainly for pest control between 1991 and 2002. Analyzed samples of each population numbered between 34 and 72. Genotypes of nine microsatellite loci of each individual were decided. The averages of allele number and expected heterozygosity were highest in Niigata, followed by E.-N.-Kinki, and lowest in E.-Chugoku. Genetic distances between W.-Chugoku, E.-Chugoku and W.-N.-Kinki were higher than that between E.-N.-Kinki and Niigata, despite being geographically more distant. We concluded that gene flow among the three western populations was rare, and the influence of isolation was especially strong in E.-Chugoku.

CO10-6 **RUDNICK, JAMIE T., Katzner, E. Bragin, O.E. Rhodes, Jr., and J.A. Dewoody** Dept. of Forestry & Natural Resources, Purdue University, 195 Marsteller St., West Lafayette, IN 47907 (jrudnick@fnr.purdue.edu) (JR, OER, JAD); Dept. of Environmental Science & Technology, Imperial College - South Kensington Campus, Exhibition Road, London, SW7 2AZ, UK (TK).

NON-INVASIVE MONITORING OF AN IMPERIAL EAGLE POPULATION IN KAZAKHSTAN

The Naurzum Zapovednik (National Nature Reserve) in Kazakhstan supports a large and unusually diverse community of breeding raptors. Included in this taxonomic assemblage is the Imperial Eagle (Aquila heliaca), a species of conservation concern due primarily to habitat loss and resultant population declines. Unfortunately, eagle populations can be difficult to monitor because of practical limitations associated with conventional mark/recapture techniques. Recently, molecular genetic analyses of non-invasively collected biological samples (e.g., feces or shed hair) have revolutionized conservation efforts. We used non-invasive feather sampling and a suite of highly variable genetic markers (microsatellites) to monitor three ecological factors relevant to the conservation of an Imperial Eagle population in the Naurzum Zapovednik. First, the stability of the breeding population was determined by monitoring the presence of genetically identified individuals over time. Second, territory fidelity was quantified by genetically identifying the individual adults that occupied given territories each breeding season. Third, we determined whether or not juvenile (2-3 yrs old) Imperial Eagles sampled in the Naurzum Zapovednik actually hatched there--that is, we tested the degree of natal philopatry. Collectively, our results will be used to help make sound management decisions for future eagle conservation efforts.

CO10-7 **PERGAMS, OLIVER R. W. and Robert C. Lacy** Dept. of Conservation Biology and The Nature Conservancy Smith Fellows Program, Chicago Zoological Society, Brookfield, IL 60513 (olpergam@brookfieldzoo.org) (ORWP). Dept. of Conservation Biology, Chicago Zoological Society, Brookfield, IL 60513 (RCL).

100 YEARS OF GENETIC VARIATION IN A WILD MOUSE POPULATION QUANTIFIED USING MUSEUM DNA

This work is part of the genetic component of an ongoing project testing the effects of captive breeding programs. Founders of northern white-footed mice (Peromyscus leucopus noveboracensis) from Volo Bog (IL, USA) are being bred in three treatments: minimization of inbreeding, selection for docility, and random. Genetic, developmental, endocrine, and morphometric effects of these treatments will be measured and compared to the wild population. This will help determine whether captive-bred stocks are suitable for release in restoration programs, and help test whether current strategies used in captive breeding programs for conservation maintain animals that are as evolutionarily fit as possible. To quantify the baseline amount of genetic variation existing in the wild population, we are sequencing mitochondrial DNA D-loop from 58 museum specimens collected 1903-1976 at Volo Bog, as well as 35 mice recently caught there. Preliminary results (as of 2/3/04) show 11 haplotypes among 56 museum specimens, with overall haplotype diversity of 0.514. Dividing museum specimens into three time periods, we find haplotype diversities of 0.829 in 1903-1906 (N = 15), 0.520 in 1928-1945 (29), and 0.467 in 1974-1976 (12). Sequencing of recently-caught mice will determine whether this monotonic decrease in genetic diversity has persisted.

CO10-8 **MCFADDEN, KATHERINE W., Matthew E. Gompper, and Juan Carlos Morales** Center for Environmental Research and Conservation, 1200 Amsterdam Avenue, Columbia University, NY, NY 10027 (kwm6@columbia.edu) (KM and JCM). Department of Fisheries and Wildlife Sciences, 302 Anheuser-Busch Natural Resources Building, University of Missouri, Columbia, MO 65211 (MG).

THE GENETIC STRUCTURE OF THE ENDANGERED DWARF CARNIVORES (NASUA NELSONI AND PROCYON PYGMAEUS) OF COZUMEL ISLAND, MEXICO

This study uses phylogenetic methods to investigate the origin and evolutionary relationships of two endangered carnivores, the dwarf coati and pygmy raccoon, endemic to Cozumel Island, Mexico. Based on morphological analyses, previous studies suggest the pygmy raccoon is a unique species while the dwarf coati may be a subspecies of their mainland conspecifics. An analysis of mitochondrial (mtDNA) and nuclear (nDNA) DNA was used in order to infer patterns of speciation. The mtDNA suggest that island coatis are marginally distinct from their mainland sister taxa and mainland and island raccoons seem more closely related. Nuclear data suggests that the island raccoon seems to be distinguished from its mainland conspecifics while the island coati is not. These incongruencies likely stem from incomplete lineage sorting, coupled with an evolutionary radiation within a short period relative to the time that has elapsed since this divergence took place. The average sequence divergence between island and Yucatan coatis and raccoons was approximately .051% and .054%, respectively. Based on estimates of nucleotide substitution rates for carnivores, this data indicates that both island forms are recent introductions to Cozumel (i.e. in the last 25-54,000), and were likely present on the island well before the Mayans populated this region.

CO11-1 **CLARK, J. ALAN** University of Washington, Department of Biology, Box 351800, Seattle, WA 98195-1800 (alanc@u.washington.edu)

A DOUBLE EDGE TO ENVIRONMENTAL CITIZEN SUITS?

Citizen suits give authority to private individuals and organizations to sue parties violating the law and governmental agencies failing to implement the law. Citizen suits have been a bulwark of successful environmental activism in the U.S. for the past 30 years. But these suits may be having increasingly negative unintended consequences. Following inclusion of the first environmental citizen suit provision in the Clean Air Act of 1970, the U.S. Congress enacted nearly 20 additional environmental laws that authorize citizen suits. Since the first environmental citizen suit in 1974, these legal provisions have constituted an important component of many major advances made in environmental protection. Over time, most large environmental organizations have decreased their use of citizen suits. But a small number of recently organized, legal-oriented environmental groups are filing increasingly larger numbers of citizen suits each year. Given this growing number of citizen suits, an increasing percentage of implementing agencies' discretionary budgets must be dedicated to defending themselves against this growing tide. As a perverse consequence, these agencies have less available resources to implement environmental laws, often resulting in the filing of additional citizen suits. This raises the uneasy question of whether more litigation necessarily leads to better environmental outcomes.

CO11-2 **GOLDSTEIN, BRUCE EVAN** Department of Urban Affairs and Planning, Virginia Tech, Blacksburg, VA 24060 (brugo@vt.edu)

DUELING VISIONS OF SCIENCE AND SOCIETY WITHIN A HABITAT CONSERVATION PLAN

My paper explores what was at stake when a committee of conservation biologists were unable to find common ground on a multispecies preserve for a habitat conservation plan (HCP). I filmed and observed the two factions of biologists on this committee for two years, supplementing these observations with interviews and documentary evidence. I found that the preserve design approach of each biological faction was predicated on assumptions about their ability to predict the state of nature and society over the duration of the plan as well as assumptions about their criteria for evaluating scientific claims. I suggest that what was at stake in this dispute was the biologists' ability to set into motion an organizational structure and institutional dynamic that was compatible with their differing forms of scientific practice. Their resistance to each other's preserve design proposals was founded on this tension, since by performing science in the manner that they considered to be credible each side unwittingly posed a threat to their counterparts' scientific practice and organizational and institutional expectations. This initiated a fierce resistance, a rivalry in the co-production of science and society.

CO11-3 **MANOLIS, JAMES C., Thomas R. Crow, David C. Zumeta, and Keith M. Wendt** Minnesota Department of Natural Resources and David H. Smith Conservation Research Fellowship Program, 500 Lafayette Rd. St. Paul, MN 55155 (jim.manolis@dnr.state.mn.us) (JCM). USDA Forest Service, 1601 North Kent Street, Arlington, VA 22209 (TRC). Minnesota Forest Resources Council, 2003 Upper Buford Circle, St. Paul, MN 55108 (DCZ). Minnesota Department of Natural Resources, 500 Lafayette Rd. St. Paul, MN 55155 (KMW).

COLLABORATIVE SCIENCE TO ADDRESS CONTENTIOUS ISSUES: A CASE STUDY OF THE MINNESOTA FOREST SPATIAL ANALYSIS PROJECT

“Collaborative Science” is an emerging approach to addressing contentious conservation issues, where both scientists and stakeholders collaborate throughout the life of scientific assessments. While increasingly common, the approach is poorly understood. Furthermore, few guidelines exist on how to successfully develop such collaborations. We provide a case study of one project to highlight findings that could be applied to other projects. Born out of controversial biodiversity concerns, the Minnesota Forest Spatial Analysis Project was a unique, 3-year collaboration of scientists, stakeholders, and managers. The project focused on improving understanding of spatial pattern change and management implications in northern Minnesota forests. Results are now beginning to influence forest management. Key process lessons were: 1) Controversy can provide an opportunity for mutual learning among stakeholders; 2) Involving stakeholders in study formulation can help build trust, particularly if compromises are made in study plans to meet different interests; 3) Substantial time and commitment to developing communications materials is essential; 4) To explain complex concepts to non-scientists, some loss of precision in terminology is often necessary; and 5) Cultivating support of key leaders is critical. With the right ingredients in place, such efforts can build a foundation for better integrating conservation science, management, and policy.

CO11-4 **PFAB, MICHÈLE F.** Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, P.O. Box 8769, Johannesburg, 2000, Gauteng, South Africa (MicheleP@gpg.gov.za)

CONSERVATION POLICY IN THE URBAN ENVIRONMENT OF GAUTENG, SOUTH AFRICA

Experience within a governmental conservation authority suggests that the only way of contributing towards successful conservation of biodiversity in the urban environment of South Africa is through the development and eventual legislation of scientifically based policy. This paper describes two conservation policies developed for Gauteng, a rapidly urbanizing province and the economic center of South Africa. A Red Data plant policy, based on a priority ranking scheme and IUCN assessments of threatened plant species and supported by principles of population and conservation biology, landscape ecology and island biogeography theory, establishes guidelines for environmental impact evaluations, with the ultimate objective of promoting the in situ conservation of threatened plant populations. Development guidelines for the protection of the ridges of Gauteng are contained in a second policy motivated by the rarity and conservation value of these topographic features, delineated using a digital elevation model and classified into sensitivity classes based on the level of existing transformation. Development guidelines range from a strict no-go development policy for the most pristine ridges to the protection of ecologically viable open spaces on the most urbanized ridges. Implementation of these policies will be demonstrated by means of relevant case studies.

CO11-5 **STENBERG, KATHRYN** Quailcroft Environmental Services, 23022 SE 48th St., Sammamish, WA 98075 (quailcroft@comcast.net)

SCIENCE AND POLITICS: WILDLIFE CONSERVATION AT THE LOCAL LEVEL

Effective urban wildlife management is a balancing act between science, politics, and educational efforts. Wildlife habitat protection at the local level can be successful only by forging cooperative relationships between agencies and constituencies. Local governments directly affect the quality and quantity of wildlife habitats within their boundaries through activities such as zoning, parks and open space acquisition and management, incentive programs to slow residential conversions, stormwater management, transportation planning, and educational programs. The award-winning King County Wildlife Program was established in response to citizens' concerns about the loss of wildlife and habitat. The Program worked for over a decade in setting policy direction, and developing growth management strategies, incentives, and regulations to protect wildlife habitats. A habitat network was developed in conjunction with development regulations and open space acquisition plans and coordinated with adjacent cities and counties to ensure that habitat protection was consistent across jurisdictional boundaries. Linking science and politics with educational programs proved to be a winning combination for wildlife conservation in the urbanizing environments surrounding Seattle, Washington. This unique program may serve as a model for other local jurisdictions in their efforts to integrate the needs of wildlife with the interests of private landowners.

CO11-6 **KREMEN, CLAIRE** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ, (ckremen@princeton.edu)

MANAGING ECOSYSTEM SERVICES: WHAT DO WE NEED TO KNOW?

Ecosystem services are critical to human survival. Recent work enumerates and values ecosystem services at a large scale, but few studies examine the ecology of ecosystem services. Little information exists, therefore, to guide plans for their conservation and management. I suggest that five avenues of ecological research are critically needed to provide the incentives and information for conserving and managing ecosystem services. These are to determine: (1) the species or other entities that are key “ecosystem service providers”, (2) the relative importance of each provider, (3) the relationship between biodiversity and ecosystem function/service, (4) the ecological factors that influence the distribution, abundance and persistence of ecosystem services and their providers in the landscape over time, and (5) the spatial scale over which providers and services operate. While many of these topics are studied singly, there are few systems that embrace them all and then apply this ecological knowledge in the economic and policy arena. I describe a case study on pollination services in California to show how this integrated approach can be used to devise management protocols, assess economic values under different management scenarios, and develop policies to stimulate the conservation and management of ecosystem services.

CO12-1 **KOH, LIAN PIN and Navjot S. Sodhi** Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543, Republic of Singapore (LPK, NSS); (dbsklp@nus.edu.sg) (LPK).

IMPORTANCE OF RESERVES, FRAGMENTS AND PARKS FOR BUTTERFLY CONSERVATION IN A TROPICAL URBAN LANDSCAPE

We assessed the effectiveness of forest reserves (i.e., protected secondary and primary forests), fragments (i.e., scattered ruderal vegetation) and urban parks (i.e., revegetated habitats) in conserving butterfly diversity in a highly urbanized tropical landscape (i.e., Singapore). We also investigated how environmental factors (e.g., canopy cover) and ecological traits (e.g., larval hostplant specificity) affected the distribution of butterflies. Further, we examined the important determinants (e.g., area) of butterfly diversity in urban parks. Rarefaction analysis showed that forest reserves had the highest number of species, number of unique species, density of species and community evenness among the habitats. Forest reserves and urban parks adjoining forests collectively accounted for 91% of all butterfly species recorded in this study. Ordination analysis revealed that different butterfly species responded differently to environmental factors (e.g., canopy cover). Classification tree analysis indicated that butterfly communities of different habitats (e.g., forests, urban parks) have distinct ecological traits (e.g., hostplant specificity). Regression analysis showed that the number of potential larval hostplant species and isolation from forests were important determinants of butterfly species richness in urban parks. We conclude that butterfly conservation strategies in urban tropical landscapes should aim to protect the least disturbed natural habitat, while creating well-designed urban parks.

CO12-2 **KEMPER, J. TODD and S. Ellen Macdonald** Department of Renewable Resources, 751 General Services Building, University of Alberta, Emdonton, Alberta, Canada, T6G 2H1 (todd.kemper@ualberta.ca)

SHORT AND LONG TERM EFFECTS OF WINTER SEISMIC EXPLORATION ON THE PLANT COMMUNITIES OF A LOW ARCTIC MIGRATORY BIRD SANCTUARY

The Kendall Island Migratory Bird Sanctuary is a 626km2) refuge on the Arctic Coastal Plain of western Canada. Oil and gas exploration has occurred within the sanctuary since the late 1960s and a total of ~1500km of seismic lines have accumulated in this time. The impacts of winter seismic exploration on low arctic vegetation have previously been thought to be short-term and mainly aesthetic. Here we present results from two years of field study in which we sampled plant communities and permafrost along recent (≤3yrs) and older (18-33yrs) seismic lines. Results suggest that different communities respond uniquely to disturbance and that the pre-disturbance plant community is a predictor of resistance. In mesic upland habitats vascular plant, lichen, and bryophyte cover was reduced by recent seismic vehicle passage. Delta wetland habitats were less affected but still experienced decreases in vascular plant cover and shrub height. In mesic uplands, 18-33 year old seismic lines remain visible and have altered community composition, with greater coverage of deciduous shrubs than adjacent undisturbed tundra. The results suggest that while most communities will eventually experience functional recovery, the complete recovery of natural vegetation communities following exploration is unlikely in some cases.

CO12-3 **OLUPOT, WILLIAM** Institute of Tropical Forest Conservation, P.O.Box 44, Kabale-Uganda (wolupot@yahoo.com)

EDGE-RELATED VARIATION IN “USEFUL” WILD PLANTS IN BWINDI IMPENETRABLE NATIONAL PARK, UGANDA

Afromontane forests of the Albertine Rift region are of global conservation importance due to high levels of biodiversity. However, these forests are also situated in some of the most densely populated areas in rural Africa. As a result of forest loss, the protected areas are now fragmented islands, surrounded by rural farmlands and settlements. The remaining forests have therefore become a focus of a variety of conservation strategies. An emerging strategy is permitting communities limited access to harvest non-timber forest products in designated zones within the protected area. Although always adjacent to the edge, such management zones are demarcated without prior consideration of edge-related variation in the resources identified for multiple use. I examined the effect of an abrupt edge on plants commonly used by communities living around Bwindi Impenetrable National Park. Of the 91 species studied, 14% increased with distance from the edge, 49% decreased, 33% showed no edge-interior trends, and 4% were rare and showed no clear edge-related response. 38 species under multiple-use agreements showed similar patterns. This suggests that patterns in resource distribution can be used to delineate zone width. I argue that effective zoning for collaborative management must incorporate an understanding of edge-interior trends in resource abundance.

CO12-4 **GILLESPIE, THOMAS R. and Colin A. Chapman** Department of Zoology, University of Florida, Gainesville, FL 32611 (TRG, CAC) (tgillespie@zoo.ufl.edu). Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (CAC).

FOREST FRAGMENTATION ALTERS PARASITE DYNAMICS IN AFRICAN PRIMATE POPULATIONS

From August 1999 to July 2003, we surveyed red colobus (Procolobus badius) and black-and-white colobus (Colobus guereza) populations in undisturbed forest at Kibale National Park, Uganda and in 22 forest fragments (1.2 to 8.7 ha) adjacent to the park. Prevalence and richness of gastrointestinal parasite infections were determined for colobus populations by non-invasive fecal flotation and sedimentation (n = 1,440). Infection risk was quantified as density of infective-stage parasites from canopy and ground vegetation plots (n = 42). Prevalence and richness of infections and frequency of multiple infections were greater for red colobus in fragmented than in undisturbed forest, but these parameters did not differ between forests for black-and-white colobus. Infective-stage parasites were found at higher densities in both canopy and ground vegetation plots from fragmented compared to undisturbed forest, demonstrating a greater infection risk for fragment populations. Our results suggest that observed declines in red colobus in forest fragments may relate to greater susceptibility to infection compared to black-and-white colobus, whose populations in fragments appear stable. Inter-fragment comparisons of physical, biological, and socioeconomic attributes demonstrate that degree of degradation and fragment size play the strongest role in explaining altered parasite dynamics including the risk of infection with anthropozoonotic pathogens.

CO12-5 **VALENTINE, LEONIE** School of Tropical Biology, James Cook University, Townsville QLD 4811, Australia (Leonie.Valentine@jcu.edu.au).

RESPONSES OF BIRD ASSEMBLAGES TO MANAGEMENT BURNING OF RIPARIAN VEGETATION IN GRAZED TROPICAL SAVANNA

Land managers in tropical savannas increasingly use fire as a management tool. Fire is an important force structuring communities in the tropics, and the type of fire regime implemented in an area can significantly impact the structure of faunal assemblages. In tropical savannas, an important component of fire regimes is the season of burn. This project examined the impacts of seasonal management burning, along creeks for weed control, on bird assemblages in grazed tropical savannas of northern Queensland, Australia. Bird species number, abundance and assemblage structure were compared among replicate experimental treatments (unburnt control, wet season burn & dry season burn) at two time intervals to examine the short-term (6-12 months post-fire) and medium-term (2-3 years post-fire) impacts of seasonal burning. Overall bird abundance and insectivore abundance was initially higher in the burnt treatments compared to unburnt controls. However, medium-term impacts showed lower overall bird abundances in the dry-season burnt treatments. Dry season burning typically removes large amounts of understorey vegetation and birds may be responding to a reduced level of habitat complexity. These results reveal the consequences of seasonal weed management burning along creeks and highlight the importance of appropriate fire management to conserve faunal assemblages.

CO12-6 **UNDERWOOD, EMMA C. and Caroline E. Christian** Dept. of Environmental Science & Policy, University of California, Davis, CA 95616 (eunderwoodrussell@ucdavis.edu) (ECU). Dept. of Ecology & Evolutionary Biology, University of Santa Cruz, CA 95064 (CEC).

EFFECTS OF PRESCRIBED FIRE AND CATTLE GRAZING ON ANT ASSEMBLAGES IN A BLUE OAK SAVANNA, NORTHERN CALIFORNIA

Techniques such as prescribed fire and grazing are widely used by conservation organizations to maintain and restore native biodiversity. However, the effects of such disturbances on ant assemblages are unclear. This study examined responses of ants to fire and grazing in a blue oak savanna (Quercus douglasii) habitat in northern California. Twenty-four 30 m x 30 m plots were established and received grazing, burning, or no treatment. Ants were sampled using 240 pitfall traps left open for 14 days each sample, with one pre-burn collection and two post-burn collections. Analysis of total ant abundance showed no effect of grazing, but a significant effect of fire. In accordance with other fire studies certain dominant dolichoderine ants increased immediately after the fire. However, in contrast to other studies, we recorded a significant increase in cryptic ant species. A second experiment at broader spatial and temporal scales supported these general findings. The relatively minor effects of prescribed fire and grazing detected in this study suggests that these are appropriate management techniques with respect to the ant fauna, for blue oak savannas in northern California.

CO13-1 **CHUAHAN, DEVENDRA S.** Wildlife Institute of India, PO Box 18, GPO Chandrabani, Dehra Dun 248001, India (devendra@wii.gov.in)

MANAGING LEOPARD (PANTHERA PARDUS) POPULATION IN HUMAN MODIFIED LANDSCAPE IN HIMALAYAS: IS IT POSSIBLE?

The leopard is widely distributed in India and survived from its ability to adapt a variety of environmental situations in and outside Protected Areas but lacking effective conservation strategies. Increase in Leopard-human conflicts has been noticed more in Himalayas due to habitat fragmentation, degradation and decline in wild prey. We studied ecological and biological requirements of leopards in human modified landscape of Himalayas to provide better conservation of species. Pauri Garhwal district (5444km2) is worst affected due to leopard-human conflicts among thirteen districts of Uttaranchal. During 1987-2002, 200 people were killed by leopards where as 110 leopards were killed as declared man-eater and by irate villagers. We classified areas in four categories based on severity of conflicts viz. no (29.5%), low (23.9%), medium (31.4%) and high (15.2%) of conflict. We found that leopards are targeting soft preys such as children and 69% victims were children below 15 years. Most of these kills (68%) were between 1600-2100 hrs. We noticed more conflicts in areas of high forest degradation and dominated by shrubs. Other factors responsible for conflicts are presence of dog, no electricity, distance of house from main village and presence of adult males. We discussed mitigatory measures to reduce conflicts.

CO13-2 **LEFER, DANIELLE, James Fraser, and Casey D. Kruse** Dept. of Fisheries and Wildlife, Virginia Tech, Blacksburg, VA 24061 USA (DL, JF) (dlefer@vt.edu). U.S. Army Corps of Engineers, POB 710, Yankton, SD 57078 (CDK).

VARIATION IN PIPING PLOVER FORAGING SITE QUALITY ON THE MISSOURI RIVER

Piping plover recovery in the Great Plains requires increasing productivity and available high quality habitat. We compared indices of foraging site quality and chick success among three sites on the Missouri River and one site in the alkali wetlands. We compared piping plover (Charadrius melodus) chick growth rates, invertebrate abundance and biomass at the four sites from 2001-2003. Chick growth rates downstream of a non-hydro-peaking, hyper-limnetic-release dam were higher than at the other sites. Invertebrate abundance and biomass were higher downstream of a non-hydro-peaking, hyper-limnetic-release dam and the alkali wetlands than downstream of the hydro-peaking, hypo-limnetic-release dam. Chick size was positively correlated with invertebrate biomass at foraging sites. Chicks with greater mass at day 4-5 and day 11-12 were more likely to survive to fledging. Results are consistent with the hypothesis that invertebrate numbers downriver from hypo-limnetic-release, hydro-peaking dams are inferior to conditions in other habitats in the region. These differences in prey availability are reflected in chick growth rates.

CO13-3 **GOOD, THOMAS P., Katie Barnas, Douglas M. Marsh, Brad A. Ryan, and Edmundo Casillas** Conservation Biology Division, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112 (TPG, KB)(tom.good@noaa.gov). Fish Ecology Division, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, WA 98112 (DMM, BAA, EC)

CONSERVATION AT THE CROSSROADS: ESTIMATING THE EFFECTS OF PREDATION BY PISCIVOROUS BIRDS ON ENDANGERED AND THREATENED SALMONIDS IN THE COLUMBIA RIVER

Understanding the effect of predators can be critical for recovering endangered species. Many predator-prey interactions are contentious due to conservation concerns for the predators, their prey, or both. These relationships are often unquantified, which can undermine management decisions. A high-profile example involves predation by piscivorous waterbirds, primarily Caspian Terns Sterna caspia, on juveniles of ESA-listed salmonids in the Columbia River in the U.S. Pacific Northwest. Management of the East Sand Island tern population requires NOAA Fisheries to provide estimates of the effect of tern predation on salmonids. We used predation rates (% of passive integrated transponder (PIT) tags detected at Bonneville Dam later detected in the tern colony) on outmigrating steelhead from 1999-2002 to approximate the relationship between tern population size and predation rate. Using this relationship, we modeled potential gains in the population growth rate (lambda) of steelhead given tern population levels on East Sand Island. The results suggest potential gains in lambda similar to those calculated for improvements to hydropower operations but below those calculated for harvest elimination. Understanding the role of predator-prey relationships and how reducing that mortality may translate into species recovery is critical, especially if we are to make rational management decisions about controversial conservation issues.

CO13-4 **MCPHEE, M. ELSBETH and Nicholas Freitag McPhee** University of Missouri-St. Louis, Biology, 8001 Natural Bridge Road, St. Louis, MO 63121 (MEM) (mcpheeme@umsl.edu). University of Minnesota Morris, 600 East 4th Street, Morris, MN 56267 (NFM)

APPLICATION OF INDIVIDUAL-BASED MODELING TO ESTIMATION OF POPULATION PERSISTENCE IN THE FACE OF RAPID ENVIRONMENTAL CHANGE

Captive-bred animals often do not survive reintroduction into the wild due to inability to behave appropriately in their native habitat. Recent research demonstrates that captivity can relax selection pressures on various behavioral and morphological traits necessary for survival in the wild, thus increasing variation in trait expression and decreasing overall survivorship in a released population. In this talk, we present individual-based computer models that explore the probabilities that a captive-bred population released back into its native habitat will have the traits necessary for survival. We use the fitness landscape concept to compare levels of fitness between the source population and the released population. We also explore how different life-history strategies affect fitness in a changing environment. We use Release Ratio calculations to determine the size of the release population. Our model uses a number of tools and concepts from evolutionary computation. Evolutionary computation has clear connections to natural systems and conservation but has rarely, if ever, been applied to conservation problems. Application of this type of individual-based modeling to conservation questions will provide conservation biologists with another valuable tool for the estimation of population persistence in the face of rapid environmental change.

CO13-5 **OLSSON, OLA** Ola Olsson, Animal Ecology, Lund University, Ecology Building, SE-223 62 Lund, Sweden, (ola.olsson@zooekol.lu.se)

EFFECT OF CLIMATE ON POPULATION CHANGE AND BREEDING SUCCESS OF WHITE STORKS (CICONIA CICONIA) DURING THE EXTINCTION AND REINTRODUCTION

The Swedish population of the white stork (Ciconia ciconia) went extinct in 1955, after at least 50 years of decline. In 1989 a reintroduction program began. In this paper I investigate how different climate variables, collected from 1890 until today, both on the breeding grounds and wintering grounds (Africa), influenced survival and reproduction. Data for the storks are available in the period from 1917 to 1954 (period 1), when only (by definition) native storks bred in Sweden, and then from 1989 to 2001 (period 2), when reintroduction has taken place. The reintroduced storks are mainly of North African decent. The total rainfall on the breeding grounds in May and June (breeding season) negatively influenced the number of fledged nestlings per pair, especially for the reintroduced population. During decline (period 1), rainfall at breeding negatively influenced survival until the following season. In contrast, annual rainfall on the wintering grounds influenced survival positively. Thus, climate variation strongly influenced year-to-year population change during the decline phase. However, the climate did not change in the relevant variables, and there were strong negative density dependent effects on the population change. Thus, habitat loss, rather than climate change is the most likely cause for the extinction.

CO13-6 **HOFFMANN, MICHAEL, Mike Parr, Eric Dinerstein, Leon Bennun, and Thomas Brooks** Center for Applied Biodiversity Science, Conservation International, Washington, DC 20036 (MH, TB) (m.hoffmann@conservation.org); American Bird Conservancy, 1834 Jefferson Place, NW, Washington, DC 20036 (MP); Conservation Science Program, World Wildlife Fund-US, 1250 24th St NW, Washington DC, (ED); BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, United Kingdom (LB)

PRIORITIES-WITHIN-PRIORITIES: TARGETING THE TIPS OF THE CONSERVATION ICEBERGS

The establishment of global priorities for biodiversity conservation is an important, but complex, issue. Three major systems of broad-scale global priorities exist: the World Wildlife Fund's Global 200 Ecoregions, Conservation International's 25 Biodiversity Hotspots; and BirdLife International's 218 Endemic Bird Areas. The Alliance for Zero Extinction (AZE), a global partnership between international, regional, and national conservation organizations, aims to conserve all Critically Endangered and Endangered species restricted entirely to single sites. But how does this exciting new initiative complement existing broad-scale global priorities? Using peer-reviewed data for more than 350 sites identified by AZE to date, we demonstrate that these 'epicenters of imminent extinctions' represent an integrated, site-scale component within all three existing global priority-setting strategies. In all three cases, significantly more AZE sites than expected due to chance alone lie within the global priority sets. While the fact that some AZE sites fall outside of these broad-scale priorities emphasizes the importance of not letting these systems become straight-jackets to conservation, overall we conclude that AZE sites form a set of priorities-within-priorities, offering a targeted site-based approach to effect the immediate conservation of a large number of species otherwise facing imminent extinction.

CO14-1 **AKCAKAYA, H. RESIT, Janet Franklin, Alexandra D. Syphard, and John R. Stephenson.** Applied Biomathematics, 100 North Country Road, Setauket, NY 11733 (Resit@ramas.com) (HRA). Department of Biology, San Diego State University, San Diego, CA 92182 (JF). Department of Geography, San Diego State University, San Diego, CA 92182 (ADS). US Fish & Wildlife Service, 20310 Empire Ave., Bend, OR 97701(JRS).

VIABILITY OF BELL'S SAGE SPARROW UNDER ALTERED FIRE REGIMES: INTEGRATING LANDSCAPE, HABITAT, AND METAPOPULATION MODELING APPROACHES

We modeled the viability of a Bell's Sage Sparrow (Amphispiza belli ssp. belli) metapopulation under different fire regimes in the foothills and mountains of San Diego County, California, USA. Our approach integrates a landscape model, which predicts the vegetation composition and age under three fire regimes, a habitat model, which interprets the resulting landscape in terms of its suitability for the Sage Sparrow, and a metapopulation model, which predicts the viability of the species based on a dynamic spatial structure as determined by the landscape and the habitat models. Bell's Sage Sparrow depends on early successional shrubland (chaparral) habitat, especially when the availability of preferred open coastal subshrub vegetation is limited. The three fire rotation intervals (FRI) used in the landscape model were 'current' (30 y FRI) representing the effect of increased human ignitions, 'natural' (90 y FRI) representing the historic shrubland fire regime at higher elevations without the effect of human ignitions, and 'long' (150 y FRI) representing a hypothetic endpoint of very low fire frequency. The results indicated that the viability of the Sage Sparrow was highest under the 'current' fire regime scenario, slightly lower under the 'natural', and lowest under the 'long' fire regime scenario.

CO14-2 **ARCE, JAVIER** Department of Ecology, Evolution and Environmental Biology, Columbia University Graduate School of Arts and Sciences, 1200 Amsterdam Ave MC 5557, New York NY 10027 (jaa@67columbia.edu)

LANDSCAPE HISTORY AND CONSERVATION ISSUES OF HUMAN POPULATED ISLANDS IN THE PERUVIIAN AMAZON

This study focuses on natural development and human intervention in the islands of the Peruvian Amazon. Although such islands have been populated since before colonial times and are an ubiquitous landscape feature of Amazonia, little attention has been devoted to the study of these ecosystems. To study the historical transitions of these islands I use century old navigational maps, air photographs dating to 1948, recent Landsat images, and oral histories. These data, combined with on-site forest inventories, soil sampling and topographical studies, demonstrate that the sequence of succesional paths that islands can follow is much more complex than previously thought. Previous studies suggested that the transformation of island landscapes follows the same trend as the transformation of river meanders. I formulate a new scheme of island transformation, determined both by the changes in river dynamics and by human disturbance. Each landscape feature represents a present use for humans as well a variety of future utilities, because it can develop into a different structure with diverse human uses. If we are to make efficient conservation prescriptions for such ubiquitous landscape features, we must be able to accurately assess the prospects for their transformation.

CO14-3 **DIAMOND, DAVID D., Taisia Gordon, C. Diane True, Walter E. Foster, and Hollis Mehl** Missouri Resource Assessment Partnership, University of Missouri, 4200 New Haven Road, Columbia, MO 65201 (diamondd@missouri.edu) (DDD, TG, CDT). US EPA Region 7, 901 N 5th, Kansas City, KS (WEF, HM).

IDENTIFICATION AND MAPPING OF CRITICAL ECOSYSTEMS IN THE LOWER MIDWESTERN USA

The US EPA, Region 7, seeks to identify the location of ecosystems that are critically important to human health and biological diversity in the states of IA, KS, NE, and MO. These areas will be assigned increased significance in decisions related to grant funding and environmental review. We identify critical ecosystems by first creating an ecological risk grid surface using GIS at 30m resolution and then picking pixel threshold values to select critical ecosystems. The risk surface is based on ecological significance and threat. Significance is assigned from the modeling of geolandforms using soils and 30m digital elevation models, modeling of historic vegetation to geolandforms, overlays of current land cover to calculate change from historic conditions by geolandform, and current land cover patch size. Threat is assigned using algorithms for urban land demand, agricultural stress, and threats from known toxic releases and superfund sites. In a prototype for the Chariton River Hills of north central MO and adjacent IA, we defined 11 % of the ecoregion as critical ecosystems, and 9% as significant. Critical ecosystems within this ecoregion are mainly forested areas within rough landscapes, whereas most of the ecoregion consists of plains that support tame pasture or cropland.

CO14-4 **EVANS, JEFFREY S. and Melanie A. Murphy** USDA Forest Service - Rocky Mountain Research Station. 1221 S. Main St. Moscow, Idaho 83843 (jevans02@fs.fed.us) (J.E.)Schoool of Biological Sciences, Department of Biology – Washington State University. Pullman, Washington 99163 (M.M.)

INTEGRATING MULTISCALE ANALYSIS AND BIOPHYSICAL MODELLING TO OPTIMIZE ECOLOGICAL RELATIONSHIPS IN SPATIAL MODELS

The relationships among landscape pattern, process, and scale are recognized as a central issue in landscape ecology. Scale dependent effects are difficult to determine, resulting in inaccurate or limited model results. Quantifying scale will provide more relevant results for common exploratory analyses sensitive to scale, such as landscape metrics. This will ultimately allow scale dependent predictions to be tested. Proposed is a method for building a vegetation pattern hierarchy using fractal net evolution, then defining a topological relationship with a biophysical classification derived from a digital terrain model. This provides ecologically meaningful units as a basis for aggregation. We tested the model on the Priest River Experimental Forest in northern Idaho and find field based measurements validate model. This method allows for landscape patterns to be tested at various scales, while providing a modeling framework for optimizing the statistical relationships of spatial pattern and ecological process. Biophysical unit aggregation provides a means of controlling the variance structure in high resolution data exhibiting significant spatial autocorrelation. Results demonstrate a solid foundation for building realistic representations of vegetation patterns across landscapes, supporting robust models with application to conservation and management decision making.

CO14-5 **FISCHER, JOERN and David B. Lindenmayer** Centre for Resource and Environmental Studies, The Australian National University, Canberra ACT 0200, Australia (joern@cres.anu.edu.au)

EXPANDING THE FRAGMENTATION PARADIGM: INSIGHTS FROM TWO STUDIES ON REPTILES IN HEAVILY MODIFIED AUSTRALIAN LANDSCAPES

The vast majority of Earth's land mass is located outside reserves. Hence, human-modified landscapes are critical for biodiversity conservation. We report on reptile distributions in two modified Australian landscapes. The first landscape was used for farming and contained native woodland remnants; the second was an exotic softwood plantation with native forest patches scattered throughout it. Thirty-two reptile species were recorded during extensive field surveys. Statistical models of reptile distributions highlighted: (1) a range of ecological processes influencing reptiles, (2) substantial species-specific differences, (3) responses at multiple scales, and (4) gradual changes through space. The traditional island-based "fragmentation paradigm" was severely limited in explaining these patterns. Hence, classifying modified landscapes as fragmented may not always be appropriate. The inappropriate classification of landscapes as "fragmented" can lead to the neglect of the "matrix" and small "patches" in favor of large ones, and ignores landscape heterogeneity and primary productivity as drivers of species diversity. Because conceptual landscape models provide the rationale for many conservation decisions, the explicit recognition of species-specific differences and gradual changes in habitat quality may be an important improvement over current models. Starting points for new ways of conceptualizing landscapes include continuum theory, habitat contours, and countryside biogeography.

CO14-6 **RADELOFF, VOLKER C., Roger B. Hammer, Susan I. Stewart, Jeremy S. Fried, Jason F. McKeefry, and Sheralyn S. Holcomb** Department of Forest Ecology & Management, University of Wisconsin - Madison, 1630 Linden Drive, Madison, WI 53706 (radeloff@wisc.edu) (VCR, JFM, SSH); Department of Rural Sociology, University of Wisconsin - Madison, 1180 Observatory Drive, Madison, WI 53706 (RBH); North Central Research Station, Forest Service, United States Department of Agriculture, 1033 University Avenue, Suite 360, Evanston, IL 60201 (SIS); Pacific Northwest Forest Inventory and Analysis, Forest Service, United States Department of Agriculture, 620 SW Main, Portland, OR 97205 (JSF).

GROWTH OF THE WILDLAND-URBAN INTERFACE IN THE U.S. FROM 1990 TO 2000

The detrimental effects of housing growth on wildlife and plant populations are a major conservation problem. The wildland-urban interface (WUI) is where human development and (semi-)wild ecosystems intermingle. Human-wildlife conflicts, exotic species invasions, and forest treatments to reduce fuel loads are concentrated in the WUI. Our objective was to assess extent and patterns of WUI growth across the United States from 1990 to 2000. Housing data were derived from the 1990 and 2000 US decennial Censuses at the block level, and integrated with vegetation data from the USGS National Land Cover Dataset. WUI areas are widespread at the fringes of metropolitan areas (e.g. Los Angeles, Denver), and in rural areas with dispersed housing patterns (e.g. New England, Appalachia). During the 1990s, net growth was 13.6 million housing units in the U.S. (13% growth). Growth rates were even higher in the WUI and reached, for example, 30, 24 and 15% in Washington state, Oregon, and California respectively. WUI area increased in these states by 16, 11 and 9%. This national assessment of housing growth in the WUI highlights the prevalence of human impacts on the environment and can facilitate in-depth studies on causal relationships between housing and wildlife or plant populations.

CO15-2 **HOEBEE, SUSAN E., Sonia Angelone, and Rolf Holderegger** Section of Ecological Genetics, WSL Swiss Federal Research Institute, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland (susan.hoebee@wsl.ch)

MATE AVAILABILITY ASSESSED THROUGH STUDIES OF SELF-INCOMPATIBILITY IN THE WILD PEAR (PYRUS PYRASTER)

Self-incompatibility and mate availability have long been of interest to plant breeders. Recently, there has been increased awareness of their importance for the conservation and management of wild plant species. To this end, we have used controlled pollinations and molecular methods to assess mate availability in 13 Swiss populations of Pyrus pyraster (Rosaceae). Pollination experiments indicated that the species has an effective self-incompatibility system and suggested that natural fruit set, which was lower in open treatments than in crosses, was reduced owing to pollinator and/or pollen limitation. Consensus primers amplified products that were highly variable and showed over 95% sequence homology to published Rosaceae S-RNase genes. Six to 21 length variants per population were amplified, while the corresponding number of incompatibility alleles was greater owing to occasional length homology. An upper limit to the number of incompatibility alleles was reached as population size increased. This likely reflects the counter-balancing influences of negative frequency-dependent selection and genetic drift. Within populations, few individuals shared both incompatibility alleles indicating that, in general, mate availability may not be restricted. However, given differences in individual flowering phenology and perhaps pollinator visitation and movement, access to compatible pollen (rather than pollen per se) may be limited.

CO15-3 **TRAVIS, STEVEN, Joanne Baggs, and Joyce Maschinski** USGS National Wetlands Research Center, 700 Cajundome Blvd., Lafayette, Louisiana 70506 (steven_travis@usgs.gov); The Arboretum at Flagstaff, 4001 S. Woody Mountain Rd.,Flagstaff, Arizona 86001 (JB and JM)

THE GHOST OF HYBRIDIZATION PAST: CHARACTERIZING THE THREAT OF GENETIC ASSIMILATION IN THE ENDANGERED ARIZONA CLIFFROSE (PURSHIA SUBINTEGRA)

Hybridization in the endangered Arizona endemic, Purshia subintegra (Rosaceae), was investigated to assess the possibility of genetic assimilation by its more widespread congener, P. stansburiana. Based on previous studies of this genus, it was hypothesized that hybridization and introgression have affected three of the four extant populations of P. subintegra. Sixteen sites were compared inside and outside the zone of sympatry. A limited number of species-diagnostic markers were detected, which showed the expected level of additivity in two P. subintegra populations hypothesized to have hybridized with P. stansburiana during the last Holocene glaciation. Marker frequencies among both P. subintegra and P. stansburiana populations from the zone of sympatry exhibited evidence of introgressive hybridization in the direction of the more common species, P. stansburiana. Individuals classified as first-generation hybrids on the basis of morphology were deemed to be no more nor less introgressed than morphologically pure individuals, although they were moderately differentiated from other populations suggesting they may represent a locally adapted ecotype arising through introgressive hybridization. These results demonstrate that a long-standing history of hybridization has resulted in a hybrid swarm and at least the partial assimilation of P. subintegra by P. stansburiana.

CO15-4 **SCHLAG, ERIN M., Maile Neel, and Marla McIntosh** Marine Estuarine and Environmental Sciences Program, University of Maryland, College Park, MD 20742 (eschlag@umd.edu) (EMS). Department of Natural Resource Sciences and Landscape Architecture, University of Maryland, College Park, MD 20742 (MN, MM)

GENETIC DIVERSITY OF MARYLAND-GROWN AMERICAN GINSENG (PANAX QUINQUEFOLIUS)

American ginseng (Panax quinquefolius) is a highly valued medicinal herb that is becoming increasingly rare due to over-harvesting of wild populations and habitat destruction. Wild-simulated cultivation of native plants is potentially a sustainable alternative to wild harvest. However, introduction of exotic commercial plants into cultivated and wild populations threatens to pollute native germplasm. We used Random Amplified Polymorphic DNA (RAPD) markers to estimate genetic diversity and genetic structure of cultivated and wild populations from the Appalachian region of Maryland. Our results corroborated earlier findings that P. quinquefolius populations are highly diverse with a substantial amount of genetic variation among populations. We also found that wild Maryland germplasm was distinct from exotic commercial germplasm but that plants cultivated from Maryland seedstock grouped predominately with wild populations suggesting a local origin of these crops. Plants from one putatively native population clustered with exotic commercial plants indicating that this population is actually derived from non-native sources. Thus, native populations are at risk of contamination via artificial seeding if local seed sources are not used. We suggest creating a Maryland germplasm bank to aid in conservation efforts by making native seed available for cultivation and artificial seeding of wild Maryland populations.

CO15-6 **LIUKKONEN-ANTTILA, TUIJA, Hannaleena Mäki-Petäys, Osmo Rätti, Pekka Helle, and Markku Orell** University of Oulu, P.O.Box 3000, Fin-90014 University of Oulu, Finland, (Tuija.Liukkonen-Anttila@oulu.fi) (TL-A, HM-P, MO). Arctic Centre, University of Lapland, P.O.Box 122, Fin-96101 Rovaniemi, Finland (OR). Finnish Game and Fisheries Research Institute, Tutkijantie 2, Fin-90570 Oulu, Finland (PH).

NO CLEAR GEOGRAPHIC STRUCTURE IN THE CAPERCAILLIE (TETRAO UROGALLUS) POPULATIONS AT A NATIONAL LEVEL IN FINLAND

The Capercaillie is listed in the Red Data books of threatened species in many European countries. In Finland, the main reason for the decline in the capercaillie populations during the past decades has been proposed to be the fundamental changes in forest landscapes. Decrease and fragmentation of mature boreal forest habitats result from modern forestry practices. The genetic effect of population fragmentation depends on gene flow. Restricted gene flow may lead to greater inbreeding and loss of genetic diversity within the fragments. In this work, we used mitochondrial DNA (control region 1, 430 bp) and six nuclear microsatellites to resolve taxonomic uncertainties, population genetic structure and the amount of genetic variation in the capercaillie at a national level in Finland. According to the results from the mitochondrial DNA data, the gene flow has been sufficient in the past to restore genetic variation in separate populations, and no population structuring can be detected. Nucleotide and haplotype diversities in different parts of the country are similar to that of the whole population. Preliminary results on nuclear microsatellites support this finding. Results obtained in this study will give guidelines for the management and conservation planning on the capercaillie in Finland.

CO15-7 **MURPHY, MELANIE A. and Jeffrey S. Evans** School of Biological Sciences, Department of Biology, Washington State University, Pullman WA, 99163 (mamurphy@wsu.edu) (MAM) USDA Forest Service, Rocky Mountain Research Station, 1221 S. Main, Moscow, Id 83843 USA (JSE)

LANDSCAPE GENETICS: SIMULATING MULTI-LOCUS GENETIC DATA TO ASSESS A NOVEL SPATIAL ANALYSIS TECHNIQUE FOR TESTING SPATIAL PATTERNS

Research integrating landscape ecology, spatial statistics, and multilocus genotyping is a new direction in conservation biology. Specific hypotheses of ecological gradients, landscape process and anthropogenic factors effecting gene flow can be tested with spatial analysis. We use genotype simulation in a simplified landscape to test the efficacy of a spatial analysis technique for multilocus data. A landscape was created with two patches of identical habitat and one linear patch of unsuitable habitat dividing the landscape. Genotype simulations were conducted to test the applicability of using assignment probability values from program STRUCTURE to create a probability surface. The simulations addressed several variables under differing sampling intensity and number of loci: time since vicariance, effective population size, migration rate and stepping stone migration. The relationship between the landscape and probability surface was tested with a Pearson's correlation coefficient. The barrier was identified with the genetic probability surface at 10 generations post vicariance, migration probability 0.05, and for all stepping stone migration model simulations. This study demonstrates that multilocus genotypes can be effectively analyzed with population probability surfaces and spatial statistics. A landscape genetics approach to population analysis provides a powerful framework for understanding landscape processes and making informed conservation decisions.

CO15-8 **KELLY, MORGAN W. and Judith M. Rhymer** Department of Wildlife Ecology, University of Maine, Orono, ME 04469 (MWK, JMR) (Morgan_Kelly@umit.maine.edu)

CONSERVATION GENETICS OF TWO RARE FRESHWATER MUSSEL SPECIES IN MAINE: THE TIDEWATER MUCKET (LEPTODEA OCHRACEA) AND YELLOW LAMPMUSSEL (LAMPSILS CARIOSA)

Freshwater mussels represent the most endangered fauna in North America, with more than 70% of species considered endangered, threatened, or of special concern. The tidewater mucket (Leptodea ochracea) and yellow lampmussel (Lampsils cariosa) are listed as threatened in Maine and are also declining range-wide. Basic taxonomic information, critically needed for conservation plans, has thus far been lacking for these species, as morphological characters have proved unreliable in diagnosing monophyletic clades for freshwater mussels. Using DNA sequences of the mitochondrial ND1 gene, we evaluated range-wide taxonomy for specimens collected throughout the Atlantic slope ranges of both species. L. ochracea and L. cariosa each form well-supported monophyletic lineages, however there is some evidence for hybridization of L. cariosa with a more common congeneric taxon in the Potomac River drainage. Evidence for hybridization could have important implications for the Federal status of L. cariosa. We also used microsatellite loci to assess population-level genetic variation for L. ochracea and L. cariosa within and among three river drainages in Maine. Both species exhibit significant genetic differences among populations. These results will be valuable in developing management plans, especially in the face of impending dam removals, likely to require translocations of both species.

CO16-1 **BONTADINA, FABIO, Adrian Britschgi, and Alex Theiler** Conservation Biology, Zoological Institute, University of Berne, Baltzerstrasse 6, CH-3012 Berne, Switzerland (fabio.bontadina@swild.ch) (FB, AB). SWILD, Urban Ecology & Wildlife Research, Wuhrstrasse 12, CH-8003 Zurich, Switzerland (FB, AB). Swiss Bat Conservation, Geneva & Zurich, Switzerland (FB, AT).

USE OF AN ARTIFICIAL HEDGEROW AS FLIGHT PATH BY AN ENDANGERED BAT SPECIES: A FIELD EXPERIMENT AND ITS IMPLICATIONS FOR CONSERVATION

In a fragmented landscape animals have to cross unsuitable habitat. Slow flying bat species often commute in the cover of vegetation corridors, probably to avoid predators. Can newly created linear structures be used as corridors so as to direct bats over green bridges? We connected a roost of the endangered bat species Rhinolophus hipposideros to its main forested foraging ground by installing a 200 m long linear structure of bushes in containers, so as to provide a cover between roost and woodland. Bats' use of this structure was monitored with ultrasound detectors and IR-video equipment. Over the six weeks of the experiment a significantly increasing amount of the bat population (n=300 individuals) used the newly offered flight path. However, the maximum proportion of bats following the corridor was 20% (mean ± SD = 12 ± 2%). Bats flying towards the new hedgerow emerged earlier and returned later to the roost than those bats using another flight path. By enabling the bats to extend feeding activity at dusk and dawn the «artificial hedge» may exert a positive effect on bat energetic balance and, ultimately, fitness, especially since insect prey abundance peaks at that time of the day. Newly created corridors may thus be readily used by bats and function as «time and energy optimizers».

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GLOBAL CLIMATE CHANGE AND MAMMALIAN SPECIES DIVERSITY IN U.S. NATIONAL PARKS

National Parks and bioreserves are key conservation tools used to protect species and their habitats within the confines of fixed political boundaries. This may be their 'Achilles Heel' as conservation tools in the face of emerging global-scale environmental problems such as climate change. Global climate change, brought about by rising levels of greenhouse gases, threatens to alter the geographic distribution of many habitats and their component species. With these changes comes great uncertainty about the future ability of parks and protected areas to meet their conservation mandates. We report here on an analysis aimed at assessing the extent of mammalian species turnover that may be experienced in eight selected US National Parks if climate change causes mammal species within the continental USA to relocate to new geographic locations. Due to species losses of up to 20% and drastic influxes of new species, National Parks are not likely to meet their mandate of protecting current biodiversity within park boundaries. This approach represents a conservative prognosis. As species assemblages change, new interactions between species may lead to less predictable, indirect effects of climate change, increasing the toll beyond that found in this study.

CO16-3 **GOMPPER, MATTHEW E. and H. Mundy Hackett** Dept. of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO., 65203 (gompperm@missouri.edu)

THE LONG-TERM, RANGE-WIDE DECLINE OF A ONCE HYPER-ABUNDANT CARNIVORA: THE EASTERN SPOTTED SKUNK

The eastern spotted skunk (Spilogale putorius) was once an economically important furbearer in the United States, with consistent range-wide harvests of 100-200,000 animals/yr. In the 1940s, however, populations seemingly crashed, and the species is currently considered endangered, threatened, or of concern across much of its range. We examined long-term harvest records from 12 states to better understand the 20th century history of the species, to discern whether the perceived decline was biologically real or an artifact of altered harvest pressures, and to identify the timing of the decline. Harvest records reveal unequivocally that the species was common in the Great Plains in the first third of the century. Beginning in about 1940, harvests in these states began to dramatically crash, although declines commenced at different times in each state. By the early 1950s total harvests were <10% of pre-crash numbers. Thereafter, rates of decline slowed, but nonetheless continued, such that by the 1980's harvests were <1% of those during pre-decline years. Analyses show that these declines are real and not an artifact of harvest effort. Although causes of these declines remain unclear, these analyses suggest a need for immediate attention to address the long-term persistence of this species.

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STATUS OF TIGERS, PREY, AND HUMAN-CARNIVORE CONFLICT IN THE NAM ET - PHOU LOUEY NPA, LAO PDR

Unique to Indochina, Laos contains extensive habitat for tiger and their prey, although the abundance or distribution of these populations remains unknown and killing of tigers in response to human-carnivore conflict is largely unmanaged. To design management strategies to alleviate this problem, we examined abundance and distribution of tiger and prey species in the 4200 km2 Nam Et -Phou Louey National Protected Area (NPA) on the Laos-Vietnam border, which reports a relatively high incidence of large carnivore attacks on livestock. We did intensive random camera-trap sampling of large carnivores and prey and collected baseline data on incidents of large carnivore depredation of livestock in NPA villages. Tigers as well as several other large carnivores were recorded in all sampling blocks. Large ungulates were found in relatively low numbers compared to smaller prey that was distributed more widely. An average of two large livestock were lost per village per year with most kills occurring when livestock were fenced away from the village to protect crops. Results contribute to management recommendations to address lack of prey and animal husbandry practices that likely underpin problems of human-carnivore conflict.

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UNGULATE DYNAMICS IN THE RUSSIAN FAR EAST: IMPLICATIONS FOR TIGER CONSERVATION

Concensus among tiger biologists suggests that enhancing and monitoring the tiger's prey base is perhaps the single most important task facing tiger conservation today. Sikhote-Alin Biosphere Reserve in the Russian Far East is an important area for conservation of the Amur tiger Panthera tigris altaica. Despite long term records from winter track surveys in this area, the densities, spatial and temporal dynamics of ungulates (the principal prey of tigers) are not fully understood. We used data on daily movements of ungulates and over 40 years of results from winter track surveys, to estimate ungulate populations and their changes over time within and outside the Reserve. Here we show that four species of ungulate (including the two most commonly preyed on by tigers, red deer Cervus elaphus and wild boar Sus scrofa) have increased significantly within the reserve over the past 40 years but remain at very low densities outside reserve boundaries. Our results have implications both for the continued surveying of ungulates in the area, and for the management of tiger habitat within and outside the Reserve. In particular, management aimed at promoting tiger conservation across the region must tackle the causes of a depauperate prey-base outside protected areas.

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SOURCE-SINK DYNAMICS OF FLORIDA KEY DEER ON BIG PINE KEY, FLORIDA

Fragmentation and habitat loss are a concern in endangered species management. Source-sink systems can occur in areas where differing habitat quality results in differing demographic rates. The endangered Key deer (Odocoileus virginianus clavium) are endemic to the Florida Keys with Big Pine Key (BPK) supporting the majority of the deer population. Habitat loss and fragmentation have altered the amount of available habitat creating areas of varying suitability where north BPK (NBPK) is believed to contain more optimal habitat as compared to south BPK (SBPK) which is more developed and fragmented. We evaluated the source-sink dynamics of Key deer using a sex- and stage-structured, stochastic matrix model. Model results indicate the NBPK population was increasing whereas the SBPK population was decreasing. The higher risk to SBPK deer observed can be explained by relative habitat quality differences between the 2 areas. Collectively, study results indicate that SBPK can be described as an ecological sink with a nonviable population supplemented by deer dispersal from NBPK (source). We recommend that future management goals continue to address mortality factors on SBPK (low-quality sink habitat) while still recognizing and preserving the important source population in NBPK.

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SPATIO-TEMPORAL DYNAMICS OF THE BEARDED PIG (SUS BARBATUS)

Bearded pigs play a key role in both the forest ecosystems of Borneo and people's livelihoods, yet few studies of their ecology exist. This is largely because the pigs have highly variable abundance and complex spatial movement patterns, featuring mass aggregations, eruptions and regional scale migrations. Interactions between bearded pigs and forest fruiting regimes occur on a regional scale, and therefore may be greatly affected by rapid deforestation. Changes in the frequency and intensity of El Nino events may alter masting patterns and hence also disrupt pig population dynamics. Such complex interactions can only be understood using spatially explicit, stochastic, individual-based population models. By relating bearded pig reproductive dynamics and abundance to food supply fluctuations we can evaluate the direct and indirect effects of environmental changes on pig population dynamics at both local and regional scales. The results demonstrate that the timing of mast fruiting events, as well as the size of the events, is important in predicting population eruptions. Using a GIS of forest cover of Sabah, we use the model to predict the effects of changes in habitat and climate on pig movement patterns and abundance, and hence make conservation recommendations.

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POPULATION VIABILITY ANALYSIS AND EXTINCTION RECORDS OF THE RARE PERENNIAL HERB VICIA PISIFORMIS

In population viability analyzes of small and isolated populations the role of stochastic processes is often emphasized. However, deterministic factors such as habitat deterioration could also be important. In order to assess the importance of stochastic and deterministic processes, I studied population extinction and viability in relation to population size, isolation and habitat quality in Vicia pisiformis. V. pisiformis is a rare long-lived herb occurring as relict populations in semi-open, semi-natural deciduous forest fragments. Herbarium records and re-inventories showed that 62% of all Swedish V. pisiformis populations went extinct during the last century, and that these extinctions were often associated with canopy closure. Individuals in the remaining 20 Swedish populations were followed over four consecutive years and matrix models were used to project extinction risks. Many small and isolated populations were viable, but populations in closing habitats had low viabilities. Deterministic factors, rather than stochastic factors, thus pose a more immediate threat to the viability of populations of V. pisiformis. The results thus suggest that deterministic factors may be of overruling importance even in very small and isolated populations and that viability assessments and management actions in such populations need to shift their focus accordingly.

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EXTINCTION RISK IN A WOOD FROG (RANA SYLVATICA) METAPOPULATION UNDER ENVIRONMENTAL CONTAMINATION BY PCBS

A stochastic population model projecting wood frog population trends into the future and computing the risk of population decline was constructed using vital rate information from the literature and abundances derived from studies of 27 vernal pools in western Massachusetts. The model was age- and sex-structured with yearly time steps, and both demographic and environmental stochasticity were incorporated. The model was spatially explicit and frogs were allowed to disperse between ponds as a function of distance. The impact of PCBs on this wood frog population was assessed by comparing population projections from a base population model, i.e., a wood frog population not impacted by PCBs, with projections from population models that included the effect of PCBs on population vital rates. Both a non-declining and a declining base population were simulated. Parameterizations included the effect of PCBs on initial population size and combinations of low and high estimates of the proportion of malformed frogs that subsequently died or became reproductively unfit due to PCB exposure. The impacts of PCBs were derived from vernal pool and laboratory studies in the study area and from literature sources. Based upon this modeling effort, PCBs increased the risk of population decline and extinction.

CO17-5 **ISAAC, NICK J.B., Carmen Bessa-Gomes, Richard Pettifor, and Guy C. Cowlishaw** Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK (nick.isaac@ioz.ac.uk) (NI, CBG, RP, GC) Mathematical Eco-Evolution Unit,Laboratoire d'Ecologie (UMR 7625), Ecole Normale Supérieure, 46 rue d'Ulm, 75230 Paris Cedex 05, France (CBG)

DYNAMICS OF PRIMATE RESPONSES TO HABITAT DISTURBANCE

Selective logging is a pervasive threat to global biodiversity. Managing this threat requires that we understand the effect of logging on population viability at relatively small spatial scales, and is therefore an important goal of conservation biology. Previous work has shown that Primate responses to habitat disturbance, including logging, can be predicted by different aspects of their biology. However, the explanatory power of these relationships is poor, due to site-specific variation in logging practices and primate ecology. In particular, we found evidence of population recovery after an initial fall in abundance, suggesting that long-term viability is dependent on sufficient periods of forest recovery between logging episodes. We go on to show that logging affects not only primate abundance, but also group size. These findings are corroborated by simulations, which suggest that some species may be vulnerable to Allee effects.

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UNDERSTANDING THE DEMOGRAPHICS OF A 'VULNERABLE' FLYING-FOX SPECIES

Understanding the age structure, growth rate and longevity of individuals of a population in decline is important in determining whether that population is capable of recovery. Genetic data using microsatellites on two populations of the ‘vulnerable’ spectacled flying-fox (Pteropus conspicillatus) show that they are large, healthy populations with good levels of genetic diversity, no indication of inbreeding and that gene flow occurs between local camps. Aging individuals in these two populations was carried out using cementum layers around the canine teeth taken from animals that had died from tick paralysis. Ages were found to occur between one and thirteen years. However, there is a serious left skew in the data with the greatest number of animals being between one and five years old. This will have a significant impact on developing future management plans for this species, as spectacled flying-foxes do not reproduce successfully until they are 3 years of age making it difficult for a population to return from a decline.

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CAN WE TRUST THE PREDICTIONS OF POPULATION VIABILITY ANALYSES? - AN EMPIRICAL ASSESSMENT

The ultimate criterion for the usefulness of any Population viability analysis is how well it predicts the actual fate of populations. However, model outputs are sensitive to estimated parameters and to the quality of data. The scarcity of field validations of PVA predictions is therefore a fundamental problem in conservation biology. We used data from 11 populations of the forest herb Lathyrus vernus followed over 15 years to assess how well projections from demographic transition matrix models agreed with actual population development. Population growth rates projected by stochastic models were positive in most cases whereas the actual change was negative for all populations. Moreover, model projections did not provide us with qualitatively correct predictions that would allow us to rank population performances. Our results suggest that predictions of PVAs should be taken with great care, in particular for species in environments subject to directional change. A wider implication is that validation of PVA predictions is necessary to argue for a greater role of PVAs in conservation and planning and that development of more appropriate models must be accompanied by validation of existing models.

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POPULATION VIABILITY ANALYSIS USING SCIENTIFIC COLLECTIONS: DEALING WITH UNCERTAINTY

Standard population viability analyses (PVA) are based on demographic or individual count data, and generally assume that observation error is negligible. Unfortunately, there is often a large gap between these requirements and the data that are available. For many species, the most comprehensive data sources are scientific collections. As measures of abundance, these data are extremely noisy. However, I argue that reasonable viability estimates can be obtained from such data, provided that the nature of data uncertainty is explicitly taken into account in the analysis. To illustrate, I compare three PVA approaches using herbarium data for beach plants in the Oslo Fjord, SE Norway. These modeling approaches emerge from three general ways of thinking about data uncertainty: (1) a stochastic model assuming process noise only (a classical PVA approach), (2) a deterministic model assuming observation error only, and (3) a state-space model with stochastic population and sampling models, assuming a combination of process noise and observation error. The three approaches lead to quantitatively different conclusions. Ignoring observation error gives pessimistic (high) estimates of extinction risk, whereas ignoring process noise gives optimistic (low) estimates. The state-space approach balances process noise and observation error and gives reasonable estimates of extinction risk.

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QUANTIFYING BIODIVERSITY LOSS IN MADAGASCAR USING BIOLOGICAL INVENTORIES, ENVIRONMENTAL DATA AND A 50-YEAR RECORD OF DEFORESTATION

Extraordinary levels of endemism and high rates of deforestation place Madagascar near the top of virtually every conservation priority list. Although deforestation on the island is readily quantified via historic maps and remote sensing, the implications of forest loss for biodiversity have not been rigorously quantified. Here we describe a technique for combining field- and museum-collected species inventories with continuous environmental and climatic data to estimate the relative biological similarity of any pair of locations on the island. This process, known as "General Dissimilarity Modeling" (GDM), provides a basis for estimating the proportion of the island's biodiversity that has been lost between two dates for which forest cover has recently become available, 1950 and 2000. We find that losses measured in simple forest area and in estimated biodiversity differ substantially. We also examine whether the spatial pattern of actual deforestation resulted in greater biodiveristy loss than would be expected from random destruction of the same total area. GDM and similar techniques can place simple habitat loss measures into more meaningful biodiversity terms, and as a result inform a variety of ecological issues and policy decisions.

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THE DESIGN OF QUANTITATIVE METHODS FOR ESTIMATING HABITAT EXTINCTION RISK

We present a procedure for determining habitat extinction risk which is analogous to the IUCN's process for determining extinction risk of plant and animal species. Three principal criteria based on spatial data and three secondary criteria based on habitat quality determine the level of habitat extinction risk. The three principal criteria include (A) the proportion of original habitat remaining, (B) rate of land cover change, and (C) fragmentation pattern. The three secondary criteria include (1) the extent of invasives, (2) degree of pollution, and (3) the type of land use that replaces the original habitat. We propose this system as a complement to more species-specific methods and hope that it will provide an alternative when only landscape-level data are available. Given the boom in available spatial data and subsequent analysis of land cover change, adoption of such a system will enable many research groups to contribute to a more coherent global picture of habitat conversion.

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PLANNING FOR LANDSCAPE CONNECTIVITY IN ISRAEL USING A SPATIALLY-EXPLICIT MODEL OF A REINTRODUCED PERSIAN FALLOW DEER

Human induced fragmentation of landscapes is a main cause of biodiversity loss. The Mediterranean region is a major component of Israel's biodiversity, but less than 2.5% of this area is protected in small and disconnected reserves. Maintaining open landscapes between the protected areas may ameliorate the effects of fragmentations. Thus, it is vital to identify key natural landscapes required to ensure connectivity. Successfully reintroduced species offer an exceptional opportunity to study the rules that govern radiation, which can then be used in projection models to identify connectivity elements in the landscape. We use the radiation patterns of Persian fallow deer (Dama mesopotamica) reintroduced in Israel, to identify key natural unprotected areas. This approach that is based on computer predictions of species radiation, identifies important connecting landscapes. The model is based on empirical data with a realistic landscape and was tested by comparing its projections to reality. Based on current landscape and regional development plans we identified and mapped preferred deer habitat and connectivity landscapes. The map presenting the landscape connectivity can be used for a long-term planning of local and regional development. Protecting areas essential for the deer will help to conserve other species in the Mediterranean ecosystem.

CO18-4 **BUSTAMANTE, JAVIER and Javier Seoane** Spatial Ecology Group. Dept. Applied Biology. Estación Biológica de Doñana, CSIC. Avda. María Luisa s/n, 41013,Sevilla, Spain (jbustamante@ebd.csic.es)

STATISTICAL MODELS OUTPERFORM EXPERTS PREDICTING BIRD DISTRIBUTION: ARE GAP PROJECTS MISSING SOMETHING?

We compared the predictive ability of statistical models, versus that of local expert ornithologists, to predict the distribution of 10 species of land birds. We used 1137 point-surveys in two areas in southern Spain. Species presence/absence at each point was predicted with Generalized Additive Models using variables derived from a land-use/land-cover map. Three experts were asked to rank two different classifications of habitats derived from the same map according to the probability to observe each species in spring. The average rankings of habitats in two circles, 175 m and 625 m radius around each point-survey were used to estimate the probability of recording the presence of each species at each sampling point. The predictive ability of models (one statistical vs. 8 expert models for each species) was evaluated by crossvalidation using the AUC of a ROC plot. For all species considered statistical models significantly outperformed the expert models. Considering that birds are the species-group for which expert knowledge is more reliable and widespread and GAP projects are based on expert knowledge to establish the relation between habitat and wildlife distribution, our results suggest that these projects could benefit from other alternatives of building predictive models for the distribution of wildlife.

CO18-5 **GOOD, TATJANA, Claire Kremen, Michelle Zjhra, Steven Phillips, and Robert Schapire** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544, (tcgood@princeton.edu) (TG, CK). Department of Biology, Georgia Southern University Statesboro, GA 30460 (MZ). AT&T Labs – Research, 180 Park Avenue, Florham Park, NJ 07932 (SP). Department of Computer Science, Princeton University, Princeton, NJ 08544 (RS)

HOW MUSEUM COLLECTIONS CAN AID CONSERVATION EFFORTS: A STATUS ASSESSMENT OF COLEA

Information on species distribution is seldom available for setting conservation priorities. While species data have a very incomplete geographical coverage, the information can nevertheless be used to model potential distributions of rare and endangered species and to assess their status. Using old locality data from museums as well as locality data from more recent collection expeditions, we analyzed how deforestation has affected Colea (Family Bignoniaceae), a tribe endemic to Madagascar and the surrounding islands of the Pacific Ocean. Specifically, we produced potential range maps of the plant species and analyzed how much of the individual species' ranges have contracted due to deforestation and how fragmentation has affected the species, their pollinators and their fruits dispersers. Lastly, we combined locality data with environmental/climate variables to create models that represent the environmental conditions where the species should occur. The model was then projected onto a map of the study area showing the species potential distribution. Predicting geographical distributions of endemic and endangered species is an increasingly important tool for focusing future collection efforts, investigating the status of species, identifying areas of endemism as well for planning conservation reserves.

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THE DEVELOPMENT OF POPULATION-BASED CONSERVATION STRATEGIES AT LARGE SCALES

Landscape scale processes need to be incorporated into conservation strategies. Models designed to do this have been developed using ideal study systems monitored for that specific purpose; but whilst conservation agencies frequently possess landscape and species-monitoring data, it is rarely of the required completeness. I have developed approaches to translate such data into conservation priorities, based on population principles. The Marsh Fritillary butterfly (Euphydryas aurinia) in Wales, UK, has been used as a model system. Data available in GIS format are species records typical of those made of threatened species, and UK standard vegetation surveys. The national population is modelled as a metapopulation with a Stochastic Patch Occupancy Model, the output of which is transformed into a GIS tool to identify conservation hotspots and compare conservation strategies. Variation in habitat quality has been evaluated using the species occupancy pattern and vegetation data, and incorporated into the model. Thus scenarios of habitat improvement or addition of new habitat patches can be compared, based on the resulting improvement in predicted population persistence and the economic costs. Additionally, management units can be defined on different time scales of population persistence. The approach allows local and national conservation agencies to integrate their strategies.

CO18-7 **RHODES, JONATHAN R., Thorsten Wiegand, Clive A. McAlpine, and Hugh P. Possingham** School of Geography, Planning and Architecture, The University of Queensland, Brisbane, QLD 4072, Australia (j.rhodes@uq.edu.au) (JRR, CAM). Department of Ecological Modelling, UFZ-Centre for Environmental Research, Permoserstrasse 15, 04318 Leipzig, Germany (TW). The Ecology Centre, The University of Queensland, Brisbane, QLD 4072, Australia (HPP).

IDENTIFYING ATTRACTIVE SINKS USING PRESENCE/ABSENCE DATA: A CASE STUDY FOR THE KOALA

The existence of source-sink dynamics in spatially structured landscapes has important implications for wildlife management. In human modified landscapes, source-sink dynamics may arise because of an inability of a species to perceive habitat quality correctly. For example, this may occur if a species has been unable to evolve a perception of human induced mortality because such changes have taken place rapidly over ecological, rather than evolutionary, time scales. This can then result in the active selection of sink habitat, i.e. attractive sinks. For a koala population in eastern Australia we fitted generalized linear models to presence / absence data in order to identify areas which resemble attractive sinks. This was achieved by explicitly separating covariates into 'natural' variables (e.g. tree species) and 'human' variables (e.g. road density) in the modeling process. In doing so we were able to identify areas which had a high predicted probability of occupancy due to 'natural' variables, but had a low predicted probability of occupancy once 'human' variables were included. We hypothesize that these areas are likely to be attractive sinks. This has important management implications because attractive sinks can elevate extinction risk over and above that due to 'natural' habitat loss.

CO18-8 **WILCOX, CHRIS, Ben Cairns, and Hugh Possingham** The Ecology Centre, University of Queensland, Brisbane, Australia 4072 (c.wilcox@uq.edu.au) Department of Mathematics, University of Queensland (BC) Department of Zoology and Entomology, University of Queensland (HP)

PERSISTENCE IN METAPOPULATIONS WITH DYNAMIC HABITATS

We present a model for metapopulations which includes habitat dynamics in the form of a continuous-time markov model, with 2 discrete states representing the number of suitable and the number occupied patches in the system. We examine the effects of changes in metapopulation dynamics, and changes in habitat dynamics on persistence of the metapopulation. We demostrate that the scaling of mean time to extinction depends on the underlying habitat dynamics, in addition to the metapopulation dynamics. Based on our results we suggest when the system may be adequately represented by an approximation, ignoring either metapopulation or habitat dynamics. And finally we demonstrate that the interaction between metapopulation dynamics and habitat dynamics results in differing patterns in persistence as the habitat dynamics vary for a given type of metapopulation dynamics. We end with a suggestion for a method for parameterizing this model using field data.

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SYMPATRIC PUMAS AND JAGUARS: DATA FROM CAMERA TRAPPING IN BOLIVIA AND BELIZE

This paper reports the first efforts to 1) estimate population densities and test landscape-wide population monitoring techniques for pumas using systematic camera trapping and capture-recapture methodologies, and 2) compare pumas and jaguars in dry forests (Bolivia) and broadleaf rainforest (Belize). Four Bolivian sites (Chaco, Chiquitanía) 100-200 km apart and one Belizean site (Chiquibul) were surveyed during 60-day periods, with 20-35 pairs of camera traps spaced 2-3 km apart. Individual pumas can be identified from photographs using a combination of features including spots, scars, and tail kinks. Puma densities appear to exceed jaguar densities at all Bolivian sites, with co-variation from site to site: densities are intermediate at the driest site (5-7 pumas, 5 jaguars/100 km2), and highest at the wettest site (15 pumas, 11 jaguars/100 km2). In Belize, jaguar densities exceed pumas (7.5 jaguars, 3.5 pumas per 100 km2). Camera trapping indicates considerable overlap between the sympatric felids in activity patterns and habitat use, suggesting both inter- and intra-specific avoidance for resource partitioning. Surveys highlight the long-term conservation importance of Bolivia's Kaa-Iya National Park (>1000 of each species, 34400 km2) and of smaller reserves in Central America such as Belize's Chiquibul Forest Reserve (133 jaguars, 62 pumas, 1775 km2).

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CAMERA TRAPPING GIANT ARMADILLOS IN THE DRY FORESTS OF SANTA CRUZ, BOLIVIA

The giant armadillo (Priodontes maximus) is considered a nocturnal, rare and endangered species (EN A1cd), but little is known regarding its abundance, ranging patterns and conservation status. As a result of systematic camera trapping surveys conducted for jaguars in eastern lowland Bolivia, we obtained 33 records of giant armadillos in three sites after a total effort of 17,000 trap-nights. We identified individuals (18, 2 and 1 at each site) according to distinct scale patterns on the carapace and hind legs. Crude densities, estimated by dividing the number of individuals by the area enclosed by the camera traps, ranged from 1-16 individuals/100 km2 across sites and surveys. At one site the number of captures and recaptures was sufficient to estimate maximum movements (2-7.5 km for three males and 1 km for a female), buffer area, and abundance using the software Capture. Together these estimates suggest a population density of 5.77-6.28/100 km2 for this site. Given the vast area (11,500 km2) of similar habitat protected within the Kaa-Iya National Park, and preliminary evidence of the species in neighboring protected areas, the dry forests of eastern Santa Cruz may offer a unique stronghold for the long-term conservation of the species.

CO19-3 **WECKEL, MARK E., William Giuliano, and Scott Silver** Louis Calder Biological Field Station, 53 Whippoorwill Rd., Armonk, New York, 10504 (weckel@fordham.edu) (MEW, WG). Wildlife Conservation Society (WCS), 2300 Southern Blvd., Bronx, NY 10468 (SS).

COCKSCOMB REVISITED: JAGUAR PREDATOR-PREY RELATIONS IN THE COCKSCOMB BASIN WILDLIFE SANCTUARY, BELIZE

Since the creation of the Cockscomb Basin Wildlife Sanctuary in 1986, hunting has been mitigated, ecotourism has been augmented and consistent wildlife monitoring has been established. Recently, research in the CBWS provided the first estimates of jaguar population density by remote photography. The purpose of our exploratory study was to implement camera trapping in monitoring the abundance and spatial-temporal distribution of the jaguar, its prey and sympatric predators. Date-time stamping of captures were used to characterize activity periods while differential capture rates among forested areas and various trail types (man-made, small mammals, and tapir) classified preferential trail use. Furthermore, we compared the prey index to historical abundance estimates and prey content of felid scats collected concurrently to the camera survey. We found preferential trail use among jaguar, puma, tapir, armadillo and gibnut. Abundance estimates by remote photography provided greater resolution than previous estimates by line-transect data, although gibnut and armadillo remained the most abundant prey items by both methods. Scats have already been assigned a species origin by molecular techniques, and are currently being dissected for prey content. Activity periods of preferred jaguar prey will be discussed upon completion of the dietary survey.

CO19-4 **DECANDIDO, ROBERT, Adrianna A. Muir, and Margaret B. Gargiullo** The City College of the City University of New York, Department of Biology, New York, NY 10031 (rdcny@earthlink.net). Graduate Group in Ecology, University of California at Davis, CA 95616. Natural Resources Group of the City of New York, Department of Parks and Recreation, 1234 Fifth Avenue, New York, NY 10029

THE HISTORICAL AND EXTANT FLORA OF NEW YORK CITY, CA. 1850-PRESENT: IMPLICATIONS FOR CONSERVATION OF NATIVE PLANT SPECIES

For the historical (ca. 1850-1980) and modern periods combined, 2179 plant species in 779 genera and 161 families have been collected in New York City. The City retains 57.4% of its native plant species diversity with 779 extant native species compared to 1357 ever recorded. Extirpations have disproportionately affected native vs. non-native species. Staten Island (Richmond County) has the greatest diversity of the five boroughs with 154 families and 1633 species known, as well as the greatest number of native extant species (621). However it has lost approximately 35% of its native flora since 1930. Manhattan (New York County) and Brooklyn (Kings County) have lost more than 75% of their native species in the last 100 years. Queens County has lost the greatest number of native species (585). Extirpations have disproportionately affected herbaceous rather than woody species. Woody families have collectively retained more than 85% of their native species, while many herbaceous families retain only 50%. In the last 70 years, extirpations have continued even in protected areas such as parks. We make recommendations to involve workers of several city agencies to help retain the remaining native plant species of the city.

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CONTRIBUTION OF NATURAL HISTORY COLLECTION DATA TO BIODIVERSITY ASSESSMENT IN NATIONAL PARKS

There has been mounting interest in the use of natural history collections to assess biodiversity; however, information is often difficult to locate and access, and few recommendations are available for effectively using natural history collections. We searched manually and by computer for specimens originating within or adjacent to 14 national parks throughout the northeastern United States. We compared the number of specimens located to collection size to determine whether there was any effect on detection rate of specimens and evaluated the importance of park characteristics for influencing the number of specimens found in a collection. We compiled >31,000 records from 78 collections of which >9,000 were park-relevant. Searching manually, we located >2,000 specimens costing $0.001-$0.15 per specimen searched and $0.81-$151.95 per specimen found. Detection rates for specimens were inversely related to collection size. Although specimens were most often located in collections within the region of interest, specimens can be found anywhere and global searches are needed to examine collections outside the area of interest. Because many institutions have not yet established electronic databases for collections, manual searches can be useful for retrieving specimens. We believe that systematic searching of natural history collections can provide valuable data for assessing historical biodiversity.

CO19-6 **OSTRO, LINDE E.T., Scott C. Silver, and Bart Harmsen** Wildlife Conservation Society, 2300 Southern Blvd, Bronx, NY 10460 (lostro@wcs.org)

MONITORING JAGUAR POPULATIONS USING CAMERA TRAPS: LESSONS FROM THREE CONSECUTIVE YEARS OF SURVEYS

The authors will present the results of three consecutive years of a jaguar abundance study in the Cockscomb Basin jaguar reserve in Belize, using remote camera trapping to estimate a population based upon a mark and recapture analysis. The results indicate a relatively high density of jaguars at this site when compared to other sites using similar techniques, but vary considerably from year to year based upon the effective sample area analyzed. Differences in the buffer area included in the analysis are chiefly responsible for this variation. The survey results will be presented in light of a variety of different estimates used to calculate the effective sample area, and the resulting differences in jaguar density estimates. Finally, all camera trap surveys to date have indicated a large male-biased sex ratio in jaguars photographed, and the possible reasons for this and its implications for estimating abundance will likewise be discussed.

CO19-7 **PENSKAR, MICHAEL R., Edward H. Schools, Peter B. Pearman, Helen D. Enander, Michael A. Kost, and David L. Cuthrell** Michigan Natural Features Inventory, Michigan State University, P.O. Box 30444, Lansing, Mich. 48909-7944 (penskarm@michigan.gov)

A RESAMPLING METHOD FOR IDENTIFYING BIOLOGICAL INDICATORS OF LANDSCAPE CONDITION USING NATURAL HERITAGE DATA ON RARE SPECIES

Management and conservation of terrestrial ecosystems in the Great Lakes region occurs within the context of physical, chemical, and biological processes. The identification of regionally applicable ecological indicators would assist in monitoring the condition of the Great Lakes environment and impacts on biodiversity. We investigated a methodology for identifying rare plant and animal species as potential indicators of condition of wetland and terrestrial environment in the Great Lakes region. We employed a statewide natural features database, initially developed as part of Michigan's Heritage Program, which tracks occurrences of 650 rare plant and animal taxa with a GIS-based data platform. First we defined spatially explicit criteria to (a) identify high quality sites and (b) to be independent of the presence/absence of rare species. We subsequently identified potential indicator species based on their occurrence within high quality sites. We devised a randomization test to identify the maximal set of species displaying statistically significant association with high quality areas. We applied this set statewide. The large number of Natural Heritage Program databases and the robustness of resampling methods to idiosyncratic databases characteristics make this methodology applicable for monitoring regional ecosystem condition and identifying additional areas of high conservation value.

CO19-8 **NOSS, ANDREW J., Leonardo Maffei, Marcella J. Kelly, Rosario Arispe, and Kathia Rivero** Wildlife Conservation Society-Bolivia, calle Pocherena 122, Casilla 6272, Santa Cruz, Bolivia, (anoss@wcs.org) (AJN, LM). Department of Fisheries and Wildlife Sciences, 210B Cheatham Hall, Virginia Tech University, Blacksburg, VA 24061-0321, USA (MJK). Museo de Historia Natural Noel Kempff Mercado, Casilla 2489, Santa Cruz, Bolivia (RA, KR)

OCELOT POPULATION DENSITIES IN DRY FORESTS (BOLIVIA) AND RAIN FORESTS (BELIZE)

This paper describes the first cross-site comparison of population densities for ocelots using systematic camera trapping and capture-recapture methodologies. We hypothesized that ocelots would be more abundant at sites with higher precipitation. Four dry forest sites 100-200 km apart in Bolivia and one broadleaf rainforest site in Belize were surveyed. Except for the wet season survey in Belize (36 days), surveys lasted 60 days, using 20-35 pairs of camera traps spaced 2-3 km apart. Surveys were repeated to cover both wet and dry season at all but one Bolivian site. Similar to jaguars, individual ocelots can be identified from photographs according to unique rosette and striping patterns. Density estimates vary significantly between wet and dry seasons at all four sites where surveys were repeated. In Bolivian dry forests, ocelots were relatively abundant (0.56per km2) at the wettest (1100 mm) Chiquitano forest site, and relatively scarce (0.25-0.34 per km2) at the driest (550 mm) Chaco forest site. However, one of the two intermediate transitional Chaco-Chiquitano forest sites (800 mm) presents a high (0.52-0.66 per km2), and the other a low (0.24-0.34 per km2), density estimate respectively. Despite the much higher rainfall (1500 mm), ocelots are considerably more scarce at the broadleaf rainforest site of Belize: 0.08-0.19 per km2.

CO20-1 **BASNET, KHADGA** Central Department of Zoology, Tribhuvan University, University Campus, Kirtipur, Kathmandu, Nepal (kbasnet@ntc.net.np)

CROP DEPREDATION BY WILDLIFE: A CHALLENGE IN MANAGING PROTECTED AREAS IN NEPAL

Crop depredation by wildlife is one of the major issues in protected area (PA) management in Nepal. But the problem has not been critically analyzed. The main objective of this paper is to assess spatial and temporal scale of crop depredation and its causes and consequences. Specifically, it will explore a) patterns, frequency and intensity of depredation across ecological regions, b) incidents from historical perspective by comparing three periods - before 1960s, 1960s-1980s, and beyond 1980s, c) relationship between the incidents and size of PAs and community forests, and d) possible socio-economical impacts and future direction through literature review, participatory rural appraisal, and field studies in PAs of Nepal. Preliminary analysis and case studies of major crop depredators such as rhinoceros, elephants, and wild boar show: a) crop depredation is common in all ecological regions but the frequency is higher in lowland, b) although the problem prevailed throughout history, it became critical particularly after 1980s, c) small PAs without adequate buffer and community forests, and expansion of agriculture field to support growing human population are the major causes of crop depredation by wildlife. These findings justify for a holistic approach of PA management and landscape level planning of biodiversity conservation

CO20-2 **RODRÍGUEZ-CLARK, KATHRYN M., María Cellamare, Rachel A. Neugarten, Romina Acevedo, René Ayala, José Manuel Briceño, Mayne Cacique, Francoise Cavada, Carlos Fajardo, Ana Cecilia García, Juan Pablo Gassman, Consuelo Hernández, Pablo Antonio Millán, Adriana** Instituto Venezolano de Investigaciones Científicas, Centro de Ecología, Apartado 21827, Caracas 1020-A Venezuela, (kmrc@ivic.ve) (KMRC, JPR). Universidad del Oriente, Departamento de Ciencias, Boca del Rio, Isla Margarita, 6301 Venezuela (MC, RA, MC, FC, CF, ACG, JPG, AM, EP, AT). Columbia University, Department of Ecology, Evolution, and Environmental Biology, 10th Floor Schermerhorn Extension, 1200 Amsterdam Avenue, New York, NY 10027 (RN). Provita, Apartado 47552, Caracas 1041-A, Venezuela (KMRC, RA, JMB, CH, PAM, JPR, IZ).

OPTIMAL INVESTMENT IN ENVIRONMENTAL EDUCATION: THE EFFECT OF TWO INTERVENTIONS ON KNOWLEDGE AND ATTITUDES IN VENEZUELAN CHILDREN TOWARD AN ENDEMIC, ENDANGERED PARAKEET

The blue-crowned conure (Aratinga acuticaudata neoxena, endemic to Margarita Island, Venezuela), is critically endangered largely due to poaching by area residents. Environmental education is frequently recommended to promote behavioral change, but little is known about what approaches are most efficient in the face of limited resources. To address this question, we tested the effect of two contrasting interventions on pre-teens from communities near remaining conure habitat. The first consisted of a 15-minute play (P) modeling desired behaviors (presented to ~150 children), while the second comprised a week-long environmental day camp (DC) for 21 children, with one day focused on conures. Before-and-after surveys administered to all DC children (with 8 matched controls), and to 46 randomly-selected P children (with 34 controls), revealed that both groups increased significantly in their knowledge of, positive attitudes toward, and expressed propensity for actions to help the conure. Superficially, results suggest that the play was much more efficient than the camp -- since ~8 times the number of children were reached, but per-child effects were comparable, as were total temporal, financial and human resources invested. However, this ignores the greater potential for lasting and actual behavioral change that the more intensive camp experience appears to promote.

CO20-3 **HOLMES, CHRISTOPHER M., Patricia Wright, Karen Kramer, Timothy Keitt, and Steig Johnson** Institute for the Conservation of Tropical Environments, Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (CMH, PW, SJ)(christopher.holmes@stonybrook.edu). Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (KK). Section of Integrative Biology, University of Texas, Austin, TX 78712 USA (TK)

UNDERSTANDING DYNAMICS OF HUMAN RESOURCE-USE AND THEIR EFFECTS ON RAINFOREST CONSERVATION IN MADAGASCAR: PRILIMINARY RESULTS FROM RANOMAFANA NATIONAL PARK

This research examines the diversity of human economic and ecological behaviors in the ethno-geographic context of rural southeastern Madagascar. Here, increasing population densities and shortening fallow periods perpetuate an unsustainable cycle of slash-and-burn (tavy) agriculture resulting in extensive deforestation around Ranomafana National Park (RNP). In the communities surrounding RNP we quantify household wetland and tavy rice production – the principle agricultural activity – and assess interest in accessing RNP's resources and conservation attitudes. Surveys of 457 households in 12 villages bordering RNP revealed variation in type (wetland or tavy) and amount (kilos) of rice production between the region's principle ethnic groups, as well as across the geographic range of community locations. Interest in accessing RNP's resources and in seeing RNP degazetted associated with geographic location, as well as with respondent age, gender, and residency period. These results suggest a dynamic ethno-geographic system in which multiple factors influence land-use practices, resource-use decisions and conservation attitudes; future stages of this research will model decision-making to predict the breakpoint at which individuals switch between modes of agricultural production. Understanding such decisions is critical to future conservation of Madagascar's rainforests. This research was funded by an Interdisciplinary science grant from the David and Lucile Packard Foundation.

CO20-4 **JOHNSON, STEIG E., Jean-Philippe Puyravaud, Felix Ratelolahy, Ravalison, Patricia C. Wright, Tim H. Keitt, Karen L. Kramer, and Christopher M. Holmes** Institute for the Conservation of Tropical Environments, SBS Building, 5th Floor, Stony Brook University, Stony Brook, NY 11794 (SEJ, J-PP, PCW, CMH) (steig.johnson@stonybrook.edu). Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (SEJ, PCW, KLK, CMH). Centre de Formation International pour la Valorisation de la Biodiversité, BP 33, Ranomafana, Ifanadiana 312, Madagascar (J-PP, FR, R). Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712 (THK)

BIODIVERSITY AND ANTHROPOGENIC DISTURBANCE AT RANOMAFANA NATIONAL PARK, MADAGASCAR

This project investigates the dynamics of coupled human and natural systems in the rain forest region of Ranomafana National Park, Madagascar. To measure the impact of human activities, we survey 4-km edge-interior transects adjacent to twelve study villages in the park periphery. We also monitor botanical plots and trapping grids arranged along transects. Our surveys indicate that forest structure, animal populations, and edge effects vary with the extent of forest products extraction and divergent agricultural techniques (slash-and-burn vs. wetland rice). There are greater edge-interior differences in habitat structure (e.g., lower tree diameters and height in edges) in forests adjacent to more sedentary wetland agriculture than in slash-and-burn habitats. In forests with more pervasive extractive activities, there are overall reductions in vertebrate richness and/or density (e.g., rodents, primates) but less marked edge effects. Overall, edge effects are more pronounced in taxa with smaller home ranges (insectivores, rodents, nocturnal primates) than in wider-ranging species (day-active primates, birds). In ongoing research, we apply these biological field data to spatially-explicit models of deforestation and land- and resource-use decision-making to better predict the future threats to Madagascar's exceptional biodiversity. This research is funded by an Interdisciplinary Science Grant from the David and Lucile Packard Foundation.

CO20-5 **KEITT, TIMOTHY H., Wendy Gordon, Christopher M. Holmes, and Patricia C. Wright** Section of Integrative Biology, University of Texas, Austin, TX 78712 (THK, WG)(tkeitt@mail.utexas.edu). Institute for the Conservation of Tropical Environments, Department of Anthropology, Stony Brook University, Stony Brook, NY 11794-4364 (CMH, PCW)

MODELING DYNAMICS OF HUMAN RESOURCE USE AND THEIR EFFECTS ON RAINFOREST CONSERVATION IN MADAGASCAR: OVERVIEW OF PACKARD RESEARCH AND MODELING APPROACHES

A significant challenge for conservation practitioners is modeling drivers of land-use and land-cover change and quantifying impacts of landscape change on biodiversity. We present an overview and preliminary results of an interdisciplinary research project to model human and natural landscape ecology of southeastern Madagascar. The research couples studies of the diversity of human economic and ecological behaviors with biodiversity surveys to assess disturbance impacts on the periphery of Ranomafana National Park, Madagascar. These results are place into a historical landscape context through retrospective analysis of satellite imagery and other remotely sensed data. In addition, we model landscape dynamics using an agent-based simulation framework where individual households make resource-use decisions based on an economic objective function. Results show important interactions between household wealth, regional integration and disturbance related impacts at the village level. Model results indicate the landscape context, including topography and the availability of arable lands, plays a significant role in determining rates of forest conversion to agriculture and other disturbance-related impacts.

CO20-6 **WRIGHT, R. MICHAEL, Miller, Daniel C., John D. and Catherine T. MacArthur Foundation**, 140 S. Dearborn St., Chicago, IL 60603, USA, rmwright@macfound.org.

COMMUNITIES OF CONSERVATION AND THE CONFLICT OVER PRACTICE

Faced with accelerating biodiversity loss, the contemporary conservation movement struggles with how to effectively protect species and habitats. Conservationists with a biocentric view stress a return to strict protectionism for conserving critical landscapes, while those representing an anthropocentric perspective argue that the imperative of human development takes precedence. To a significant extent, the debate in approach between different conservation communities is not reflected in proposals submitted to large private foundations. While some proposals emphasize traditional preservation, a larger percentage assume that community approaches are the universally appropriate and accepted strategy and few explore the relevance of two decades of field experience in demonstrating the value of proposed interventions. The MacArthur Foundation is developing an initiative to capture the perspectives of practitioners, researchers, and policymakers in an effort to address the apparent disconnect between proposals for conservation action and intellectual debate over which approaches are most effective. Input received from more than 60 advisors on the design of this initiative indicates a need to move beyond the analysis of individual community-oriented projects and debate over the techniques used to a systematic investigation of conditions and interventions that can lead to effective conservation at a landscape scale in complex social-ecological systems.

CO20-7 **SONGER, MELISSA, U Myint Aung, Khaing Khaing Sway, Thida Oo, Peter Leimgruber, and Ruth DeFries** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (M.S., P.L); Chatthin Wildlife Sanctuary Headquarters, Kanbalu, Myanmar (U.M.A., K.K.S., T.O); Department of Geography, University of Maryland, College Park, MD 20742 (R.D. (songerm@crc.si.edu).

HUMAN RESOURCE USE AND PROTECTION AT MYANMAR'S CHATTHIN WILDLIFE SANCTUARY

Human activity and land use change are drivers affecting natural ecosystems. While their presence and effects may be mitigated, they can rarely be eliminated. Even in protected areas where logging and forest conversion are curtailed, subsistence use of forest products continues, particularly where local people depend on natural ecosystems for their subsistence. Restricting natural resource use through protection puts a greater burden on lower income households, which makes policy makers question whether forest product use should be completely restricted. We surveyed 784 people in villages in and around Chatthin Wildlife Sanctuary in Myanmar to elicit information about forest product use, agriculture practices, and socioeconomics. Our studies demonstrate that preventing low-income villagers from using forest products would cause significant hardship in our study area. We found 67% of the households collect non-timber forest products and 33% hunt in the forest. Villagers collect fuelwood, fodder, over 90 medicinal plants, 50 food and household products, and thatch for houses from the forest. The average yearly household income is $550. We are currently working on developing conservation partnerships to regulate and manage forest use in a sustainable, equitable way.

CO20-8 **BROOKS, THOMAS, John Pilgrim, Ana Rodrigues, and Mike Hoffmann** Center for Applied Biodiversity Science, Conservation International, 1919 M St NW Suite 600, Washington DC 20036 (t.brooks@conservation.org)

CIVIL CONFLICT, BIODIVERSITY, AND CONSERVATION

Global security has an expanding place on the public agenda, with important implications for biodiversity conservation. We examine global links between these pressing concerns. Quantitative data on the distribution of civil conflict are available from several sources, including IIMCR and NDCF. Meanwhile, distribution data for all mammal, bird, and amphibian species are now available through the IUCN Red List partnership. We find that, globally, correlations between the distributions of civil conflict and of species richness are weak, while those with endemism and with numbers and proportions of threatened species are stronger. These correlations stimulate a number of important hypotheses regarding causation: declining environmental quality could cause conflict; conflict could cause biodiversity loss; or both factors could be covary with independent factors (such as environmental heterogeneity, human population density, or cultural diversity). Testing these hypotheses will require further study. Regardless of causation, however, these correlations have two clear policy consequences. First, in order to conserve biodiversity, conservation organizations must grasp the nettle of developing programs in war-torn regions. Second - whether to ameliorate root causes or to mitigate effects - military and humanitarian programs in conflict zones must ensure that biodiversity conservation is a significant component of their investment.

CO21-1 **WILLIAMS, NICHOLAS S.G., John W. Morgan, and Mark J. McDonnell** Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne, South Yarra VIC 3141 and School of Botany, University of Melbourne, VIC 3010, Australia (NSGW, MJM) (nsw@unimelb.edu.au); Department of Botany, La Trobe University, Bundoora, VIC, Australia 3083 (JWM)

INFLUENCE OF PLANT SPECIES ATTRIBUTES AND LANDSCAPE CONTEXT ON THE PROBABILITY OF LOCAL EXTINCTION IN THE ENDANGERED GRASSLANDS OF SOUTHEASTERN AUSTRALIA

Native temperate grasslands are one of the most endangered ecosystems in southeastern Australia. They are extremely fragmented and populations of many rare plant species are restricted to small, isolated remnants in urban and rural landscapes. To determine if there were differences between the persistence of plants in urban vs rural landscapes we re-surveyed 30 grassland remnants that had under gone comprehensive botanical survey between 1979 and 1990. 289 (26%) of the 1104 plant populations present in the 1980's were not relocated and were presumed locally extinct. Different suites of species were lost from urban compared to rural grasslands, but species common in both landscapes had consistently higher extinction rates in urban grasslands, which also lost more populations than rural patches. Bayesian logistic regression models were used to determine the plant attributes that influence the probability that a population of a species will become locally extinct in each landscape. Attributes that increased the risk of local extinction were seeds dispersed by wind or adhesion, growing buds at or below the soil surface, low seed mass and soil stored seed. A regional analysis highlighted that these attributes are common to many of the threatened flora of southeastern Australian grasslands.

CO21-2 **WOSSINK, ADA, Jaap van Wenum, and Alfons Oude Lansink** Department of Social Sciences, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands and Department of Agricultural and Resource Economics, North Carolina State University, Raleigh NC 27695-8109(AW)(ada_wossink@ncsu.edu) LTO Nederland, P.O. Box 29773, 2502 LT The Hague, The Netherlands (JvW)Department of Social Sciences, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands (AOL)

BIODIVERSITY CONSERVATION IN AGRICULTURAL LANDSCAPES: THE IMPACT OF ARABLE FIELD MANAGEMENT AND FARM-SPECIFIC CONDITIONS ON FLORAL SPECIES

The identification of the biodiversity benefits of conservation activities is crucial for efficient private and public conservation management. In this paper we address this issue for conservation practices in agriculture. Based on farm economic, agronomic and ecological insights, a random effects model is developed to capture the relationship between biodiversity output, management practices, site-specific characteristics and non-observed farm specific factors. The model is implemented for the conservation management of plant species on fields and field margins in cropland. The data included 278 observations on 49 farms varying in natural conditions and parcel lay out. Main result is that non-observed farm specific conditions have a significant impact on biodiversity production. Hence, biodiversity-output based payment systems are prone to adverse selection because the program is attractive to farmers that have favorable conditions for the presence of wildlife. A second result with policy implications is that extensive agricultural activities have a positive impact on biodiversity, also when compared with fallow.

CO21-3 **WILLIAMS, NEAL M. and Claire Kremen** Bryn Mawr College, 101 N. Merion Ave. Bryn Mawr, PA 19010 (nwilliam@brynmawr.edu). Princeton University, Princeton NJ 08544 (CK)

LOCAL HABITAT AND LANDSCAPE-LEVEL RESOURCES AFFECT OFFSPRING PRODUCTION BY THE NATIVE BEE OSMIA LIGNARIA IN AN AGRICULTURAL MOSAIC

Survival and fecundity of populations in mosaic landscapes are affected by local habitat quality, but also by the composition of the surrounding landscape and the resources provided by different component habitats. Populations may persist in locally degraded habitat by gathering resources from complementary habitat types. We measured offspring production, for the native bee Osmia lignaria nesting in three habitat types (riparian remnants, organic farms and conventional farms) located along a landscape gradient from primarily native to primarily agricultural habitat. For each nest site we determined the composition of the surrounding landscape across spatial scales, focusing on the proportion of native habitat. We also identified the flower species used by bees nesting at each site and the distribution of these species among habitat types within the landscape. Productivity of females nesting on conventional farms and riparian remnants decreased significantly with loss of natural habitats; however, females at organic farms were unaffected by this loss. Consistent productivity by females at organic farms was not due to the more abundant flower resources at organic farms. Instead females at all sites used pollens primarily from native plants located in upland and riparian habitat. Connectivity with natural habitats appears integral to maintaining these native bee populations in agricultural landscapes.

CO21-4 **MARTIN, TARA G., Petra M Kuhnert, Kerrie Mengersen, and Hugh P. Possingham** The Ecology Centre,The University of Queensland, St. Lucia 4072 Australia (TGM, PMK, HPP)(Tara.Martin@csiro.au). School of Mathematical and Physical sciences, The University of Newcastle, Callaghan NSW 2308 Australia (KM)

DO EXPERTS KNOW ANYTHING ABOUT BIRDS AND GRAZING? A BAYESIAN APPROACH USING EXPERT OPINION

One of our greatest challenges is predicting impacts of landuse on biota. Predicting the impact of commercial grazing on Australian birds is no exception given that grazing is often confounded with other disturbances resulting in few publications on the impact of grazing alone. Ecologists with extensive experience observing birds in grazed landscapes could inform an analysis when time and monetary constraints limit the amount of data that can be collected. Using responses from twenty well-recognised ecologists we capture this expert knowledge and incorporate it into a statistical model using Bayesian methods. Although relatively new to ecology, Bayesian methods allow the integration of different types of information from many sources, including scientific judgement. Field data on bird density was collected across three grazing levels. This field data was used in conjunction with expert data to produce estimates of species persistence under grazing. The addition of expert data through priors strengthened results under at least one grazing level for all bird species examined. In fields where there is extensive expert knowledge, yet little published data, the use of expert information as priors for ecological models is a cost effective way of making more confident predictions about the effect of management on biodiversity.

CO21-5 **DRISCOLL, MELISSA A., John P. Loegering, and Vernon B. Cardwell** Conservation Biology Program, 180 McNeal Hall, 1985 Buford Ave., University of Minnesota, St. Paul, MN, 55108 (dris0037@umn.edu)(MAD, JPL); Fisheries, Wildlife and Conservation Biology, University of Minnesota, St. Paul, MN 55108 and Natural Resources, 2900 University Avenue, University of Minnesota, Crookston, MN 56716-5001 (JPL). Agronomy and Plant Genetics, 411 Borlaug Hall, 1991 Upper Buford Circle, University of Minnesota, St. Paul, MN 55108-6026 (VBC).

ACCOMMODATING NESTING BIRDS IN CATTLE PASTURES IN SOUTHEAST MINNESOTA

With less than 1% of prairies remaining in the Upper Midwest, grassland birds depend on pastures and hayfields to nest and raise young. Our study compared the abundance and reproductive success of grassland birds in rotationally and continuously grazed cattle pastures in southeast Minnesota. Savannah Sparrows were the most abundant species, and we found no difference in Savannah Sparrow reproductive success between grazing systems ($P > 0.1$). Vegetation density was the best predictor of nest success in all pastures; nests were 58 times more likely to fledge at least one chick with each 1 dm increase in the Visual Obstruction Reading (VOR) and the improvement in success was most pronounced from 0 to 1 dm VOR. We found more breeding birds in pastures with an average vegetation density > 1 dm VOR and those birds experienced greater rates of reproductive success. Stated grassland management schemes such as 'rotational grazing' or 'continuous grazing' encompass a broad range of practices, and grazing intensities; including those that are detrimental to grassland birds. Grassland bird reproductive success cannot be tied to such broadly defined grazing practices, and we recommend that the Conservation Security Act include monitoring to ensure good grassland bird habitat.

CO21-6 **BÁLDI, ANDRÁS, Sarolta Erdős, Péter Batáry, Tibor Kisbenedek, Tamás Rédei, Miklós Sárospataki, and Tamás Szűts** Animal Ecology Research Group, HAS, Hungarian Natural History Museum, 2 Ludovika tér, Budapest, 1083 Hungary (AB, TK), baldi@nhmus.hu. Hungarian Natural History Museum, 2 Ludovika tér, Budapest, 1083 Hungary (AB, SE, PB), Institute of Ecology and Botany, Vácrátót, 2163 Hungary (TR). Department of Zoology and Ecology, Szent István University, 1 Páter K. u. Gödöllő, 2103 Hungary (MS), Systematic Zoology Research Group, HAS, 1/c Pázmány P. sétány Budapest, 1117 Hungary (TS).

GRAZING INTENSITY AND BIODIVERSITY IN HUNGARY: WHAT WILL BE THE EFFECTS OF THE EU ENLARGEMENT?

The intensification of agriculture in the second half of the 20th century resulted in a dramatic decline of biodiversity in western Europe. The intensification is attributed to the effects of the common agricultural policy (CAP) of the EU, which favoured large and intensively managed farms. In 2004, ten Central- and Eastern European countries (CEECs) will enter the EU, adding 738,000 km2 and 75 million people to it. What can the CEECs anticipate if CAP will govern agriculture? In an EU 5th framework project (EASY) we sampled plants, birds and three functional groups of arthropods (orthopterans - herbivores, bees - pollinators, spiders - predators) in 42 pastures in the Hungarian Great Plain. The pastures were paired; an extensively and an intensively grazed site formed the pair. We found more bird species on intensive pastures, which had more heterogeneous landscapes with farm buildings and shelters, while the number of individuals were higher in the extensive sites. The preliminary results on the arthropod taxa indicate that intensively and extensively grazed sites had different assemblages, but this largely depend on the local vegetation structure.

CO21-7 **DONALDSON, JOHN** Kirstenbosch Research Centre, National Botanical Institute, P/Bag X7, Cape Town, South Africa (donaldson@nbi.ac.za)

AN ASSESSMENT OF EXTINCTION RISK DUE TO THE COLLAPSE OF POLLINATOR MUTUALISMS IN AFRICAN CYCADS

Approximately 53% of the world's ~300 cycad species are listed in the IUCN Red List and 46 species have <1000 individuals. Many populations are so small and isolated that there is an increasing risk of extinction from reproductive failure due to the geographical separation of male and female plants, shifts in sex ratio, and the collapse of pollinator mutualisms. Surveys of 54 populations of 14 African cycads, show that populations of <300 mature plants have reduced seed set and populations <50 plants have no seed set. The abundance and diversity of insect groups also declines with decreasing population size, although there appears to be a natural decline in insect diversity along a north-south gradient. Isolation also plays a role in reproductive failure. Insect pollinators appear to be able to locate isolated plants if there is a suitable source population within 7-10 km. Weevils occurred more often on isolated plants than other beetle pollinators, leading to differences in the risk of pollination failure in different pollination systems. The collapse of mutualisms is a significant risk for at least four African cycads and efforts to conserve these species will fail unless pollination problems can be remedied. Data from phylogenetic and experimental studies of host switching, suggest that it may be possible to re-establish pollinators in some populations and this will influence the assessment of risk.

CO21-8 **PYKE, CHRISTOPHER R. and Jaymee Marty** National Center for Ecological Analysis and Synthesis, 735 State St., Suite 300, Santa Barbara, CA 93101 (pyke@nceas.ucsb.edu); The Nature Conservancy, Cosumnes River Preserve, 13501 Franklin Blvd., Galt, CA 95632

GRAZING CONFOUNDS CLIMATE CHANGE

Livestock grazing and climate change are generally considered major global stresses on biodiversity. Using a combination of experimental manipulations and simulation modeling, we find that the presence of grazing is important for maintaining biodiversity in threatened vernal pool ecosystems in the Central Valley of California under climate change. Moreover, we found that it is impossible to assess the impacts of climate change on this system without understanding the biophysical implications of grazing. The ecological importance of grazing-climate interactions for hydrologically-sensitive endangered species endemic to these habitats ranges from trivial to dominant as a function of position along a regional precipitation gradient. We conclude that grazing plays a positive role in maintaining hydrologic conditions in these wetlands that can potentially confound hydrologic changes driven by climate change. These findings reinforce an increasing general conclusion: the biophysical impacts of land-use, land-cover, and land-management will be an important aspect of climate change at local, regional, and global scales.

CO22-1 **BOWMAN, REED, Stephan J. Schoech, and Glen E. Woolfenden** Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33862 (rbowman@archbold-station.org) (RB, GEW). Dept. Biology, University of Memphis, Memphis, TN 38152(SJS).

URBANIZATION INFLUENCES TIMING OF BREEDING IN BIRDS: INTERACTIONS BETWEEN FOOD AND STRESS ON REPRODUCTION

Recent studies suggest that increased temperatures associated with global climate change may advance the timing of breeding in birds. Predictions of global climate models include increased climatic variability. Urbanization also is likely to increase temperatures, but may lead to more stable ecological conditions. Over the past 10 years, we compared the reproductive ecology of suburban and wildland populations of Florida Scrub-Jays (Aphelocoma coerulescens). Three distinctive patterns are evident: suburban scrub-jays 1) always breed earlier than wildland jays, 2) show less between-year variation, and 3) breed earlier in every year than has been observed in any year in the wildland population. Access to supplemental food, whether human-provided in suburbs or experimentally-provided in wildlands, reduces corticosterone levels. A model of the interactive effects of food and stress on reproduction predicts advanced laying date and reduced annual variation, consistent with our empirical observations, but not the third pattern, which may be driven by other urban artifacts. We suggest that global increases in urbanization is a plausible alternative to global climate change for changes in timing of breeding in birds. The two hypotheses, although not mutually exclusive, are distinguished by their differing predictions for patterns of between-year variation.

CO22-2 **BURKE, DAWN M., Erica Nol, Judith Phillips, and Wendy Dunford** Southern Science and Information Unit, Ontario Ministry of Natural Resources, 659 Exeter Rd., London, ON, N6E 1L3 (dawn.burke@mnr.gov.on.ca). Biology Department, Trent University, Peterborough, ON, K9J 7B8 (EN). Watershed Ecosystems Graduate Program, Trent University, Peterborough, ON, K9J 7B8 (JP). Species at Risk Branch, Canadian Wildlife Service, 351 St. Joseph Blvd., Hull, Quebec, Canada, K1A 0H3 (WD).

EFFECTS OF HOUSING DEVELOPMENTS ON BREEDING SUCCESS OF FOREST BIRDS

Exurban development is converting crop land, pastures, and forests to built environments on a massive scale, with little known ecological consequences. This low-density development occurs beyond city limits, and may 'preserve' a forest physically, but fail to safeguard it ecologically. We monitored the impact of exurbanization on American Robin, Wood Thrush, and Ovenbird in two landscapes within southern Ontario, Canada, from 1990-1993. Woodlots surrounded by high-density housing (>0.5 houses/ha around woodlot) were less likely to be selected by Wood Thrush, and to a lesser extent Ovenbirds. These woodlots also suffered from lower rates of paired males, and higher rates of parasitism by Brown-headed Cowbirds, particularly for Wood Thrush. Woodlots with high-density housing had higher predation rates on Ovenbird and American Robin nests, in at least one landscape. Population growth and development are inevitable. Research should serve to direct development so that threats to biodiversity are minimized. Our results suggest that maintaining sharp boundaries between urban and rural landscapes will be the most successful approach to preserving avian biodiversity.

CO22-3 **MORTBERG, ULLA and Hans-Georg Wallentinus** Dept. of Land and Water Resources Engineering, Royal Institute of Technology, SE-100 44 Stockholm,Sweden (mortberg@kth.se) (UM),Dept. of Landscape Planning, Swedish University of Agricultural Sciences, Box 7012, 750 07 Uppsala, Sweden (HGW)

WATERBIRDS AND DRAGONFLIES IN AN URBAN-RURAL GRADIENT

For efficient consideration of biodiversity objectives in urban planning and environmental impact assessment, knowledge is needed on how habitat characteristics, landscape context and urban disturbances influence occupance patterns of different taxa. In order to investigate whether the two species groups waterbirds and dragonflies followed a similar pattern in an urban-rural gradient, 64 ponds and small lakes were surveyed for birds and dragonfly larvae in and around Stockholm, the capital of Sweden. As explanatory variables for predicting species richness of the two species groups, we used habitat variables from field surveys, GIS-derived landscape context variables and spatially explicit, quantified urban disturbances like density of urban population, recreation pressure, road density and traffic intensity. The results showed that high species richness of waterfowl was not correlated with high species richness of dragonflies, but predictive models for both species groups were improved by incorporating landscape context and urban disturbance variables. The results would imply that when considering biodiversity objectives in urban planning and environmental impact assessment, the two species groups would have to be considered separately, and that apart from habitat characteristics, landscape context and urban disturbances also should be taken into account.

CO22-4 **STRATFORD, JEFFREY A. and W. Douglas Robinson** Department of Biological Sciences, Auburn University, Auburn, AL 36849 (JAS) (stratja@auburn.edu) Department of Fisheries and Wildlife, and Oak Creek Lab of Biology, 104 Nash Hall, Oregon State University, Corvallis, OR 97331(WDR).

DISTRIBUTION OF NEOTROPICAL MIGRATORY BIRD SPECIES ACROSS AN URBANIZING LANDSCAPE

The scale at which habitat alteration, particularly urbanization, most strongly influences species distributions is poorly understood. We quantified Neotropical migratory birds species richness for two years at 650 points across a gradient of urbanization in the southeastern US. This gradient extended from downtown areas of Columbus, GA to natural woodlands, covering an area of approximately 2100 km2. Buffers of 100, 200, and 1000 m were constructed from 7 TM Landsat images around each counting point to quantify land-use with the goal of evaluating land-use parameters and scales that best described spatial variation in migrant bird species richness. An information-theoretic approach indicated that large-scale urban cover influences the local species richness of migrant birds more than the proportion and scales of other habitats. Our results demonstrate that the conservation value of small woodlots in urban settings may be minimal, indicating that conservation of migratory birds will be best achieved by giving higher priority to sites where urban cover is still low and by preserving large areas of “green space” in urbanizing landscapes. The negative influence of urban cover combined with relatively minor effects of non-urban habitats on distributions of Neotropical migratory birds indicates that continued urbanization of landscapes is a serious concern for conservation efforts.

CO22-5 **SNEP, ROBBERT P.H., Wim Timmermans, Paul F.M. Opdam, and Robert G.M. Kwak** Alterra - Green World Research. Wageningen University & Researchcentre. P.O. Box 47, 6700 AA Wageningen, the Netherlands. (www.groenemetropolen.nl) (Robbert.Snep@wur.nl)

APPLYING URBAN LANDSCAPE ECOLOGY IN MULTI-LANDUSE CASES IN THE HIGHLY POPULATED NETHERLANDS

The presentation will describe the Dutch urban ecological research of the Alterra-team for Urban-Rural Relations. Due to the high density of humans and the lack of space for nature in the overpopulated country of the Netherlands 'multi-landuse' type of solutions are needed to conserve actual and potential nature values. During the past five years Alterra applied landscape ecological principles on urban ecological topics. Various projects which combined both human and nature demands are carried out by using spatial expert systems, simulation models, GIS, remote sensing and scenario studies. This resulted in a new type of urban ecological concepts, including e.g. i) the design of a multilevel highway wildlife passage with several levels of offices and an ecological corridor on the roof, ii) the concept of peri-urban nature development supporting urban nature quality, iii) green veining-structures in the Port of Rotterdam, the world largest harbour, iv) urban biodiversity strategies for new, fastgrowing towns, v) architecture concepts supporting urban nature. These days our research is also focusing on spatial concepts for sustainable business parks, using landscape ecological principles to design a sophisticated urban green structure which will provide extra economical, social and natural values to business parks.

CO22-6 **HOLDSWORTH, ANDREW R., Lee E. Frelich, and Peter B. Reich** Conservation Biology Graduate Program, University of Minnesota, 1530 N. Cleveland Ave. St. Paul, MN 55108 (ARH) (hold0094@umn.edu), Department of Forest Resources, 1530 N. Cleveland Ave. St. Paul, MN 55108 (LEF, PBR)

THE EFFECT OF DEER EXCLUSION ON PLANT COMMUNITIES IN A SUBURBAN FOREST FRAGMENT

Maintaining and restoring native plant diversity in urban forest fragments poses significant challenges to natural area managers. Overabundant deer, exotic species, and fragmentation effects have been associated with sparse, low diversity herbaceous layers, yet we know little about the relative importance of these factors. We studied the effect of deer herbivory on herbaceous layer recovery in a suburban old-growth oak-maple-basswood forest fragment using 80 permanent plots inside and outside two 0.4 hectare deer exclosures. After 4-5 years of deer exclusion, herbaceous layer cover was still sparse, an average of 5%, only slightly more than plots exposed to deer. Total plant species richness declined over 4 years but the decline was lower in the absence of deer (12% versus 55% for plots exposed to deer grazing). Plants were significantly taller without deer grazing. While species loss slowed when deer were excluded, other important factors such as exotic earthworms and low plant propagule supply may also be contributing to species loss in urban and suburban forests. We are currently investigating the role of these factors.

CO22-7 **LEPCZYK, CHRISTOPHER A., Anna M. Pidgeon, Volker C. Radeloff, Roger B. Hammer, and Curtis H. Flather** Department of Forest Ecology and Management, University of Wisconsin-Madison, Madison, WI 53706, USA (clepczyk@wisc.edu) (CAL, AMP, VCR); Department of Rural Sociology, University of Wisconsin-Madison, Madison, WI 53706, USA (RBH); USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO 80526, USA (CHF)

THE INFLUENCE OF HOUSING GROWTH ON BIRD COMMUNITIES IN THE NORTHEASTERN U.S.

In recent decades the Northeast United States has experienced dramatic housing development, both at the fringe of cities and in rural areas rich in amenities. Because housing density is a crucial aspect of habitat quality for birds, it is imperative to understand the effect housing growth is having on breeding birds. Our goal was to estimate the effects of housing growth on bird diversity from 1970 to 2000 for the Northeastern United States. We used a time series of housing density at a fine spatial resolution derived from the U.S. decennial Census coupled with bird abundance and diversity data from the North American Breeding Bird Survey (BBS). Independent variables were housing units and housing growth (both absolute and percent) at several spatial scales. Overall, a negative relationship existed between total avian diversity (species richness) and the number of housing units. However, species richness of exotic invaders was positively related to housing growth. Because urbanization and sprawl are expected to continue, our findings are significant to not only the Northeast U.S., but anywhere that is experiencing housing growth.

CO22-8 **HADIDIAN, JOHN and Seth Riley** The Humane Society of the United States, 2100 L St. NW, Washington, DC 20037 (jhadidian@hsus.org), Wildlife Ecologist Santa Monica Mountains National Recreation Area, 401 W. Hillcrest Dr., Thousand Oaks, CA 91630, 805-370-2358

URBAN WILDLIFE IN THE UNITED STATES: HISTORY, STATUS, TRENDS AND PROJECTIONS

In 1967 the first technical session on urban wildlife held in the United States was held at the 32nd North American Fish and Wildlife Conference. Since then there have been at least 10 national conferences and a steady growth in the number of publications on this subject. While the field has come to be acknowledged as a part of the wildlife sciences it still receives far less notice and fewer resources than more traditional areas. One reason for this undoubtedly lies in the strong consumptive use orientation of state and federal wildlife agencies and the historic emphasis they place on game species. The rise of environmental and animal protection movements and the growth of conservation biology may be forcing greater recognition of the heuristic and scientific value of urban wildlife. The need for change is not only evident in the growing number of human-wildlife conflicts and public demands these be addressed, but in an emerging awareness, if not yet appreciation, of the potential ecological and sociological value of “natural” ecological communities that are associated with urbanizing environments. This presentation summarizes and critically reviews the contemporary status of urban wildlife programs in the United States and discusses their possible future.

CO23-1 **CHRISTEN, CATHERINE A. and Peter Leimgruber** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (christenc@crc.si.edu).

WINDOW FROM THE SKY: THE IMPACT OF SATELLITE MONITORING ON CONSERVATION OF NATURAL RESOURCES

Human-induced global changes in the 21st century will have tremendous impact on the survival of our natural world and its human societies. Such changes include deforestation, desertification, climate change, massive species extinctions and loss of intact natural ecosystems. They start subtly and occur at spatial and temporal scales unfamiliar to conventional human thinking, often going undetected and unmonitored for years. Programs for acquiring earth science information from orbital satellites have dramatically altered our ability to monitor and assess these global changes. Unlike most environmental monitoring programs, satellite sensors often were experimental. Frequently scientists have developed new environmental applications for sensors already in orbit; monitoring protocols have been driven by sensor characteristics rather than monitoring objectives. We inspect the Landsat satellite program's role in the conservation of species, communities and ecosystems during the past 30 years. By analyzing numbers of publications and frequency of citations in major ecological, conservation and satellite remote sensing journals, we show how use of the environmental potential of the Landsat program has increased (and diversified) over these three decades. Our findings demonstrate the rising importance of Landsat to conservation biology, and the dire implications for conservation policy and practice of the program's present non-continuation.

CO23-2 **HAYES, DEBORAH, Patricia Manley, Barbara Weber** Associate Deputy Chief for Research and Development, USDA Forest Service, 1 NW Yates Building, 1400 Independence Ave., SW, Washington, DC 20250-1120 (bweber@fs.fed.us)

STATUS, ROLE, AND FUTURE DIRECTIONS OF THE U.S. MAN AND THE BIOSPHERE PROGRAM

U.S. MAB Program is part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere (MAB) program, and is a member of one of six regional MAB programs that span the globe. The MAB Program was created in 1971 with the goal to explore, demonstrate, promote, and encourage harmonious relationships between people and their environments. Biosphere reserve networks are the vehicle for accomplishing MAB goals and serve four specific functions: 1) conserve biodiversity, 2) demonstrate sustainable development approaches, 3) support research and monitoring related to local, national and global issues of conservation and sustainable development, and 4) build social capacity for sustainable development through education and training. The U.S. network, established in 1976, is currently comprised of 47 reserves that represent a diversity of ecosystems. As the U.S. MAB Program approaches its 30 year anniversary, it is actively: 1) taking stock of the accomplishments achieved over the past three decades, 2) evaluating its unique role in meeting national and global sustainability challenges through an ecosystem approach, 3) evaluating strengths and weaknesses of the current U.S. reserve network, and 4) forging a path for the next decade of the U.S. MAB Program.

CO23-3 **THROOP, WILLIAM and Rebecca Purdom** Department of Environmental Studies, Green Mountain College, Poultney, VT 05764 (throopw@greenmtn.edu)

PROTECTING BIODIVERSITY BY PRESERVING WILDERNESS: A RECONSIDERATION

Increasingly, wilderness preservation is defended on the grounds that it is necessary to protect biodiversity. Many argue that sensitive species are best protected in core areas by prohibiting vehicular traffic and resource extraction. The negative assumptions about human interactions with sensitive species that are required for such defenses are rarely analyzed and alternative ways of managing such interactions are rarely assessed. Surveying research on selected megafauna, amphibians and herbaceous plants, we argue that these assumptions are not usually sufficiently justified, and thus that the biodiversity defense of wilderness is vulnerable. Moreover, wilderness designation can be an awkward tool for maximizing biodiversity protection, for it may frustrate restoration activities and increase the cost of monitoring species, as is evident in the case of Bandelier Wilderness. We argue that those wishing to defend wilderness will find more support in cultural values than in science, and that scientifically driven biodiversity protection will benefit from less restrictive land management polices.

CO23-4 **SATERSON, KATHRYN** Duke Center for Environmental Solutions, Box 90328, Duke University, Durham , NC 27705 (saterson@duke.edu)

HOW IS THE PRECAUTIONARY PRINCIPLE USED IN CONSERVATION POLICIES IN THE US AND EUROPE - AND DOES IT MATTER FOR BIOLOGICAL DIVERSITY?

There has been considerable debate in recent years over the merits of “precautionary” regulation of environmental risks, and many claim that European regulations are more precautionary than in the United States. Policy approaches to conservation of biodiversity in the US and Europe were examined in order to understand 1) how precaution is applied in US and European national regulations and multilateral treaties aimed at conserving biodiversity, and what scientific, cultural, or institutional factors might explain the differences; and 2) what have the actual conservation impacts of precautionary approaches been in practice. The 1973 US Endangered Species Act was one of the earliest precautionary laws; in recent years it has been criticized both for allowing populations of species to decline (inadequate precaution) and for restricting private property rights (excessive precaution). Most European countries have adopted analogous legislation to protect wild plants and animals. The US has not ratified the 1992 Convention on Biodiversity, which adopts the precautionary principle, while most European countries have. Some of the factors that influence the degree of precaution in US and European biodiversity regulations include differing views on personal property rights, the amount of relatively undisturbed biodiversity remaining in a country, and cultural conceptions of nature.

CO23-5 **DEHGAN, ALEX** Coalition Provisional Authority (Baghdad) and U.S. Department of State, 2201 C Street, NW, Washington, DC 20009 (dehgana@orha.centcom.mil)

THE STATUS OF CONSERVATION BIOLOGY AND SCIENCE IN IRAQ

With the end of major combat in Iraq, the focus has been on rebuilding the country. The major effort for this has been through the occupying powers represented by the Coalition Provisional Authority (CPA). The CPA has a tremendous task in front of it. The ravages of three wars (the Iran-Iraq War, Gulf War 1, and Gulf War 2), the use of environmental degradation as a political tool, and years of economic sanctions and economic stagnation have all taken their toll on the biological environment in Iraq. Moreover, environment did not figure strongly into the government's interests, and therefore, Iraq has only a weak regulatory structure in place to oversee the environment (especially outside of water resources). There are a number of environmental problems in Iraq that merit international attention, including environmental contamination due to warfare and stocks of chemical and nuclear wastes (which also bring out non-proliferation issues), water degradation, the draining of the southern marshes, failure of the previous regime to monitor the status of endangered species within the country and a lack of accurate species inventories. This talk will discuss State Department efforts as well as the efforts of our Coalition partners to address biological, legal, and political aspects of these problems within a conservation framework.

CO23-6 **RODRIGUES, ANA S. L., Sandy J. Andelman, Mohamed I. Bakarr, Luigi Boitani, Thomas M. Brooks, Richard M. Cowling, Lincoln D. C. Fishpool, Gustavo A. B. da Fonseca, Kevin J. Gaston, Michael Hoffmann, Janice S. Long, Pablo A. Marquet, John D. Pilgrim, Robert**
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GLOBAL GAP ANALYSIS: ASSESSING THE EFFECTIVENESS OF THE GLOBAL NETWORK OF PROTECTED AREAS IN REPRESENTING SPECIES DIVERSITY

The Fifth World Parks Congress (Durban, South Africa, September 2003) announced that the global protected area network now covers 11.5% of the planet's land surface. This surpasses the 10% target proposed a decade earlier, at the Caracas Congress, for nine out of 14 major terrestrial biomes. Such uniform targets based on percentage of area have become deeply embedded into national and international conservation planning. While politically expedient, their scientific basis and conservation value have been questioned. In practice, however, little is known of how to set appropriate targets, or of the extent to which the current global protected area network fulfils its goal of protecting biodiversity. Here, we combine global data on the distribution of more than 100,000 protected areas and 11,000 species of mammals, amphibians, turtles and threatened species to provide the first global gap analysis assessing the effectiveness of protected areas in representing species diversity. We found more than 1,400 species not covered by protected areas in any part of their range, demonstrating that the global network is far from complete. We also demonstrate the inadequacy of uniform (i.e., 'one size fits all') conservation targets for establishing priorities for allocation of future conservation investments.

CO24-1 **Nicole Benjamin-Fink, Jim Perry, and John Moriarity** (benj0057@umn.edu)

AMPHIBIAN COMMUNITY COMPOSITION AND LAND USE PATTERN IN EASTERN MINNESOTA

In much of the world, including North America, amphibian populations are in decline. Concern for this apparent worldwide decline in amphibian populations was initially raised at the First World Congress of Herpetology in England in 1989. Human population growth and development result in landscape fragmentation, which affects wildlife by altering habitat and isolating populations, deterring movement and causing extensive mortality. Factors such as deforestation, fragmentation, cultivated areas, roads and housing operate across multiple spatial scales and often have synergistic impacts. During the 1990`s, amphibian declines became regarded as “an ecological emergency in progress” (i.e., a large number of regional instances of a phenomenon, posing a threat to global biodiversity). We studied the impacts of landscape fragmentation by measuring amphibian community and species densities in 28 ponds in Washington County, Minnesota. Each pond was sampled 12 times during the reproductive season; we documented surrounding land cover and land use within a radius of 2 km from our observation point. Preliminary analyses suggest that land use, specifically proximity to forest and density of vegetation within 2 meters of the wetland, is significantly correlated with amphibian community composition. We found a significantly different community (American Toad), in areas where forests were more than 50 m from pond edge and where pond riparian vegetation covered less than 25% of the immediate 5 meters surrounding the pond. Those situations had a significantly higher percentage of tolerant species, introduced species and American Toads. These results suggest that immediate (i.e., 5 m) and proximal (i.e., 50m) habitat management strongly influences local amphibian biodiversity, a potential indicator of other forms a biodiversity.

CO24-2 **BUHLMANN, KURT A.** Conservation International-Center for Applied Biodiversity Science, 1919 M Street NW, Washington, DC 20036 USA and University of Georgia's Savannah River Ecology Laboratory, Aiken, South Carolina 29802. (kbuhlmann@earthlink.net)

CONCEPTUALIZING A GLOBAL, MULTI-FACETED CONSERVATION PLAN FOR TORTOISES AND FRESHWATER TURTLES

The problems facing the world's tortoises and freshwater turtles have become well publicized over the past decade. The recognized endangerment of a large proportion (65%) of Asia's turtles -the richest turtle fauna in the world- has lead to a multitude of conservation efforts by a variety of organizations and institutions. However, endangered turtle species are found in all regions of the world. Generalized categories of conservation action include 1) species assessments, 2) field ecological surveys, 3) university research (i.e., genetics, disease studies, and relocation research), 4) assurance colony establishment (i.e., captive breeding), and 5) capacity-building (i.e., education, enforcement, turtle farming, turtle rescue centers, and protected area development). Prioritizing the most important category(s) of action for each species is required. Coordination and the building of partnerships among conservation organizations become essential because funds are limited and no single organization has the ability to implement projects in all of the categories. A comprehensive strategy is two-staged and should 1) prevent the ultimate extinction of any turtle species and 2) ensure that viable, self-sustaining turtle populations exist in protected areas and that turtles are part of functioning ecosystems.

CO24-3 **BUSTEED, GARY T., Seth P. D. Riley, Lee Kats, Tom Vandergone, Rosi Dagit, Cassity Bromley, Piper Roby, Cathy Schoonmaker, Lena Lee, Brian Westerhouse, Jeff Sikich, and Robert Fisher** National Park Service—Santa Monica Mountains National Recreation Area, 401 West Hillcrest Dr. Thousand Oaks, California 91360 (gary_busteed@nps.gov.) (GTB, SPDR, PR, CS, LL, BW, JS), Pepperdine University, Malibu California (LK, TV), Resource Conservation District of the Santa Monica Mountains, Topanga Canyon, CA (RD), U.S. Geological Survey-Biological Resources Division, San Diego CA. (RF)

URBAN IMPACTS ON TERRESTRIAL AND AQUATIC REPTILE AND AMPHIBIAN COMMUNITIES IN SOUTHERN CALIFORNIA

Urbanization can have significant impacts on both aquatic ecosystems, through altered hydrology, and on terrestrial systems through habitat loss and fragmentation. In the Santa Monica Mountains northwest of Los Angeles, from 2000-2004 we have assessed reptile and amphibian communities in both terrestrial and aquatic habitats to determine the impacts of urbanization. Surveys in 35 streams have shown that in watersheds with greater than 8 percent development have: larger water volumes, are more permanent, reduced aquatic habitat diversity, more exotic species such as crayfish (Procambarus clarki), reduced invertebrate diversity, and have fewer aquatic-breeding amphibians (Taricha tarosa, Hyla regilla). Using pitfall and snake traps in small patches, large patches, and core parklands, we determined that terrestrial species richness was strongly correlated with patch size. Some species common in parklands (e.g. Bufo boreas, Crotalus viridis and Masticophis lateralis) were absent in the smallest patches. On the other hand, side-blotched lizards (Uta stansburiana) were most abundant in small habitat fragments, perhaps because of a greater proportion of open habitat created by anthropogenic activities. While some small habitat patches and some urban streams still represent important habitat for reptiles and amphibians, urbanization can significantly reduce herpetofauna diversity.

CO24-4 **TUBERVILLE, TRACEY D., Erin E. Clark, Kurt A. Buhlmann, and J. Whitfield Gibbons** University of Georgia's Savannah River Ecology Laboratory, Aiken, South Carolina 29802 (tuberville@srel.edu) (TDT, EEC, JWG). Conservation International-Center for Applied Biodiversity Science, 1919 M Street NW, Washington, DC 20036 (KAB).

TRANSLOCATION AS A CONSERVATION TOOL: REPATRIATION OF GOPHER TORTOISES (GOPHERUS POLYPHEMUS) TO A FORMERLY OCCUPIED SITE

Gopher tortoises are declining and have become fragmented throughout the Southeast. Relocation is commonly practiced "solution" to development of occupied sites. Current policies are criticized for failing to recognize the need for a conservation plan for the species and for not addressing associated risks (e.g., disease, genetic mixing). However, translocation may be the only option for reestablishing extirpated populations. In Fall 2001, we moved 105 tortoises from an industrial development site to the Savannah River Site, South Carolina, USA – an area within historic range but from which tortoises were extirpated. The goals of the project were to re-establish a protected viable population, test efficacy of existing relocation methods, and develop a model for relocation of other tortoise species. Thirty-nine adults were assigned to one of three penning treatments: no pen, 9-mo., and 12-mo. penning and radio-tracked for 2 years. Penning dramatically increased site fidelity (69%, 92% vs. 31%) and resulted in smaller home ranges (76 ha, 2 ha vs. 191 ha) in Year 1. Year 2 home ranges were smaller than Year 1 and more similar among penning treatments and to published values for resident animals. Simple techniques such as penning may improve viability of translocation as a conservation tool.

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WHERE HAVE THE GREEN TOADS GONE? ALARMING POPULATION DECLINE OR VARIABLE RECRUITMENT?

The green toad (Bufo viridis), once a very common anuran in Israel, has been recently declared endangered. Here we report the results of the first three years of an ongoing study assessing the state of toad populations in the coastal plain. Green toad tadpoles were recently found in 77% of rainpools (n= 51) in the above region, compared to 57%, 25 years ago (n=51, 23 shared with recent survey), suggesting no decline. However, records of presence alone may be deceptive as they do not reflect population strength. Indeed, we recently recorded early drying and failure to complete metamorphosis in altered pools, where recruitment was estimated at < 0.2% and survival prospect of the population seem slight. Moreover, compared to the 1970's, availability of suitable breeding sites in the coastal plain has dropped 33%, and at least 20% of existing pools has been altered. Another concern is strong fluctuations in recruitment. Recruitment of metamorphs in spring 2002 was significantly lower than that recorded in 2003, and returns of juveniles in fall 2001 and 2002 were significantly lower than that recorded in 2003. Climatic variations are the suspected cause of variable recruitment. Whether there is also an alarming trend of population decline resulting from habitat destruction compounded by low recruitment is currently being investigated.

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POWER REQUIREMENTS AND ALTERNATIVE STUDY DESIGNS FOR GAUGING NO IMPACT FROM PRESCRIBED FIRE ON WOODLAND SALAMANDERS IN THE SOUTHERN APPALACHIANS

Conclusions of no impact from land management prescriptions demand study designs with sufficient power. We evaluated a range of conditions over no impacts from prescribed fire were justified for woodland salamanders. If the response variable consisted of mean number of salamanders caught, power ranged from only 5-49% in pitfall drift-fence arrays. In time-constrained search arrays, power ranged from 5-100%, but was acceptably high (>80%) for only one of four species, Jordan's salamander (Plethodon jordani). After reanalyzing with a more sensitive response variable, impacts from prescribed burning were detectable in 7 of 10 instances. In 4 of 5 instances where the null hypothesis of no impact was rejected, salamanders declined after fire. Fewer mountain dusky salamander (Desmognathus ochrophaeus), Jordan's salamander, and all species combined were all associated with burning. Therefore, failure to detect effects from fire may stem from poor design rather than no impact. Because burn treatment places peculiar demands on field study design, we describe alternatives drawn from medical epidemiology that are better suited for impact assessments. If prescriptions cause patchy burns, or unpredictable location of intensity of burns could destroy sampling arrays, we recommend case-control analysis with fire used as a variable risk factor.

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HAVE CANOPY CLOSURE AND COMPETITION CONTRIBUTED TO THE DECLINE OF THE ENDANGERED DUSKY GOPHER FROG (RANA SEVOSA)?

Tree canopy closure over breeding ponds can affect growth and survival of tadpoles within ponds, and may mediate competitive interactions among species. I conducted two experiments to test whether canopy closure may have contributed to the decline of dusky gopher frogs (Rana sevosa) but allowed the persistence of southern leopard frogs (R. sphenocephala). The response of both species to canopy closure was explored in single and mixed (1:1) species experimental units of identical tadpole density. An experiment using aquatic enclosures in temporary ponds showed that growth of tadpoles of both species was reduced by canopy closure (~20% for both species). Survival of R. sevosa tadpoles was higher in mixed species enclosures than in single species enclosures. In a complementary experiment using artificial ponds, R. sevosa had lower survival to metamorphosis in shaded ponds, whereas R. sphenocephala exhibited reduced size at metamorphosis when shaded. These studies suggest that pond canopy closure, but not larval competition with R. sphenocephala, may be a contributing factor to the decline of the dusky gopher frog. Additionally, the results suggest that the relative ability of a species to respond to habitat change may contribute to the rarity or commonness of that species in altered environments.

CO24-8 **WILLIAMS, YVETTE, Michelle Waycott, Christopher Johnson, and Ross Alford** Department of Tropical Biology, James Cook University, Townsville, Australia 4814 (yvette.williams@jcu.edu.au)

DISPERSAL OF RARE AND COMMON MICROHYLID FROGS OF THE WET TROPICS, AUSTRALIA

Dispersal is often cited as a key factor in determining the relative rarity of a species. However, it is a difficult parameter to measure, especially in such small animals as microhylid frogs. Many studies of rarity either ignore dispersal or make qualitative estimates of dispersal ability. Here I present results measuring dispersal rates of 3 species of frog from the genus Cophixalus (1 common species and 2 rare species) using genetic markers. Tissue samples were collected from 10-25 individuals at each of seven points at increasing distances apart over a 1 km transect. Dispersal distance was calculated based on gene flow measures estimated from Inter-simple sequence repeat (ISSR) variation. These analyses enable me to quantify the relationships between geographic rarity, as measured by distribution range, and dispersal ability for each species. A direct relationship between extant distribution and gene flow was evident. The species C. neglectus with the smallest range had the lowest gene flow while C. ornatus with the largest range had the greatest gene flow. This provides direct evidence that geographically restricted microhylid frogs reflect an extreme vulnerability to changes in the environment.

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WOODY PLANT RICHNESS ACROSS FIVE SPATIAL SCALES IN THE INDIAN WESTERN HIMALAYA: PATTERNS AND IMPLICATIONS

We explore the elevational gradient in species richness in the Indian Western Himalaya, an extensive, yet unstudied region with respect to macroecological patterns. Landscape level data on woody plant distributions was collected over a 4-year period and supplemented with compilation of a distribution database for the Western Himalaya. The five nested units ranged from 60 km2 (a single local gradient) to approximately 150,000 km2 (entire Western Himalaya) and covered altitudes between 100 and 5000m. The landscape level dataset consisted of approximately 50,000 individuals of 123 species (70 genera, 40 families), and the regional datasets comprised 1100 species (489 genera, 134 families). Richness across all scales showed asymmetric hump-shaped patterns with maximum values below the middle elevations. Richness patterns were correlated with different variables (area, environmental parameters, productivity, mid-domain models) at different scales. At regional scales, maximum diversity values roughly coincides with the tropical–temperate interface. This zone therefore merits conservation attention as mid-elevations are underrepresented within Himalayan reserves and are under anthropogenic pressure. At the same time, species sharing between forest types and altitudinal classes is low indicating high turnover. This necessitates protection of entire assemblages and stresses the importance of preserving at least a few contiguous altitudinal gradients.

CO25-2 **CEBALLOS, GERARDO, Paul R. Ehrlich, Gretchen C. Daily, Jorge Soberón, Irma Salazar, and John P. Fay** Instituto de Ecologia, UNAM, Apdo. Postal 70-275, Mexico D.F. 04510, Mexico. (gceballo@miranda.ecologia.unam.mx) (GC, JS, IS). Center for Conservation Biology, Department of Biological Sciences, Stanford University, Palo Alto, CA 94305-5020.

GLOBAL MAMMAL CONSERVATION PRIORITIES: WHAT MUST WE MANAGE?

As the extinction of populations and species proceeds, it is becoming apparent that we must take a global approach to the preservation of biodiversity. For the first time, we examine the world situation for a major taxon, land mammals, and evaluate the minimum areas in which populations require protection under conservation schemes to assure their persistence. We first compiled the geographic range maps of the 4800 species of mammals. Then we determine the complementary areas that will permit all species to be represented at least once in a 100 sq km cell (i.e. planning units), and then what will take to protect a given percentage of all species geographic range. Finally, we evaluate the current status of those units based on the percentage of natural vegetation they have. Our results indicate that approximately 10% of the land mass (i.e. 1200 planning units) is required to have represented all species either once or to cover10 % of their geographic range. Approximately 50% of these units have lost more that 25% of their natural vegetation. It is clear that a diversity of approaches ranging from protection (or establishment) of reserves to countryside biogeographic enhancement of human-dominated areas. Our findings suggest that the time is growing short.

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TURNOVER OF PASSERINE BIRDS ON MEDITERRANEAN ISLANDS

Understanding the nature of vagile species turnover is important for conservation as it can aid wildlife managers in protecting better natural populations. We examined the change of passerine bird communities on a set of landbridge islands in the Mediterranean Sea. Passerine birds of five Aegean islands (Greece) were surveyed in 1954 and 1960 and then re-surveyed between 1988 and 1992. Overall, species numbers changed little between the surveys although 12 population extinctions and 11 immigrations were recorded. We calculated annualized turnover rates for each island with the smallest island having the highest, and all other islands having lower but mutually similar turnover rates. Populations on high-elevation islands were less likely to go extinct most likely because of larger population sizes, and greater habitat diversity. We found no effect of body size on probabilities of immigration and extinction. Migratory status (resident, short-distance or long-distance migrant) affected extinction and immigration rates differently: migratory species were more likely to immigrate but less likely to go extinct.

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GLOBAL WARMING AND EXTINCTIONS OF ENDEMIC SPECIES FROM BIODIVERSITY HOTSPOTS

Global warming caused by increasing concentrations of anthropogenic greenhouse gases is thought to be one of the most important threats to biodiversity in the coming decades; however, few attempts have quantified the magnitude of this threat at the global scale. We used two biome models and doubled-CO2 climates from seven general circulation models to measure biome change in 25 biodiversity hotspots, and, based on species area relationships, the number of projected extinctions of endemic plant and vertebrate species. In addition to investigating different biome and climate models, we varied species migration capabilities (perfect and zero migration) and species tolerances to the climate/biome changes. Extinctions ranged from 2-12% of the total fauna, with the three sensitivity factors being approximately equally important in influencing this variation. Estimated future migration rates in the hotspots were often much higher than even rapid post-glacial migration rates, suggesting that our estimates at the high end of this range are most reasonable. Assuming that doubled-CO2 climates will be attained in 100 years, our estimated rates of habitat loss in tropical hotspots are on par with those due to deforestation, supporting suggestions that global warming is one of the most serious threats to the planet's biodiversity.

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RELATING HUMAN CONSUMPTION PATTERNS, SPECIES ENDANGERMENT, AND HABITAT PROTECTION: LESSONS FOR GLOBAL CONSERVATION

Human consumption of earth's resources is among the most serious threats to ecosystems and species. Both human consumption and biodiversity are unevenly distributed worldwide, however, so potential threats to species differ markedly among regions. A useful aggregate measure of human consumption is the fraction of total net primary production (NPP) that people appropriate for their own use. Using a newly-developed global map of human-appropriated NPP (HANPP), we compare levels of human consumption with patterns of species endangerment and habitat protection among the world's 866 terrestrial ecoregions. We define threatened species using IUCN categories of Critical, Endangered, and Vulnerable, and we use protected area information from the recently updated UNEP-WCMC database. Overall, we find that species endangerment levels are related to human consumption, but this relationship varies widely among biomes and continents. Ecoregions with lower levels of human consumption tend to have higher coverage of protected areas, but there is only weak and inconsistent evidence that rates of species endangerment are related to levels of protection. The results suggest that habitat preservation remains biased away from regions in most need, and that protected areas do not appear to clearly reduce rates of species endangerment at this scale.

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HOW MUCH HABITAT IS THERE? A GLOBAL ASSESSMENT OF HABITAT LOSS AND PROTECTION

Habitat loss is the dominant threat to biodiversity. Awareness of widespread losses due to human activity has prompted conservation organizations and governments to designate protected areas around the world in an effort to ensure persistence of species, preserve the structure and dynamics of biological communities, and sustain valuable ecological services. How much habitat has been lost globally? How much has been protected? And, what does this suggest about how well biodiversity is being conserved? We juxtaposed and analyzed recently published datasets about global land cover and designated protected areas to quantify and compare estimates of habitat loss and protection for all of the world's terrestrial biomes. Cumulative habitat loss is most extensive in temperate forests and grasslands, but habitat protection is most extensive in tundra and high altitude grasslands. Our results suggest that habitat conservation is not addressing the threat of habitat loss head-on. We assert that conservation priorities need to push for a more representative global network of protected areas.

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SHELF LIFE OF SPECIES-AREA RELATIONS

Species-area relations are among the few recognized laws of ecology. Much work has been conducted on many taxa and study regions to document how fast and in what way species accumulate with increasing area. Limitations of existing data have meant that comparisons across scales or biomes for one taxon are rare. We demonstrate here that different biomes show different rates of species accumulation for one taxon at one scale. Climate change predicts that biomes will change in size and location and new biomes are expected to emerge. We find that if climate models and species distribution models are accurate, species area curves within one biome in Africa will change shape and rate as climate warming progresses. Thus, our current understanding of species area curves may have a limited shelf life.

CO25-8 **RICKETTS, TAYLOR H., Marc L. Imhoff, Lahouari Bounoua, Colby J. Loucks, Robert Harriss, and William T. Lawrence** World Wildlife Fund, 1250 Twenty-fourth St. NW, Washington D.C. 20037 (taylor.ricketts@wwfus.org)(THR, CJL). Department of Biological Sciences, Stanford University, Stanford CA 94305 (TR). NASA's Goddard Space Flight Center, Greenbelt MD 20771 (MLI, LB). University of Maryland, College Park MD 20742 (LB). National Center for Atmospheric Research Foothills Laboratory, 3450 Mitchell Lane, Boulder, CO 80307 (RH) Bowie State University, Bowie, MD 20715 (WL).

THE GEOGRAPHY OF CONSUMPTION: HUMAN APPROPRIATION OF NPP

Human population and consumption profoundly affect our planet's ecosystems. One compelling measure of humanity's cumulative impact is the fraction of the planet's net primary production (NPP) humans appropriate for their own use. NPP is the net solar energy captured through photosynthesis and thus represents the primary energy source for the world's ecosystems. Human co-option of the products of photosynthesis, aside from leaving less for other species to use, alters the composition of the atmosphere, levels of biodiversity, and the flow of ecosystem services. Here we present, for the first time, a global map of human NPP consumption (HANPP), from which we derive spatially explicit comparisons of NPP carbon "supply" and "demand." To calculate HANPP, we use FAO statistics on agricultural consumption and back-calculate the total amount of NPP required to derive the final products. We estimate global HANPP to be 20% of NPP, but this percentage varies regionally from 6% (South America) to over 70% (Europe), and locally from near 0% (e.g., central Australia) to over 30,000% (e.g., New York City). Spatial data on HANPP illustrate the degree to which local human populations depend upon NPP "imports," and indicate future changes in global HANPP under different policy and development scenarios.

CO26-1 **DONALDSON, JOHN** Kirstenbosch Research Centre (donaldson@nbi.ac.za)

AN EVALUATION OF THE COSTS AND BENEFITS OF CONSERVATION FARMING IN BIODIVERSITY HOTSPOTS IN SOUTH AFRICA

Effective conservation often requires implementation of conservation compatible land uses on farmland. This is especially true in biodiversity hotspots, such as South Africa. A three-year study evaluated the biodiversity benefits as well as other ecological and economic costs and benefits associated with various farming practices in four biodiversity-rich sites. Results show that there was a high variance in biodiversity benefits, which were not consistently associated with pre-selected conservation farms, and that retention of particular landscape elements was often more important for biodiversity conservation than the management practices applied at the farm level. Sites fell into three categories: sites with strong congruence between ecological benefits and economic benefits resulting in a rapid changeover to conservation friendly practices; sites with little ecological or economic variation so that different farming systems gave similar benefits; and sites with low congruence between biodiversity value, ecosystem services (shelter, water infiltration, nutrient cycling), and production resulting in tension between conservation and production objectives. Farmers appear to convert naturally to conservation friendly practices when the economic benefits are obvious but may be more influenced by social factors when the economic benefits are obscure. In this case, incentives may be required to induce change. Carbon sequestration was one factor that stood out as a benefit that could make conservation farming practices economically viable

CO26-2 **HAJAGOS, JANOS G.** Department of Ecology and Evolution Stony Brook University Stony Brook, NY 11794 (jhajagos@life.bio.sunysb.edu)

DISTRIBUTION-FREE MONTE CARLO FOR POPULATION VIABILITY ANALYSIS

Monte Carlo methods are widely used in quantifying the risk of extinction for a population. An important assumption is that the mean and the variance of the population growth rates are known exactly.
Satisfying this assumption may be difficult for species that are threatened and for which longterm population data are sparse. Rather than specifying the mean and variance as points the values might be bounded by upper and lower values. A distribution-free approach using interval analysis is proposed for propagating the uncertainty from specifying the statistical moments as intervals. In this approach, the risk of decline to a critical abundance, the final endpoint of the model, will be an interval and not a point. Unlike alternative approaches such as second-order Monte Carlo methods, the interval will correctly encompass all possible values that the mean and variance would imply. The implications of this approach to modeling the risk of decline to a population will be discussed. A final conclusion from applying this method is that the operational definition of an interval as either bounds on a fixed value or as a bounded set will give bounds of differing width for the risk of decline for the population.

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DESIGNATABLE UNITS FOR SPECIES STATUS ASSESSMENT AND PROTECTION

Assessment of a species' endangerment status, or "red-listing", frequently requires recognizing populations below the taxonomic level of species. Defining the "distinct population segment" provision of the US Endangered Species Act has been tackled largely by conservation systematists in terms of "Evolutionarily Significant Units" (ESUs). Yet contrasting conceptions of the ESU, paralleling those bedevilling the "species problem", are not resolvable into a single approach, to the potential detriment of biodiversity protection. The Canadian Species at Risk Act encounters the same difficulty, which the arm's length, status-determining, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) resolves case by case. A red-listing agency such as COSEWIC can estimate endangerment risk based upon available information but should not make value judgements such as "evolutionary significance" or "systematic value". The practicable solution is the "Designatable Unit" (DU), to which status may be assigned in cases where a single status designation for a species is insufficient to portray probabilities of extinction accurately. The DU, unlike the ESU, is solely a device for reporting status rather than a concept of subspecific systematics. DUs may be based on established taxonomy, genetic evidence, range disjunction, and/or biogeographic distinction. They do not apply to biologically arbitrary management units.

CO26-4 **MYERS, DAVID H., Resit Akcakaya, and Scott Ferson** Applied Biomathematics, 100 North Country Road, Setauket, New York 11733 (dmyers@ramas.com)

ASSESSING STATUS AND TRENDS OF THREATENED SPECIES FROM UNCERTAIN MONITORING DATA

Range (spatial distribution) and population trends (temporal dynamics) are two important attributes of a species, and are used in most assessments of species status, including the U.S. Endangered Species Act, the IUCN criteria, and NatureServe's Heritage Status criteria. Measures of spatial distribution and temporal trend are often known with large uncertainties. We developed data analysis methods that input uncertain monitoring data and output estimates of three variables (area of occupancy, extent of occurrence and trend in population size) that incorporate uncertainties. All three variables may be uncertain because observations may have different levels of reliability (e.g., because they are old, unconfirmed, have inexact information to identify the location, etc.). In addition, the extent of occurrence can be uncertain because of uncertainty about whether and to what extent to exclude discontinuities in the distribution; the area of occupancy can be uncertain because of inconsistencies in the resolution and position of the measurement grid; and temporal trends can be uncertain because of variability in observation effort and uncertainty in generation length. We developed methods based on the alpha-hull, the scale-area curve, and fuzzy regression to estimate the three measures as uncertain quantities.

CO26-5 **SUZUKI, NOBUYA and Deanna H. Olson** Department of Zoology, Oregon State University, Corvallis, OR 97331 (nobi.suzuki@oregonstate.edu) (NS). USDA Forest Service, Pacific Northwest Research Station, 3200 SW Jefferson Way, Corvallis, OR 97331 (DHO).

ASSESSMENT OF RISK TO CONSERVATION OF SISKIYOU MOUNTAINS SALAMANDERS IN SOUTHWESTERN OREGON

Assessing risk to conservation of rare species requires enormous time and effort. Our objective was to develop GIS maps to effectively assess risks to conservation of Siskiyou Mountains Salamanders in southwestern Oregon, USA. Using GIS layers, we quantified potential risks within 100 and 1000 acres of 5875 random landscape points and developed GIS maps of conservation risks. The risks we assessed included land-use pattern, road density, wildland-urban interface, and catastrophic fire. Cumulative scores of all the risks at the random points were used as z-values to create 3 dimensional maps. To identify suitable habitats on the landscape, we developed a logistic regression model, in which probability of salamander occurrence was negatively associated with solar illumination. Of 86 conservation areas proposed by experts based on salamander occupancy and habitat suitability, our maps identified 11 and 21 areas as moderate to high conservation risks at spatial scales of 100 and 1000 acres, respectively. Experts may likely overlook risks at a broader spatial scale without an aid of our maps. We conclude that our conservation risk maps can be used to effectively select low risk areas for reserves and to increase consistency and objectivity of conservation planning.

CO26-6 **SHARMA, SUBRAT and Surendra P. Singh** G.B. Plant Institute of Himalayan Environment & Development, Kosi-Katarmal, Almora 263643 INDIA (subrats@rediffmail.com) Department of Botany, Kumaun University, Nainital, India (SPS)

SURVIVAL OF BROWN-OAK FORESTS IN THE HIMALAYA ON THE FACE OF GLOBAL CLIMATE CHANGE COUPLED WITH ANTHROPOGENIC FACTORS

In this paper we hypothesize that the Himalayan brown oak (Quercus semecarpifoila Smith) is likely to be among the first major forest forming species of the Himalayan high ranges to go extinct locally as well as globally because of environmental changes and global warming. Our approach is mainly speculative based on the fact that apart from slow migration rate, several factors can combine to restrict migration of plants to safe habitats. In the case of brown oak they are – (i) its already island-like distribution in the near mountain peaks of the outer Himalayan ranges, i.e., summit trap, and in the inner Himalayan ranges next to alpine belts with little or no room left for further upward movement, (ii) low recruitment of seedlings from viviparous seeds and the poor survival because of migratory livestock grazing in alpine areas and vivipary, and (iii) lack of soil in high mountains toward which the species would march as temperature rises. The regional level complexities as they are likely to make the path of survival of brown oak narrower rather than broader, and can further complicate our ability to predict about its fate in the face of global warming.

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ECOLOGICAL RESTORATION IMPLEMENTATION WITHIN THE CHICAGO WILDERNESS REGION - A NEW APPROACH

Chicago Wilderness is an unprecedented alliance of more than 170 public and private organizations working together to protect, restore, study and manage the precious natural ecosystems of the Chicago region for the benefit of the public. In recent years land management agencies in the Chicago region have been redefining how they implement restoration projects. In the past efforts were geared at restoring/managing all natural areas owned by the agency. Recent efforts have been targeting large-scale restoration projects with emphasis on completing projects over a 2-3 year period. These efforts called for additional funding sources outside the agencies own budget. Collaboration between Chicago Wilderness members has provided excellent sources for funding these large-scale projects. These large-scale restoration projects have allowed land management agencies to concentrate efforts on projects that have proven benefits to communities and the species dependent upon them. Restoration efforts are targeted at restoring ecological functions, controlling invasives and re-introduction of native species. Documentation of the effectiveness of these restoration projects with ecological surveys has shown improved habitat for a wide array of native species including rare species. The completed projects have been well publicized, which has generated support for agency bond referendums and new funding sources.

CO27-2 **ANDELMAN, SANDY, J. and Michael R. Willig** National Center for Ecological Analysis and Synthesis, UC Santa Barbara 735 State St., Suite 300, Santa Barbara, CA 93101 (Andelman@nceas.ucsb.edu) (SJA), Ecology Program, Dept. of Biological Sciences, Texas Tech University, Lubbock, TX 79409-3131

SPATIAL DYNAMICS OF BIODIVERSITY AND ECOSYSTEM FUNCTION IN A SAVANNA ECOSYSTEM: IMPLICATIONS FOR MAINTAINING BIODIVERSITY IN KRUGER NATIONAL PARK, SOUTH AFRICA

Fire management policy in South African savanna parks is based on the assumption that variable fire intervals and sizes are beneficial to biodiversity. We developed structural equation models describing the relationships among fire, herbivory, and other key drivers of biodiversity and ecosystem function in Kruger National Park. Mean fire intervals and precipitation had both direct and indirect effects on biomass and diversity of grasses, but these effects differed among soil types. Short-term grazing intensity had only weak effects on the diversity and biomass of grasses. The low impact of herbivory could indicate either that ungulate density is low and the effect of grazing ungulates on herbaceous vegetation is negligible, or that the temporal and spatial scale of the current herbivore sampling program does not provide a good measure of grazing intensity at the monitoring scale for vegetation. Because the dynamics of grass biomass and grass species diversity differed between basaltic and granitic soils, different management policies may be necessary for each of the two main soil types in Kruger. Our analyses provide a basis for developing ecological criteria for guiding and evaluating management policy in Kruger and in other South African savanna ecosystems.

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STRATEGIC PLANNING: SETTING CONSERVATION PRIORITIES ACROSS THE LANDSCAPE

Successful landscape-scale biodiversity conservation often hinges on a well-designed conservation plan. In recent years, conservation planning has become quite sophisticated, resulting in well documented methods for the selection of areas requiring conservation action on-the-ground. Setting priorities, however, has lagged behind planning; few systematic approaches exist that enable practitioners to decide where to focus efforts first. Because choosing to act in one place means not acting in another, clear priorities are crucial to ensure that conservationists are making the right choices and allocating limited resources to areas of the utmost importance. To address this, we initiated a strategic planning process designed to identify a limited suite of areas of both high ecological importance and high programmatic value. As a first step, we conducted an ecological analysis of Washington state. Landscape-scale areas were identified based on factors including multiple matrix communities and the integration of terrestrial, freshwater (and marine) systems. We then developed a decision tree to prioritize between areas, resulting in eighteen highest priority areas where the need for immediate action is most pressing. Next steps involve integrating these results with a socioeconomic and opportunities analysis to develop a comprehensive prioritization scheme for conservation action throughout Washington state.

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RAPID TROPICAL FOREST INVENTORY: A COMPARISON OF TECHNIQUES USING INVENTORY DATA FROM WESTERN AMAZONIA

Floristic inventory is critical for conservation planning in tropical forests but notoriously difficult due to enormous numbers of species. In an effort to identify the best means of abbreviating inventory, we defined four classes of inventory abbreviation and evaluated them for use in inventory: occurrence metric, the occurrence metric measured for individual taxa (e.g. presence-absence, abundance); taxonomic resolution, the taxonomic level to which stems are identified (e.g. species, genus, or family); diameter class, the diameter classes to be included in inventory; and taxonomic scope, the taxon or taxa to be included in inventory. Using these four classes and all their possible combinations, we constructed >300 abbreviated inventories for nine sites near Iquitos, Peru, and evaluated these by four criteria: correlation between the floristic patterns of the full and abbreviated inventories; mean number of stems per site; total number of taxa; and height of inventoried stems. Taxonomic scope abbreviations were more efficient than any other type of inventory, including random sampling, and required one-fifth the number of stems and taxa of diameter-class-based methods and one-twentieth the number of a full inventory. We believe that taxa-based inventory may provide the optimal instrument for biological survey and conservation planning in western Amazonia.

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BIODIVERSITY QUANTIFICATION: ARE VEGETATION STRUCTURE AND RICHNESS RELIABLE INDICATORS OF SPECIES RICHNESS IN MEDITERRANEAN ECOSYSTEMS?

Vegetation is the most frequently used indicator of biodiversity. The underlying assumption is that floral richness patterns and structural characteristics reflect diversity patterns of other taxa in the ecosystem. This assumption was not tested in Mediterranean ecosystems despite the widespread application of vegetation as a sole indicator in many conservation initiatives. We investigated correlations between richness patterns and structural characteristics of vegetation and other taxa, in order to evaluate the reliability of vegetation as an indicator of species richness in a Mediterranean ecosystem. The research was conducted in the Jerusalem Mountains and Judean foothills. We performed an annual survey of arthropods (ground beetles, moths, diplopods, arachnids), small vertebrates (rodents, shrews, and lizards), and vascular plants (using measures of species richness, stratification, and cover) in forty 1000m2 plots, representing different habitats in this area. A few correlations were found between vegetation and faunal richness patterns. However, low correlation coefficients indicate that only a small fraction of the variation is represented. Vegetation structural characteristics correlated with richness patterns of some taxa. However, both positive and negative correlations were found, and correlation coefficients were low. These findings point to the limited value of vegetation as a sole indicator of richness in Mediterranean ecosystems.

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GIS MODELS FOR IDENTIFYING HIGH-QUALITY AMPHIBIAN HABITAT IN WOODLOTS WITHIN AGRICULTURAL LANDSCAPES

Small woodlots in the Midwestern USA often provide the only remnant habitat for a number of pond-breeding amphibian species. Without using habitat suitability models and remote sensing data, it is unlikely that we will have an opportunity to identify and take conservation action at many high-quality sites before they are irreversibly lost. We examined the association between the landscape composition and presence of seven pond-breeding amphibian species in wetlands within the agricultural landscape of Ohio. Habitat suitability models incorporating both local and landscape-level variables were developed for each species, and evaluated using AIC. Presence of several species (e.g., spotted salamander) was strongly associated with the amount of forest within the 200m core zone, and presence of others (e.g., tiger salamander) was associated with landscape variables outside of the "core zone" (e.g., road density). Overall salamander diversity was positively associated with the amount of forest within the core zone, and negatively associated with the presence of predatory fish and cumulative length of paved roads within 1km of the site. These habitat suitability models are now used to identify unknown woodlots that still provide quality amphibian habitat in Ohio, and guide conservation activities related to forest preservation and restoration within agricultural landscapes.

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A SEASCAPE APPROACH TO STUDYING AND MODELING NETWORKS OF MARINE PROTECTED AREAS IN CORAL REEF ECOSYSTEMS

The need to investigate effective ways to design networks of marine protected areas (MPAs) in coral reef ecosystems increases as various countries have initiated plans for MPA networks. Unfortunately, because of the scarcity of existing or even incipient networks, little research to date has addressed how networks of ecologically-connected MPAs may function across realistic seascapes that include both natural and human dimensions. The Bahamas Biocomplexity Project (BBP) was initiated to address this important need for integrated, interdisciplinary research while responding to recent management directions in The Bahamas. Drawing on approaches from oceanography, population genetics, ecology, anthropology, and economics, the BBP is integrating theory and data in statistical and computational models about Bahamian coastal dynamics. Major areas of interest include (1) the crucial interactions and feedbacks among physical, biological, and social systems that influence how MPA networks function; (2) the roles of different stakeholder groups in determining these MPA functions; and (3) the relative function of networks designed to maximize biodiversity or fisheries objectives versus those designed to minimize certain socioeconomic impacts. Methods to bridge multiple scales of analysis and diverse study components have been critical to progress in this ambitious ongoing project.

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CHANGING BY DEGREES: ADAPTIVE RESPONSE OF REEF CORAL SYMBIOSES TO CLIMATE CHANGE

Reef corals worldwide are threatened by rising sea surface temperatures and recurrent episodes of mass bleaching and mortality. However, corals in different parts of the world experience different temperature regimes, and some corals are able to survive temperatures far in excess of those causing mortality elsewhere. To test the hypothesis that corals survive high temperatures by hosting genetically distinct algal symbionts, molecular surveys were undertaken of reef corals in extreme high temperature environments (Saudi Arabia) and from the latitudinal limits of coral distribution in three oceans (Japan, Madagascar, Israel, Brazil, Bermuda). Results showed that corals from high temperatures were dominated by unusual algal symbionts that appear resistant to bleaching, while corals at high latitudes contained entirely different symbionts that appear suited to higher seasonality and lower mean temperatures. The capacity of some corals to flexibly host different algal symbionts suggests an important potential mechanism by which corals might mitigate the effects of climate change. Evidence suggests that worldwide shifts in algal symbiont communities are already occurring in response to recent climate change-related bleaching events; monitoring these changes may be useful in predicting the long-term survival trajectories of different coral species, reefs, or regions.

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THE STATUS OF COMMUNITY–BASED MARINE PROTECTED AREAS IN THE PHILIPPINES: SUCCESSES, EMERGING ISSUES AND FUTURE DIRECTIONS

Haribon studies show that there are already close to 600 marine protected areas (MPAs) established in the Philippines. Haribon gathered both empirical proofs and anecdotes and some successes would point out to the following: 1) an average 4year old marine sanctuary increases the fish catch of local fishers by an average of 50%; 2) a 50-95% decrease in illegal fishing surrounding the marine sanctuary; 3) improved habitats, varying increases in coral cover and fish density and improvements in fish biodiversity; 4) improved competence and accountability in government and community; 5) lead to open communication between the local government units and the communities; 6) development of collectivism; 7) built commitment to protect and manage the resources; 8) encouraged other communities to set up a sanctuary. Though a number of successes is notable, only 18-20% of the total established MPAs in the country are functional. Most of these functional MPAs are community led or community based. Oftentimes sustainability of MPA management and enforcement is hindered by conflicting socioeconomic and politico-cultural forces which lead to a number of challenges and emerging issues. On the other hand, these lead to some future directions, notable of which is the strengthening of MPA catalysts on the ground, towards a more sustainable management of community based MPAs in the Philippines

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FISHING-INDUCED PHASE SHIFTS IN A PACIFIC OCEAN FISH ASSEMBLAGE

The Pacific coast of the US has largely been free of the fishery collapses that have occurred elsewhere in the world. However, this envious position appears to be rapidly changing. In the first examination of the US Pacific groundfish assemblage, we reveal that fishing has caused striking declines in the sizes of fish as well as shifts in the structure of the assemblage. Using novel methodology, we estimated annual population growth rates (i.e.,λ) for 31 fish species. A number of species are declining rapidly producing λ's of >0.90, while other species are increasing with λ's of >1.1. The net result is that rockfishes (Sebastes spp.), which once comprised 60% of the assemblage, now make up less than 17% of the assemblage. In contrast, flatfishes have increased from 34% to nearly 80% of the assemblage. Moreover, average fish size has declined 45% in 21 years. Further analyses shows that λ appears to be function of life history and habitat interacting with historical fishing pressure. The results of our analyses are disquieting as they raise the possibility that fishing-induced phase shifts in fish communities may affect the recovery of fishes, even after the implementation of severe fishing restrictions.

CO28-5 **BEISSINGER, STEVEN R. and Benjamin H. Becker** Division of Ecosystem Sciences, Department of Environmental Science, Policy and Management, 151 Hilgard Hall #3110, University of California, Berkeley, CA 94720-3110 (beis@nature.berkeley.edu) Pacific Coast Science and Learning Center, Point Reyes National Seashore, Point Reyes Station, CA 94956

COLLAPSE OF FISHERIES CAUSES A THREATENED SEABIRD TO “FISH DOWN THE FOODWEB”

Coastal marine ecosystems worldwide have undergone dramatic changes due to overfishing, pollution, habitat destruction, exotic species introductions, and climate change. Of these, the most pervasive is overharvesting of higher trophic level species, whose effects cascade to lower trophic levels. “Fishing down the food web” reduces the average trophic level of marine organisms by selectively harvesting larger, higher trophic level fishes and has periodically required human harvesters to shift to new, often lower trophic level fishery resources. Here we show how the infamous collapse of the sardine and similar fisheries in central California has greatly reduced the trophic level of a legally threatened marine predator, the Marbled Murrelet. Comparison of stable delta 15N and delta 13C ratios in feathers of museum specimens collected 100 years ago prior to fishery exploitation with ratios in murrelet feathers collected recently indicate the proportion of energetically superior, high trophic level prey (e.g., sardines and anchovies) have declined strongly, while energetically poor, low and mid-trophic level prey (e.g., young rockfish and krill) have increased. Decreased prey resources have reduced the murrelets’ diet by one-half a trophic level, are partly responsible for poor murrelet reproduction, and may have contributed to listing as an Endangered Species.

CO28-6 **SECORD, DAVID** University of Washington, Tacoma, Environmental Science Program, 1900 Commerce Street, Box 358436, Tacoma, WA 98402-3100 (dave@u.washington.edu)

PESTS AT SEA AND METHODS FROM LAND: A CONSERVATION PERSPECTIVE ON MARINE BIOLOGICAL CONTROL

Biological control (biocontrol) has successfully regulated pest populations in terrestrial agroecosystems, but it has also caused negative unintended consequences for native species. Marine biologists and resource managers have recently published a growing number of proposals to include biocontrol in integrated pest management programs in oceans, seas and estuaries. In this talk I review six ecologically and taxonomically diverse case studies of marine biocontrol programs at various stages of planning and implementation, from the perspective of conservation risks they may pose. Case studies involve a wide range of taxa, including several marine invertebrate phyla, fishes, macroalgae, phytoplankton, microbes, insects and flowering plants. Host specificity cannot be guaranteed in the marine biocontrol proposals examined, presenting a significant conservation risk at population and community levels. Feasible alternatives to classical biocontrol in the marine realm should be emphasized, including more investment in invasion prevention, early detection and eradication while invasions are small, and increased attention to native natural enemies to control invasive marine species. I conclude that biocontrol at sea is risky, posing many more uncertainties and a much sparser history compared with its counterpart on land.

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A MULTI-SCALE ANALYSIS OF SPECIES-ENVIRONMENT RELATIONSHIPS: RARE MOTHS IN A PITCH PINE-SCRUB OAK COMMUNITY

The threatened pitch pine – scrub oak (pine barrens) communities of the northeastern USA provide critical habitat for many species of rare moths. We used partial canonical correspondence analysis to assess the relative effects of three levels of environmental variables (plot, patch, and landscape) on the distribution and abundance of ten rare moth species in a pine barrens community in southeastern Massachusetts. We also used a set of spatial variables to quantify and partial out the effects of spatial autocorrelation of species composition among sampling locations. All three levels of environmental factors combined accounted for virtually half (48.4%) of the total variation in the moth community. Sequential partitioning of the variance explained by each level of environmental factors indicated that landscape factors explained more than twice as much variance as plot and patch factors. A model that included only landscape variables explained 53% of the total variation. Patch density and percentage of the landscape comprised of open and sparse canopy, scrub oak habitats were the most significant variables. These results suggest that presence of scrub oak habitat within large, heterogeneous, landscape mosaics may be more important for the maintenance of rare pine barrens associated moth populations than plot or patch characteristics.

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BIODIVERSITY ASSESSMENT AND CONSERVATION STATUS OF FIVE VEGETATION TYPES IN A MONTANE INTERURBAN AREA OF CENTRAL MEXICO

Pine forests and other mountain vegetation types of Central Mexico constitute natural islands, separated by endorreic valleys, which are occupied by large cities or industrial-urban areas. The mountains between two big urban areas of Mexico -the cities of Puebla and Mexico- are part of the Iztaccihautl-Popocatepetl and Zoquiapan National Parks. This particular spatial disposition has caused a high level of isolation between forested areas. These areas have been heavily logged during the last 50 years for paper pulp and fire wood, and are key because of the environmental services they provide. The aims of our study were to assess the conservation status of an 840-ha forest not exploited for the last ten years and to study relationships between insect groups and tree population parameters. We censused tree populations and sampled insects in five types of forest: Pinus, Abies, Arbutus, Pinus-Alnus-Abies, and Quercus using 400m2 plots. For each tree species, we studied importance value, age structure and insect groups associated. Pine, fir, and oak forests are recovering from logging, while Arbutus and P-A-A forests represent successional phases of the corresponding climatic forests. The association between mycophile insects and fir forests is a good indication of environmental health for this vegetation type.

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STAGE-SPECIFIC AND INTERACTIVE EFFECTS OF SEDIMENTATION AND TROUT ON A HEADWATER STREAM SALAMANDER

Abundance of the salamander Gyrinophilus porphyriticus (Plethodontidae) is negatively related to both logging-associated sedimentation and brook trout (Salvelinus fontinalis) in headwater streams. To understand the mechanisms underlying these patterns, we investigated stage-specific and interactive effects of sedimentation and brook trout on G. porphyriticus. We conducted quantitative surveys of salamanders, brook trout and substrate embeddedness in 15 first-order streams and used a controlled experiment to test the direct and interactive effects of these factors on larval growth and survival. Abundance of larvae was negatively related to brook trout abundance but unrelated to substrate embeddedness. Adult abundance was primarily related to substrate embeddedness. Consistent with the field pattern of larval abundance, brook trout alone had a negative effect on larval growth and survival in the experiment. Consequently, adult resistance to fish may facilitate G. porphyriticus coexistence with brook trout, and larval resistance to sedimentation can buffer populations from extinction in fishless streams impacted by logging. In streams with brook trout, where larval abundances are low, reductions in adult abundance caused by logging impacts may pose a risk to species persistence. Our findings underscore the value of information on species life history, demography and community ecology in assessing sensitivity to anthropogenic perturbation.

CO29-4 **PENNINGTON, DERRIC** (penn0107@umn.edu)

EFFECTS OF LAND USE ON URBAN RIPARIAN BIRD COMMUNITIES DURING THE SPRING MIGRATORY SEASON IN GREATER CINCINNATI METROPOLITAN AREA

Riparian areas are important in supporting a high diversity of plants and animals, along with providing critical habitat for migrating birds, yet little is known about the effects of urbanization on bird species using urban riparian corridors during the migratory season. To address this, I examined patterns of habitat use by birds at the local and landscape level during the 2002 spring migratory season at 71 riparian plots along an urban gradient. As development increased, streamside woodlands tended to be narrower and have fewer native trees and shrubs. I explored how the variation in different land covers (percent tree cover, percent grass cover, building density, and road density), at four different scales (50, 100, 250, and 500 m) affected abundance, species richness, and evenness of 4 different migratory bird guilds (en-route Neotropical migrants, resident Neotropical migrants, short-distance migrants, and permanent residents) using linear regressions. Relationships varied according to guild and bird diversity measures. All native bird measures were best described by the amount of tree cover within 250 m to 500 m of the stream; non-natives were most sensitive within 100 m of the stream. Multiple linear regressions indicated that total bird, short-distance migrant, and permanent resident abundances were best characterized by narrow forests and human settlement. The opposite was observed for both resident and en-route Neotropical migrants. Species richness and evenness for all bird guilds was best described by landscape measures of urbanization, increasing with higher levels of tree cover and lower levels of development around a plot. Neotropical migrants were also associated with the frequency of native trees. Canonical correspondence analysis (CCA) confirmed that bird community variables were strongly influenced by these variables. Habitat selection appears to be different among resident and en-route Neotropical migrants; residents appear to be more sensitive to development, while en-route migrants appear most dependent on the presence of vegetation structure and composition around streams. My analyses indicated that spring migratory bird communities and local habitat around urban riparian areas were both affected by the level of urbanization in the surrounding landscape and that further research is needed to understand how life-histories influence habitat use by birds. To best mitigate the negative impacts of human settlement on native birds in streamside woodlands management should focus on maintaining or restoring vegetation structure and composition of riparian habitats within urban areas, limiting development within at least 250 m of the stream.

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HABITAT SELECTION OF EASTERN SCREECH OWLS IN CENTRAL PARK

A better understanding of screech owl (Otus asio) population ecology in urban landscapes is necessary to facilitate the recovery of this once common raptor in New York City (NYC) parks. In cooperation with the NYC Department of Parks and Recreation (NYCDPR), we have been studying the population ecology of reintroduced owls, obtained from wildlife rehabilitators, in Central Park, Manhattan, NY. Specifically, we have been interested in habitat selection, if any, of these owls. Locations and home ranges of 9 owls were examined to assess habitat selection of 8 habitat types. Average home range size was 53.91ha. Owls selected forested and savannah-like areas, and avoided urban areas. However, owls did not show selection for or against paved paths or buildings within the park itself. Survival was greatest for owls whose home ranges existed primarily within forested habitats. All areas of the park received large amounts of human traffic, and owls appeared to be able to habituate well to human presence. Our data suggests that in order to maintain screech owl populations, parks need to have ample forested area (as well as sufficient tree cavities or nest boxes) and human use is likely not a detrimental factor.

CO29-6 **LISSIGNOL-HUSTE, AURELIE, Slaheddine Selmi, Jean Clobert, and Thierry Boulinier** Laboratoire d'Ecologie, Université Pierre et Marie Curie, CNRS UMR 7625,Bât A, 7ème étage, 7 quai St Bernard, 75252 Paris cedex 05, FRANCE (LHA, JC, TB) (alissign@mail.snv.jussieu.fr.) Département des Sciences de la Vie & de la Terre, Faculté des Sciences de Gabès, Route de Médenine, 6029 Gabès, TUNISIA (SS)

DIVERSITY AND TEMPORAL DYNAMICS OF BIRD SPECIES IN THE SUBURBDS OF PARIS, FRANCE

In urban environments, wildlife species are confronted with both a loss of suitable habitats and increased disturbances from activities in the urban surrounding matrix. Studying the effects of urbanization on biodiversity need to survey large numbers of remnant patches with often confounding factors due to the human disturbed context. Determine what factors spatially and temporally affect species diversity has important conservation implications because it allows the design of appropriate management. We present the results of a 3 years study on forest breeding bird species in 91 suitable patches of a suburban area next to Paris, France. We used capture-recapture approaches to estimate parameters of communities dynamics (species richness, extinction and turnover rates). Taking into account the spatial distribution of patches, we investigated their spatial and temporal variations in relation to characteristics of patches (area and vegetation covert) and the urban disturbances (management of patches, human population densities and proportion of surrounding flats). In this urban area, human activities play a role for the spatial distribution and the quality of the suitable patches, leading to variability of the dynamics of forest bird communities.

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DECONSTRUCTING FLAWED SCIENTIFIC INFERENCES ABOUT THE FLORIDA PANTHER

We describe major flaws in two sets of inferences in the peer-reviewed literature on the endangered Florida panther. First, the conclusions that panthers are forest obligates, prefer large forest patches, and are reluctant to travel >90m from forests are unreliable because the analyses excluded (without mention or rationale) half the available data, ignored telemetry error, were limited to morning observations (panther daybeds), and failed to compare used to available habitats. Using these inferences, developers have obtained permits to destroy habitats, such as those >90m from forests. Second, the conclusions that neonate survival = 0.87 and that the panther population was demographically vigorous prior to 1995 are flawed because the survival analysis ignored mortality during the first 4 months, and because other inferences were based on numbers of births and deaths in samples of convenience rather than appropriate vital rates. Conservation Biology published both key papers in 1995, contributing to 8 years of scientific and management confusion. We hope these examples will spur increased rigor in scientific peer-review and publication. To allow prompt scrutiny of contested scientific inferences affecting panther management, we recommend a Scientific Steering Committee that would have unfiltered 2-way communication with stakeholders.

CO30-2 **BISHOP, MELANIE J. and Charles H. Peterson** University of North Carolina at Chapel Hill, Institute of Marine Sciences, 3431 Arendell St, Morehead City, NC, 28557 USA (mbishop@email.unc.edu)

ECOLOGICAL MONITORING TO DETECT IMPACTS OF BEACH NOURISHMENT: CURRENT STATE OF PLAY AND RECOMMENDATIONS FOR IMPROVEMENT

Due to unprecedented rates of coastal development along the southeast USA over the last 30 years, increasing storm activity and rising sea levels, there is growing public demand for shoreline protection. Beach nourishment, the placement of large quantities of sediment to extend the beach seaward, is the currently favored response. Beach nourishment can disrupt the existing benthic and pelagic communities, both at the site of nourishment and at the 'borrow' site, supplying the sediments. Due to the poor quality of monitoring studies examining the putative ecological impacts of nourishment, they remain largely unknown. Our critical review of existing monitoring studies addressing the impacts of nourishment reveal a plethora of common problems in their design and implementation that severely compromise their ability to test for impact. These include use of inadequately rigorous methods, collection of data over inappropriate temporal and spatial scales, failure to consider natural seasonal variability in development of a test for impact and misinterpretation of results. Very few utilize the BACI designs necessary to unambiguously attribute change to disturbance. Based on these flaws we provide recommendations of minimum standards for monitoring studies to ensure that they contribute meaningfully to our understanding of the ecological impacts of beach nourishment.

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BRIDGING MONITORING AND MANAGEMENT: EXPERIENCES OF MONITORING WILD PANDA IN WANGLANG NATURE RESERVE, SICHUAN, CHINA

In the past decade, the importance of monitoring has been commonly realized and monitoring work has been significantly improved in China's nature reserves. By the end of 2003, over 20 nature reserves have implemented monitoring to protect panda populations and their habitats, and to improve efficiency of their management efforts. Among them, as the "Pioneer", Wanglang NR plays an important role. Monitoring experiences gained in Wanglang have been widely introduced to other nature reserves. A conservation decision-making and support system based on monitoring data was first set up in 1999, and is being continuously improved. Field data has been collected and stored in a GIS database and been analyzed. The results have helped the managers to improve their management by specifying tasks for each important "parcel" area and each time period in their respective nature reserve. With detailed information on where and when human disturbance occurs, or will take place, managers could launch more efficient campaigns, anti-poaching, for example. As the result, varies management have been utilized in a more timely manner. Monitoring results showed panda population in Wanglang remained stable during the past 3 years. Information from monitoring has also helped to fill the knowledge gap on the seasonal distribution pattern of panda population in Minshan Mountains, where the largest panda population in the world lives. Nomadic herding has existed for centuries, while maintaining natural balance. Traditionally in Mongolia, four seasonal pastures were used by herders, with sufficient reserves for grazing and due consideration for vegetation re-growth and recovery after grazing. Centrally planned economy also played a part in maintaining the land in considerably balanced manner. When Mongolia began the transition to a market-oriented economy in the early 1990s, both the animal husbandry and herders' interests changed radically. Unfortunately, the government was not able to foresee the ecological, economic and social consequences of these changes and formulate policies accordingly.

CO30-4 **GAMUI, BANAK** GAMUI, BANAK. Wildlife Conservation Society-PNG Program, P.O.Box 277, Goroka, EHP, PNG (bgamui@global.net.pg)

SCIENTIFIC RESEARCH AS A TOOL IN MOBILIZING LOCAL COMMUNITIES FOR BIODIVERSITY CONSERVATION

Trained local research assistants (TLRAs) promote research and conservation values by learning about and appreciating the ecology of their forests. A yearlong research project was conducted at the Mekil montane forest near Mt. Stolle in Papua New Guinea (PNG). The study used TLRAs to collect data on seasonal variations in forest litter fall, bird and insect population fluctuations, and climatological data. With 3900 man-hours of fieldwork, the TLRAs collected and recorded 1500 litter samples, 1140 insect samples, 3600 minutes of bird point-counts, 1397 data points of rainfall and 926 data points of temperature. The project paid the local community over K9000 (@0.31 USD, this is 4-5 times PNG's per capita income) in the form of wages, local produce purchases, community fees and lodging fees. This, and other scientists employing TLRAs generate the only cash income for the community. The TLRAs were trained in important aspects of scientific research and conservation. Two aspiring PNG conservation biologists were also trained. Consensus building continued and the community was mobilized towards creating and locally managing a conservation area. Data from this study will contribute to the management of Mekil forest. The approach used here can also be adopted in protecting other forest ecosystems.

CO30-5 **LOWE, ARIANNE, Stephen Dovers, and David Lindenmayer** Centre for Resource and Environmental Studies, Bldg 43, Hancock, Australian National University, Canberra, ACT 0200, Australia (arilowe@cres.anu.edu.au)

TOWARDS IMPROVED THEORY AND PRACTICE IN EVALUATION OF CONSERVATION PROJECTS

Significant effort and investment are being placed into environmental conservation around the world. How much conservation projects can achieve will be determined by the effectiveness and efficiency of this investment. Measuring the success or failure of a project requires examination of the relationship between goals and outcomes, based on rigorous evaluation methods. However, it is not clear that conservation projects are (i) commonly evaluated, (ii) evaluated in a consistent manner, or (iii) the subject of a shared body of evaluation practice. This paper reviews the status of project evaluation as reported in the conservation biology literature and selected grey literature, establishing the frequency of evaluations and their theoretical and methodological bases. This is analysed against core principles for evaluation distilled from the general non-environmental evaluation literature. Key issues identified are (1) paucity of evaluation and/or inconsistencies in evaluation (e.g. resistance, skills, resources) (2) lack of congruence between evaluation theory and practice in conservation and the general evaluation field (3) the relevance of key attributes of policy and management areas to conservation project evaluation. The paper concludes that the theory, methods and application of evaluation in nature conservation – and thus the effectiveness of management interventions – can be improved, and indicates ways in which this can be brought about.

CO30-6 **INMAN, R. M., K. H. Inman, and C. R. Groves** Wildlife Conservation Society, 2023 Staduim Drive, Suite 1A, Bozeman, Montana 59715 (binman@wcs.org)

WOLVERINES IN GREATER YELLOWSTONE

Wolverine (Gulo gulo) population status in the contiguous U.S. remains uncertain and ecological requirements are not well described. Managers need scientific data to inform and substantiate decisions on T&E status, trapping regulations, and impacts from snowmobile use. Between 2000-04, we captured 17 wolverines at 2 study sites in the Yellowstone Ecosystem. Six wolverines were fit with GPS or satellite collars. Mean 100% MCP home range size was 754 km2 for adult females (3 wolverines, 202 locations) and 910 km2 for adult males (5 wolverines, 231 locations). One dispersing male made exploratory movements into at least 8 mountain ranges and 9 political jurisdictions; 251 locations yielded a 100% MCP estimate of 37,638 km2. Mortalities included trapper-harvest, avalanche, and inter-specific competition. Peak snowmobile activity occurred between 11:00-15:00 and use levels differed between weekdays and weekends ($P \leq 0.005$). We surveyed 5,582 km2 for distribution of snowmobile use and study sites varied in amount of area that was highly impacted (11% vs. 1%). Because of their trophic position, relatively vulnerable demographics, and the extremely large scale at which populations may function, wolverines may be an important indicator of ecosystem health whose persistence depends on collaborative planning and management at a regional scale.

CO31-1 **CHAN, KAI M. A. and Gretchen C. Daily** Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, CA 94305 (kaichan@stanford.edu).

PREDICTING THE EFFECTS OF LANDSCAPE MANAGEMENT ON TROPICAL COUNTRYSIDE BIODIVERSITY

Given the limited resources available for the conservation of biodiversity, there is great interest in crafting conservation instruments that maximize the marginal gains for diversity. While it has been demonstrated for numerous taxa that high species richness can occur in human-dominated countryside, it is unclear how much will persist into the future, and how this quantity depends on land-use decisions. We address these questions for costa rican birds using two modeling approaches: a data-driven "double jackknife" approach, and a parameterized multi-species population viability analysis (PVA). Incorporating available data for the costs of land management interventions, we calculate the cost-effectiveness of different management strategies. One clearly attractive strategy is to invest in tree growth within and between agricultural plots.

CO31-2 **ACEVEDO, MIGUEL A. and T.Mitchell Aide** University of Puerto Rico, Río Piedras Campus, Department of Biology, P.O. Box 23360, San Juan, PR 00931-3360 (miguel_a_acevedo@yahoo.com)

AVIAN COMMUNITY DYNAMICS IN A SUBTROPICAL COASTAL LANDSCAPE MOSAIC

Coastal habitats have been reduced and modified due to deforestation for agriculture and urban areas. These land use changes have modified the landscape from a continuous forested system to forest fragments in a grassland/agriculture and urban matrix. Our objective was to describe the bird community composition and dynamics in four vegetation communities (karst, brackish-forested wetland, mangrove, and seasonally flooded grassland) based on monthly censuses for one year. Data were analyzed using a Non-metric multidimensional scaling analysis (NMS). The presence/absence ordination grouped the 48 censuses into three bird communities: (1) karst with the highest diversity (29 species) and four unique species, (2) brackish-forest and mangrove, which shared four unique species, and (3) grassland with a large component of exotic species. The ordination based on bird abundance data produced four groups. Karst and grassland remained as independent groups, while mangrove and the brackish-forested wetland were separated into two groups: mangrove/brackish-forest during the non-migratory period and mangrove/brackish-forest during the migratory period. This difference was due to the high abundance of Northern Waterthrush and Ovenbird during the migratory period. Although many native species continue to use the forested habitats, the increase in grasslands has led to an increased abundance of exotic birds.

CO31-3 **PAIRIS, AMBER D. and Jonathan L. Atwood, Ph.D.** Antioch New England Graduate School, 40 Avon Street Keene, NH 03431-3516 (AP and JLA); (amber_pairis@antiochne.edu)

PREDICTING CALIFORNIA GNATCATCHER (POLIOPTILA C. CALIFORNICA) DISTRIBUTION BASED ON ENVIRONMENTAL VARIABLES

The California Gnatcatcher (Polioptila c. californica), a federally threatened subspecies numbering about 3000 pairs in the U.S., is restricted to remnant patches of coastal sage scrub (CSS) in southern California and northern Baja California. California Gnatcatchers are not evenly distributed throughout the CSS plant community, and land managers often conduct intensive surveys to monitor the species. The use of remotely-derived environmental variables such as elevation, slope, and aspect as predictors of gnatcatcher distribution within CSS may provide adequate information on which to base regional management goals. We used logistic regression to model California Gnatcatcher presence/absence on Camp Pendleton Marine Corps base, San Diego County, California, and then validated the model with focused survey data collected in subsequent years. Of 612 pair locations from the survey, 80% were found in areas identified by the model as having a high probability of gnatcatcher occurrence and covered 30% of the original survey area. At this site, exclusion of areas of CSS with a low probability of gnatcatcher occurrence could reduce the area to be surveyed from the original 19,097 ha to 5,971 ha.

CO31-4 **BOUZAT, JUAN L., Jeremy D. Ross, Allan D. Arndt, Roger F. C. Smith, and Jeff A. Johnson** Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403, (jbouzat@bgnet.bgsu.edu) (JLB, JDR).Department of Biology, University College of the Fraser Valley, British Columbia, Canada (ADA). Department of Zoology, Brandon University, Manitoba, Canada (RFCS). Museum of Zoology, University of Michigan, Ann Arbor, MI 48109 (JAJ)

DEMOGRAPHIC AND GENETIC EVIDENCE SUGGEST RE-EVALUATING THE CONSERVATION STATUS OF THE GREATER PRAIRIE CHICKEN, TYMPANUCHUS CUPIDO

The extent to which a species' historical range has been reduced is commonly used as an important criterion in categorizing the conservation status of wild populations. The Greater Prairie-Chicken (GPC) has been extirpated from much of the area it once inhabited. However, within a large part of this area the species is not considered to be native, warranting no recovery effort or special protection. Demographic and genetic simulations based on provenance data from 161 specimens from museum collections and 100 mtDNA sequences indicate that this species was native to the northern prairies, extending from central Minnesota to Alberta, Canada. Provenance data from 1880 to 1935 indicate that the GPC would have required colonization and establishment of populations on an average 12,170 km2 every year, with a per capita growth rate of 9.1% per year. These rates seem unrealistic given the limited dispersal capabilities and high mortality reported for this species. DNA mismatch distributions do not show evidence for a recent colonization of the putative ;expanded; range, but suggest a post-Pleistocene expansion of the species about 18,000 ybp. This study suggests that the current status of the GPC should be re-evaluated within all areas where this species is now considered non-native.

CO31-5 **WATSON, JAMES, Robert Whittaker, and Terence Dawson** Biodiversity Research Group, School of Geography and the Environment, University of Oxford, Oxford OX1 3BW United Kingdom (james.watson@geog.ox.ac.uk)

CONSERVATION OF THREATENED BIRDS IN THE FRAGMENTED LITTORAL FORESTS OF SOUTHEASTERN MADAGASCAR

Madagascar's lowland littoral forests are seriously threatened by deforestation and habitat fragmentation. In this study we examine how littoral forest bird communities have been affected by habitat fragmentation at both patch and landscape scales. Bird community composition within 30 littoral forest remnants of differing size, shape and isolation was determined using point counts conducted in October – December in 2001 and 2002. Each remnant was characterised by measures of remnant area, remnant shape, isolation, and surrounding landscape complexity. Step-wise regression, Canonical Correspondence Analysis and binomial logistic regression modelling were used to test the relationship between bird species and landscape variables. Bird species richness in remnants was significantly ($p<0.01$) explained by remnant area but not by any measure of isolation or landscape complexity. The majority of forest-dependent species had significant ($p<0.01$) relationships with remnant area and minimum area requirements ranged from 15-150 ha. The distribution of four forest-dependent species also appeared to be affected by remnant shape but no species appeared to be affected by remnant isolation or landscape complexity. The results of this study suggest that bird conservation strategies in littoral forests must focus on preserving the last large, intact, forest remnants on the island.

CO31-6 **DELGADO, MARTA, José Guerreiro, and Rita Alcazar** Faculdade de Ciências da Universidade de Lisboa, Campo Grande, Edificio C5 1749-016 Lisboa Portugal(marta_delgado@mail.pt)(MD, JG). Liga para a Protecção da Natureza, Estrada do Calhariz de Benfica 187, 1500 Lisboa Portugal(RA).

PLANNING ECOTOURISM IN THE SPECIAL PROTECTION AREA OF CASTRO VERDE, PORTUGAL

The Special Protected Area (European Union Bird Directive) of Castro Verde in the south of Portugal has a high potencial for ecotourism exploitation, mainly for bird watchers. Nevertheless it was needed to choose the best approach to establish the circuits, according to biodiversity and minimizing all the possible impacts. Having the conservation of threatened species and their steppe habitat as main object of study, and after the survey of the existing circuits in the area, we selected four pedestrians circuits and two car circuits. Circuits were chosen according to the data collected in the field considering biodiversity and equitability, during the four seasons of the year.Concerning the ecological interpretation of the circuits, the “stopping points” were chosen taking in account the raised abundance of the species or special panoramic interest.

CO32-1 **SADIGHI,KAY, Frank Lowenstein, Douglas Feick, and Jay Hestbeck** The Nature Conservancy, P.O. Box 268, Sheffield, MA 01257, (ksadighi@tnc.org)(KS,DF,FL)

ANALYSIS OF NON-NATIVE PLANT INVASIONS OF A LANDSCAPE-SCALE SITE

Conservation of functional landscapes presents unique challenges, particularly when invasion by non-native species occurs. We surveyed 264 plots (5x5m) for ten taxa of non-native invasive plants to determine the infestation association with roads, recreational trails, and paired-sample off-trail forest plots in a 36,000-acre upland conservation area spanning three states in Lower New England. Plots were recorded using a global positioning system unit and projected onto Geographic Information Systems data layers for elevation, slope, and soil type (combined as ecological land units). Analysis with Tukey's Comparison of Multiple Proportions and Randomized Blocks for Frequency Testing shows that roads maintained year-round have a significantly higher level of infection than do seasonal roads (P.001) or recreational trails (P.001). Trail plots and their paired off-trail forest sites were not significantly different from each other. Forest edge and hedgerows were significantly more infested than forest and field cover types (P.001). Ecological land units of gently-sloping calcareous lands were significantly more infested than gently-sloping acidic sed/metased lands (P.025). This survey provided the baseline data and planning maps for a multipyear federally funded invasive species' removal program called "Weed It Now".

CO32-2 **SCHLAEPFER, MARTIN A., Bernd Blossey, Michael C. Runge, and Paul W. Sherman** Department of Integrative Biology, 1 University Station C0930, University of Texas at Austin, Austin TX 78712 (mas50@mail.utexas.edu) (MAS). Department of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853-3001 (BB). US Geological Survey, Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, MD 20708-4017 (MCR). Dept of Neurobiology and Behavior, Mudd Hall, Cornell University, Ithaca, NY 14853-2702 (PWS).

INTRODUCED SPECIES, EVOLUTIONARY TRAPS, AND EVOLUTIONARY RELEASES

Population responses of both native and introduced species can be understood by considering the degree to which their decision-making rules ('behavioral algorithms') and life-history characteristics match their current environment. Organisms often rely on environmental cues to make behavioral and life-history decisions. Normally these decisions are adaptive because they rely on cues that correlated with a high probability of survival and reproduction in the past. A rapid anthropogenic change to the environment, however, can potentially result in an 'evolutionary trap', where formerly adaptive behavioral algorithms now lead to fitness-decreasing outcomes. Introduced species can cause sudden, dramatic change to their host environment and 'trap' native species. The conceptual framework underlying the evolutionary trap can also explain (1) why most species introductions are unsuccessful, (2) why some introduced species benefit from an 'evolutionary release' and become invasive, and (3) such paradoxes as why introduced species sometimes out-compete and displace native species, even though the latter should in theory hold the advantage from years of adaptation to local conditions. By integrating an organism's evolutionary history and current behavioral algorithms, the evolutionary trap/release concepts provide a useful framework for predicting the ecological and evolutionary impact of non-indigenous species.

CO32-3 **WHARTON, DAN Goncalves da Silva, Anders, Serios-orestis Kolokotronis, and** Dept. of Ecology, Evolution, and Environmental Biology, Columbia University, Schemerhorn Extension, 10th Floor, 1200 Amsterdam Ave, Mail Code 5557, New York, NY 10027 (AGDS; SOK). Wildlife Conservation Society, 830 Fifth Ave, New York, NY 10021 USA (DW, e-mail: dwharton@wcs.org)

USING THE “STERILE MALE TECHNIQUE” TO ASSIST EXTINCTION OF INVASIVE VERTEBRATES: A SIMULATION EXERCISE

Invasion of exotic species is a known factor in the degradation of ecosystems. Island ecosystems are especially vulnerable to degradation by exotic species of most classes of flora and fauna. For example, domestic goat (Capra hircus) introductions are damaging to various islands of the Pacific, notably those of the Galapagos Archipelago. Direct eradication (i.e. hunting) is usually the method of choice to drive extinction of ungulate invasives. One obstacle to eradication, using hunting alone, is increasing difficulty in finding scattered remnants of the assaulted population. We suggest that a secondary assault on the population could be effected by introducing behaviorally competitive, phenotypically distinct sterile male goats in some proportion greater than the estimated number of remaining, fertile male goats (“sterile male technique”). We present a simulation of population dynamics using stage-structured Leslie matrices under two control measures, hunting and sterile male goat introduction. Results indicate that the method could complement hunting and achieve eradication. We recommend a pilot study to reduce some of the uncertainties in the estimation of our demographic parameters, and to attain more accurate values assigned to hunting pressure and sterile male ratios. The technique also has potential as a “sentry system” for ecosystems at risk of invasion.

CO32-4 **BOCKARIE, ANNE TODD, Dennis Burton, Christina Czarnecki, Amanda Bryant, Jessica Hulitt, Luke Bourassa, and Fran Lawn** Philadelphia University, School of Science and Health, 4201 Henry Ave, Philadelphia, PA 19144-5494, USA, (BockarieA@philau.edu) (ATB, CC, AB, JH, LB). The Schuylkill Center for Environmental Education, 8480 Hagy's Mill Road, Philadelphia, PA, 19128, USA (DB, FL).

MANAGING INVASIVE EARTHWORMS TO RESTORE AN URBAN FOREST SITE

Invasive, exotic earthworms Amynthas spp disrupt nutrient cycles, remove leaf litter, increase soil compaction and erosion, and destroy the forest floor habitat in urban temperate deciduous forests of the Northeast United States. Twenty-six earthworm control treatments were tested in two year-long studies at the Schuylkill Center for Environmental Education, Philadelphia, PA. In the pilot study, the most effective treatments were 180g per m2 and 200g per m2 of sulfur, 20 black walnuts (Juglans nigra)per m2, and 10 cm depth of white pine needles. Amynthas populations decreased from a mean of 86 worms per m2 before treatment to 2 worms per m2 after one year. Sulfur applications were the only treatments to lower soil pH from 6.5 to 4. In the pilot study, the most effective treatments were 180g per m2 and 200g per m2 of sulfur, 20 black walnuts (Juglans nigra)per m2, and 10 cm depth of white pine needles. Amynthas populations decreased from a mean of 86 worms per m2 before treatment to 2 worms per m2 after one year. Sulfur applications were the only treatments to lower soil pH from 6.5 to 4.

CO32-5 **HOARE, JOANNE M. and Nicola J. Nelson** School of Biological Sciences, Victoria University of Wellington, P O Box 600, Wellington, New Zealand (joanne.hoare@vuw.ac.nz)

NEW ZEALAND LIZARDS DO NOT RESPOND TO PREDATOR SCENT CUES

Many of New Zealand's diverse lizard species have declined following human colonization of New Zealand, and associated introduction of predatory mammals. Yet in other parts of the world mammals and reptiles successfully coexist. Native predators of New Zealand lizards (birds and tuatara) hunt primarily using vision, which may explain the evolution of cryptic coloration and secretive behavior in lizards. In contrast, introduced mammals often use scent to detect prey. We hypothesize that New Zealand lizards, as opposed to other lizards that coexist with mammals, do not use scent to detect and avoid predators. We tested the use of scent by mammal-naïve lizards (Scincidae; Gekkonidae) in predator avoidance. Behavioral responses of lizards to the scent of native (tuatara) and introduced (rat) predators were recorded continuously for eight minutes after placing each lizard on a calico cloth covered with predator urine. Behavior of New Zealand lizards did not change in response to chemical cues of predators. We conclude that scent does not play a major role in predator avoidance by New Zealand lizards, which may partially explain their extreme vulnerability to mammalian predation.

CO32-6 **HOCHULI, DIETER F., Lauren M. McIntosh, and Fiona J. Christie** Institute of Wildlife Research, School of Biological Sciences, Heydon-Laurence Building (A08), The University of Sydney, N.S.W. 2006, Australia. (dieter@bio.usyd.edu.au)

EFFECTS OF URBANIZATION ON DOMINANT AND INVASIVE PLANT SPECIES IN SYDNEY, AUSTRALIA: WHAT ROLES DO NATURAL ENEMIES AND NUTRIENT ENRICHMENT PLAY?

Declines in the state of dominant native vegetation in urban remnants are often associated with the establishment of invasive species beyond their natural range. The “enemy-release” and “plant stress” hypotheses are often offered to explain these patterns; the former reflecting the loss or absence of natural enemies in urban environments and the latter reflecting high levels of nutrient enrichment caused by urbanization. We examined the interactions between soil nutrients, plants and the arthropods associated with them in urban forest remnants in Sydney, Australia. Angophora costata, the dominant tree in these remnants, supported a different assemblage of arthropods and suffered higher levels of herbivory in urban areas where soil nutrient levels were high. Manipulative experiments also showed that A.costata seedlings could not establish in high nutrient soils, supporting the contention that enemy-release and plant stress contributed to its decline in urban remnants. A major native weed Pittosporum undulatum showed contrary patterns, suffering less herbivory in urban areas and no response to nutrient enrichment, suggesting that its success in new environments may be partially attributed to release from natural enemies. By driving biodiversity loss and the modification of soil properties, urbanization disrupts fundamental ecological processes and the ecological integrity of urban remnants.

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STRATEGIC METHODS FOR TROPICAL CONSERVATION THROUGH COMMUNITY OUTREACH

Conserving threatened resources requires changing prevailing attitudes and behaviors of targeted human populations. Outreach and education are therefore important strategies for conservation. An international NGO, Rare, has developed a systematic method of community-based outreach for conserving natural areas in developing countries. Since 1988 Rare has carried out 50 outreach campaigns in 32 countries and states. As these campaigns are conducted sequentially using identical methodology at sites with varying social and environmental characteristics a great opportunity arises for standardizing methods and identifying those societal characteristics that associate with positive conservation outcomes. Here we present key variables under examination in an ongoing cross-site comparison, and we analyze comparative data from 18 sites where these campaigns are currently under way. Surveys of target populations reveal significant variation across sites in awareness of environmental regulation and attitudes towards protection. Post-test comparisons reveal societal factors that are influenced by these campaigns. Using these data we describe practical methods for identifying sites with high probabilities of conservation success, and we identify key indicators for assessing project impacts. Finally we use examples from the field to illustrate successful strategies for linking changes in societal awareness and attitudes to tangible conservation results.

CO33-2 **HEADY, LAURA T. and Gretchen Stevens** Hudsonia Ltd., PO Box 5000, Annandale, NY 12504 (heady@bard.edu)

TRAINING LOCAL DECISION-MAKERS: A HABITAT APPROACH TO BIODIVERSITY CONSERVATION IN THE HUDSON VALLEY

The Hudson River Valley supports rich biological diversity, including more than 2000 species of plants, birds, mammals, reptiles, and amphibians. Connecting a major metropolitan area and the state capital, the Hudson Valley is also desirable habitat for the human population, and has experienced tremendous development pressure in recent decades. Although a few federal and state regulations help protect biological resources from incompatible land uses, in New York much of the land use regulatory authority resides with local (town) agencies, and most conservation efforts originate at the local level. Historically, however, these efforts focused on agricultural, recreational, and historical resources – with little concern over biodiversity or habitats. Moreover, little information on biological aspects of the landscape has been available to land use decision-makers. To address this gap, Hudsonia developed the Biodiversity Assessment Manual for the Hudson River Estuary Corridor, published in 2001. Since then, Hudsonia has offered a training program to representatives of municipal agencies, land trusts, and watershed alliances who are actively engaged in land use planning. The program familiarizes participants with habitats of ecological significance, identification of habitats through remote analysis and field investigation, creation of habitat maps, and conservation strategies for protection of these habitats and the biodiversity they support.

CO33-3 **HOSTETLER, MARK and Kara Youngentob** Department of Wildlife Ecology & Conservation, University of Florida, PO Box 110430, Gainesville, FL 32611-0430 (MH, KY) (hostetlerm@wec.ufl.edu)

URBAN “GREEN” DEVELOPMENTS AND NATURAL RESOURCE CONSERVATION: CAN WE TRULY CREATE SUSTAINABLE COMMUNITIES?

“Green” or Neo-traditional developments are being built throughout the United States with goals to conserve natural resources and to promote a sense of community. Ultimately, decisions made by homeowners determine whether a community functions as a sustainable community. We conducted a mail survey of middle class homeowners in Gainesville, Florida to determine if there were differences in sense of community and environmental attitudes, behavior, and knowledge among residents from three development types (Traditional, Post-WWII, and Neo-traditional). The Neo-traditional community had the strongest sense of community between the development types, but in terms of environmental attitudes, knowledge, and behavior, it did not differ from Post-WWII communities and was generally lower than the traditional community. However, Neo-traditional homeowners did have greater knowledge about the legal status of the Gopher Tortoise. This was due to a local conservation Gopher Tortoise program in the Neo-traditional development. Results demonstrate that conservation biologists need to partner with developers and residents to produce on-site education programs that help communities understand and conserve natural resources. We will discuss how a unique educational package consisting of interpretive signs, a Web site, and brochure can be used to increase environmental awareness and action within a neighborhood.

CO33-4 **JOHNS, DAVID M.** (Johnsd@pdx.edu) The Wildlands Project; and School of Government, Portland State University, PO Box 751, Portland, OR 97207

MYTH AND MOBILIZATION: THE URGENCY FOR MORE EFFECTIVE OUTREACH AND RECENT LESSONS FROM BIO AND SOCIAL PSYCHOLOGY

Conservationists rely heavily on support from urban populations. This makes sense because political power resides in urban centers. Urban support for conservation, however, is wide but not deep and seems to be weakening. People want wildlife protected, but it is not a priority. This must be changed. Some of the obstacles are material—e.g. fewer people have spent any part of their childhood immersed in nature. But many of the obstacles to deepening support among urban constituencies rests with conservationists' prejudices: a belief that if people know the facts they will do the right thing; that truth by itself can overcome propaganda; that people are persuaded to act by argument. The evidence runs contrary to these assumptions. People are motivated by their needs and emotions; most political action is not the result of conscious decision processes; people respond to information encoded in symbols and stories, both religious and secular, to which they have been socialized; ritual and organization are more important than belief in motivating and sustaining political action. Conservationists, by using these findings and becoming more adept at understanding and speaking within the framework of existing mythologies and symbolic systems, can become more effective at mobilizing key constituencies.

CO33-5 **OLDFIELD, RONALD G.** Museum of Zoology, 1109 Geddes Avenue, University of Michigan, Ann Arbor, MI 48109 USA, (roldfiel@umich.edu)

DISSEMINATING SCIENTIFIC KNOWLEDGE TO AMATEUR BIOPHILES: A UNIVERSITY BASED AQUARIUM SOCIETY

Education and outreach programs of most conservation and science organizations target audiences of children and lay-people. Fewer programs target advanced audiences like amateur naturalists and exotic pet owners. Animal and plant enthusiasts affect biodiversity directly by removing and releasing organisms from and into nature, and indirectly by influencing conservation initiatives and policy. This justifies them as prime targets for education and outreach. The Aquarium Society of Ann Arbor, based at the University of Michigan, was established to disseminate scientific knowledge to amateurs. University scientists regularly lecture at monthly meetings. Field trips conceptually connect captive pets to natural ecosystems. As an official student organization, the ASAA has received facilities and media support from the University that has helped overcome obstacles encountered by regular amateur organizations. Dues are not required, and the organization has successfully attracted members. The ASAA benefits from its unusually diverse membership that includes students of natural resources, biology, and unrelated fields, as well as hobbyists unaffiliated with the university. Information contained in the human and literature resources of the University has successfully reached the target audience. The organization highlights the necessity of reaching amateur biophiles and exemplifies an approach to doing so.

CO33-6 **MANOPAWITR, PETCH and Antony J. Lynam** Wildlife Conservation Society – Thailand Program, P.O. Box 170, Laksi, Bangkok 10210 THAILAND; (pmanopawitr@wcs.org)

CONSERVATION TRAINING AND EDUCATION IN THAILAND: OVERVIEW AND THE FUTURE

With nearly 300 fully staffed protected areas covering 17% of lands, Thailand has developed a solid foundation for practicing conservation. However, current approaches in conservation science are rarely employed in managing these areas. The proximate reason for the deficiency is that staffs lack familiarity with current conservation practices. This arises from a lack of appropriate training curricular in schools, universities, and in-service courses. In partnership with the Thailand government, the Wildlife Society Society (WCS) has developed an innovative program to meet conservation training needs and to motivate and inspire government staff, students and field practitioners. Basic training provides wildlife enforcement staff with skills used in day-to-day management, including navigation, wildlife identification and field note-taking. Specialized courses such as marine mammal conservation and herpetology have provided opportunities for regional practitioners to learn from world-experts and establish communication networks. Advanced infrastructure, communications and financial services together with supporting institutions and in-country instructors make Thailand an ideal base for regional training programs especially those where standardization of techniques would benefit transboundary conservation e.g. endangered species monitoring, environmental law enforcement and GIS training. Funding support for the training program comes from a range of sources including the Thailand government.

CO34-1 **HUNDERTMARK, KRIS J., Tim J. Wacher, Osama B. Mohammed, and Robert L. Hammond** King Khalid Wildlife Research Centre, National Commission for Wildlife Conservation and Development, PO Box 61681, Riyadh 11575, Kingdom of Saudi Arabia, and Conservation Programmes, Zoological Society of London, Regent's Park, London NW1 4RY (kris.hundertmark@zsl.org)

PHYLOGEOGRAPHY AND TAXONOMY OF MIDDLE EASTERN GAZELLES

Taxonomy of Middle Eastern gazelles is confused but proper taxonomy is essential for effective conservation. We assessed current taxonomy in light of phylogeography of 2 groups of Red-Listed gazelles from the Middle East and closely related African and Asian forms. Sand gazelles (Gazella subgutturosa marica) from the Arabian Peninsula traditionally are considered conspecific with Persian goitered gazelles (G. s. subgutturosa) from Asia but distinct from slender-horned gazelles (G. leptoceros) from northern Africa. Phylogenetic relationships inferred from variation within the mitochondrial cytochrome-b gene indicate that G. subgutturosa is paraphyletic with respect to G. leptoceros, with a closer relationship between sand and slender-horned gazelles than between either of those taxa and goitered gazelles. Vicariance in combination with secondary contact of Middle Eastern and Asian populations may explain prevailing confusion concerning taxonomy. The mountain gazelle (G. gazella) was once widespread in the Middle East whereas Speke's gazelle (G. spekei) is limited in distribution to the horn of Africa (Somalia and Ethiopia). Mean genetic distance among mountain gazelle cytochrome-b haplotypes from across the Middle East is equivalent to distance between mountain and Speke's gazelles. We suggest a very recent common ancestry between Speke's and mountain gazelles such that they may properly be considered conspecifc.

CO34-2 **JONES, MENNA, David Paetkau, Eli Geffen, and Craig Moritz** Department of Zoology and Entomology, University of Queensland, Queensland 4072, Australia (Menna.Jones@utas.edu.au) (MJ, DP, CM). Institute for Nature Conservation Research, Tel Aviv University, Ramar Aviv 69978, Israel, (EG).

GENETIC DIVERSITY, POPULATION STRUCTURE AND THE CURRENT CANCER EPIDEMIC IN TASMANIAN DEVILS

Tasmanian devils (Sarcophilus laniarius, Dasyuridae; Marsupialia) are an insular, medium-sized marsupial carnivore. They have undergone repeated population declines; the most recent, caused by infectious tumour-causing disease epidemic, resulting in dramatic decline in parts of their range. We asked: 1) whether island effects or repeated population reductions have compromised genetic diversity, which can reduce individual fitness and adaptability, and 2) what is the spatial scale of gene flow in relation to natural and anthropogenic habitat discontinuities? We developed 11 microsatellite markers and screened 35-60 devils at six sites across their core distributional range. Genetic and allelic diversity is uniformly low in all subpopulations, with restricted, almost continuous allelic size ranges. This is consistent with island effects, primarily, but repeated population reductions may have contributed. Gene flow appears extensive at scales of 50 km with reduced gene flow but no evidence for isolation by distance at larger (150-250 km) scales across relatively continuous habitat. Substantial genetic structuring was observed for comparisons spanning unsuitable habitat, implying limited dispersal of devils between the well connected eastern populations and a smaller western population. Low devil densities in unsuitable habitat may limit the spread of this density-dependent disease. Eastern and western subpopulations need to be managed separately.

CO34-3 **ROSENBAUM, HOWARD C., Matt, Leslie, Scott Glaberman, Tom Jefferson, Tim Collins, Gianna Minton, Vic Peddemors, and Rob Baldwin** International Conservation and Conservation Genetics Program, The Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (hrosenbaum@wcs.org) and American Museum of Natural History, 79th St. and CPW, New York, NY 11024 (HCR, ML). Department of Ecology, Evolution, and Behavior, Yale University, New Haven, CT 06520 (SG). Southwest Fisheries Science Center, NOAA-NMFS, PO Box 271, La Jolla, CA 92038 (TJ). Oman Whale and Dolphin Research Group, PO Box 2531, CPO 111, Muscat, Oman (TC, GM, RB). School of Biology, University of Durban-Westville, P. Bag X54001, Durban 4000 South Africa (VP). University of London, University Marine Biological Station Millport, Isle of Cumbrae, Scotland, KA28 OEG (GM).

DETECTING SPECIES-LEVEL CONSERVATION UNITS AND PHYLOGENETIC RELATIONSHIPS AMONG HUMPBACK DOLPHINS: IMPLICATIONS FOR CONSERVATION AND MANAGEMENT

Humpback dolphins (genus Sousa) are considered obligate shallow water animals that are distributed around the coastal waters of southeast Asia, Australia, the Indian sub-continent, Arabia, and Africa. The taxonomy, systematic relationships, and population structure of humpback dolphins have been controversial. Recent reports suggest the division of Sousa into one to five distinct species or various sub-species. Molecular character data are needed for resolving the taxonomic status, defining units of conservation, and determining relationships among populations or species of humpback dolphins. Here we present an extensive genetic analysis of humpback dolphins sampled throughout their range, including the first-ever analysis of Atlantic humpback dolphins. A total of 200 samples were sequenced for the mtDNA control region and significant regional population structuring was detected. Population Aggregation Analysis using diagnostic characters and phylogenetic analyses of mtDNA sequences and several nuclear introns revealed complex species and population relationships among humpback dolphins in the Indian, Pacific, and Atlantic Oceans. With concern that these species may be vulnerable to unsustainable levels of by-catch, direct hunting, and habitat degradation of their coastal habitats, these data are a critical first step to better resolving conservation units and the relationships that exists amongst them for conservation priory setting throughout their range.

CO34-4 **RUSSELLO, MICHAEL, Eugene Gladyshev, Dale Miquelle, and Adalgisa Caccone** Department of Ecology and Evolutionary Biology, Yale University, 21 Sachem Street, New Haven, CT 06511, (michael.russello@yale.edu) (MR, EG, AC). Russian Far East Program, Wildlife Conservation Society, New York, NY (DM).

POTENTIAL GENETIC CONSEQUENCES OF A RECENT BOTTLENECK IN THE AMUR TIGER OF THE RUSSIAN FAR EAST

The Amur tiger, Panthera tigris altaica, is a highly endangered felid whose range and population size has been severely reduced in recent times. At present, the wild population is estimated at 490 individuals, having rebounded from the 20-30 tigers remaining following a severe bottleneck in the 1940's. Preliminary data is presented regarding patterns and levels of genetic variation in the mitochondrial control region using DNA extracted from non-invasively sampled faecal material, collected throughout the entire range of P. t. altaica in the Russian Far East. Analysis of 82 scat samples representing at least 27 individuals revealed extremely low levels of haplotype diversity, characterized by a single widespread haplotype (96.4%) and two rare variants, each differing by a single step within the hypervariable I (2.4%) and central conserved regions (1.2%), respectively. Comparison with a previous study of 14 captive individuals revealed a potentially greater amount of genetic variation represented in captivity relative to that found in the wild population. This work highlights the continuing need to assess levels of genetic variation even in recovering populations and underscores the important role that captive breeding programs may play in preserving remnant genetic diversity of endangered species.

CO34-5 **SHANKER, KARTIK, R.K. Aggarwal, J. Ramadevi, B.C. Choudhury, and L. Singh** Ashoka Trust for Research in Ecology and Environment, No. 659, 5th 'A' Main Road, Hebbal, Bangalore, 560 024, Karnataka, India (kartik@atree.org)(KS) Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad 500007. India. (RKA, JR, LS) Wildlife Institute of IndiaPO Box 18, Chandrabani, Dehradun 248001. India (BCC, KS)

INDIA - THE CRADLE OF THE WORLD'S OLIVE RIDLEY TURTLES LEPIDOCHELYS OLIVACEA: PHYLOGEOGRAPHY AND IMPLICATIONS FOR CONSERVATION THEORY

Orissa, on the east coast of India, is one of the three mass nesting sites in the world for olive ridley turtles (Lepidochelys olivacea). This population is currently under threat due to fishery related mortality; more than 100,000 olive ridleys have been counted dead in the last ten years in Orissa. Mitochondrial DNA sequencing analysis suggests that this large and distinct Indian population is likely to be the ancestral source for contemporary global populations of olive ridleys as a result of recent (re)colonization events from the Indian Ocean. Nested clade analysis and conventional analysis both support range expansions from the Indian ocean clades to other oceanic basins. Indian Ocean haplotypes share a signature 7 bp indel with Kemp's ridleys and other marine turtles, which supports their ancestry to other olive ridley turtles. While earlier studies distinguished all olive ridleys from Kemp's ridleys, our data reveals three clusters including the Kemp's ridley, Indian ocean ridleys and other olive ridleys. Due to the former distinction, many olive ridley populations have not received adequate conservation attention. This suggests that conservation prioritisation should be based on appropriate data and not solely on designations of certain populations or groups of populations as species.

CO34-6 **VIGNIERI, SACHA, and G. Jim Kenagy** Department of Biology and Burke Museum, University of Washington, Seattle (sachav@u.washington.edu)

UNDERSTANDING CONNECTIVITY IN PATCHY ENVIRONMENTS, LIMITED GENE FLOW AND UNEXPECTED MIGRATION PATTERNS IN THE PACIFIC JUMPING MOUSE Zapus trinotatus

Fragmentation within a species range can lead to decline and extinction. In contrast, species in naturally heterogeneous habitats persist. Improved understanding of how connectivity in these environments facilitates persistence also improves our ability to understand and assuage the effects of anthropogenic habitat fragmentation. To this end, we used 8 microsatellite markers to investigate connectivity, across temporal scales, in a heterogeneously distributed species, the Pacific jumping mouse. We found significant differentiation between all but two sub-populations (Fst=.02-.08, p<.01), indicating limited gene-flow over time. Bayesian assignment methods estimating recent migration showed highly limited gene-flow (68-99% originating in their natal population). Spatial autocorrelation analyses showed significant relationships between individual genetic distance and geographic distance (r=.25-.02, p<.01) from 20-10000m. In addition, direction of migration did not always follow geographical predictions. These results suggest that heterogeneously distributed species may be composed of groups of related individuals that largely remain within their natal habitat patches, but are connected by intermittent migrants. Further, the pattern of migration, therefore the definition of the metapopulation, may be somewhat cryptic. This knowledge allows us to better understand the patterns of connectivity that facilitate persistence in a heterogeneous environment. It also cautions us against predicting the boundaries of a metapopulation, leading perhaps to those of a reserve, without understanding habitat distribution within the landscape.

CO35-1 **GLENNON, MICHALE J. and William F. Porter** Wildlife Conservation Society, Adirondack Communities and Conservation Program, 7 Brandy Brook Ave, #204, Saranac Lake, NY 12983 (MJG)(mglennon@wcs.org) State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210 (WFP)

EFFECTS OF LAND USE MANAGEMENT ON BIOTIC INTEGRITY IN THE ADIRONDACK PARK, NEW YORK

The Adirondack Park has been described as an experiment in sustainable development because of the unique combination of public and private lands that characterize the area. Public lands in the Adirondacks are well protected by the New York State constitution. Private lands, however, are characterized by varying intensities of human use. We examined patterns in the structure of bird communities along a gradient of human impact in this region. We explored the response of an Index of Biotic Integrity, constructed from bird guilds, to a range of human impacts represented by land use types. We found significant differences in total, functional, compositional, and structural integrity on 5 land use types ranging from hamlet to wilderness. In all cases, integrity was lowest in hamlet areas and increased along the gradient to its highest level in wilderness areas. Bird community integrity was strongly related to roadlessness and birds responded primarily to the distinction between developed and undeveloped land types. We examined the effects of increased development on biotic integrity by modeling 3 scenarios of potential residential development. Our results showed that biotic integrity declines most rapidly when development is channeled to areas of the Park that are currently in open space uses.

CO35-2 **SANDERSON, ERIC W.** Wildlife Conservation Society, 2300 Southern Blvd., Bronx NY 10460 (esanderson@wcs.org).

THE MANNAHATTA PROJECT: HISTORICAL ECOLOGY TO SPUR CONSERVATION IN AN URBAN CONTEXT

In an urbanizing world, conservationists need ways to speak to urban people about the importance of wildlife and wild places. One effective way to reach people is to talk to them about their own backyards, even if the backyards we describe are over 400 years old. The goal of the Mannahatta Project is to reconstruct, in as much detail as modern ecological analysis will allow, the landscape structure and diversity of Manhattan in 1609 and compare it to what we know today. The key to Mannahatta is a remarkably accurate map produced during the American Revolution and the reservoir of natural history information available about the city, past and present. Our research demonstrates how historical maps and records can be integrated in a geographic information system context; how we can generate a digital elevation model from historical sources; and how dynamic systems models can be integrated with historical information to reproduce landscape patterns in the same geography as the blocks of the Manhattan today. Conservation is as much about persuasion and imagination as it is good science; fortunately good science in the appropriate context can fire the imaginations of urban people.

CO35-3 **KINNAIRD, MARGARET, Yok-Yok Hadiprakarsa, Timothy O'Brien, and Mohamed Iqbal** The Wildlife Conservation Society-Asia Program, 2300 Southern Blvd., Bronx, NY 10460 (MK, TO), The Wildlife Conservation Society-Indonesia Program, Jl. Pangrango 8, Bogor, Indonesia (YYH, MI),(mkinnaird@wcs.org),

EFFECTS OF FOREST FRAGMENTATION ON SUMATRAN HORNBILL COMMUNITIES

Sumatra, Indonesia has high rates of deforestation and extensive forest fragmentation. We used remote sensing, and hornbill and vegetation surveys to examine effects of forest size, isolation, and resource availability on the 9-species hornbill community of Lampung Province, Sumatra. We sampled 16 patches of varying sizes (1.5 - 462 km2) and distances from source forests of Bukit Barisan Selatan National Park (1108 and 1495 km2). Forest structure, disturbance levels, Ficus and nest tree densities were similar among forests. Hornbill species richness increased with increasing forest size but there was no effect of isolation. Forest isolation did not have an effect on large, non-territorial species densities but did influence small, territorial hornbill densities. Large hornbill densities increased with increasing forest area but this relationship did not hold for small hornbills. Results agree with predictions that territorial species are sensitive to isolation whereas larger species are area sensitive. Large hornbills are more frugivorous, relying on patchy resources. As forest size decreases, resource density may remain similar to larger forests but total numbers of resources decline. Hornbills may survive in small forest fragments but communities will become depauperate. Persistence will vary according to habitat needs, territorial behavior, and landscape configurations.

CO35-4 **MURCIA, CAROLINA, and Nilsen Lasso** Wildlife Conservation Society, Northern Andes Regional Program, AA 15527, Cali, COLOMBIA (CM)(cmurcia@wcs.org)

SHIFT IN ALTITUDINAL DISTRIBUTION OF CECROPIA TELEALBA IN THE CENTRAL ANDES OF COLOMBIA ASSOCIATED WITH TEMPERATURE INCREASE

Climate change models predict that temperature increases will affect altitudinal species distributions, as montane species migrate uphill to stay within their range of environmental tolerance. The negative impacts of altitudinal species resettlement include: disruptions in community composition and function if some species migrate faster than others, protected areas loosing species as they move out of their range and a reduction in ecosystem area as they move uphill. We document one case of vertical displacement occurring in the central Andes of Colombia over the past 3-4 decades. Using remote sensing we document a shift in the upper altitudinal range limit of at least 50m in the past 35 years, for Cecropia telealba, a long-lived pioneer tree species typical of mid-elevation forests in Colombia. Field surveys show that juveniles have a skewed distribution towards the upper elevation, while adults exhibit a normal distribution centered at mid range. These changes coincide with an average annual temperature increase in the region of at least 1.5 degrees Celsius in the last four decades. If this trend continues, within 150 years, we anticipate that cloud forest will be occupying what is now covered with paramo, and the paramo will have no peaks left to climb.

CO35-5 **TUCKER, W. TROY and H. Resit Akçakaya** Applied Biomathematics, 100 North Country Rd., Setauket, NY 11733 (Troy@ramas.com).

MODELING THE EFFECT OF HUMAN POPULATION ON LAND USE AND SPECIES VIABILITY

Projecting landscape change is prerequisite to conservation planning. Both natural and anthropogenic processes drive landscape change. Relevant human ecological impacts include habitat loss due to direct human use for agriculture and housing, landscape fragmentation due to roads and development, and habitat quality decline due to altered drainage, soil loss, nutrient leaching, pollution, selective harvest, wildfire suppression, the introduction of exotic species, and grazing. Simulating human-induced landscape change remains difficult and problematic and no one best solution has emerged. We have developed an eclectic modeling framework that integrates spatially explicit landscape and metapopulation models with models of human social, economic, and demographic change. This framework is applicable to cases where sophisticated and data intensive models of human population and landscape interaction exist, as well as to cases where data is sparse and anthropogenic impacts are not well understood. In the latter case, while precision may be difficult to achieve, accurate predictions of landscape change relevant to population viability over useful time horizons are possible.

CO35-6 **LEIMGRUBER, PETER, Daniel S. Kelly, Thomas Mueller, and Melissa Songer** Smithsonian's National Zoological Park, Conservation and Research Center, 1500 Remount Road, Front Royal, VA, 22630 (leimgruberp@crc.si.edu)

FOREST DYNAMICS AND CONSERVATION PRIORITIES IN MYANMAR 1990-2000

For centuries, Myanmar (Burma) has been known for its expansive forests extending from the Ayeyarwady Delta to the Himalayas. Recently, global forest assessments have listed Myanmar among the 10 tropical countries with the highest deforestation rate. However, these reports are based on small samples of satellite images and do not withstand rigorous statistical evaluation. To quantify forest dynamics, we utilized wall-to-wall Landsat imagery from the 1990s and 2000s. We demonstrate that Myanmar is among the countries with the largest remaining forest cover in mainland Southeast Asia. The countrywide annual forest loss of 0.2% is not above the global average. However, we also found that in 10 areas annual forest losses are severe and will result in total forest loss if degradation continues. This is especially true for the mangroves of the Ayeyarwady delta (20% loss) and the central dry zone forests (7% loss). Both areas should have high priority in future conservation plans. The Ayeyarwady delta represents one of the few large areas of remaining mangrove forests in Southeast Asia. The central dry zone forest is reported to be the last stronghold for wild populations of the endangered Eld'd deer which is extinct in most of Southeast Asia.

CO36-1 **BRASHARES, JUSTIN S. and Moses K. Sam** Conservation Biology Group, Cambridge University, Cambridge, UK (JSB), (jsb58@cam.ac.uk) Ghana Wildlife Division, Accra, Ghana (MKS)

CASCADING TO COLLAPSE IN GHANA: INDIRECT IMPACTS OF OVER-HUNTING ON VERTEBRATE COMMUNITIES

Bushmeat hunting has contributed directly to the decline and local extinction of many wildlife species. However, the effect this loss of targeted species has on the stability of wildlife communities remains unclear. Here, we use 32 years of mammal count data and estimates of bird nesting success to examine the impacts of local extinctions on the population and community dynamics of remaining vertebrates. Our results suggest that the loss of even one or two key species can lead to widespread declines of mammal and bird populations. These cascading effects result primarily from disruptions of natural predator-prey dynamics and subsequent increases in populations of smaller predators. We conclude that indirect impacts of over-hunting comprise a greater threat to species diversity and ecosystem health than direct off-take alone. Such long-term costs of over-exploitation must be considered in management strategies and assessments of hunting's impact on biodiversity

CO36-2 **BYNUM, NORA and Claire Hemingway** Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th St.,NY,NY 10024 (NB) (nbynum@amnh.org). Missouri Botanical Garden, Box 299, St. Louis, MO 63166 (CH)

CONSERVATION IMPLICATIONS OF PRIMATE RESPONSES TO SEASONALITY

Habitat loss, fragmentation, and climate change threaten to dramatically alter relationships between consumers and their resources - consumers unable to track resources or use alternate foods risk extinction. Our review of responses to seasonality (n=130 studies, 100 taxa) indicates that virtually all primates face seasonal scarcity of preferred foods and most (>70%) respond by dietary switching. We detected patterns with conservation relevance across the order, and among clades and biogeographic regions. Across the order, overall diet variability increased with degree of seasonality. New leaves, nectar, exudates, and seeds were common fallback foods at sites without a dry season, while mature leaves became more important as dry season lengthened. Behavioral flexibility to capitalize on response options is contingent on intrinsic features of a clade; some lack dental or digestive specializations required to process mechanically or chemically defended foods. Primate responses to seasonality are intimately bound to prevailing phenological patterns, particularly in Madagascar, where feeding variability, phenology and climatic variables are strongly correlated, and at sites affected by the increasingly frequent boom and bust cycles of ENSO. Finally, habitat switching and seasonal migration, which accompany dietary switching in some primates, emphasize the need for conservation or restoration of intact habitat matrices.

CO36-3 **GROVES, CRAIG and Eric Atkinson** Wildlife Conservation Society, 2023 Stadium Drive Suite 1-A, Bozeman, MT 59715 (cgroves@wcs.org)

NFLUENCE OF TIMBER HARVEST ON SMALL MAMMAL AND AMPHIBIAN COMMUNITIES IN OLD GROWTH CEDAR-HEMLOCK FORESTS OF THE NORTHERN ROCKY MOUNTAINS, U.S.

Although numerous studies have focused on the effects of fragmentation in old-growth forests of the Pacific Northwest, only scant attention has been paid to the interior cedar-hemlock forests of the Rocky Mountains. We sampled small mammal and amphibian abundance and estimated habitat structure and composition within three types of forest treatments in northern Idaho: old growth stands, second-growth stands, and recent clearcuts. A total of 12 species of small mammals and three amphibian species were captured on 15 trapping grids over a 3-yr period. Species richness but not species composition was similar across the three treatments. Masked shrews (Sorex cinereus) and vagrant shrews (S. vagrans) were the most commonly captured small mammals. Old-growth sites had significantly lower numbers of small mammals than either second-growth or clearcut sites. Multi-variate analyses revelaed that 63% of the variance in the diversity and abundance of the small mammal community across sampling sites is explained by habitat differences while 30% of the variation is related to forest treatment. New information on habitat preferences and relative abundance was gathered on two species that are scientifically poorly known and of conservation concern - the pygmy shrew (S. hoyi) and the northern bog lemming (Synaptomys borealis).

CO36-4 **LAMBERT, THOMAS D., Jay R. Malcolm, and Barbara L. Zimmerman** Faculty of Forestry, University of Toronto, Toronto, Ontario, Canada, M5S 3B3 (TDL, JRM) (thomas.lambert@utoronto.ca); Conservation International, Washington, DC (BLZ)

EFFECTS OF SELECTIVE LOGGING ON SMALL MAMMAL COMMUNITIES AND IMPLICATIONS FOR AMAZONIAN CONSERVATION

The extraction of high value of timber species such as mahogany has been proposed as a conservation tool because low levels of extraction are assumed to have minor ecological impacts. However there are few data to support this assumption. We examined the ecological impacts of mahogany logging in one of the Kayapo indigenous areas of the southeastern Amazon. The Kayapo control over 110,000 sq. km. of territory, including some of the most significant conservation areas in the region; however, mahogany has been logged from most of their lands, leading to extensive damage in some areas. Small mammal community structure was examined as a function of the intensity of logging damage, and included live-trapping on 10 logged and 10 unlogged grids. The effects of logging on forest structure were relatively small, relating largely to an increase in downed logs. However, logging had strong effects on the small mammal community, resulting in increased overall abundance and species richness. Most species responded positively to disturbance; however, a few species were more abundant in the unlogged forest. These changes in small mammal communities will presumably alter seed predation and dispersal, with the potential to affect the viability of selective logging as a conservation tool.

CO36-5 **RUEDAS, L. A., L. J. Dizney, J. J. P. Veerman, G. Lafferiere, and P. D. Jones** Department of Biology (LAR, LJD, PDJ) and Museum of Vertebrate Biology (LAR); Portland State University; Science Building II, Room 232B; 1719 SW 10th Avenue; P. O. Box 751; Portland, OR 97207–0751 (ruedas@pdx.edu). Department of Mathematics and Statistics; Newberger Hall; Portland State University; PO Box 751; Portland Oregon 97207–0751 (JJPV, GL).

MESOSCALE POPULATION CYCLING IN URBAN PARKS' SMALL MAMMAL FAUNA: INFLUENCE OF DISEASE LOAD ON POPULATION ECOLOGY AND CONSERVATION IMPLICATIONS

Critical to understanding communities are knowledge of the population biology of its species, and a temporal framework. We started monthly monitoring of small mammal populations in October 2002 to assess the influence of zoonotic diseases on community ecology and are beginning to elucidate populational patterns. Considered at the level of community, small mammal populations in Portland parks show an annual pattern of variation in density: highest densities occur around the autumnal equinox, lowest near mid–Spring. These patterns were not homogeneous across parks: those with higher diversities demonstrated a greater magnitude between annual maxima and minima. In contrast to the community, the species with the greatest dominance across all parks, the deer mouse (Peromyscus maniculatus), showed smaller magnitude in annual variation in density. We show that cyclical variations in numbers are an emergent property of the system when zoonotic disease (Hantavirus) is taken into consideration: even in the absence of external influences, populations will show cyclical patterns of small amplitude with periodic maxima and minima. The proportion of infected individuals is inversely proportional to population densities of Peromyscus, in turn dependent on local biodiversity. Incidence of infected mice (hence risk of disease to humans) is therefore negatively correlated with biodiversity.

CO36-6 **REGESTER, KURT J., Karen R. Lips, and Matt R. Whiles** Department of Zoology, Southern Illinois University, Carbondale, IL 62901-6501, USA (regester@siu.edu).

THE SIGNIFICANCE OF POND-BREEDING SALAMANDERS TO ENERGY FLOW AND SUBSIDIES IN AN ILLINOIS FOREST ECOSYSTEM

The transfer of energy and nutrients between habitats (subsidies) can influence recipient organisms and food webs. Many amphibians may be important in this regard because of their movements between freshwater and terrestrial ecosystems. Although causes for amphibian declines are currently under investigation, their impacts on ecosystem function have not been addressed. We assessed the ecosystem-level significance of three communities of metamorphosing salamanders by measuring larval secondary production and quantifying energetic subsidies to both aquatic (eggs) and terrestrial (emigrating juveniles) habitats. We estimated production was between 2050 and 9150 mg AFDM/m3/yr-1 for six populations of larvae, and up to 13,930 mg AFDM/m3/yr-1 for entire communities. Annual turnover rates (P/B; range = 2.06–12.08) were comparable to those reported for many aquatic insects. Intraguild predation among salamanders influenced larval populations, juvenile recruitment (mean <+/-> 1SE = 187 <+/-> 49.2 mg AFDM/m^2/yr^{-1}, range = 31–287), and thus the amount and direction of subsidies for individual species. As a community, metamorphosed larvae “exported” 10%, 16%, and 30% of the organic matter “imported” to ponds as eggs (1046, 2244, 3584 mg AFDM/m^2/yr^{-1}). Our study is the first to quantify energy flow in metamorphosing amphibians and provides evidence for potential ecosystem-level impacts of population declines.

CO37-2 **PULLIN, ANDREW S., Teri M. Knight, Christopher F. Coles, and Gavin Stewart** Centre for Evidence-Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK (a.s.pullin@bham.ac.uk)

USING THE EVIDENCE-BASED FRAMEWORK TO SUPPORT DECISION-MAKING IN CONSERVATION

We report on an extensive test of the need and utility of the evidence-based framework to support decision-making in conservation. We present data from questionnaire studies that show that current decision-making in conservation is generally not evidence-based. Responses from decision makers indicate that this is partly because evidence is scattered among journals and reports and thus not readily accessible in a suitable form to use in the decision-making process. We argue that an evidence-based framework similar to that developed in medical practice can significantly improve the provision of scientific evidence to decision-makers. To test this we have established the first Centre for Evidence-Based Conservation and conducted four studies that involve systematic review and dissemination of evidence on either the effectiveness of a conservation intervention or the impact of an anthropogenic factor in relation to achieving conservation objectives. The studies show the evidence-based framework to be effective in 1. objective appraisal and synthesis of available evidence and 2. identifying deficiencies in the evidence base indicating need for further research. This approach offers the possibility of a culture shift in conservation similar to that realised in health care, transforming the relationship between research and practice and attracting significantly more money for needs-led research.

CO37-3 **ADKINS GIESE, COLLETTE L.** University of Minnesota Law School, 229 19th Avenue South, Minneapolis, MN 55455 (adki0020@umn.edu)

SOCIETAL CONCERNS VERSUS SOUND SCIENCE: A REVIEW OF U.S. FISH AND WILDLIFE MANAGEMENT OF DEPREDATING AND “NUISANCE” MIGRATORY BIRDS

Striking the appropriate balance between conflicting human and wildlife interests is a difficult task. This complexity is readily apparent in management of migratory birds, which are protected by the Migratory Bird Treaty Act. The FWS has promulgated numerous regulations that allow killing of depredating and “nuisance” migratory birds to protect agriculture, property, and other interests. The Federal Register notices and environmental analyses for these regulations were reviewed to assess the agency’s justification for initiating lethal control. This research indicates that agency decisions were often driven by societal perceptions of wildlife impacts, rather than actual scientific evidence of impacts. For example, the FWS responded to concerns about perceived impacts to sport fisheries from double-crested cormorants by authorizing massive lethal control, despite scientific evidence that cormorant diet typically consists of low percentages of sport fish. Mere concern about impacts to human interests, however, is insufficient justification for lethal control of migratory birds. The Migratory Bird Treaty Act permits the FWS to authorize lethal control only under “extraordinary conditions” when birds become “seriously injurious.” The agency fails in its duty to protect migratory birds when societal concerns are allowed to take precedence over sound science.

CO37-4 **DELLASALA, DOMINICK, Jack Williams, Cindy Deacon Williams, and Jerry F. Franklin** World Wildlife Fund; 116 Lithia Way, Ashland, OR 97520 (dellasal@wwfks.org), Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520 (JW), Headwaters, 84 4th St., Ashland, OR 97520 (CDW), University of Washington, College of Forest Resources, Seattle, WA 98195 (JF)

BEYOND SMOKE AND MIRRORS: A SYNTHESIS OF FIRE POLICY AND SCIENCE

Fire performs many beneficial ecosystem functions in dry regions of North America. In the last century, the role of fire has been dramatically altered by widespread logging and road building, fire suppression, habitat fragmentation and urban development, livestock grazing, and, more recently, climate change. The intensity and extent of fires in the Western USA, specifically, have increased dramatically over the past several decades. Such shifts in fire behavior have triggered sweeping policy changes (e.g., WhiteHouse “Healthy Forest Initiative” and related legislation) intended to prevent or contain fires but posing significant risks to ecosystem integrity. We summarize key findings from 11 papers on fire management and policy published in a special 2004 fire issue in Conservation Biology, including general guidelines for managers concerned about balancing the risks of inaction against action over extensive areas. A conceptual framework is provided for prioritizing fuel treatments and restoration activities in the wildlands-urban intermix vs. wildland areas based on risk reduction and integrity goals. In general, the science of conservation biology has much to offer in helping to shape wildfire policy direction; however, conservation biologists must become more engaged to better ensure that policy decisions are based on sound science and ecological risks are incorporated.

CO37-5 **MILLER, NICHOLAS, Michael W. Klemens, and Jennifer Schmitz** Wildlife Conservation Society, Metropolitan Conservation Alliance, 68 Purchase Street, 3rd Floor, Rye, NY 10580; (nmiller@wcs.org)

NEW PATHWAYS TO ACHIEVING CONSERVATION: INTEGRATING BIODIVERSITY CONCEPTS INTO MUNICIPAL LAND USE PLANNING

There is a need to bring innovative solutions generated by conservation research to non-biologists whose decisions shape our habitats and landscapes. Far more land use decisions are made at local levels than at federal and state levels combined. However, most conservation planning efforts occur at statewide or regional scales that are difficult to implement at local levels. Local land use practitioners usually make decisions in the absence of biological data and conservation concepts, leading to habitat degradation and fragmentation. In the tri-State New York metropolitan region, the Wildlife Conservation Society has developed the Biotic Corridor approach to integrate biodiversity conservation issues into local land use planning processes. Within selected groups of towns, field survey data are combined with collateral datasets to distinguish areas of conservation concern from areas more suitable for development. Biodiversity overlay maps are incorporated into regulatory frameworks, including town master plans and open space prioritizations. Tools are developed to further this integration, including “best development practices” manuals and model ordinances. By developing working partnerships with local land use decision-makers, conservation organizations and scientists can help municipalities make better, biologically informed land use decisions, improving conservation at local and regional scales.

CO37-6 **MILLS, APRIL, Vivek Shandas, Kara Whittaker, Tessa Francis, and Jessica Graybill** Department of Urban Design and Planning, Box 355740, Gould Hall, Rm.410, University of Washington Seattle, WA 98195 (amills@u.washington.edu); Division of Ecosystem Science, College of Forest Resources, University of Washington, Seattle, WA 98195; Department of Biology, University of Washington, Seattle, WA 98195; Department of Geography, University of Washington, Seattle, WA 98195.

APPLICABILITY OF "BEST AVAILABLE SCIENCE" TO CRITICAL AREA ORDINANCES IN JURISDICTIONS WITH VARIED LEVELS OF URBANIZATION

The process of incorporating scientific information into public policy is complex and opaque. We investigated the use of "best available science" (BAS) in ordinances protecting biological critical areas of city and county jurisdictions in western Washington State. Recent state statutes mandate that the Critical Area Ordinances (CAOs) be updated and that these updates "shall include" BAS (RCW 36.70A.172). We studied the CAO revision process using 43 scripted interviews with planners and consultants responsible for the CAO update in 27 jurisdictions. 60% of city respondents stated that the majority of BAS they reviewed did not apply to urban areas. 66% use science primarily to obtain specific standards recommendations, such as buffer widths. However, many felt the standards in the literature for agricultural and non-urban areas were inappropriate for their jurisdictions. The most commonly listed constraints on the use of BAS are resources (money, time, staff) (44%) and lack of relevant science (43%). We have found that the ability of planners and consultants to use BAS for protecting critical areas in urban settings is hampered by the (perceived) inapplicability of the science and the difficulty of balancing scientific recommendations with the constraints of a built-out environment.

CO38-1 **GEI, VIDIRO and Debra Wright** Wildlife Conservation Society-PNG Program, P.O.Box 277, Goroka, Eastern Highlands Province, Papua New Guinea (VG, DW) (vgei@global.net.pg)

AN INTERACTIVE KEY TO THE FLORA OF CRATER MOUNTAIN BIOLOGICAL RESEARCH STATION (CMBRS), PAPUA NEW GUINEA: AN AID TO RESEARCH AND CONSERVATION PLANNING

One problem hindering conservation planning and monitoring in PNG is the difficulty of identifying plants in the field and the lack of trained plant systematists. A partial solution will be the creation of interactive keys. These are flexible when there are limited available characters, more powerful than dichotomous keys, and very user-friendly for non-botanists. I and collaborators collect data on the bark, leaf, flower and fruit characters of identified plant species, on long-term plots of CMBRS. Currently over 75 dominant species have been scored based on field observations and field notes (collected previously by collaborators, 1989 – present). The characters on the datasheets were adapted and modified from Hyland et al's (1999) Australian tropical tree and shrub key, and I have added numerous additional character states to aid field identification of non-reproductive plants. I am including digital pictures of the bark, leaves, fruits, and flowers taken opportunistically. The Lucid Professional v2.1 software was used to create the preliminary interactive key and I will give a demonstration of it. By using a digital interactive key, it is simple to enhance with more photographs or add more taxa. The key will continue to improve and have more applications as we build the database.

CO38-2 **MCKENNA, DAVID** Institute for Conservation Biology and Law, University of Wollongong, NSW, 2522, Australia (djm02@uow.edu.au).

THE BURNING QUESTION: HOW OFTEN SHOULD WE DO IT?

Recent widespread bushfires across much of eastern Australia have placed renewed focus on how best to manage urban fringes to reduce the loss of life and property. The extent and frequency of hazard reduction burns has been one particular topic of heated discussion, with the need to conserve threatened plant species an important element in this decision process. This study looked at the effect of varying fire frequencies on threatened fire sensitive perennial shrub species of the genus Persoonia in the Sydney region. I used three years of demographic data to construct size-based projection matrices for three rare and one common Persoonia species. These were used in a stochastic model to examine the effect of different fire frequencies on the extinction probability over a 100-year period. Optimal fire frequencies were found to occur between 10 and 20 years depending on the species, with fire frequencies greater than 1 year in 4 resulting in total extinction in all cases. Elasticity analysis revealed survival in the seed bank stage was most influential for population persistence. It is concluded that these time frames may be at odds with public perception of best practice in terms of reducing risk to life and property.

CO38-4 **NELSON, CARA R. and Charles B. Halpern** College of Forest Resources, University of Washington, Box 352100, Seatle, Washington 98195-2100 (crnelson@u.washington.edu)

SHORT-TERM EFFECTS OF TIMBER HARVEST AND FOREST EDGES ON GROUND-LAYER BRYOPHYTES IN THE PACIFIC NORTHWESTERN UNITED STATES

There is widespread interest in the ecological effects of timber harvest, and the resulting fragmentation of forest habitat and creation of edges. However, there has been surprisingly little research devoted to the effects of these activities on forest bryophytes. We examined short-term responses of ground-layer bryophytes to disturbance and creation of edges in structural retention harvest units in the western Cascade Range of Washington States. Pre- and post-treatment abundance of bryophytes were measured in four, 1-ha patches of intact forest and in surrounding logged areas, using 16, 81-m long transects placed perpendicular to the edges of these patches. One year after harvest, species richness, total cover, and frequency of most taxa declined significantly within harvested areas. In contrast, minimal change was observed within forest patches. Species richness declined with proximity to forest edge, but only one common taxon exhibited a significant decline in abundance near the edge. Our first-year results suggest that forest patches of at least 1 ha may play an important role in maintaining common bryophyte species in forests subjected to harvest with aggregated retention. However, future monitoring of these sites will be necessary to determine whether the diversity and strength of edge-effects will increase over time.

CO38-5 **LEMA, MATHIAS** Tanga Catchment Forest Office, POBox 1449, Tanga,Tanzania (mathiaslema@hotmail.com)

SEED BANK STUDIES REVEAL THE POTENTIAL FOR DISTURBED FOREST PATCHES TO BE DOMINATED BY HERBACEOUS AND GRASS SPECIES IN AN AFRICAN BIODIVERSITY HOTSPOT

A seed bank study using seedling emergence methods was carried out in East Usambara Mountains, Tanzania. The main goal was to evaluate ecosystem resiliency or its recovery potential following natural or anthropogenic disturbances, results of which would guide sustainable management of Tanzanian forests. Species composition, seed density, seed distribution and relationship with surrounding vegetation were investigated in three different disturbance regimes (disturbed, intact and exotic tree-dominated patches). Within each patch, 500 cm3 soil samples at three soil horizons were collected from the litter and incubated under natural weather and light conditions. A total of 4625 seedlings germinated, representing 63 families and 101 species grouped into trees, shrubs, climbers, herbs and grasses. Most seedlings emerged from the litter layer, and the number of germinants significantly decreased with increasing soil depth ($P < 0.05$). Mean seed bank density ranged from 5415 <+/-> 2344 seeds/m2 to 6194 <+/-> 1789 seeds/m2. The exotic tree patch had the highest seed bank densities followed by intact and disturbed patches. Seed bank species varied in similarity with surrounding vegetation (similarity indices range: 0.08 - 0.32) in all patches. It was concluded that forest disturbance may shift species composition towards small seeded species dominated by herbaceous and grass families.

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DO POLITICS AND MANAGERS PUT THE CART BEFORE THE HORSE FOR THE POTENTILLE OF THE DAUPHINÉ (POTENTILLA DELPHINENSIS GREN. & GODRON, ROSACEAE)

The Potentille of the Dauphiné (Potentilla delphinensis) is an extremely rare and threatened rosaceae endemic of the French Alps. Although, its status as a species has been unclear, it is already an emblematic species in the region. Thus, substantial fundings support the conservation of P. delphinensis populations and habitats (NATURA 2000 network). Actually, two other species (Potentilla grandiflora and Potentilla thuringiaca) are morphologically close to the Potentille of the Dauphiné and share the same geographical locations. The identification of P. delphinensis is difficult because morphological traits and phenology are variable among environments. We used molecular genetic markers and cross-pollination experiments to help resolve the species or hybrid status of P. delphinensis. Samples were genotyped from single and mixed localities for the 3 species. Seeds from hybridization that germinate were also genotyped. Results show that, although hybridization is possible among species, the Potentille of the Dauphiné is genetically distinct. Speciation appears to be in process and P. grandiflora is most likely the parent species of P. delphinensis. Here, the cart was put before the horse; but fortunately our genetic results support the management status of emblematic species of the Potentille of the Dauphiné.

CO39-1 **BHAGWAT, SHONIL A.** The Natural History Museum, Cromwell Road, London, SW7 5BD, UK (S.Bhagwat@nhm.ac.uk)

WHAT CAN A BIRD'S EYE VIEW TELL US THAT A BUG'S EYE VIEW DOESN'T? BIODIVERSITY CONSERVATION IN SACRED GROVES OF THE WESTERN GHATS IN INDIA

The sacred groves tradition in India has received a great deal of attention from researchers including biologists and ecologists. Sacred groves in the Western Ghats mountain range are patches of forest in otherwise agricultural landscape. Most research so far has focused on tree diversity within the forest patches. However, in a coffee-growing district of the Western Ghats, landscape surrounding sacred groves is also tree covered. This has important consequences for biodiversity within forest patches. We investigated patterns of diversity in trees, birds and mushrooms at 58 sites in Kodagu district in the Western Ghats of India. Measurement of landscape composition and configuration was made around each site using GIS. Multivariate models were constructed using CHAID (CHi-squared Automatic Interaction Detection) in order to explain biodiversity within forest patches. Established measures of landscape fragmentation such as patch size did not influence species richness within patches, but isolation from large forest as well as measures of composition and configuration of the surrounding landscape were influential. We conclude that the investigation of biodiversity within sacred groves requires consideration of composition and configuration of surrounding landscape; and the objective should be to encourage conservation planning and management of the agricultural landscape surrounding sacred groves.

CO39-2 **SMITH, COURTLAND M. and Douglas G. Wachob** Teton Science School, Conservation Research Center, P.O. Box 68 Kelly, WY 83011 (court.smith@tetonscience.org)

THE EFFECTS OF HUMAN RESIDENTIAL DEVELOPMENT ON AVIAN COMMUNITIES ALONG THE SNAKE RIVER RIPARIAN CORRIDOR IN JACKSON HOLE, WY, USA

To assess the impacts of residential development on avian communities in vital riparian breeding habitats, we sampled bird community parameters and habitat variables at three spatial scales (microhabitat, macrohabitat, and landscape) along a human development gradient along the Snake River corridor in Jackson Hole, WY, USA. Fifty-six cottonwood forest patches were surveyed during the 2001-2002 breeding seasons. Principal component analysis, multiple linear regression, and canonical correspondence analysis statistical tests were used to determine the effects of housing densities on habitat variables, avian community parameters, and guilds. Landscape-level features were most affected by human development and habitat fragmentation primarily structured local bird communities. Overall species richness and diversity declined with increasing human development. Neotropical migrant species were most negatively impacted and consistently declined in proportional representation as human development densities increased. Short-distance migrants, food generalists, ground gleaners, and avian nest predators all increased with increasing human development. Brood parasites, however, did not increase with increasing fragmentation and their distribution may reflect the availability of nest host species. These results suggest that residential development within riparian habitats may be exerting a strong negative influence on western bird communities and at high densities may lead to a depauperate avian biota and reproductive sinks.

CO39-3 **ONEAL, AMBER S. and John T. Rotenberry** Department of Biology and Center for Conservation Biology, University of California, Riverside, CA 92521 (AmberSOneal@aol.com)

DISTRIBUTION OF RIPARIAN BIRD SPECIES IN AN URBANIZING LANDSCAPE

In coastal southern California, natural riparian corridors occur in a landscape mosaic comprised of an abundance of anthropogenic land use categories interspersed with undeveloped areas, primarily native shrublands. We asked, to what extent does the composition of the landscape surrounding a riparian survey point appear to influence the distribution of birds? We conducted counts at 137 points in Orange County, California, within riparian habitats along a gradient of urbanization. The macrohabitat setting of each point was determined from aerial photographs, and we used logistic regressions to assess species distribution with respect to percent developed and percent riparian landcover out to a 300-m radius of each point. Of 42 species with sufficient detections to analyze, 20 had statistically significant (P less than 0.05) models. Of these, 18 showed a response to the proportion of development, about equally divided between positive (e.g., Northern Mockingbird, Anna's Hummingbird) and negative (e.g., Phainopepla, Oak Titmouse). Only one species (Common Yellowthroat) showed a positive response to the proportion riparian and no response to development. Thus, the landscape matrix in which a survey point is embedded appears to influence bird species occurrences, with direct consequences for reserve design and species conservation.

CO39-4 **SHANAS, URI, Yunes Abu Galyun, Mohammed AlShamlih, Fares Khoury, Shacham Mittler, Khaled Nassar, Idan Shapira, Danny Simon, Hatem Sultan, Elad Topel, Dalit Ucitel, and Yaron Ziv** Department of Evolutionary and Environmental Biology, University of Haifa, Israel (US, SM, IS), Department of Biology, University of Haifa-Oranim, Israel (US), Hashemite University, Zarka, Jordan (YA, FK, MA), Friends of the Earth Middle East, Jordan (KN, HS). Department of Zoology, Tel Aviv University, Tel Aviv, Israel (DS), Department of Biology, Ben Gurion University, Beer Sheva, Israel (ET, YZ), Arava Institute for Environmental Studies, Kibbutz Ketura, Israel (US, DU). (shanas@research.haifa.ac.il)

BIODIVERSITY ACROSS THE ISRAELI – JORDANIAN BORDER

The peace treaty signed by Israel and Jordan in 1994 has opened the opportunity to study the biodiversity of the Arava rift valley across the borders. The two sides of the border are distinguished by the level and type of human activities. While the Israeli side has been heavily settled with modern agricultural farms, Jordan remained sparsely settled, occupied by a traditional and pastoral culture. We study the effect of human activity on the abundance and richness of several taxonomic groups, including birds, rodents, reptiles, beetles, spiders, and antlions, across landscape units (sand dunes, semi-stabilized dunes, acacia tree-dominated riverbeds, salt marshes) and seasons. Results of the first year fieldwork show that the landscape units significantly differ in their fauna, with varied alpha diversity for different taxonomic groups. In general, alpha diversity tends to be higher on the Israeli side compared with the same landscape units in Jordan. However, beta diversity appears to be higher in Jordan. We suggest that the nomadic culture has a profound effect on the landscape and fauna on the Jordanian side of the Arava valley, while intensive farming and strict hunting regulations, on the Israeli side, might be favouring some herbivores and carnivores, thereby affecting lower taxonomic groups.

CO39-5 **HAUGAASEN, TORBJØRN and Carlos A. Peres** University of East Anglia, Centre for ecology, evolution and conservation, Norwich, Norfolk, NR4 7TJ, United Kingdom (TH&CP)(T.Haugaasen@uea.ac.uk)

SEASONAL DYNAMICS, STRUCTURE AND COMPOSITION OF A HIGHLY HETEROGENEOUS AMAZONIAN FOREST LANDSCAPE: IMPLICATIONS FOR RESERVE DESIGN

Few studies have explicitly considered how reserve design criteria could accommodate seasonal shifts in habitat use by entire frugivore assemblages that are free to move within a region. In this study we examined the patterns of habitat-specific fruit production and vertebrate frugivore abundance in a large Amazonian forest landscape consisting of seasonally inundated (várzea and igapó forest) and terra firme forest, to examine the underlying mechanisms of seasonal habitat use by vertebrates. The contribution of each forest type to the β-diversity was also evaluated for trees and lianas and non-volant mammals. The results suggest that many frugivores exhibit habitat shifts on a seasonal basis and show that the three environments differ profoundly in faunal and floral species composition. We conclude that the preservation of many wide-ranging species and the biotic integrity of vast tracts of highly heterogeneous forest landscapes such as much of lowland Amazonia will require conservation of large, connected blocks of different forest types. This is consistent with the concept of “landscape species” which require very large areas containing different landscape elements and a complement of landscape functions.

CO39-6 **KELLY, DANIEL S., Peter Leimgruber, and Christen Wemmer** Conservation and Research Center, Smithsonian National Zoological Park, Front Royal, VA 22630 (kellyd@crc.si.edu).

SEASONAL HABITAT USE OF ASIAN ELEPHANTS IN TWO PROTECTED AREAS IN MYANMAR

Wild populations of Asian elephants are threatened by habitat loss and are restricted to fragmented ranges across 13 range countries. Despite the suspected population declines, little information exists on the ecology of the species, particularly in the dense tropical forests of mainland Southeast Asia. Myanmar's expansive forests may be one of the last strongholds for Asian elephants in mainland Southeast Asia. Over a three-year period, we used recce surveys to collect elephant dung count data at Alaungdaw Kathapa National Park and Htamanthi Wildlife Sanctuary, Myanmar. Additionally, we determined elevation, slope, aspect, landform and habitat type for the two parks using ASTER and Landsat satellite imagery in a Geographic Information System. Based on our dung count and environmental data layers we found strong seasonal patterns in elephant habitat use. During the dry season, elephant habitat use was clearly restricted by water availability while during the rest of the year elephants roamed over vast parts of the protected areas. In addition, topography had a marked effect on elephant movement and habitat use throughout the year. Based on our habitat analysis we make management recommendations for the two protected areas.

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RE-ESTABLISHMENT TRIALS IN ENDANGERED PLANTS: THE EXAMPLE OF ARENARIA GRANDIFLORA L., A SPECIES ON THE BRINK OF EXTINCTION IN THE PARISIAN REGION (FRANCE)

The successful restoration of plants species in the wild depends on the knowledge of their habitat requirements and on the consideration of genetic, demographic and ecological traits that increase vulnerability to stochastic extinction processes. The experiment we performed on an endangered plant in the Parisian region (Arenaria grandiflora L.) is presented as an example of experimental restoration plan. In a case where inbreeding depression was suspected in the remnant populations, we created new populations by mixing plants from two different origins. The transplanted individuals were adult plants from cuttings multiplied hundreds of times by in vitro culture. We have observed that plants from distant origin are at least as well adapted to their new environment as local plants. In one of the three sites, populations are increasing thanks to the numerous plantlets that appeared from 2001. In the two other sites, no recruitment was observed until now. This result is likely explained by the slight ecological differences existing among sites and shows how their choice is crucial for the success of the management plan. Our aim is to give advice on how a restoration experiment has to be conducted to maximize the likelihood of success.

CO40-2 **ROSENTHAL, SADIE K., Samantha S. Stevens, and David M. Lodge** Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana 46556 (srosenth@nd.edu)

ARE INVASIVE SPECIES-DRIVEN REGIME SHIFTS REVERSIBLE? LONG-TERM, WHOLE-LAKE EFFECTS OF INVASIVE CRAYFISH ON AQUATIC PLANTS AND INVERTEBRATES

Invasive species can be drivers of community structure, shifting systems from one regime to another. Questions revolve around what these changes are and whether they are reversible. Previous laboratory studies and in-lake cage experiments suggest that the invasive rusty crayfish (Orconectes rusticus) reduce macrophyte and snail abundance and alter species composition in north temperate lakes. In summer 2003, macrophytes and benthic invertebrates were resurveyed in 11 lakes originally surveyed by the Michigan DNR in the late 1930's to examine the effects of rusty crayfish invasion. We also conducted a laboratory seed bank study to examine the potential for macrophyte restoration in a lake that has had high densities of rusty crayfish for 8 years. In uninvaded lakes, changes in macrophyte and invertebrate species richness and abundance were highly variable, possibly due to natural variation or human activity such as damming. In lakes invaded by crayfish, however, macrophyte species richness and abundance and snail abundance declined, suggesting that crayfish were the main drivers of this alteration. The seed bank experiment showed that invaded lakes may have depauperate seed banks. This suggests that even if crayfish could be removed, restoration of invaded macrophyte communities will require manual planting.

CO40-3 **SPORRONG, JILL M. and Craig A. Davis** Oklahoma State University, Zoology Department, 430 Life Sciences West, Stillwater, OK 74078 (sporron@okstate.edu)

HIGH- VERSUS LOW-DIVERSITY GRASSLAND RESTORATIONS: DOES IT MAKE A DIFFERENCE TO GRASSLAND BIRDS?

Upland grasslands in the Rainwater Basin Region in south-central Nebraska are restored with low-diversity (4–5 grass species) and more recently, high-diversity (>20 forb and grass species) plantings without specific regard to grassland bird habitat requirements. Our objectives were to compare grassland bird habitat-use and nest productivity between restoration treatments and evaluate the response of the grassland bird community to these restorations. We conducted bird surveys using transects, nest searches using random searching and rope-dragging, and sampled vegetation percent coverage, maximum vegetation height, litter depth, and visual obstruction on plots along transects on grasslands during summer 2002 and 2003. Mean avian abundance was higher in low-diversity than high diversity sites ($p = 0.039$). The most abundant species for both restoration types were Ammodramus savannarum, Spiza americana, and Dolichonyx oryzivorus. Maximum vegetation height was the only vegetation measurement that we found to differ between treatments ($p=0.012$). For overall nest productivity, 26% of nests were successful, 65% failed, and 9% were of unknown fate. Since there was a lack of difference in vegetation characteristics between restoration treatments, a variety of other factors (e.g., basin size, surrounding landscape, amount edge habitat) likely influence bird habitat-use and nest productivity on these upland grasslands.

CO40-4 **ZACK, STEVE and Hilary A. Cooke** Wildlife Conservation Society, Portland Office, 219 SW Stark Street, Suite 200, Portland, OR 97204 (szack@wcs.org) Department of Biological Sciences, CW405 Biological Sciences Building, University of Alberta, Edmonton, AB T6G 2E9 CANADA

THE WHOLE DAM STORY: REINTRODUCTION OF AMERICAN BEAVERS AND MIGRATORY SONGBIRD RESPONSE

American Beaver (Castor canadensis) must be the quintessential ecosystem engineers of North America. Beaver dams trap sediment and raise water table levels, restoring incised stream channels, and cerate a wider, more productive riparian zone. In arid regions of the western U.S., many riparian birds have declined as a result of widespread habitat degradation. Here, we examine relationships among riparian birds, riparian habitat structure, and beaver dam building activity in southern Wyoming where beaver have been widely reintroduced. In 2002 and 2003 we established study sites 1.2 km in length along 12 streams in sagebrush and adjacent riparian habitat in southern Wyoming. At five sampling points along each study site we surveyed the bird community and measured a suite of habitat variables. At each we surveyed all active and inactive dams and total ponded area. Using correlation analyses and a model selection procedure we found the total number of dams on a study site to be the best descriptor of variation in riparian bird species richness based on a Poisson regression model. Riparian bird species richness was also positively correlated with the width that woody vegetation extended across the riparian zone, and with total ponded area behind dams. The total number of dams had significant positive correlations with woody riparian zone width, riparian shrub height, riparian shrub cover and emergent vegetation cover. Our study suggests that beaver dams create habitat for a diversity of riparian birds and that beaver reintroductions are a valuable tool for restoring declining bird populations.

CO40-5 **KELLY, JAY F.** Graduate Program in Ecology and Evolution, Rutgers University, Plant Physiology Bldg., 1 College Farm Road, New Brunswick, NJ 08901(jaybird@eden.rutgers.edu). New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, P.O. Box 404, Trenton, NJ 08625-0404.

THE RESTORATION OF BACK BEACH HABITATS AND RARE PLANT SPECIES IN NEW JERSEY: ADDRESSING ANTHROPOGENIC CONSTRAINTS AT THE LANDSCAPE LEVEL

Annual censuses were conducted between 2001-2003 for Amaranthus pumilus (seabeach amaranth), a federally threatened plant species, along the 130 miles of shoreline in New Jersey. Current patterns of land-use were found to be the single greatest obstacle to the recovery of this and other rare sympatric species in the state, as well as the primary limiting factor for the distribution of beach plant communities in general. With extensive beach raking taking place on most municipal beaches and heavy off-road vehicular traffic on the majority of what remains, less than 20% of potential habitat is currently available. In order to meet the restoration objectives outlined in the Recovery Plan for the species, 75% of the suitable habitat in the state must be available to the species for it to be de-listed. Cooperative agreements must therefore be sought with both municipal and state park officials to change existing patterns of land use. Field data on the spatial distribution of recreational uses and public opinion as to possible alternatives, suggests that there is ample room for compromise, sufficient to meet the needs and interests of both municipal and park officials, as well as the endangered species and communities of concern.

CO40-6 **PAGANO, ALAIN, David Lesbarrères, and Thierry Lodé** Ecologie animale, Universite d'Angers, Campus Belle-Beille, 49045 Angers cedex, France (alain.pagano@univ-angers.fr)(AP, TL) Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, PO BOX 65, FIN-00014 University of Helsinki, Finland (DL)

ECOLOGICAL RESTORATION IN ANTHROPOGENIC LANDSCAPES: DEAD END ROAD OR KEY FOR CONSERVATION?

In a context of world Amphibian decline, habitat destruction, habitat alteration, or habitat modification are given as important factors of population decreasing. Therefore, habitat restoration (or creation) is one of the key solutions to preserve species and biodiversity. Regarding Amphibians, our knowledge is surprisingly poor on basic issues such as engineering protocol or outcome of habitat restoration (or habitat creation). Our review aims at synthesising restoration plans that have been attempted in different situations of Amphibian population threats: their number and geographic localisation, their protocols (parameters and variables related to ecology taken into account), their results and the really specific effects observed in case studies. Such overview will give a basis for protocol comparison, improve our knowledge in restoration ecology, and help decision makers to plan future conservation actions.

CO41-1 **THOMAS, SHELLY L. and Stephen A. Woods** Department of Biological Sciences, University of Maine, Orono, ME 04469 (shelly_thomas@umit.maine.edu).

HARVEST GAP EFFECTS ON CLICK BEETLES (ELATERIDAE: COLEOPTERA) INHABITING COARSE WOODY DEBRIS AND SOIL IN THE ACADIAN FOREST OF MAINE, USA

We examined how click beetle communities in a mixed hardwood-softwood forest in Maine, USA, are affected by gap harvesting in the Forest Ecosystem Research Project (FERP). The FERP harvest regime is based on natural disturbance patterns in the Acadian forest. Harvesting creates small and large gaps in the canopy, producing differences in micro-environmental conditions to which insects might respond. We compared the differences in community composition and abundance of individual species between harvest gaps and the adjacent unharvested portions of the stand. Using emergence traps, we captured over fifty species of adult click beetles as they emerged from down coarse woody debris (CWD) during the summers of 2001 and 2002 and from soil during the summer of 2002. In the CWD study, community composition was significantly affected by microhabitat variables such as CWD type (softwood vs. hardwood), decay class, and position relative to gap exposure. Certain individual species also responded to the size of CWD. In the soil study, community composition and individual species responded to placement relative to gap exposure. This study contributes to a better understanding of the effects of gap harvesting on forest species, which is necessary for incorporating sustainability and conservation objectives into managing commercial forests.

CO41-2 **STRITTHOLT, JAMES, Heather Rustigian, and Dominick DellaSala** Conservation Biology Institute, 260 SW Madison Ave., Suite 106, Corvallis, OR 97333 (stritt@consbio.org) (JS, HR). World Wildlife Fund, 116 Lithia Way, Suite 7, Ashland, OR 97520 (DD).

ECOLOGICALLY RESPONSIBLE PLANNING AFTER WILDFIRE: THE BISCUIT FIRE - SISKIYOU NATIONAL FOREST, OREGON, USA

During the summer of 2002, Oregon's largest wildfire in recorded history (the Biscuit Fire) burned approximately 500,000 acres mostly within the Siskiyou National Forest in southwest Oregon. According to agency data, this natural fire event burned approximately 50 percent at very hot levels resulting in high tree mortality (>75%). Soon after the fire, the USFS began developing a post-fire management plan including a salvage logging component. Heavily influenced by timber interests, the preferred alternative of the draft environmental impact statement (DEIS) called for over 500 million board feet of salvage logging as part of the post-fire management plan. We conducted an independent assessment to address a number of administrative, operational, and ecological constraints facing this particular region using GIS mapping and concluded that an ecologically responsible salvage level would be between 75-95 million board feet. One of the pivotal issues for this region is the high concentration of roadless areas. The preferred alternative clearly challenges the intent of this rule. We addressed not only the where but the how in implementing an ecologically responsible salvage plan. The analytical approach we employed for the Biscuit Fire could be easily applied to wildfire events in other regions throughout the USA and elsewhere.

CO41-3 **KEYSER, PATRICK D., T. Bently Wigley, Carola A. Haas, Petra B. Wood, W. Mark Ford, John W. Edwards, David. C. Guynn, Jr., and Craig Loehle** Forestry Division, MeadWestvaco, PO Box 577, Rupert, WV 25984 (PDK), (pdk2@meadwestvaco.com). NCASI, PO Box 340362, Clemson, SC 29634-0362 (TBW). Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (CAH). WV Coop Fish and Wildlife Research Unit, USGS-BRD, Box 6125, Morgantown, WV 26505-6125 (PBW). USDA Forest Service (WMF). Division of Forestry, West Virginia University (JWE). Department of Forest Resources, Clemson University (DCG). NCASI (CL).

DISTURBANCE AND HABITAT FRAGMENTATION IN EXTENSIVELY FORESTED LANDSCAPES, THE APPALACHIAN LANDSCAPE ECOLOGY PROJECT

Habitat fragmentation is often assumed to be a key process influencing biological responses to disturbance in forested ecosystems. However, due to substantial logistical constraints, only a limited number of field experiments have been implemented to evaluate the effects of fragmentation empirically. Most conclusions are instead based on models or purely correlative studies. Further, most correlative studies of fragmentation have been conducted in high contrast landscapes in which the non-forest matrix is agriculture or urban development, a context quite different from extensively forested landscapes. Consequently, the processes and fundamental causes of population change related to disturbance in forested ecosystems remain poorly understood and invoking fragmentation models may be counterproductive. Instead, we must base our understanding on rigorously designed investigations involving long-term, replicated and manipulative field experiments. Beginning in 2000, we initiated the Appalachian Landscape Ecology Project (ALEP) in a heavily forested landscape that allows for evaluation of landscape-level effects of forest disturbance and associated population processes appropriate to such a context. We are aware of only two other such studies in temperate North American forests. Results from studies such as the ALEP will allow for sustainable management of forest ecosystems that meets society's expectations.

CO41-4 **ROSSON, JR., JAMES F.** USDA Forest Service, 4700 Old Kingston Pike, Knoxville, TN 37919 (jrosson@fs.fed.us)

TEMPORAL LAND-USE TRANSFORMATIONS ACROSS SIX STATES IN THE MIDSOUTH, USA

Habitat destruction and alteration has been recognized as a key factor impacting plant and animal population stability. Lacking are quantitative assessments of the amounts of land-use transformations across large regional scales. Forest Inventory and Analysis (USDA Forest Service) data were used to make an evaluation across Alabama, Mississippi, Arkansas, Louisiana, east Oklahoma, and east Texas. Encompassing 622,425 km2 across the region, 26,700 permanent sample plots placed on a 4.8 X 4.8 km square grid were monitored over three decades. Between assessments made in the 1970's and those made in the 1980's and again in the 1990's, 3.7 (<+/->0.17) million ha changed from a forest class to a farmland class. However, 4.0 (<+/->0.18) million ha transformed from farmland to forest, resulting in a net gain in forest land. In contrast, 1.5 (<+/->0.11) million ha changed from forest to urban (housing, rights-of-way, etc.) but only 0.5 (<+/->0.07) million ha changed from urban class to forest class. Trends in the data show that although some forest lands divert to an agriculture land use, some of these lands may revert back to forest at some time in the future. However, there is a permanence associated with forest land that diverts to an urban class and less liklihood for these lands to revert back to forest.

CO41-5 **LUNDQUIST, CAROLYN J., Simon F. Thrush, Judi E. Hewitt, and Vonda J. Cummings** National Institute of Water and Atmospheric Research (NIWA), PO Box 11-115, Gate 10, Silverdale Road, Hamilton, 2001, Zealand (c.lundquist@niwa.co.nz)

PREDICTING RECOVERY OF ESTUARINE INTERTIDAL COMMUNITIES AFTER HUMAN DISTURBANCE

Human impacts on estuarine communities are numerous; New Zealand estuaries are primarily impacted by increasing sedimentation rates due to catchment development in the surrounding watershed. To better manage future impacts, and to guide restoration of disturbed areas, we have focused on predicting spatial and temporal variability in recovery potential of soft sediment intertidal fauna with varying dispersal strategies. Our hydrodynamic models of larval and juvenile transport predict that location of the disturbance and organism dispersal strategy are the most important predictors of recolonization time. Field experiments using sediment traps demonstrate spatial variability in the pool of available colonists, as well as organism variability in dispersal strategy (bedload or water column transport). Juvenile bivalves were particularly important as dispersing fauna for community recovery. We combine these model and experimental results to predict that higher reaches (e.g., tidal creeks) are less likely to recover than more exposed, intertidal sandflats, and that post-settlement dispersal stages (juveniles and adults) contribute more to recovery processes than larval dispersal in New Zealand estuarine intertidal soft sediment communities. Our results are used to guide management of development impacts around more sensitive locations in estuaries, and to both maintain and restore disturbed shellfish beds.

CO41-6 **BROADHURST, Linda M. and Andrew G. Young** CSIRO Plant Industry, PO Box 1600 Canberra ACT 2601 Australia (Linda.Broadhurst@csiro.au)

ECOLOGICAL AND GENETIC CONSTRAINTS ON POPULATION PERSISTENCE IN ACACIA DEALBATA (MIMOSACEAE)

Broadscale clearing in agricultural landscapes across southern Australia has fragmented vast tracts of natural vegetation and is now contributing to serious environmental impacts such as dryland salinity and reduced water quality. The management and restoration of remnant vegetation is these areas is now of high priority but the success of these endeavors relies on an understanding of the biological factors that influence plant population persistence. The impact that altered ecological and genetic variables have on long term population persistence have been demonstrated by numerous studies involving rare and threatened taxa but almost nothing is known of how common and widespread species are responding to this recent and often severe fragmentation. Acacia dealbata is an important woody perennial species widely distributed across the grassy woodlands of the southern tablelands in NSW and the ACT where little intact vegetation remains. Correlating two years of reproductive output data with several ecological variables indicates that population size, plant density, level of degradation and degree of isolation influence reproductive output with seasonal variation affecting the magnitude of these responses. In contrast, only marginal differences were observed in the levels of genetic diversity which may largely reflect the highly outcrossed mating system.

CO41-7 **BOLGER, DOUGLAS T., Michael A. Patten, and Eric L. Walters** Environmental Studies Program, HB6182, Dartmouth College, Hanover NH 03755 USA (DTB, ELW) (dbolger@dartmouth.edu). Sutton Avian Research Center, University of Oklahoma, PO Box 2007, Bartlesville OK 74005 (MAP).

VARIATION IN TOP-DOWN CONTROL OF AVIAN REPRODUCTIVE SUCCESS ACROSS AN URBAN FRAGMENTATION GRADIENT

The degree to which habitat fragmentation and edge effects cause top-down cascades in ecosystems is an important conservation issue. We studied variation in avian reproductive success in coastal sage scrub habitat across a fragmentation gradient (interior of large habitat blocks [> 2300 ha] edge of large habitat blocks large habitat fragments [37–80 ha] small habitat fragments [5–17 ha]) in urban southwestern California. We focused on four species of birds: the shrub-nesting Wrentit (Chamaea fasciata) and California Towhee (Pipilo crissalis) and the ground-nesting Spotted Towhee (P. maculatus) and Rufous-crowned Sparrow (Aimophila ruficeps). Snake abundance was the best predictor of nest failure in the ground-nesting species, whereas abundance of avian predators (Corvidae, Mimidae) was associated with nest failure of the Wrentit and a combination of snake and avian predator abundance was correlated with nest failure of the California Towhee. Avian nest predator abundance increased across the fragmentation gradient; by contrast, snake abundance decreased across this gradient. As a result, top-down control of reproductive success in populations of the Spotted Towhee and Rufous-crowned Sparrow was largely absent in habitat fragments.

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CHANGES IN BIRD COMMUNITIES IN FOREST FRAGMENTS OF A THREATENED AFRICAN ECOSYSTEM

While it is well known that habitat fragmentation negatively impacts populations of many tropical forest bird species, few studies address how forest fragmentation shapes bird community structure. I evaluated the consequences of forest fragmentation on bird community structure by censusing birds in 14 fragments (0.5520 ha) and 3500 ha of continuous forest in the East Usambaras, Tanzania. I divided species into feeding guilds and two habitat specialization characteristics (primary foraging stratum, and habitat preference) and analyzed the number of species in each ecological category as a function of fragment area. As expected, the number of secondary forest species increased and forest-interior species decreased with decreasing fragment area. Similarly, there were fewer species of ecological specialists, such as understorey insectivores, as fragment area decreased. In contrast, however, generalist foragers, species with broad vertical foraging preferences and secondary forest dwellers were positively affected or unaffected by decreasing fragment size. Relative abundances for 38 species generally revealed similar trends to analyses using species number. What these results indicate is that as foraging and habitat specialists decline with increasing fragmentation, their ecological opposites remain unaffected or increase. Conservation strategies in fragmented tropical landscapes would therefore differ for these different ecological groupings.

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CONSERVATION RESPONSES TO CLIMATE CHANGE

One of the most far-reaching impacts of human development is the alteration of our atmosphere and the resultant changes in climate systems. The effects of climate change on natural systems are already visible in ecosystems around the planet; among others, decreased polar ice cover, coral bleaching, altered precipitation patterns, rising sea level, and changes in reproductive timing of numerous organisms are well documented. To create effective, long-term conservation strategies, we must consider how climate change will affect that which we want to conserve, and be creative in designing solutions that will work in the face of climate change. Because climate change is already having an impact, it is imperative that we begin conversations now to help share ideas on such solutions, and generate new ones. This talk explores some of the conservation strategies that are being tested to improve ecosystem resilience in response to climate change.

CO42-2 **MCCANCE, ELIZABETH** School of Natural Resources and Environment, University of Michigan, 430 E. University, Ann Arbor, MI 48109, USA (emccance@umich.edu)

CHICAGO WILDERNESS: A CASE STUDY OF PARTICIPATION IN COLLABORATIVE ECOSYSTEM MANAGEMENT

Ecosystem management is an approach to natural resource management, which involves large spatial scales, collaboration among multiple stakeholders, social as well as ecological goals, and systems thinking. A good example of ecosystem management in practice, Chicago Wilderness is a collaborative effort of more than 150 organizations and agencies working through a variety of diverse strategies to conserve biodiversity and improve quality of life in metropolitan Chicago. As member organizations vary considerably in the degree to which they take up the Chicago Wilderness cause, I used Chicago Wilderness as a model to look at which factors may facilitate an organization to embrace ecosystem management. Results reveal that organizations differ in their beliefs about ecosystem management based on how involved they are with Chicago Wilderness. So then what factors affect the degree to which organizations and individuals participate in Chicago Wilderness activities? Bases on survey results, my study shows that a number of variables, including education, organization size, and leadership support for Chicago Wilderness affect how active an individual is in the Chicago Wilderness coalition. This study also explores the different types of involvement and reveals that informal networking plays a powerful role in shaping opinions.

CO42-3 **RICH, TERRELL D., Aaron L. Holmes, Mary M. Rowland, and Michael J. Wisdom** U. S. Fish and Wildlife Service, 1387 S. Vinnell Way, Boise, ID 83709 (terry_rich@fws.gov) (TDR). PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970 (ALH). U. S. Forest Service, Pacific Northwest Research Station, 1401 Gekeler Lane, La Grande, OR 97850 (MMR, MJW).

GREATER SAGE-GROUSE AS AN UMBRELLA SPECIES IN THE INTERIOR COLUMBIA BASIN, USA

We examined the hypothesis that Greater Sage-grouse (Centrocercus urophasianus) may serve as an umbrella species for other avian species in sagebrush ecosystems. In previous work, we evaluated performance of models designed to assess landscape conditions for sage-grouse across 13.6 million ha of sagebrush in the interior Columbia Basin. Our main predictor, the Environmental Index (EI), was calculated for each subwatershed in the Basin. Models met expectations by predicting poorer environmental conditions and a higher probability of population extirpation in areas where sage-grouse occurred historically but are now absent. We tested predictions of sage-grouse EI scores, with independent point count data from Oregon and Washington for six shrub-associated and four grassland-associated species. Numbers and densities of shrub-associated species, total bird abundance, and total species richness were higher in better sage-grouse habitat, but grassland-associated species showed no significant relationships with sage-grouse habitat conditions. Thus, although some components of the bird community apparently were protected by the sage-grouse umbrella, others were not. This may be due to an inability at the landscape scale to adequately assess habitat understory components that are important to grassland-associated species. Importantly, some individual components of EI actually performed better than EI for shrub-associated species.

CO42-4 **THIRGOOD, SIMON, Anna Mosser, Sebastian Tham, Grant Hopcraft, Ephraim Mwangomo, Titus Mlengeya, Morris Kilewo, John Fryxell, Tony Sinclair, and Markus Borner** Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania (ST,ST,GH,MB) (simonthirgood@fzs.org) Department of Ecology, Evolution & Behavior, University of Minnesota, St. Paul, Minnesota 55108, (AM) Tanzania National Parks, PO Box 3434, Arusha, Tanzania (EM,TM,MK) Department of Zoology, University of Guelph, Ontario N1G 2W1, Canada (JF) Centre for Biodiversity Research, University of British Columbia, Vancouver V6T 1Z4, Canada (TS)

CAN PARKS PROTECT MIGRATORY UNGULATES? THE CASE OF THE SERENGETI WILDEBEEST

The conservation of migratory species can be problematic because of their requirements for large protected areas. We investigated this issue by examining the annual movements of the migratory wildebeest Connochaetes taurinus in the 25,000 km2 Serengeti-Mara Ecosystem of Tanzania and Kenya. We used Global Positioning System telemetry to track eight wildebeest during 1999-2000 in relation to protected area status in different parts of the ecosystem. The collared wildebeest spent 90% of their time within well-protected core areas. However, two sections of the wildebeest migration route – the Ikoma Open Area and the Mara Group Ranches - currently receive limited protection and are threatened by poaching or agriculture. Comparison of current wildebeest migration routes to those recorded during 1971-73 indicates that the western buffer zones appear to be used more extensively than in the past. This tentative conclusion has important repercussions for management and needs further study. The current development of community-run Wildlife Management Areas as additional buffer zones around the Serengeti represents an important step in the conservation of this UNESCO World Heritage Site. This study demonstrates that detailed knowledge of movement of migratory species is required to plan effective conservation action.

CO42-5 **WATKINS, G.G.** Iwokrama International Centre for Rain Forest Conservation and Development, 77 High Street, Georgetown, Guyana, South America (gwatkins@iwokrama.org)

CONSERVING THE REMAINING TROPICAL RAIN FOREST – IWOKRAMA AND THE GUIANA SHIELD

Tropical rain forests continue to disappear at alarming rates. There are four remaining large blocks of pristine tropical rain forest in the world – the Amazon, the Guiana Shield, the Congo and Papua New Guinea. These areas are isolated, have low population densities of mainly indigenous people, and are in developing countries facing national development challenges and the need to build national institutional and individual capacity for natural resource management. Effective tropical rain forest conservation requires consideration of human ecosystems and the development of partnerships involving indigenous people, private sector, Governments and NGOs. This paper examines the work of the Iwokrama Centre over the past five years and presents a blueprint for the future management of Wilderness Tropical Forests. In particular, the paper presents lessons learned from the collaborative management of the 371,000 Ha Iwokrama Forest in central Guyana and recommends mechanisms for the involvement of private sector in the development of sustainable businesses to ensure local and national benefits and maintain international conservation values.

CO42-6 **GOETZ, SCOTT, Claire Jantz, and Patrick Jantz** The Woods Hole Research Center, PO Box 296, Woods Hole, MA 02543-0296 (sgoetz@whrc.org)

EXURBAN SPRAWL, THE LOSS OF RESOURCE LANDS, AND FOREST VULNERABILITY ASSESSMENT WITHIN THE CHESAPEAKE BAY WATERSHED

The contemporary pattern of urban development in industrialized countries is increasingly taking the form of low density, decentralized residential and commercial development. Our objectives were to document how this urbanization process has expanded throughout the mid-Atlantic region of the United States, which includes the entire Chesapeake Bay watershed. We then explored how lands comprising the natural resource base, particularly forests, have been replaced by a matrix of the built environment and fragmented habitat. We accomplished this by mapping impervious surface (houses, roads, etc) and tree cover as continuous variables across the ~200,000 km2 area using a time series of satellite imagery. We calculated metrics of land use change, and used these to estimate the loss of resource lands and wildlife habitat across the region. We also used the time series to calibrate a spatial model of future urbanization under different policy scenarios, and assessed the vulnerability of forest lands out to 2030. A classification of vulnerability threats was developed, and will be presented. Future work will focus on potential impacts to specific biota of the region.

CO42-7 **RAHN, MATTHEW, James Diffendorfer, and Holly Doremus** San Diego State University, Department of Biology, 5500 Campanile Drive, San Diego, CA 92182 (mrahn@sciences.sdsu.edu) (MR, JD); University of California, Davis, School of Law, Davis, CA 95616 (HD)

DISASTER PLANNING FOR BIODIVERSITY CONSERVATION: THE SAN DIEGO WILDFIRES IN RETROSPECT

Catastrophic declines in populations occur, whether caused by natural phenomena or anthropogenic calamities, yet upfront planning for these situations is rare in natural resource management. Two paradigms for maintaining biodiversity exist in conservation biology. One focuses on creating large reserves using principles derived from island biogeography, metapopulation theory, and species-area relationships. This paradigm is useful when creating reserves (especially in the context of multi-species habitat conservation plans), but has little bearing management once the reserve is in place. The other paradigm focuses on single species and the roll of random stochastic events and catastrophes on population dynamics and extinction rates. This paradigm often focuses on developing detailed management strategies for specific species, including population viability analyses. While not entirely mutually exclusive, long-term biodiversity conservation requires the integration of these two paradigms. This integration becomes particularly important for both minimizing the probability and the severity of large-scale catastrophes. It also helps in the development of effective post-catastrophe responses for individual species of interest. We cannot overstate the importance of upfront disaster planning and emergency response in conservation planning. Reviewing the recent catastrophic wildfires in San Diego County, we recommend major improvements in the areas of reserve design, species management, and defining post-disaster responsibilities.

CO42-8 **HAZARIKA, ARUP KUMAR, A. Dutta, and P. Sarkar** Post Graduate Department of Zoology, Cotton College, Guwahati-781001, Assam (India); (hazarikacotton@sify.com), Department of Zoology, Gauhati University, Guwahati-781014, Assam (India), Department of Zoology, Gauhati University, Guwahati-781014, Assam (India)

ECOLOGICAL MONITORING OF WORLD FAMOUS KAZIRANGA NATIONAL PARK (INDIA) WITH SPECIAL REFERENCE TO COSERVATION STRATEGIES OF RHINOCEROS UNICORNIS

Kazirnaga National Park of Assam (India), is identified as one of the World Heritage sites because of its largest population of One horned Rhinoceros and several other endangered mammals. The question is whether or not these resources can be sustained in the future. Specially, the One horned Rhinoceros, which is killed for its horn, has become an endangered species. A study was conducted to find out the habitat utilization pattern of Rhinoceros. A vehicle drive was followed to measure the number of sighting and the habitat utilization pattern covering four seasons. Study has reveled that rhino was found more frequently in waterlogged grassland habitat for feeding and wallowing activities. However, those wetlands, which are densely covered with water hyacinth and lantana, have got less frequency of rhinoceros. Besides, it has been found that large areas of the park are infested with Mimosa, which further eliminating the grassland habitat the prime source of food for Rhinoceros. An immediate clearance of water hyacinth, lantana and Mimosa should be done for conservation of the rhino habitat. Uprooting of tree sapling is required to maintain grassland ecosystem. Broad-based conservation education programs, designed to diffuse conservation information to the public, must become an important priority.

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ITALIAN PROTECTED AREAS AND THEIR EFFICIENCY IN THE CONSERVATION OF VERTEBRATES: EFFECTS OF SCALE AND PLANNING UNIT SIZE

Protected areas are among the most important tools that Conservation Biology has to protect biodiversity. However, they are often chosen just considering political and socio-economical questions, without considering their biological importance. To assess the adequacy of the current coverage of the Protected Area system in Italy we have tried the first Italian application of the irreplaceability concept. We built deterministic habitat suitability models for each terrestrial vertebrate species present in Italy (504 species) using the available GIS layers. Moreover, we collected a geographic database with 775 protected areas (the great majority of the Italian terrestrial protected areas). For the analysis, we divided the Italian territory into square planning units, and, using the habitat suitability models, for each unit we calculated the amount of the suitable territory for each species. We performed the analysis using planning units of different size (1 km2 and 25 km2) and we compared the results obtained. The analysis demonstrates that the results are strongly influenced by the planning unit used. Both the extent and the location of the areas classified as important for the conservation of the Italian vertebrates changes, demonstrating the importance of using a carefully chosen planning unit as the basis for the analysis.

CO43-2 **JUSTUS, JAMES, Sahotra Sarkar, Chris Kelley, Justin Garson, and Trevon Fuller** Biodiversity and Biocultural Conservation Laboratory, University of Texas at Austin, 1 University Station #C3500 Austin, TX 78712 –1180 (justus.phil@mail.utexas.edu)

EFFECTIVENESS OF ENVIRONMENTAL SURROGATES FOR THE SELECTION OF CONSERVATION AREA NETWORKS

Standard biodiversity measures –all species, ecosystems, etc.– usually cannot be fully surveyed before taking conservation action. Adequate surrogates that can be rapidly and economically assessed from limited surveys, remote sensing, and/or modeling must therefore be found to represent biodiversity in conservation planning. We constructed a global database of environmental parameters for potential use as surrogates and analyzed the performance of 30-56 parameters at 7 spatial scales (0.012-0.102) for two widely differing regions: Québec and tropical Queensland. Four methods were used to evaluate surrogate performance: (i) surrogacy graphs (generalizing species accumulation curves); (ii) marginal surrogacy charts, which are new; (iii) distance analysis; and (iv) spatial congruence analysis. Our results show environmental parameters perform significantly better than random site selection, especially at coarser scales. Surrogate performance also improves as the number of parameters increases. With all 56 parameters, protecting 10% of their distributions protected >92.5% of 719 vertebrate species at every scale in Québec and >90% of 2348 plant taxa at every scale except 0.012 in Queensland. Contrary to previous analyses, our results justify using environmental parameters as biodiversity surrogates for planning. They also demonstrate that planning should be done at scales 0.052, at which these surrogates performed best.

CO43-3 **KATTAN, GUSTAVO, Carolina Murcia, Carlos Valderrama, Olga Lucia Hernandez, and Vladimir Rojas** Wildlife Conservation Society, Colombia Program, AA 15527, Cali, COLOMBIA (GK, CM, CV, VR), (gkattan@wcs.org), World Wildlife Fund-Colombia, Cra 35 4A-25, Cali, Colombia (OLH)

DESIGNING A REGIONAL SYSTEM OF PROTECTED AREAS IN A HIGHLY FRAGMENTED LANDSCAPE

Complying with the Biodiversity Convention, Colombia is redesigning its system of protected areas to increase the conservation potential of its National Park System. This new system is being built as modular regional networks of PAs. We are designing the first module of these regional systems for the coffee-growing region of the Central Andes. This area of 27,000 km2 has some of the most globally diverse and highly endangered ecosystems. We are applying current scientific principles of reserve network design, based on the four-R framework of representativity, resilience, redundancy and restoration. A gap analysis shows good representation of high elevation ecosystems (above 2000m) but little representation of lower elevation (1000-2000m) in the current PA system. In this highly fragmented landscape, population density and land value are high and creation of new national parks impractical. Thus, we propose a model of multiple-use regional and municipal reserves as a pragmatic strategy for preserving regional biodiversity. This is possible because Andean ecosystems function at small spatial scales. We are identifying benign land uses in rural landscapes that provide functional connectivity among forest remnants. Attempts to apply rigorous recent models of reserve network design are limited by the dearth of biological information for this region.

CO43-4 **LEVIN, NOAM and Avi Shmida** Department of Geography and Human Environment, Tel Aviv University, Israel (levinnoa@post.tau.ac.il) (NL); Rotem-Israel Plant Information Center, Dept. of Evolution, Systematics and Ecology, The Hebrew University, Jerusalem 91904, Israel (NL, AS).

SETTING CONSERVATION PRIORITIES FOR GIVEN GEOGRAPHICAL AREAS IN ISRAEL BASED ON PLANT RICHNESS, SPATIAL EXCLUSIVENESS AND RED LIST CRITERIA

With increasing human population and fragmentation of open spaces in Israel, setting priorities for directing conservation and planning is becoming crucial. Substantial effort has been given to locate richness and rarity hotpots. However, this approach biases priorities against environments that maintain low richness (e.g. arid). As part of a project led by the Israeli Ministry of Environment, 618 landscape units were determined in Israel. This study aims to determine the relative conservation value of each unit based on the Israeli Plant Information Center database. We compared values of the following variables: (i) richness, (ii) an index for “red plants” based on rarity, extinction rate, attractivity, and distribution type and (iii) a spatial exclusiveness score that indicates whether a species’ distribution is limited to a given area. The value of the landscape units was determined from quadrats at several spatial scales (0.33 to 9 sq. km.), normalizing for artifacts caused by uneven sampling effort, area size and rainfall (which is especially important in areas as Israel where sharp environmental gradients occur). The exclusiveness parameter was relatively less influenced by rainfall (R=0.13) and area (R=0.5), than richness or the red plants index, and is also applicable for categorical data (e.g. lithological units).

CO43-5 **NAIDOO, ROBIN** WWF Science Post-Doctoral Fellow, Conservation Science Program, WWF-US, Asuncion, Paraguay (rnaidoo@ualberta.ca) rnaidoo@ualberta.ca

SPATIO-TEMPORAL ECOLOGICAL TRENDS IN THE MBARACAYU FOREST BIOSPHERE RESERVE, PARAGUAY: IMPLICATIONS FOR SUSTAINABLE MANAGEMENT

The Reserva Natural del Bosque Mbaracayu (RNBM), a 600 km2 fragment of endangered Interior Atlantic rainforest in Paraguay, was established in 1991. In 2000, this core area and the surrounding watershed were together recognized as a UNESCO Biosphere Reserve. To assess the effectiveness of conservation programs in the area, I calculated two spatio-temporal ecological trends, from 1991 to 2003. Using satellite imagery, I calculated that deforestation within RNBM was essentially nil during this period, but that almost 50% of surrounding forests were converted to agricultural land. At current deforestation rates, virtually all forests outside the RNBM will have disappeared by 2015, with spatial deforestation models suggesting that remaining forests to the south and west are most immediately at risk. In addition, data from 1994 – 2003 on large vertebrate encounters in RNBM indicate that populations of certain vertebrates (Dasypus novemcintus, Nasua nasua, Penelope superciliaris, Tapirus terrestris) are in significant decline. The continued disappearance of forests outside the RNBM is likely to exacerbate this trend. Managers of the Biosphere Reserve therefore have two choices: either substantially increase programs to preserve forests outside RNBM, or else concede that deforestation cannot be halted, and instead focus on protecting threatened species and ecosystems within RNBM.

CO43-6 **NICHOLSON, EMILY, Karin Frank, Wayne A. Rochester, and Hugh P. Possingham** The Ecology Centre, University of Queensland, St Lucia, Queensland 4072, Australia (EN, WAR & HPP) (e.nicholson@zen.uq.edu.au); UFZ, Dept Ecological Modelling, Permoserstrasse 15, 04318 Leipzig, Germany (EN & KF).

OPTIMIZING LANDSCAPES FOR THE PERSISTENCE OF METAPOPULATIONS OF MULTIPLE SPECIES

For a metapopulation of a given species, there is likely to be one or several optimal landscape configurations that maximize the species' persistence. Across several species, these optima may conflict, giving us, as conservation biologists, a difficult problem to solve. The aim of this research is to optimize the landscape configuration for more than one species by minimizing the combined extinction risk. This concept is based on reserve selection methods that aim to include a representative sample of each species in the reserve system. These methods address species persistence with generic design rules, such as fewer larger reserves. We extend this approach by maximizing persistence across the species, a function of the landscape configuration and the species' ecology. We use an approximation formula for the mean lifetime of metapopulations (Frank, K., & C. Wissel, 2002 Am Nat), a spatially explicit model that assesses species persistence without simulations. Because this optimization problem is too large to solve exactly, we use a fast approximating method: simulated annealing. We explore the sensitivity of the resultant landscapes to changes in the colonization sub-models and assumptions about dispersal. We also examine the effects of increasingly different species ecologies, where species' needs may conflict.

CO43-7 **BEDNAREK, ANGELA T.** Earth Institute, Columbia University, Hogan Hall B-19, MC 4501, 2910 Broadway, New York, NY 10027 (atb2101@columbia.edu)

ADAPTIVE ECOSYSTEM MANAGEMENT IN U.S. FEDERAL DAM RELICENSING: CONCEPTIONS AND LIMITATIONS

Adaptive ecosystem management (AEM) is a tool that has great potential to integrate scientific inquiry with a process of building consensus among stakeholders to produce improved environmental policy outcomes. Despite its conceptual attractiveness, however, AEM has not yet been widely or successfully implemented, in part because it involves experimentation, divergent stakeholder groups, and can be expensive. In this study, I examined several hydropower dam relicensing processes as case studies of attempts to implement AEM. I assessed the characteristics of license proceedings to examine the adaptive nature of both the management experiments and the stakeholder involvement in these projects. Although adaptive management protocols had been agreed upon in settlement agreements for the particular licenses I studied, I found that experimental designs were limited compared to AEM theory. The design of stakeholder input, in the form of collaborative groups that meet regularly, integrated a significant degree of public involvement into the decision-making process for these relicensing processes. Understanding how implementation of AEM occurs, and why it is successful, will help to inform future efforts in ecosystem management, especially as one-third of private hydropower generating capacity is relicensed over the next 15 years.

CO43-8 **REYERS, BELINDA, Mark Keith, Chris T. Chimimba, and Yolan Friedman** Department of Zoology and Entomology, University of Pretoria, Pretoria, 0002, South Africa (MK), Department of Zoology, University of Stellenbosch, Pvt Bag X1, Stellenbosch, 7602, South Africa (breyers@sun.ac.za) (BR); Mammal Research Institute, Department of Zoology & Entomology, University of Pretoria, Pretoria, 0002, South Africa (CTC); Endangered Wildlife Trust, / CBSG (SSC / IUCN) Southern Africa, Pvt Bag X11, Parkview, 2122, South Africa (YF)

ASSESSING THE CONSERVATION STATUS AND PRIORITY OF SOUTH AFRICAN MAMMALS

A regional Red Data List (RDL) assessment of 295 South African mammals identified 58 threatened species. Due to limited funding, not all threatened species can be given attention therefore we investigate methods for prioritizing these species. Criteria for prioritizing species include global RDL status, endemism, phylogenetic uniqueness and future pressures. These measures were: compared to the regional status, used to highlight threatened mammals requiring urgent attention; and used to investigate risk facing 52 data deficient taxa. Results illustrate similarities between global and regional classifications with the regional assessment highlighting more threatened (58 vs. 43), near threatened (37 vs. 14) and data deficient taxa (52 vs. 17). Differences arose in the insectivores contributing 14 threatened and 14 data deficient taxa. Significant relationships were found between regional ranks, global ranks and measures of threat; however this was not the case with measures of endemism and phylogenetic distinctiveness illustrating potential for these measures when prioritizing mammals. Several techniques including priority scores and multidimensional plots were developed in order to aid conservation agencies in their decision making. These techniques highlight the risk facing small endemic mammals including members of the family Chrysochloridae, and many smaller carnivore, rodent, bat taxa, and importantly almost all cetaceans.

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MOLECULAR GENETIC DATA REVEALS A NEW CRYPTIC SPECIES OF AFRICAN CROCODILE REQUIRING A REASSESMENT OF CONSERVATION STRATEGIES FOR CROCODYLUS NILOTICUS

In order to explore the possibility of cryptic variation within the widespread species, Crocodylus niloticus, 2670 nucleotides of mitochondrial DNA (12s, 16s, control region (Dloop), WANCY and NADH dehydrogenase subunit four (ND4)), and 2251 nucleotides from 4 nuclear regions (Rag1, S6, and introns for Tropomisin (TROP) and Oocyte Determination Factor (OD) were sequenced. Populations sampled represent 12 localities corresponding to previously described subspecies. Relationships among populations were examined using the character evaluation approach as implemented under Population Aggregation Analysis (PAA), and subsequently explored in a tree based framework using parsimony, maximum-likelihood, and Bayesian analyses. These analyses uncovered a paraphyletic C. niloticus consisting of two highly divergent clades separated by all other true crocodiles. The two branches correspond to a western Saharan/Congo basin clade and an Eastern clade including Madagascar. The pattern of haplotype distribution between Eastern and Western clades is congruent with the previous identification of unique regional morphotypes based on scalation patterns (Fuchs 1974). These data support recognition of the Western Saharan/Congo clade as a distinct species. Due to its restricted distribution, ongoing threats to survival and basal position within the genus Crocodylus, an immediate reevaluation of both IUCN and CITES status for this taxon is recommended.

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APPLICATION OF GENOMICS TECHNIQUES TO NON-MODEL ORGANISMS FOR CONSERVATION BIOLOGY: WHAT CAN GOPHERS AND LIZARDS LEARN FROM HUMANS AND FLIES?

ora of new genomes being dumped onto databases has spawned a wholly new field of genome science. This field is dominated by specialists in cloning and high-throughput sequencing, genome assembly, gene prediction and annotation, computational analysis, and not insignificantly, those trying to resolve the numerous, remaining mysteries. This mammoth dataset has not had an obvious effect on genetic work with non-model organisms, especially the generation of data for conservation biology. We are creating genomic libraries for non-model organisms. Library screening, computational genomics methods, and comparative resequencing permits us to compare patterns of genomic diversity expected from review of the formal genome projects with those in non-model organisms. We compare variation in low-copy number regions of the genomes of several non-model animals to that in several model genomes. We review the advantages of characterizing nuclear loci with respect to annotated regions, and approaches to doing so. Finally, we summarize ways that this initial genomic library screening phase is leading to the development of myriad new markers for conservation, population and evolutionary genetic applications, with a particular emphasis on markers that can be used to genotype historical (museum preserved) samples, thus opening a window to historical population processes.

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MALE GENES AND MALE SONGS: FIN WHALES AS A CASE STUDY FOR INTEGRATING GENETIC AND ACOUSTIC DATA IN DEFINING BALEEN WHALE STOCKS

Understanding genetic relationships among whales from different geographic areas is essential to effectively managing these endangered species. Here, we focus on assessing relatedness and gene flow among fin whales (Balaenoptera physalus) in the North Pacific and North Atlantic to better understand the utility of genetic and acoustic variation for identifying “stocks” of vocally active baleen whales. To directly estimate male-mediated gene flow, Y chromosome-specific markers were isolated from fin whales. Gene flow estimated from Y-specific markers is compared directly to female-mediated gene flow estimated from mitochondrial DNA to determine whether gene flow is “gender-biased”. Geographic variation in songs produced by male fin whales in the North Pacific and North Atlantic are quantified for comparison with estimates of genetic distance based on Y chromosome, mitochondrial DNA, and autosomal DNA to identify particular signal features that are concordant with patterns of gene flow mediated by male fin whales, female fin whales or both. Acoustic features useful for detecting shorter-term discontinuities in fin whale movement and/or social behavior are also identified. Integrating acoustic and genetic data will help define management units for fin whales and inform conservation efforts for other baleen whale species whose pelagic life histories have made monitoring recovery status difficult.

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METAPOPULATION DYNAMICS IN THE MAGGIE CREEK BASIN, NEVADA, AS REVEALED BY MICROSATELLITE GENETIC MARKERS

Lahontan cutthroat trout (Oncorhynchus clarki henshawi, LCT) is an interior basin salmonid endemic to the hydrographic Lahontan basin of northern Nevada, eastern California and southeastern Oregon. Listed as threatened under the U.S. Endangered Species Act in 1973, this subspecies continues to decline with a loss of greater than 30 populations over the past fifteen years. Metapopulation dynamics are hypothesized to describe the natural dynamics of inland salmonid species that historically were found in large interconnected stream systems, but little empirical evidence has been collected to test this idea. Here we use species specific microsatellite markers to test predictions of metapopulation theory, i.e., independent population dynamics, gene flow among subpopulations and evidence of local population extirpation. We examined historical population genetic structure and contemporary gene flow among LCT populations in the Maggie Creek basin, one of the few remaining interconnected stream systems. Results of F statistics reveal significant but moderate differentiation among the three study stream populations (overall FST 0.067). Assignment tests suggest contemporary, but unequal movement among streams, consistent with pairwise FST results. Each population also showed evidence of genetic bottlenecks (IAM, P > 0.002). Together genetic differentiation, contemporary gene flow and evidence of bottlenecks support theoretical predictions of metapopulation dynamics.

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FREEWAY REDUCES GENE FLOW IN WIDE-RANGING MAMMALIAN CARNIVORES

Because they have large area requirements, mammalian carnivore populations can be particularly susceptible to the effects of habitat fragmentation. However the high vagility of carnivores also may allow them to traverse potential barriers and reduce population isolation. Since 1996 we have been studying the impacts of urbanization on bobcats and coyotes in an urban landscape in southern California. Here we address whether a major freeway is a barrier to carnivore movement, and consequently to gene flow. Data from radio-tracking 87 bobcats and 110 coyotes and from monitoring 15 freeway underpasses indicates that the freeway is a significant, but not complete, barrier to movement for both species. For each species, we used 7 highly variable microsatellite markers to genetically characterize sub-populations both across and along the freeway. Despite the fact that some migrants continue to traverse the freeway barrier, both bobcat and coyote populations on either side of the freeway are significantly differentiated (F_{st}=0.038 for bobcats, F_{st}=0.037 for coyotes, $p<0.003$), and this differentiation is two to six times greater across the freeway than along it. Our results indicate that major roads can be barriers genetically as well as behaviorally, and that many migrants may be necessary before successful genetic mixing occurs.

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EFFICACY OF A BAYESIAN APPROACH FOR DETECTING HYBRIDIZATION AMONG WESTSLOPE CUTTHROAT TROUT AND RAINBOW TROUT: COMPARING MICROSATELLITE AND RFLP DATA

One of the greatest threats facing westslope cutthroat trout persistence is introgressive hybridization with non-native rainbow trout. Microsatellite loci have been developed for both westslope cutthroat trout and rainbow trout but a lack of non-overlapping allele size ranges between the species has limited its applicability in hybridization research. In this study, we test the efficacy of a Bayesian model, which uses microsatellite data, for hybrid detection. 501 samples were screened from ten populations with three to five RFLP loci and four microsatellite loci. The percentage of hybrids detected ranged from 0 - 56%. High concordance in the percentage of hybrids detected was found between methods, but microsatellite analysis had difficulty assigning hybrids to specific hybrid categories (F1, >F1, F2). Future use of microsatellite analyses may be valuable for detecting hybridized populations but additional studies are needed to evaluate this method's precision with varying degrees of backcrossing. Moreover, the incidence of introgressive hybridization was not uniform throughout the study area, the Middle Fork Salmon River, Idaho. Stocking of non-native rainbow trout may explain high levels of introgression in some populations, however additional research is needed regarding environmental and anthropogenic factors that likely play a role in the occurrence of hybridization.

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GENETIC VARIATION OF THE THREATENED SPECIES HEPTACODIUM MICONIOIDES (CAPRIFOLIACEAE): IMPLICATIONS FOR CONSERVATION

Heptacodium miconioides is a national endangered plant species, endemic to China. It was disappeared in Hubei Province where the modal specimen was collected and about 10 populations were found in Zhejiang Province and Anhui Province. Population size ranged from less than 20 to several hundreds. Samples were collected from 9 remaining populations and were analyzed using RAPD markers. The species exhibited high level of genetic diversity in comparison to other threatened or rare plants. Measures of genetic diversity within populations were strongly related to the log of estimated population size. AMOVA indicated that about 1/4 of the variation was among populations. Significant relationship was observed between differentiation and geographical distance. These results indicated that large populations should receive highest priority for conservation and populations most differed from the large populations also have conservation values.

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PHYLOGENETIC DISTINCTNESS AND POPULATION STRUCTURE ARE CONDUCIVE TO THE DEFINITION OF CONSERVATION MANAGEMENT UNITS WITHIN NEW ZEALAND BROWN KIWI (APTERYX SPP.)

Having demonstrated that brown kiwi (Apteryx spp.) are three species, rather than one or two, we suggested that the unit for management within all the species is the regional population. We now extend the phylogenetic methods we previously used, into the realm of populations. We employ additional analytical tools from phylogeography with mitochondrial control region data to examine conservation management units (CMUs) within the brown kiwi species. Results reveal that genetic structuring is not limited to among regional populations (or CMUs), but also extends to within populations. Perhaps this is not surprising, given that these flightless birds are generally thought to be poor dispersers and they inhabit a geologically active country. Within the mountainous ranges of the South Island the most extreme case of within population structuring occurs: two phylogenetically distinct mtDNA lineages exist in one regional population. Although a decision on the recognition of these two lineages as independent CMUs will not be decided until further samples are collected, we confirm the status of our previously suggested CMUs for brown kiwi species.

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WILDLIFE SPECIES EXPANSIONS IN NEW JERSEY: THE SUBURBAN NICHE

Throughout the Twentieth Century expanding human populations have altered landscapes, especially through suburban sprawl. While some wildlife species have been adversely affected, others have persisted, taking advantage of human dominated landscapes, and in recent decades have exploded into suburban environments where they were previously scarce. White-tailed deer (Odocoileus virginianus), virtually extinct in New Jersey in the early 1900's, have increased to an estimated statewide population of 175,000 to 200,000. Resident Canada geese (Branta canadensis), now commonly found in residential areas, corporate landscapes, and municipal parks, soared from 28,000 in 1990 to over 106,000 by 2000. Black bear (Ursus americanus), numbering less than 100 by the mid 1900's, rebounded to between 450 and 550 by 1992, and are currently estimated at 2,000 to 3,000 individuals. Wild turkey (Meleagris gallopavo), a wary species once rarely found around humans, was extinct in 1900, reintroduced in 1977, and had exploded to 23,000 by 2000. Turkeys can now be seen grazing along interstate highways, and in residential neighborhoods throughout the state. Factors promoting expansion in suburbs may differ among wildlife species. However, some common factors are: abundant resources, restrictions on hunting, and an apparent reduction in human outdoor activity.

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ECOLOGICAL CONNECTIVITY IN URBANIZING LANDSCAPES

Urban areas are increasingly important systems in landscapes and affect the environment and ecology of species in a variety of ways, including impacting organism movement and dispersal. These ecological processes can be related to landscape connectivity, which can be measured in different ways. I examined connectivity as a function of natural landscapes, human land-uses, and dispersal distance. I selected 66 urban areas across the United States and combined these with a factorial set of simulated habitat maps. I used three connectivity measures, other landscape metrics, and human population statistics to investigate the impact of urban development on ecological connectivity. Some types of habitat configurations are more sensitive to increased development than others, especially at low initial habitat proportions for all dispersal distances measured. At high habitat proportions, decreases in habitat area cause a larger magnitude decrease in connectivity for longer dispersal distances. Total size of urban areas is the most important statistic in determining changes in connectivity across landscapes. Although small urban areas decrease connectivity less than larger ones, once the developed area is greater than 5% of the landscape, then connectivity decreases sharply at all dispersal distances measured.

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THE PERSISTENCE OF BLACK-TAILED PRAIRIE DOGS IN HABITAT FRAGMENTS ALONG A GRADIENT OF URBANIZATION IN THE COLORADO FRONT RANGE

Urban gradients are increasingly used in ecological studies, and produce environmental heterogeneity that is useful in exploring how human development can influence species diversity. This study focuses on the persistence of black-tailed prairie dogs (Cynomys ludovicianus) within urban habitat patches in Denver, Colorado. We identified 397 habitat fragments distributed along a gradient of urbanization (ca. 375 km2) from downtown Denver through the south suburbs; 54 of these fragments were colonized by prairie dogs. Local and landscape characteristics were measured on a subset of fragments. Fragment area was the strongest landscape predictor of the probability of occupancy. Local vegetative characteristics significantly differed between colonized and uncolonized portions of fragments, with fewer graminoids, more forbs, more bare ground, less litter, and shorter, less dense vegetation on the colonized portions. Results indicate that prairie dogs are more likely to be present on sites capable of growing substantial amounts of grass, although the prairie dogs diminish the grass around their colonies. By determining how landscape and local characteristics of urban habitat patches are associated with the persistence of prairie dogs, we are able to better understand how prairie dogs are impacted by the urbanization and fragmentation ongoing in the Front Range of Colorado.

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EVALUATING HABITAT RESTORATION OPPORTUNITIES FOR PACIFIC SALMON WITHIN THE DUWAMISH RIVER, AN URBAN ESTUARY

The Duwamish River Estuary, the industrial heart of the city of Seattle, is home to eight species of Pacific Salmon. Despite the expenditure of millions in conservation and restoration funds, relatively little is known about the potential ecological benefits that small patches of “natural” habitat confer in this ultra-urban landscape. The objectives of this study are to (1) inventory current nearshore habitat condition, and (2) evaluate habitat quality differences between reaches with and without riparian vegetation. We mapped the length of the Duwamish River and inventoried the spatial distribution of nearshore habitats. We found that over 64% of the Duwamish shoreline consists of armored banks completely devoid of vegetation. At eight paired study sites with and without riparian vegetation, maximum summer temperatures were significantly higher at unvegetated sites, and terrestrial insect inputs were higher at vegetated sites. These results suggest that although restoration efforts may of necessity be very localized, they can still have ecological benefit. This study will help in identifying areas for future conservation, provide important baseline information for restoration monitoring, and help to evaluate the role riparian vegetation and bank armoring play in fish habitat quality in an urban estuarine environment.

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AN INDIVIDUAL-BASED MOVEMENT APPROACH TO EVALUATING CONNECTIVITY FOR MOUNTAIN LIONS (PUMA CONCOLOR) IN SOUTHERN CALIFORNIA, USA

Landscape change due to urban, agricultural, and transportation infrastructure development can alter the ability of animals to move among remaining core habitat areas. Coastal southern California has been severely fragmented by such development, jeopardizing the persistence of mountain lions (Puma concolor) in the region. We use statistical models of individual animal movement and individual-based movement models (IBMMs) to predict movement on geographic information system landscape models of conservation interest. We briefly introduce these models, and then describe IBMM output specific to simulated locations and paths that are useful in evaluating connectivity. We provide methods that use this output to visualize connectivity, to quantify connectivity among pairs of core habitat areas, and to quantify resistance that specific landscape elements provide to movement. We apply this approach to the evaluation of connectivity for mountain lions in southern California. The IBMM simulations identify key linkages among core habitats, along with predicted probability of success, cost of use, and risk of use for large carnivores. These results are being used to guide the design of habitat conservation plans (HCPs) in our study area. As such, this approach has the potential to become a useful tool in reserve design and proactive conservation measures.

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CHICAGO WILDERNESS: A MODEL FOR CONSERVATION IN AN URBANIZING WORLD

Over the last ten years, conservation organizations in the greater Chicago region have developed a way of effectively increasing the impact of each organization's work. In 1996, thirty-four organizations founded the Chicago Wilderness coalition, which now numbers 172 members. We have developed a unique organizational structure which has allowed us to integrate several areas of biodiversity conservation: land management, applied research, education and outreach, and policy work to improve sustainability. Through this structure we have collectively developed a regional Biodiversity Recovery Plan, and have implemented more than 200 collaborative projects to bring us closer to our common goals. From this process, we have gained a better understanding of how to implement ecosystem management. A few ingredients have been instrumental in allowing Chicago Wilderness to succeed as a massive coalition and indeed become greater than the sum of our parts to improve biodiversity conservation in the region. These include: 1) a critical mass of people thoroughly -- passionately -- committed to seeing the work succeed, and ready to put an inordinate amount of time and effort into making it happen; 2) early, visible, and popular successes; and 3) mission-related benefits to individual members.

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A UNIQUE URBAN U.S. FISH AND WILDLIFE SERVICE CONSERVATION PARTNERSHIP IN THE PORTLAND, ORE./VANCOUVER, WASH. AREA

Urbanization is a primary threat to the U.S. Fish and Wildlife Service's (Service's) trust resources - migratory birds, endangered species, and certain marine mammals and fish, and the ecosystems upon which they depend. The Service is engaged in urban issues through its traditional programs, primarily to address the growing list of species protected under the Endangered Species Act, and to mitigate the effects of development projects with a Federal regulatory nexus. But escalating urban conservation challenges beckon for non-traditional approaches, such as those that have been tested and proven by the Metropolitan Greenspaces Program. This unique model is the result of a successful grassroots effort to obtain Federal support to conserve greenspaces for fish, wildlife and people. Funded by the Service since 1991, it is administered in partnership with Metro, Portland's regional government. It has enabled the Service to break new ground in addressing urban-focused conservation needs and work collaboratively with others by a) supporting habitat restoration, conservation, and education projects through grants, b) connecting researchers and practitioners through the Urban Ecological Research Consortium, c) establishing Portland's Urban Conservation Treaty for Migratory Birds program, and d) conserving the Service's trust resources through regional efforts to protect natural areas, manage growth and maintain livable communities.

CO45-8 **PATWARDHAN, ANKUR A., Mukul Mahabaleshwarkar, Kapil Sahasrabuddhe, Neelesh Dahanukar, Rupesh Raut, Anuja Damle, Janhavi Kale, and Utkarsh Ghate** Abasaheb Garware College, Pune - 411004, Maharashtra, India. (ankur_patwardhan@vsnl.net) (AAP, AD, JK).RANWA (Research and Action in Natural Wealth Administration) C- 26/1 Ketan heights, Kothrud, Pune- 411038, Maharashtra, India. (MM, KS, ND, RR, UG)

URBAN AREAS AS WILDERNESS CORRIDORS OR SINKS?

Assessment of ecosystem health of Pune City, Western India is underway since year 1999 with the purpose of developing blueprint for conservation of biodiversity amidst rampant urbanization. Straying of a leopard Panthera pardus or gaur Bos gaurus into cities along Western Ghats indicate cities as wild life corridors that can be converted to sinks. While urban metropolises may seem, to be overstressed habitats, they in fact provide mosaic of different types of habitats, including skyscrapers, riversides, graveyards etc. Ecosystem health has deteriorated on the parameters of Biodiversity (10-30%), Carbon emissions (25-40%) and water quality. Pollution, uncontrolled harvesting, introduction of exotics seem to be threats to the biodiversity service. Vegetation cover declined by 25% over last 50 years. However, green cover still survives in informally protected areas like university campuses thereby harboring 51% of tree species and 40% of butterfly species from total recorded species. We argue for the ecological conservation values of such institutions in urban ecosystem, as such areas continue to be the ‘biodiversity source’ by which most urban habitats like gardens, roadside plantings can be converted to ‘sinks’ through ‘wise planning’ as we are proposing. Vulnerability mapping of the study area is done to identify priority areas for conservation.

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FISH FAUNA OF AN AFROMONTANE FOREST: IMPLICATIONS FOR CONSERVATION

The fish fauna of montane streams in the Bwindi Impenetrable National Park (331 km2) was characterized from January to October 2003 through the quantitative survey of 16 sites along a disturbance gradient from relatively pristine to heavily disturbed forest. A total of 2690 fishes were collected and classified into 5 families and 15 species. The mosquito fish Aplocheilichthys eduardensis, Barbus cercops, and B. neumayeri were the most abundant species. Amphilius spp. were the most widespread occurring in 81% of the sampled sites. Major factors correlating with fish assemblage characters and species distributions were identified as ecological/ physical barriers, altitude, and anthropogenic disturbance. For example, fish diversity (Shannon's) index ranged between 0-1.65 and was highest as sites characterized by low altitude and grazing. Species richness across sites ranged between 1 and 14 and was highest at sites characterized by grazing. A species threatened by habitat degradation Labeo victorianus, was found in high abundance in relatively undisturbed forested sites, and Bwindi may serve as an important refuge for the species. We conclude that Bwindi forest and other forest remnants are important for conservation of the Lake Edward system fish fauna, especially for the threatened species Labeo victorianus and some haplochromine cichlids.

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THE EFFECT OF A LITTORAL ZONE INVASIVE CRAYFISH ON PELAGIC ZOOPLANKTON

Invading species can serve as experimental probes to test the strength of interactions between species and habitats. The invasive rusty crayfish (Orconectes rusticus) and northern crayfish (O. propinquus) can disrupt north temperate lake ecosystems by destroying macrophytes and consuming benthic invertebrates. Due to crayfish predation on fish eggs and the loss of macrophyte habitat (demonstrated previously), we hypothesize that small planktivorous fish are less abundant in lakes with high densities of invasive crayfish. Rather than testing this hypothesis directly, we tested a corollary: that crayfish omnivory in the littoral zone reduces fish predation pressure on the dominant pelagic herbivore Daphnia. In 2003, we sampled zooplankton and crayfish in 29 lakes with native or invasive crayfish. We found that lakes with high abundances of invasive crayfish had Daphnia with greater average total lengths (an index of fish predation pressure), supporting our hypothesis. The effects observed were considerably greater in shallow lakes, probably because deep lakes provide Daphnia with a vertical refuge from fish predation regardless of the abundance of crayfish. Our results suggest the effects of invasive crayfish extend beyond the littoral zone they inhabit and into the pelagic zone, emphasizing the important functional links between habitats in lakes.

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APPLYING NEURAL NETWORKS TO FRESHWATER CONSERVATION IN THE NEW YORK CITY DRINKING WATER WATERSHED

Artificial neural networks (ANNs) are relatively new computational tools that hold promise for modeling complex nonlinear relationships in ecology. Particularly in aquatic ecosystems, resource encroachment due to anthropogenic use is proceeding much faster than the knowledge of species-habitat interrelations required to develop explicit mechanistic models. ANNs can learn from examples, generalize to novel situations, tolerate noisy data and approximate any continuous function, making ANNs ideal for modeling the complex and often poorly understood relationship between key ecological resources and focal species. This study evaluates the potential use of an ANN model for freshwater conservation planning based on stream macroinvertebrate and water quality data from the New York City drinking water watershed. Human impact represents a large scale, albeit uncontrolled, experiment providing an opportunity to explore species interactions under novel conditions. Comparing aquatic communities over a range of watershed conditions in the New York City drinking water watershed, using an ANN model reveals patterns of community composition suggesting underlying mechanistic processes. Applied as a means to detect patterns of impairment and evaluate mitigation strategies, ANN models represent a powerful tool for conservation science and ecosystem management.

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IS URBANISATION AFFECTING FISH LIFE IN SYDNEY HARBOUR, AUSTRALIA?

Waterways associated with coastal cities are littered with built structures such as marinas, wharfs and swimming enclosures. These new habitats cause a number of changes to waterways. They introduce novel habitats and may replace or fragment existing natural habitats. It has been suggested that artificial structures, to some extent, provide habitat which is similar to natural hard substratum, such as rocky reefs, despite being very different in appearance. Although this has been a topic of debate for some time, little research has been done to investigate if artificial structures, such as marinas, can potentially mitigate the loss of natural fish habitats. In this study, fish assemblages associated with urban structures and natural rocky habitats were sampled in different areas in Sydney Harbour to test the hypothesis that artificial structures support similar assemblages to natural habitats. Assemblages were similar in the two types of habitat, and overall more species were associated with artificial structures than natural habitats. This pattern persisted in locations at different positions along Sydney Harbour. These results suggest that, at least within Sydney Harbour, artificial structures are supporting equivalent types and abundances of fish to natural rocky reefs. Whether similar patterns are found for other estuaries in the Sydney region will be discussed.

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A NEED FOR SYSTEMATIC APPROACH TOWARDS CONSERVATION OF FISH IN THE WESTERN GHATS OF INDIA

Western Ghats of India harbors 288 species of freshwater fish belonging to 12 orders, 41 families and 109 genera, of which 41% species are endemic to this zoogeographical region. Species accumulation curve, however, shows that there might be 345 species in this region, indicating that at least 16% of fish species have not been recorded till date. As new species are still being described from this region, we predict that further exploration will not only contribute to new records but also to description of new species. The Northern Western Ghats comprises of about 80 species of food fish, 25 species of aquarium fish and 32 species of larvivorous fish that have potential for bio-control of malaria. Such a natural wealth is under threat due to various anthropogenic activities such as pollution, heavy harvesting, construction of dams and introduction of exotic fish leading to homogenization. The threat status of fishes in the Western Ghats suggests that at least 41% of the fish fauna is threatened, being Vulnerable, Endangered or Critically Endangered. Essential conservation measures include pollution management, fishery management, construction of fish ladders on dams, fish sanctuaries, halting siltation and exploring checks on the growth of exotic fish.

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GEOSPATIAL CHARACTERISTICS OF KARST SPRINGS IN SOUTHEAST MINNESOTA

Karst aquifers are important ground-water resources, but are vulnerable to contamination due to relatively fast transport and limited attenuation processes. Springs are direct links to these aquifers and are critical to the viability of cold-water fish communities. For example, in southeastern Minnesota, cold ground-water input is a critical component for reintroducing the native brook trout Salvelinus fontinalis. Therefore, identification of watershed springs is important for proper watershed management and conservation of cold-water aquatic populations. Geographic information systems (GIS) offer potential for the detection of pattern and process of surface features like springs. For example, in southeast Minnesota, 1,987 springs have been geospatially located over seven counties. This database continues to grow as more springs are identified. To examine spatial patterns of known springs, we used redundancy analysis to correlate known spring locations with data from GIS layers containing information relating to physical spring location. Preliminary results suggest that springs are not randomly dispersed on the landscape, but cannot be predicted based on currently developed spatial layers. Springs appear to be related to clusters of variables indicative of particular physical landscape characteristics. However, much variation remains unexplained and warrants more investigation into current spatial data accuracy and spring identification methodology.

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CONSERVATION OF THE COASTAL GREAT BLUE HERON (Ardea herodias fannini) IN AN URBANIZING ENVIRONMENT

The Coastal Great blue heron, a non-migratory subspecies found in the Puget Sound region, appears to be declining. In 1999, roughly 40% of the heron colonies in the Puget Sound region abandoned their nests in mid-season, leaving behind eggs and chicks. Established heron colonies are vulnerable to natural and human disturbances that can result in reduced productivity and nest abandonment. Disturbances include bald eagle and crow incursions, human activity under nest trees, and noises from construction equipment and fireworks. Bald eagle and crow populations are growing in urban areas and incursions may be having an increasingly negative impact on herons. Eagles and crows predate on eggs and chicks and disrupt normal brooding and feeding behavior at colonies. Observed incursions have resulted in nest abandonment and occasionally colony abandonment. Colony distributions over 15 years and observed disturbances potentially contributing to colony abandonment in King County, Washington, are presented. Conservation strategies include buffers, seasonal development restrictions, land acquisition, colony tree stand management, monitoring, and education.

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INTERSPECIFIC RELATIONSHIPS AND HABITAT PREFERENCES OF THE URBAN BIRD COMMUNITY OF SYDNEY, AUSTRALIA

As cities expand, the urban environment is replacing and modifying a large proportion of the natural habitat. However, there are sizeable quantities of vegetation available within the urban matrix, including suburban gardens. If this vegetation could be managed to promote native bird diversity, it may provide valuable secondary habitat for conserving native bird populations. Currently, a suite of introduced birds and large aggressive native species dominate gardens of the Sydney region whilst smaller native insectivores and honeyeaters are thought to be in decline. More than 800 volunteers completed a community survey to explore some of the factors driving this trend. The occurrence of 20 bird species was recorded along with garden attributes, pet presence and supplementary food provisioning. These variables and the presence of three large, aggressive bird species were correlated with the presence of small birds. Although garden characteristics influence the occurrence of small birds, the presence of an aggressive native honeyeater, the Noisy Miner, appears to be the strongest determinant of the distribution of these species in suburban areas. In addition, supplementary feeding is likely to have a negative impact upon some small birds whereas the presence of pets appears to have no direct effect on these species.

CO47-3 **KARUBIAN, JORDAN** UCLA (jordank@ucla.edu)

CONSERVATION AND BASIC BIOLOGY OF THE LONG-WATTLED UMBRELLABIRD IN THE ECUADORIAN CHOCO

The long-wattled umbrellabird, Cephalopterus penduliger, is one of more than 40 species of bird endemic to Chocó habitat in western Colombia and northwestern Ecuador. As with many Chocó endemics, the long-wattled umbrellabird is in danger of extinction due to widespread habitat degradation coupled with hunting pressure. However, little is known of the species' basic biology, hampering conservation efforts. Here we present findings from the first systematic research on the long-wattled umbrellabird, conducted in the Mache-Chindul Reserve in northwestern Ecuador from 2002 to the present. Long-wattled umbrellabirds are a lek-breeding species. Although males are present at lek sites year-round, peak breeding occurs in the dry season (September-January). Radio tracking of 13 adult umbrellabirds revealed that both males and females maintain limited home ranges. Contrary to common belief, long-wattled umbrellabirds use a range of habitat types, from primary to highly degraded forests, suggesting that it is not habitat degradation per se causing their decline (interviews suggest that hunting pressure is an important factor). Both males and females form large, socially cohesive foraging flocks, a rare trait for a lek-breeding species. Long-wattled umbrellabirds are an important seed disperser in Choco forests: they eat a wide range of fruits and disperse seeds > 2 km. from the source tree, often from primary to secondary forests.

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RADAR OBSERVATIONS QUANTIFY THE IMPORTANCE OF SUBURBAN HABITAT TO MIGRATORY BIRDS

Years of intense mechanized agriculture throughout the Midwestern United States caused severe loss of native habitat. Today, much existing wooded habitats remain as part of the suburban landscape. For this reason, suburban areas may represent the only alternative to extremes in agriculture or urbanization for nearctic-neotropical birds seeking stopover habitat at the end of migratory flight. To understand how urban, suburban, and agricultural landscapes might collectively influence regional migrant distributions, data from weather surveillance radar was used to quantify migrant abundance in habitats throughout the greater Chicago, Illinois area. Around Chicago, migrant abundances correlated significantly with the distribution of wooded habitat; this relationship was stronger in spring than fall. Much of this wooded habitat falls within the suburban belt surrounding Chicago. Suburban dominated metropolitan areas outside Chicago also exhibited higher migrant abundances than surrounding agricultural habitats. Although suburban Chicago experienced high migrant abundances, highest migrant densities were associated with wooded patches in the surrounding urban and agricultural landscapes. Though not an endorsement of sprawl, suburban encroachment into highly agricultural landscapes can represent an oasis of stopover habitat to migrating birds. Landscaping that favors habitat for birds may be especially beneficial to migrants occupying suburban areas bordered by agricultural landscapes.

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IMPORTANCE OF CLAY LICKS ON SOCIAL PATTERNS AND DISTRIBUTION OF MACAWS IN TROPICAL RAINFORESTS

The importance of clay licks to numerous rainforest species has been noted by several scientists, though none has radio-tracked birds to monitor their movements to and from the licks. Macaws are heavy users of clay licks, reportedly either to obtain minerals or to neutralize toxic chemicals in their food. We monitored the use of a clay lick in southeastern Peru by radio-collared red-and-green macaws (Ara chloroptera) to determine visitation patterns and distances traveled to the lick. While certain individuals took clay and left the lick quickly, others remained in trees around the lick for several hours without taking clay, suggesting that they visit the site for other reasons. We suggest that clay licks have a social, as well as an alimentary, function and that the licks impact macaws' behavior and distribution more than previously thought. These data further emphasize that conservation planners must consider the distribution of small-scale landscape features, such as clay licks, as well as reserve size, in designing areas to protect wide-ranging species.

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GREAT LAKES PIPING PLOVER MIGRATION STOPOVER SITES: USING BIRDERS' REPORTS TO STUDY MIGRATION PATTERNS AND HABITAT USE

The Great Lakes population of Piping Plovers (Charadrius melodus) has been extensively studied, but knowledge about migration ecology is limited; this information is needed for recovery. Because the population is small (~ 50 breeding pairs), tracking individual birds is not feasible. This study compiled records (e.g. state atlases, bird journals) of Piping Plover sightings from a “hypothetical migration pathway” used by Great Lakes birds between winter and breeding sites. Data were used to identify current and historic stopover sites and sites to visit to study habitat characteristics. Additionally, we examined chronology and spatial patterns of migration between the breeding and wintering grounds. We located >1500 fall and spring stopover records and visited >15 sites to measure habitat characteristics. Results show that Piping Plovers use sites throughout the migration pathway during both fall and spring. Habitat used was shoreline of reservoirs, natural lakes, and rivers. Finally, reports indicate that plovers do not concentrate in large numbers at inland stopover sites and site use is highly influenced by local water levels and water management policy.

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AVIAN ASSEMBLAGES ALONG A GRADIENT OF URBANIZATION IN A HIGHLY FRAGMENTED LANDSCAPE

We evaluated how avian assemblages varied along a gradient of urbanization in the highly fragmented landscape of coastal southern California. We measured species richness and abundance of birds within continuous blocks of habitat, within urban habitat fragments that varied in landscape and local habitat variables, and within the urban matrix at different distances from the wildland interface. At the fragment scale, we found that fragment area was a strong, positive predictor of the total number of breeding species detected per fragment and total bird abundance per point count. Tree cover was higher in small fragments, as was the abundance of birds that typically occupy wooded habitats. In unfragmented habitat, we recorded a relatively high diversity of urbanization-sensitive birds. In urban transects, these species were rare, and a relatively few species of non-native and anthropophilic birds were common. Bird communities along the urban gradient reached their highest richness and abundance in fragments. The marked difference in vegetation structure between urban and natural landscapes in this arid shrubland system likely contributed to this pattern. As is characteristic of biotic homogenization, urban fragmentation in coastal southern California may increase local diversity but decrease overall regional avifaunal diversity.

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URBAN BIRD DIVERSITY ALONG A GREEN CORRIDOR IN JERUSALEM: AN ANALYSIS USING REMOTE SENSING AND GIS APPROACHES

Expanding urban landscapes are leading ecologists to study the forces that shape diversity patterns and processes in these environments. Urban systems can be studied using similar approaches to those applied in more “natural” systems. Applying point-sampling methods we sampled bird diversity in 40 Locations in Jerusalem between July-October 2003. We examined the hypothesis that bird richness will decrease along a green corridor from the city periphery to the city core as well as a secondary urban gradient from the green corridor to adjacent neighborhoods. Both gradients had little explanatory power of bird richness. However using Landsat satellite images to classify the different degrees of vegetation cover and parks within the neighborhoods (i.e. built vs. park areas) we explained 62% of the total variation in bird richness. The Normalized Difference Vegetation Index (NDVI) proved to be most effective in explaining bird richness patterns: looking at increasing spatial scales we were able to explain up to 81% of the observed variance in bird richness at a 0.15 km^2. This research emphasizes the effectiveness of remote sensing as a tool in biodiversity, including urban diversity studies, and highlights the need to further examine the relative importance of different variables across spatial scales.

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CONSERVATION PLANNING AND POPULATION VIABILITY: PROBLEMS OF USING PRESENCE/ABSENCE DATA TO PROTECT THE MAMMALS OF SWAZILAND

Presence/absence distribution data are often used in conservation planning exercises to identify where new protected areas (PAs) should be located, but caution is needed when interpreting their results. This is because populations of each focal species recorded in the selected areas may not be viable. However, this may be less important if these species list data reflect levels of agricultural transformation, so we used a species distribution and landcover dataset to test whether this is the case for the mammals of Swaziland. The mammal dataset described the distribution of 155 species in 82 1/8th degree grid squares that were all sampled for between 3 and 5 days during the mid-1990s. The distributions of these species are affected by habitat transformation at the site scale but there was no correlation between grid square species richness and the proportion of the square that was transformed. More importantly, the near-minimum set of squares needed to represent each species at least once were no less transformed than unselected squares, although squares that overlapped with existing PAs were significantly less transformed. Therefore, we suggest that similar planning exercises incorporate landcover data to increase the likelihood of identifying more viable PA systems.

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SELECTING FOCAL SPECIES IN URBANIZING AREAS WITH INPUT FROM EXPERTS AND LOCAL PEOPLE

Focal species are a critical component of conservation planning in urbanizing regions. A Delphic-survey, matrix-based approach was used for involving regional experts in the selection of potential focal species, as applied in Nova Scotia, Canada and Maine, USA. Matrices with native species and selection characteristics were related to biological traits and habitat requirements were used to summarize expert knowledge and judgment. Thirty experts completed the matrices, which were subsequently numerically assessed. Three-stage, in-depth qualitative surveys were also conducted with 70 members of the general public to determine which species would motivate them to conserve wildlife. These findings were compared with the species identified by the experts. Areas of greatest overlap included endangered and charismatic species such as small birds, Peregrin Falcon, Northern Goshawk, southern flying squirrel, Blandings and wood turtles, Brook trout, Atlantic salmon, black bear, beaver, lynx and bobcat. Concerns remain around the lack of representation of some classes of species and the subjective nature of the assessments. Accordingly, potential focal species should be subject to verification through more rigorous and quantitative analysis and monitoring. Nonetheless, if applied with care, survey, matrix-based approaches can provide an effective way of engaging relevant communities in focal species selection.

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INCORPORATING EXPERT ADVICE INTO CONSERVATION PLANNING: SOME INSIGHTS

Improving the practice of conservation requires practitioners to use the best available science to set clear and meaningful objectives for the conservation of focal species or systems ("targets"), develop strategies designed to accomplish those objectives, monitor whether focal target status is improving, and systematically build learning into this cycle of planning, action, and monitoring. Data to substantiate each decision along the way are generally unavailable for most targets, requiring practitioners to rely on expert opinion. The objectives developed are, therefore, hypotheses until more complete data are available. However, researchers, while comfortable with developing and testing hypotheses, are not comfortable when actions and hypotheses are simultaneously implemented. The Nature Conservancy's Florida Chapter has convened expert workshops, conducted interviews, and worked with a graduate class to obtain the best available data and advice. Thus far, we conclude that iterative one-on-one interviews are the most effective, but most time-consuming approach.

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LOCAL RESISTANCE TO CONSERVATION PLANNING: 'CONSPIRACY THEORY' AND NATURAL HERITAGE 2020 IN NEVADA COUNTY, CALIFORNIA

Conservation biologists and land use planners are increasingly turning their attention to protecting biodiversity on private lands, seeking to integrate principles of conservation biology into land use planning efforts that address the patterns of development occurring in rural areas of the United States. Employing a political ecology approach, this research demonstrates the role that land use planning plays in community political struggles and the ways these struggles may have unintended consequences for conservation planning efforts. The authors present research on a collaborative land use planning process in Nevada County, CA—known as Natural Heritage 2020--and the contention over its efforts to conserve natural habitats threatened by ongoing residential development in this exurban community of the American West. The conflict over Natural Heritage 2020 demonstrates how claims of ‘U.N. conspiracy’ fundamentally altered community dialog about the planning process, and ultimately contributed to its demise. The research highlights the importance of understanding the local social and political dynamics within which conservation planning efforts are attempted.

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WHERE THE ARCS MEET THE RIFT: BIOGEOGRAPHY, OUTLIERS AND CONSERVATION IN TANZANIA'S SOUTHERN HIGHLANDS

Since the term 'Eastern Arcs' was first coined and its southern limit defined as the Makambako Gap, there has been little research to evaluate the broader validity of this boundary. We have investigated the montane forests and grasslands of Tanzania's Southern Highlands, enabling a greater understanding of the area's biodiversity and shedding more light on its place on the biogeographical map. On Mt Rungwe, a 10,000 ft volcano, 530 species of plants, 83 mammals, 230 birds, 32 reptiles, 34 amphibians, 11 fish, 253 butterflies, 64 hawk/silk moths and 18 dragonflies have been recorded. Some represent range extensions from the Eastern Arcs and the Albertine Rift. Others are endemic to the Southern Rift, to which the mountain is usually attributed. The biogeographical boundaries of the region are blurred and interpretation is dependent upon the taxa and habitats being examined. Classifying Mt Rungwe as an 'Outlier' may also be accurate, however the term can have negative connotations undermining an area's perceived worth. Indeed, Mt Rungwe is a rich site with its own endemics, as well as considerable economic and cultural value. Our broad-based activities in the region therefore, seek to protect important sites that have not necessarily registered on the conservation radar.

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HANAUMA BAY: SUCCESSFUL MANAGEMENT OF A SMALL URBAN MARINE PROTECTED AREA (MPA)

The Hawaiian Islands contain 85% of US coral reefs, 1.2 million residents and over 6 million annual visitors. The City/County of Honolulu (CCH) has a population density of 596 persons/km2, houses 75% of residents and accommodates most visitors. The Hanauma Bay Nature Preserve (HBNP) was acquired by the CCH in 1928 as rural parkland fronting an eight-acre crescent beach and 101-acre coral-filled bay. Designated the state's first no-take Marine Life Conservation District in 1967, the Bay became Hawaii's premier snorkel site and a tourist destination second only in popularity to Waikiki Beach. By 1989, over 3 million visitors/year (mean of 9,000 people/day) were crowding the Bay and degrading the resources. The CCH implemented a management plan in 1990, reducing visitation two-thirds and creating a visitor education program. In 1997, a user-fee was instituted and in 2001 state-of-the-art education and concession facilities added. These actions positively changed visitor behavior; for example the reduction of reef walking by 50%. In 2002, an economic asset valuation of HBNP exceeded US$1 billion. HBNP stewardship is achieved through a model partnership among CCH, Friends of Hanauma Bay, Hawaii Sea Grant, and volunteers that may have utility in the stewardship of other urban MPAs.

CO48-7 **FILARDI, CHRISTOPHER E. and Catherine E. Smith** Department of Ornithology, American Museum of Natural History, Central Park West at 79th Street, NY, NY 10024-5192 (filardi@amnh.org)

CONSERVING INSULAR DIVERSITY ACROSS AN ARCHIPELAGO: DEFINING AREAS OF GENETIC ENDEMISM FOR SOLOMON ISLAND BIRDS

The Solomon Archipelago is characterized by some of the richest and intact patterns of avian endemism in the world. However, with over 900 islands spanning nearly 1500 kilometers, only a small portion of the Solomons will ever be protected. This poses special challenges for identifying key areas for biodiversity conservation, especially when patterns of endemism appear idiosyncratic in geographic scale and evolutionary degree. We used a phylogenetic approach to compare genetic distinctiveness among codistributed bird groups found across the archipelago. One island, Malaita, contains the most distinctive genetic lineages, but a high degree of phylogenetic diversity is shared among several main island groups historically connected by land bridges. Thus, archipelago-wide phylogenetic analyses suggest several large reserves may protect much of the Solomons' unique diversity. Interestingly, both analyses of morphological species limits and phylogeographic analyses of several endemic lineages on a smaller spatial scale within the New Georgia group suggest significant partitioning of genetic diversity across very short geographic distances. Therefore, a set of smaller areas across this island group may also be essential. These results suggest genetic techniques are useful for defining biodiversity within island arcs but argue for analyses on multiple geographic and evolutionary scales.

CO48-8 **BEKESSY, SARAH A., Brendan A. Wintle, Joe Banks, and Michael A. McCarthy** School of Social Science and Planning, RMIT University, GPO Box 2476V, Melbourne, Australia, 3001, (sarah.bekessy@rmit.edu.au) (SAB, JB). School of Botany, University of Melbourne, Victoria, Australia, 3010 (BAW, MAM).

PREDICTIONS OF SPECIES PERSISTENCE AS A TOOL FOR STRATEGIC PLANNING IN THE EXPANDING URBAN FRINGE

In Australia, over 40% of nationally listed threatened ecological communities occur in urban areas and accelerating urbanisation is considered one of the greatest threats to biodiversity. This threat will increase without a more strategic approach to conservation planning that recognises the complicated tradeoffs between competing land uses in the urban fringe, including housing development, agricultural production and conservation. We describe a risk assessment framework for evaluating competing urban expansion scenarios that incorporates modeled predictions about the probability of persistence of native species. The method integrates spatial models of landscape change with meta-population models that describe demographic attributes of species and the dynamic consequences of migration and habitat change. Such models may be used to predict the meta-population level consequences of landscape planning options on species, while maintaining a realistic representation of prediction uncertainty. We illustrate the method using a case study in the urban fringe of Melbourne, Australia. The case study demonstrates the sensitivity of models to differences between scenarios in terms of population persistence. Our models provide an efficient and inexpensive approach to assessing and ranking the sustainability of planning options. This tool will facilitate transparent decisions based on optimal trade-offs between competing values in the urban fringe.

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DEMOGRAPHIC AND LANDSCAPE CORRELATES OF WOLF PREDATION ON DOMESTIC ANIMALS IN THE MIDWESTERN USA

Large carnivore populations recovering within a mosaic of private and public lands will come into conflict with people when they damage property, prey on domestic animals, or threaten human safety. Wildlife managers can benefit from tools to predict where such conflicts will occur. We review correlates of wolf predation on livestock and hunting dogs in the Lake Superior region and present two predictive models to forecast the locations of such conflicts. The models employ a GIS framework and a matched-pair discriminant function analysis to compare affected areas to neighboring, unaffected areas. Our models and maps are designed to help managers focus their outreach and interventions to areas of greatest vulnerability. We discuss methods of studying, monitoring and mitigating human-carnivore conflicts generally.

CO49-2 **VANDEMAN, MICHAEL J.** 221 W. Winton Ave., C300, Hayward, CA 94544-1212 (mjvande@pacbell.net)

THE IMPACTS OF MOUNTAIN BIKING ON WILDLIFE AND PEOPLE -- A REVIEW OF THE LITERATURE

The sport of mountain biking is expanding rapidly, fueled partly by the mountain bike and tourism industries, the Olympics, and other competitive events (recently, e.g., "adventure racing"). It is putting intense pressure on wildlife habitat, worldwide, as well as inhibiting efforts to protect additional lands. It is important, therefore, to assess its impacts on wildlife, people, and the environment. I reviewed all the available studies, focusing primarily on physics and conservation biology. All of the studies on mountain biking that attempt to compare the impacts of hiking and mountain biking (which address primarily erosion, but also intimidation of wildlife, horses, and other trail users) conclude that their impacts are essentially the same. However, their research designs all have serious flaws: they ignore speed and distance travelled, and nearly all ignore impacts on wildlife; they also make no attempt to test mountain biking under realistic conditions (e.g. normal speeds). A more accurate conclusion from the data presented would be that the impacts of mountain biking are actually from two to six times those of hiking, due in part to the greater speed and distance travelled by mountain bikers.

CO49-3 **MACK, ANDREW and Paige West** Wildlife Conservation Society PNG Program, Box 277, Goroka, EHP, PAPUA NEW GUINEA, (amack@wcs.org). Department of Anthropology, Barnard College, Columbia University, 3009 Broadway, New York, NY 10027-6598

PRELIMINARY RESULTS OF A STUDY OF HUNTING OFFTAKE IN PAPUA NEW GUINEA: SUMMARY OF WILDLIFE CONSUMPTION

In the Crater Mountain Wildlife Management Area we surveyed wildlife consumption by a subset of people in two different ethno-linguistic groups over 60 days. Through structured interviews we collected data on what is hunted, where, by whom, and many socio-economic parameters. Of 489 animals killed, 96.5% were by men; 61% of kills were by bow and arrow and 18% by hand-- no guns were used. Dogs located 24.5% of the animals. Most (93.4%) were killed for food; the remainder fulfilled social obligations. Pigs and cassowaries comprised most of the game mass, followed by cuscus, and tree kangaroos. The total mass of the game sampled was about 1,221 kg. Individual items were shared among 1 to 56 individuals, mean = 566g (SD = 2520) per consumer. About 40 g of game per person per day was consumed in these communities. Extrapolating from this suggests that the estimated 1.75 million people (35% of PNG's population) heavily dependent on wild game consume roughly 26 million kg of game per year. Per capita wild game consumption exceeds the national per capita domestic meat production. Sustainable wildlife management in PNG is necessary to sustain the health, diets, cultures and livelihoods of millions of people.

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DIFFERENTIAL IMPACTS OF THE WILDLIFE HARVEST AND TRADE IN RURAL LIBERIA, WEST AFRICA

Liberia is a conservation priority within the Upper Guinea forest block of West Africa. With a wildlife consumption rate that is among the highest in Africa, Liberia's biodiversity is at risk. However, much of Liberia's population is socio-economically dependent upon wild meat and the bushmeat trade. Hunters in Sinoe County reported that, although species specific, 45% of all meat harvested was sold. While the majority of the catch was common crop pest species (black and Maxwell's duiker, bushbuck and Red River hog), the frequency at which rare species were reported was related to the proximity of high forest. Hunters located near high forest reported greater species diversity (30-36 species versus 15-21 in more agricultural sites) and a higher percentage of protected species (27-39% of the total catch versus 17-19%). Protected species management efforts could significantly impact income generation in rural communities characterized by abject poverty. Managers must be aware of the biological and economic impacts of the harvest, and focus attention on a few species that are most threatened. Wildlife managers, as well as conservation and development organizations, may then target regions where priority species are most threatened and assist communities in meeting development needs while also achieving conservation goals.

CO49-5 **DOVIE, DELALI B.K.** Restoration and Conservation Biology Research Group, School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Wits 2050, Johannesburg, South Africa (delali@biology.wits.ac.za)

LINKAGES BETWEEN INDIGENOUS KNOWLEDGE SYSTEMS, HOUSEHOLD PROFILES, DEVELOPMENT AND RESOURCE UTILIZATION

Majority of marginalized people depend largely on key resources from the woodlands of the biodiversity rich savannas of South Africa for their livelihoods. However, the link between households' characteristics, resource use and availability is poorly understood. Analysis of households' dependence on woody plant species and implications for conservation is presented. Diversity and richness of woody plant species in communal rangelands were evaluated alongside availability and use. Most species had more than single usage and often three. These were medicinal, nutritional, fuel, cultural, aesthetic, building materials, art and craft, and fencing purposes. Although more households had females who harvested resources from the woodland vegetation, females had limited knowledge about individual species diversity. However, females were more knowledgeable in rare and less easily accessible species. Younger females aged 30 years and below were more conversant with diversity compared to others. Conversely among the males, those aged 31 years to 50 years were generally more knowledgeable about species diversity. Urbanization and work on commercial farms were noted to reduce knowledge about species. Most indigenous names and identification represented uses, local conservation status, and history of growth. Conservation programs need to target females, as more are becoming household heads and significant resource users.

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INTEGRATION OF SCIENCE AND LOCAL KNOWLEDGE: LANDSCAPE LEVEL CONSERVATION, SCIENCE, AND THE SOCIO-ECONOMIC CONTEXT

Long-term large-scale studies developed in collaboration with ranchers and researchers of the Arizona-New Mexico borderlands document the interaction of driving processes in these arid and semi arid rangelands. The process demonstrates that developing and sustaining research at scales relevant to management often requires innovative institutional frameworks as much as a solid foundation of science. The application of science to the collaborative conservation process supports conservation related research and helps sustain communities by giving credibility to locally-based conservation efforts. Two key points emerge from the analysis. First, when examining scale dependant processes such as fire or grazing one must first get the scale right if the results are to be truly applicable to conservation and management. Second, the action is in the interaction. Studies that examine single variables in isolation can often be misleading or at best miss much of the inherent complexity and dynamics of working landscapes.

CO49-7 **PINTEA, LILIAN** University of Minnesota, Conservation Biology Program, 100 Ecology Building,St. Paul, MN 55108 (pint0020@umn.edu)

THE ROLE OF HYPERSPATIAL SATELLITE IMAGES FOR CONSERVATION PLANNING AT THE VILLAGE LEVEL: THE CASE OF CHIMPANZEES IN GOMBE NATIONAL PARK, TANZANIA

A multitude of satellite-based sensors of varying characteristics now make it possible to map land cover and land use within ape ranges in Africa. Recent availability of hyperspatial imagery promise to revolutionize the way we perceive and manage landscapes at the local scales. Considering that this is the level where many human activities impact ape habitats, such data could be extremely useful to objectively plan, implement and measure success of conservation interventions. The objective of this study was to explore the feasibility of using hyperspatial satellite images to support chimpanzee conservation on the village lands adjacent to Gombe National Park, Tanzania. We combined interpretation of 1-meter IKONOS satellite images with the participatory mapping methods of PRA to solicit detail land cover information in six villages. The study suggests that integrating villager's knowledge of natural resources with "high tech" mapping tools could improve their usefulness for conservation. Villagers were able to easily locate village infrastructure, social services, and vegetation patterns from satellite images printed at 1:7000 scales. Accessible and credible to local institutions, it is anticipated that such information will have a higher chance to assist in negotiating future chimpanzee conservation strategies on the village lands adjacent to Gombe National Park.

CO49-8 **GEORGE, SHALENE and Kevin R. Crooks** University of Wisconsin-Madison, Department of Wildlife Ecology, 226 Russell Labs, 1630 Linden drive, Madison, WI 53706 (shalenegeo@yahoo.com) Colorado State University, Department of Fishery and Wildlife Biology, 115 Wagar, Fort Collins, CO 80523

THE EFFECTS OF RECREATION ON LARGE MAMMALS IN AN URBAN NATURE RESERVE

Recreational impact studies on wildlife behavior mostly occurred in natural settings. Urban wildlife may be exposed to high recreation levels, to which some large mammals may be particularly sensitive. Remotely-triggered cameras detected wildlife and humans along paths in the Nature Reserve of Orange County, a large reserve (ca. 150km2) immersed within the vast urban landscape of southern California. Relative abundance indices and circadian activity patterns were determined from camera data (1999-2001; 49 stations; 16995 images; 4232 observation nights). Humans were the most detected species followed by coyotes, mule deer, dogs, bobcats, gray foxes, striped skunks, cougars and raccoons. Relative abundance and daily activity data indicated bobcats were the most sensitive to recreation, then coyotes, with mule deer least likely to exhibit behavioral shifts. Bobcats and coyotes were less active on paths with high versus low human use. Bobcats also tended to shift to more nocturnal patterns in high recreation areas. Relatively few detections of gray foxes, cougars, raccoons and striped skunks limited our ability to assess recreational impacts on these species. Results indicated varying degrees of negative behavioral responses by urban wildlife to recreation; more information is necessary to determine if behavioral shifts translate into fitness effects and population persistence.

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CONSERVATION MEDICINE, SENTINEL SPECIES AND MARINE ECOLOGICAL HEALTH: CAN WE MAKE THE CONNECTION?

Methods to assess marine ecological health are grossly lacking. Infectious disease outbreaks, mass mortality events, harmful algal blooms, and anomalous changes in selected species abundance and composition, may signal a decline in ecological health. One proactive method to get a handle of this large-scale problem on disease emergence is the surveillance of sentinel species. Sentinel species are the proverbial “canaries in the mineshaft”. As bioindicators of their environment they reflect the quality of health in marine ecosystems. This approach provides a series of “snap shots” of environmental changes to determine if animal, human or ecosystem health may be affected. Marine vertebrates are good integrators of changes over space and time and represent excellent sentinels of ecosystem health. By moving in and out of infected/polluted areas, they can spread pathogens and contaminants geographically as well as throughout the food chain. The sentinel species concept can be useful for providing an “early warning” system of emerging diseases or for monitoring the course of disease related activities requiring prevention, remediation or control. We have identified a number of critical research needs and opportunities for transdisciplinary collaboration that could help advance the use of sentinel species in ecosystem health and monitoring of disease emergence.

CO50-2 **BROMLEY, CASSITY, Seth P.D. Riley, Piper L. Roby, Jeffrey A. Sikich, Catherine M. Schoonmaker, and Raymond M. Sauvajot** Santa Monica Mountains National Recreation Area. 401 W Hillcrest, Thousand Oaks, CA 91360 (Cassity_Bromley@nps.gov)

A MANGE EPIDEMIC AND ANTICOAGULANT EXPOSURE IN URBAN BOBCATS IN SOUTHERN CALIFORNIA

Though mammalian carnivores are particularly susceptible to the loss and fragmentation of habitat associated with urbanization, some carnivores persist and even thrive in urban areas. Since 1996 we have studied bobcat ecology in an urban southern California landscape. Beginning in 2002 we observed significantly lower bobcat survival rates due to notoedric mange. When we tested for anticoagulant presence, we found that 17 of 19 animals with advanced mange also had detectable levels of anticoagulant in the liver. We also tested animals that died of other causes, to determine background levels of exposure to anticoagulants. Of 39 livers tested for anticoagulants, 25 had a detectable level of one or more compound. Anticoagulant exposure and mange are highly correlated (Fisher exact P = .002). We suspect that animals with an anticoagulant burden are more susceptible to mange. Home range and movement data allows us to pinpoint the intensity of urban use for individual animals and determine if urban area usage and anticoagulant levels are correlated. Disease and toxin exposure are serious threats to urban carnivores and urban wildlife in general. Public education may be a critical tool for mitigating these effects.

CO50-3 **FIORELLO, CHRISTINE V. and Andrew J. Noss** Center for Environmental Research and Conservation, 1200 Amsterdam Ave., Columbia University, NY, NY 10027 (fiorelloc@mail.vetmed.ufl.edu) (CVF). Wildlife Conservation Society Field Veterinary Program (CVF) and Latin America Program (AJN), 4424 NW 13 St., A2, Gainesville, FL 32609.

DEMOGRAPHICS, ECOLOGY, AND SEROSURVEY OF DOMESTIC DOGS IN THE ISOSO OF BOLIVIA

Disease is increasingly recognized as a threat to wildlife conservation. In many wild carnivore disease outbreaks, the pathogen source is the domestic dog. For disease spillover to occur, three conditions must be satisfied: 1) susceptibility of the wild species; 2) presence of the pathogen in the domestic population; and 3) contact between the two populations. This study investigated conditions (2) and (3) in the Bolivian Isoso, an area of tropical dry forest contiguous with the Kaa-Iya National Park. Resident questionnaires were used to gather data on the demographics of dogs, including adult and neonatal mortality, age, and litter size. A large dataset containing self-recorded hunting information was analyzed to determine the extent of dog participation in hunting and duration of hunting trips. Blood samples were taken from 98 Isoceño dogs for a serosurvey of canine pathogens. Our results demonstrate that dogs have a high seroprevalence of canine distemper virus (95%), parvovirus (95%), and herpesvirus (68%); a high population turnover (suggesting the potential for disease endemnicity) based on low average age (3-4 years) and high neonatal mortality (80%); and frequent opportunities for contact with wild carnivores. In conclusion, domestic dogs represent a disease risk for susceptible wild carnivores in this habitat.

CO50-4 **GOTTDENKER, NICOLE, Luis Padilla, Diego Santiago-Alarcon, Jane Merkel, Mary Duncan, Tim Walsh, Gustavo Jimenez, R. Eric Miller, and Patricia G. Parker** Charles Darwin Research Station, Puerto Ayora, Galapagos, ECUADOR (ngottdenker@earthlink.net)(NG, GJ). Saint Louis Zoo, One Government Drive, Saint Louis Mo 63110 (NG, LP, JM, MD, NG, TW, RM, PP). University of Missouri – St. Louis, Department of Biology, 8001 Natural Bridge Road, St. Louis MO 63121 (PP, DA)

URBAN WILDLIFE OF THE GALAPAGOS ARCHIPELAGO: ROCK DOVES (COLUMBA LIVIA), DISEASE, AND CONSERVATION OF NATIVE GALAPAGOS AVIFAUNA

Over the past century, rock doves (Columba livia) were introduced to Santa Cruz, San Cristóbal, and Isabela islands in the Galapagos archipelago. Efforts are underway to eliminate rock doves from the islands. Our goal is to identify diseases of introduced rock doves and evaluate their risk to the health of endemic Galapagos avifauna. During rock dove eradication campaigns on Santa Cruz and San Cristóbal, ante- and post-mortem examinations were performed. Concurrent health surveys were conducted on Galapagos doves (Zenaida galapagoensis). Trichomonas gallinae, a pathogen of many Columbiformes, was identified by polymerase chain reaction in 44% of the rock doves on San Cristobal. Chlamydophola psittaci antigen was not detected in rock doves but it was present in 6% of Galapagos doves. Although no hemoparasites were detected in rock doves, a Haemoproteus species was identified in 89% of Galapagos doves. Histopathologic lesions seen in rock doves included severe granulomatous hepatitis in 36.2% of birds, and renal trematodiasis in 17.4%. The Trichomonas gallinae and liver disease findings are significant, and may pose a health risk to native avifauna. The presence of T. gallinae on S. Cristobal may have contributed to the apparent rarity of Galapagos doves on that island.

CO50-5 **PEARMAN, PETER B., Trenton W. J. Garner, Monika Straub, and Urs F. Greber** Michigan Natural Features Inventory and Department of Fisheries and Wildlife, 345 Giltner Hall, Michigan State University, East Lansing, Michigan, 48223 (PBP, pearman@msu.edu), Zoologisches Institut, Universitaet Zuerich, Winterthurerstrasse 190, 8057 Zuerich, Switzerland (TWJG, MS, UFG)

SUSCEPTIBILITY OF A RED-LISTED ANURAN TO AN EMERGING VIRUS PREDICTED BY POPULATION GENETIC DIVERSITY

The global decline in amphibian populations is of concern because of the implications that widespread die-offs and extinctions have for the conservation of biodiversity. Emerging diseases likely play a causative role in amphibian die-offs and factors that influence disease susceptibility in amphibians are currently of great interest. We experimentally addressed the relationship between population genetic diversity and susceptibility of the Italian agile frog (Rana latastei), an IUCN red-listed anuran, to an emerging ranavirus that is associated with amphibian die-offs. R. latastei populations vary in levels of genetic diversity across the species' range in northern Italy. We simulated continuing emergence of an infectious agent by using a North American strain of ranavirus, Frog virus 3 (FV3), in challenge trials of R. latastei tadpoles from six populations. We exposed ten replicate full-sib families from three high- and three low- diversity populations to FV3 using an established, standardized protocol. Population genetic diversity predicts relative susceptibility to emerging ranaviral disease in R. latastei. It remains unclear whether variation in susceptibility results from recent genetic effects of habitat fragmentation and population isolation, or results from bottleneck events during a post-glacial range expansion. We provide a framework for distinguishing between these two hypotheses.

CO50-6 **PARKER, PATRICIA G., Teresa Thiel, Noah Whiteman, Jennifer Bollmer, Timothy Walsh, Mary Duncan, and Eric Miller** University of Missouri – St. Louis, Department of Biology, 8001 Natural Bridge Road, St. Louis MO 63121 (pparker@umsl.edu) (PGP, TT, NW, JB). Saint Louis Zoo, One Government Drive, Saint Louis MO 63110 (TW, MD, EM).

INFECTIOUS DISEASE IN ISLAND ENDEMICS: AVIAN POX IN GALAPAGOS BIRDS

Avipoxvirus is a genus of DNA viruses of birds transmitted mechanically by hematophagous insects or through breaks in the skin. Thirteen described strains exhibit taxon specificity and differ in pathogenicity. Cutaneous lesions symptomatic of pox had been observed in domestic chickens and in several endemic passerine birds on the Galapagos Islands. We confirmed the presence of cytoplasmic inclusion bodies diagnostic of pox through histopathology. We amplified DNA from pox lesions of 55 chickens, Galapagos mockingbirds, yellow warblers, and several species of Darwin's finches and sequenced 650 bp at two loci. The sequences of viral DNA from Galapagos chickens are virtually identical to published sequence of fowlpox virus, while those from passerine birds describe two viral strains that are very similar, although not identical, to canarypox virus. Both Galapagos viral strains occur in all Galapagos passerine taxa examined. The most parsimonious explanation for this pattern is that there were two independent colonizations by pox viruses, one of fowlpox virus infecting the chickens, and one of canarypox virus or a close variant, which has differentiated slightly on the islands. This conclusion has large impact on management decisions regarding keeping of domestic poultry in this National Park and World Heritage Site.

CO50-7 **DAVIDSON, CARLOS, Michael Benard, H. Bradley Shaffer, Louise Rollins-Smith, and John M. Parker** Dept of Environmental Studies, California State University, Sacramento, 6000 J Street, Sacramento, CA 95819-6001 (CD) (cdavidson@csus.edu) Center for Population Biology, University of California, Davis, CA 95616 (MB) Section of Evolution and Ecology, and Center for Population Biology, University of California, Davis, CA 95616 (HBS) Department of Microbiology and Immunology, Vanderbilt University, Nashville, TN 37232-2363 (LR) Office of Laboratory Animal Care, University of California, Berkeley, CA 94720-7150(JP)

THE EFFECTS OF LOW DOSES OF PESTICIDES ON FROG SUSCEPTIBILITY TO CHYTRID FUNGUS

It has long been suggested that disease and environmental contaminants may synergistically contribute to amphibian population declines. Sub-lethal levels of contaminants may suppress amphibian immune defenses and thereby facilitate disease epidemics. We conducted laboratory experiments on newly metamorphed foothill yellow-legged frogs (Rana boylii) to determine if low-level exposure to the pesticide carbaryl would increase susceptibility to the pathogenic chytrid fungus (Batrachochytrium dendrobatidis) that has been associated with amphibian declines. In two separate experiments we examined the effect of pesticides, chytrid and interactions on individual survival, time to death, and growth over a two-month period. Pesticide treated animals were given a one-time 24-hour sub-lethal exposure to either 0.48 or 0.048 mg/l of the pesticide carbaryl in water at the start of the experiment. Chytrid treatments consisted of 24-hour exposure to nine million chytrid zoospores in water three days later. We found a strong negative chytrid effect on growth, but no chytrid, pesticide or interaction effects on survival or time-to-death. Chytrid infection reduced growth by about 50% but it did not result in higher mortality. We also measured animal antimicrobial skin peptide production. R. boylii skin peptides strongly inhibited chytrid growth in-vitro, and pesticide exposure significantly reduced animal's skin peptide production.

CO51-1 **RAUCH, ERIK** MIT 200 Technology Square, Room 434, Cambridge, MA 02139 (rauch@ai.mit.edu)

DIVERSITY IS UNEVENLY DISTRIBUTED WITHIN SPECIES

Global efforts to conserve species have been strongly influenced by the heterogeneous distribution of species diversity across the Earth. Recent conservation policy has become concerned with "biodiversity hotspots". This policy is motivated by recognition of the unevenness of species diversity around the world. The conservation of genetic diversity within an individual species is also an important factor in its survival in the face of environmental changes and disease. Here we show that diversity within species is also distributed unevenly. Using simple genealogical models, we show that a disproportionate fraction of genetic diversity is concentrated in small sub-populations. We also show that diversity can be geographically non-uniform, potentially including sharp boundaries between distantly related organisms, without extrinsic causes such as barriers to gene flow or past migration events. Our theoretical results agree with experimental results on the distribution of diversity in global samples of Pseudomonas bacteria. The results suggest that conservation of genetic diversity in populations may be leveraged by identifying specific highly unique groups and ensuring their continued reproduction.

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OPTIMAL CORRIDOR QUALITY COUNTERACT BUTTERFLY DISPERSAL

The value of corridors to increase dispersal between habitat fragments is a controversial and topical issue in conservation biology. Conclusions drawn from corridor experiments have often been specific to the corridor and organism under study. It is thus important to instead focus on characteristics of species and corridors that favor dispersal. Here we use a novel approach to assess butterfly behavior in corridors. One hundred individuals each of two lycaenid and two satyrid butterfly species were caught in the landscape outside Uppsala, south-central Sweden. In each species pair, one was a habitat specialist and one a habitat generalist. Butterflies were translocated to an experimental arena comprised of three 2 x 30 m grassland corridors; one having nectar resources, one shelter from wind and one without nectar and shelter. Corridor movement was compared against a control with continuous grassland habitat. Only habitat specialists dispersed along corridors. Corridor quality that was similar to main habitat preferences decreased distance covered in corridor. Thus optimal corridor quality for the species concernced may counteract the aim of corridors. Butterfly movements indicate that stepping stones may direct movement and increase speed over inhospitable terrain more efficiently than habitat corridors.

CO51-3 **STRALBERG, DIANA, Nils Warnock, Nadav Nur, Hildie Spautz, and Gary Page** PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94924 (dstralberg@prbo.org)

MODELING THE EFFECTS OF LANDSCAPE CHANGE ON SOUTH SAN FRANCISCO BAY BIRD COMMUNITIES: AN EVALUATION OF POTENTIAL RESTORATION SCENARIOS

The recent acquisition of 5,000+ hectares of salt evaporation ponds by state and federal agencies provides an unprecedented opportunity to restore large areas of contiguous tidal wetlands in San Francisco Bay. The conversion of existing ponds to tidal marsh will create valuable habitat for a range of marsh-dependent species. At the same time, many waterbird species now depend on salt ponds as a replacement for natural shallow water habitats that have been lost since European settlement. In light of these apparent trade-offs, we evaluated the potential effects of restoration on wetland bird communities. We used a combination of standardized bird surveys, salt pond salinity and bathymetry, aerial photos, and land use data to develop empirical spatial models that predict the effects of specific restoration scenarios on bird diversity and potential numbers (as represented by available habitat). Our models suggest that waterbird habitat potential can be improved by maintaining a wetland mosaic that includes tidal marsh in various successional stages interspersed with salt ponds managed for appropriate depths and salinities. This has led to the current development of a spatial optimization model that will identify optimal tidal marsh-salt pond configurations and management regimes for a range of conservation targets.

CO51-4 **WINFREE, RACHAEL, Claire Kremen, and Terry Griswold** Department of Ecology and Evolutionary Biology, Guyot Hall, Princeton University, Princeton, NJ 08544, (rwinfree@princeton.edu) (RW, CK); USDA-ARS Bee Biology & Systematics Laboratory, Utah State University, Logan, UT 84322 (TG)

EFFECT OF AGRICULTURAL AND SUBURBAN DEVELOPMENT ON WILD BEE BIODIVERSITY

Pollinating insects are essential to maintaining ecosystem function; however, their conservation needs are poorly known. We investigated how human land use affects the most important pollinator taxon, wild bees (Apoidea). Our 960 km2 study system in southern NJ, USA, included 29 sites located in natural habitat but surrounded by varied land use (natural, agricultural, or developed), and 13 sites placed in the cropland or suburban "matrix." In 2003 we collected >2700 specimens, of which >2100 have been identified to >106 species. In contrast to expectations, total bee abundance was significantly higher in sites surrounded by agricultural and/or development than in sites surrounded by natural habitat. Of the 10 species with the largest sample sizes, 1 species has a significant positive response to natural land cover, while 3 had significant positive responses to agriculture and/or development. Total bee abundance was also significantly higher in matrix as compared to natural habitat sites. Our results suggest that moderate land use change may benefit some bees, but that sensitivity varies across species. Analyses of the complete species data set, species richness as a function of land cover, and spatial analysis based on GIS data are in progress and will be presented.

CO51-5 **SUNARTO, MAJU BINTANG.HUTAJULU, Duwi Yulipan, Victoberry, Isman Affandi, Wilson Novarino, Asep S. Adikerana, Habib Subagyo, and Frank Lambert** Conservation International Indonesia, Jl. Pejaten Barat No 16A, Kemang, Jakarta 12550, Indonesia (S). Kantor Balai Taman Nasional Bogani-Naniwartabone, Kotamubago, Sulawesi Utara, Indonesia (MBH). Jurusan Biologi FMIPA Universitas Andalas, Kampus Limau Manis Padang,Sumatera Barat 25163, Indonesia (DY, V, IA, WN). BirdLife Indonesia, Jl. Dadali No. 32 Tanah Sareal, Bogor 16161 Indonesia (ASA, FL). Balai Geomatika-BAKOSURTANAL Jl.Raya Jakarta Bogor Km.46, Cibinong 16911, Indonesia (HS). (sunarto@conservation.org)

IMPORTANT BIODIVERSITY AREAS IN TIMBER CONCESSIONS AROUND KERINCI SEBLAT NATIONAL PARK, SUMATRA: MISSING CONSERVATION TARGETS?

We conducted biodiversity surveys in nine timber concession areas bordering Kerinci-Seblat National Park (KSNP), Sumatra. Aims of the survey were to identify the indication of biodiversity richness in the concessions and formulate recommendations for an improved management of the concession areas in regard of the biodiversity. The survey focused on documenting the distribution of mega-fauna in the concession areas. The presence of each target species or its clue was recorded with GPS reading taken for each record. General description of the habitat was also made in each point. Target survey areas within the concessions were selected based on, among others, forest cover and closeness to KSNP boundaries. We documented significant biodiversity rich areas in the concessions surveyed. Siamang, sun-bear, Malayan tapir and Sumatran tiger were documented in all concession areas. Meanwhile, Asian elephant, Sumatran rhino and agile gibbon were found in some concession areas. Based on these results, we recommended an improved management of KSNP and extension of its coverage to include the biodiversity rich-areas in the concessions.

CO51-6 **PODOLSKY, RICHARD, Jerry Freilich, and Alexander de Sherbinin** Avian Systems, PO Box 732, 31 Main St. Rockport, Maine 04856-0732 (podolsky@att.net) Research & Monitoring Coordinator, Olympic National Park, 600 E. Park Ave.Port Angeles, WA 98362 (JF) CIESIN, Columbia University P.O. Box 1000, Palisades, NY 10964 (AS)

DIVERSITY AND SIMILARITY: TOOLS FOR BIODIVERSITY HOTSPOT PROSPECTING

Field assessments of biodiversity are absolutely critical, yet they are among the most capital intensive and intellectually demanding activities that ecologists can undertake. We discuss this dilemma and present a cost effective method for mining digital earth imagery for biodiversity hotspots. We present field results from Diversidad software which computes pixel heterogeneity and uses it as a surrogate for biodiversity and Similaridad software which computes histogram overlap to find field sites that exhibit similar structure. Field data from groundtruthing of AVIRIS (Airborne Visual Infrared Imaging Spectrometer), Landsat and Spot satellite imagery from Wyoming, Maine, Costa Rica and Patagonia will be presented. Diversidad and Similaridad are based on the premise that much of the spectral variability often considered "noise" in earth imagery is actually closely correlated with landscape and taxonomic heterogeneity. We present groundtruthing data for both plants, vertebrates, and invertebrates that support the hypothesis that spectral diversity correlates with biodiversity at the community level and that the method offers a quick and inexpensive way to identify biodiversity hotspots in the landscape.

CO51-7 **TODD, STELLA W., Curtis H. Flather, and Debra J. Shields** Metro State College of Denver, Campus Box 22, P.O. Box 173362, Denver, CO 80217-3362 (toddst@mscd.edu) (ST), US Department of Agriculture, Rocky Mountain Research Station, Fort Collins, CO, 80526

SPECIES ENDANGERMENT PATTERN RELATIVE TO MINING ACTIVITIES IN THE CONTERMINOUS UNITED STATES

The spatial relationships between mining activities, human population, and the occurrence of threatened and endangered taxa were explored on anecoregion stratification across the conterminous U.S. Mining point data locations and commodity types from the Mineral Availability System/Mineral Industry Location System (MAS/MILS) database were compared with county data indicating the number of threatened and endangered species, grouped by taxa. We hypothesized that the number of endangered species (hereafter called endangerment), for species sensitive to mining, should increase as the density of mines per county increased, and that the commodities mined and types of mining operations should affect this relationship. Results indicated significant positive correlations between endangerment and mining, particularly for those ecoregions with a high incidence of endangerment, such as the Tropical/Subtropical Steppe, Tropical/Subtropical Desert, and Mediterranean divisions. Human population was highly correlated with endangerment for the Mediterranean and Tropical/Subtropical Desert ecoregions (r = 0.57 and 0.66 respectively). Underground mining was highly correlated to endangerment degree (r = 0.63 in the Tropical/ Subtropical Steppe). A high degree of species endangerment in the Tropical/Subtropical Desert related to surface metal mining (r=0.72), underground and surface-underground metal mining (r=0.80), other metal mining (r=0.62), and surface sand and gravel mining (r=0.69). These results indicate the need for assessment and monitoring of the mining threats to taxa in these regions.

CO51-8 **COLDING, JOHAN, JAKOB LUNDBERG, and Carl Folke** The Beijer Institute of Ecological Economics, Royal Swedish Academy of Sciences, Stockholm, Sweden, Box 5005. Centre for natural resources and the environment, and Department of Systems Ecology, Stockholm University, Sweden, 106 91 Stockholm (Jakob@system.ecology.su.se)

A NEW LOOK AT URBAN GREEN AREAS: IMPLICATIONS FOR PHYSICAL PLANNING AND BIODIVERSITY MANAGEMENT

Biodiversity is often viewed from a narrow biological perspective; species and habitats are the principal concern to the neglect of a broader ecosystem perspective that includes the activities of humans in the provision and maintenance of biodiversity and ecosystem services. Our objectives are to present the social-ecological functions of various land uses at different spatial scales along a rural-urban gradient in the greater metropolitan region of Stockholm, Sweden. Based on a GIS-analysis, we describe these functions through a 'zooming approach', progressively moving from regional to local scales. Analysed and estimated land uses include rural ecosystems, older property rights structures, protected areas, home gardens, golf courses, cemeteries, allotment gardens, and city parks, of which many are informally preserved and managed. Results propose that these land uses take on different functions depending on their location in the urban matrix. Human activities, such as informal management, play a key role in the provision of critical ecosystem services, something that largely is unperceived in official green area management strategies. We conclude that it is critical to understand in what ways informally managed green space contribute to biodiversity functions in urban settings, especially when new management policies are being considered.

CO52-1 **JAMES, STACY, Edward Little, and Raymond Semlitsch** Division of Biological Sciences, University of Missouri, Columbia, MO 65211 (smj21b@mizzou.edu) (SJ,RS) USGS Columbia Environmental Research Center (EL)

RESPONSES OF TWO AMPHIBIAN SPECIES TO CHRONIC CADMIUM EXPOSURE AS TADPOLES IN AQUATIC OUTDOOR MESOCOSMS

Many United States waters are impaired in their ability to support aquatic life, and metals are among the primary pollutants. We determined the effects of chronic cadmium exposure on the metamorphosis of Southern leopard frogs (Rana sphenocephala) and American toads (Bufo americanus). The species were reared separately in outdoor mesocosms from shortly after hatching, and cattle tanks were used to enhance environmental realism. Both species exhibited a decrease in survival with increasing aquatic cadmium concentration. Cadmium did not have a significant effect on metamorph mass when survival was included as a covariate, but it did cause a significant delay in time to metamorphosis for the toads. The cadmium content of metamorph tissue significantly increased with aquatic cadmium concentration for both species, and the toads tended to have higher body burdens. Cadmium may have acted directly on the amphibians, or indirectly through changes in the plankton and periphyton community. Cadmium-contaminated sites may produce fewer metamorphs, and those that survive will metamorphose later and could experience reduced fitness. Natural variation in life history characteristics and behavior may affect sensitivity to contamination and result in differences among amphibian species in response, tolerance, and persistence.

CO52-2 **LEWIS, RICHARD, Herizo Andrianandrasana, Lala Jean Rakotoniaina, Robert Bourou, Hafany Tiandray, and Joanna Durbin** Durrell Wildlife Conservation Trust- Madagascar Programme, BP 8511, Antananarivo 101, Madagascar (richard.lewis@durrell.org)

USING FIRE TO CONTROL FIRE: THE INSTALLATION OF FIREBREAKS TO PROTECT GEOCHELONE YNIPHORA AND ITS HABITAT IN WESTERN MADAGASCAR

Geochelone yniphora is considered one of the rarest tortoises in the world having a limited range, 7,000 ha, and less than 1,000 individuals. The major threats to its existence are fires and illegal collection. Fires are traditionally set by local people to renew surrounding grassland for their cattle and these fires can invade adjacent forests. Durrell Wildlife Conservation Trust has been working to conserve this species since 1991. A series of village festivals and environmental competitions helped to establish dialogue and collaborative actions between the communities, the local authorities and Durrell Wildlife. Over the following years, these groups worked together to establish firebreaks around the tortoise's habitat using a traditional method of controlled burning of a 50 m wide grassland band around tortoise habitats at the end of the wet season. These areas will no longer burn in the dry season. By 2002, 70% of the habitat was protected by approximately 50 km of firebreaks. From 1999 to 2002 there was a reduction in annual fires from 700 ha to 50 ha. Using local expertise, local collaboration and low technology measurable conservation progress has been achieved in a cost-effective and sustainable manner.

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INTEGRATING ECOLOGY AND GENETICS TO DEFINE AND CONSERVE DISTINCT POPULATIONS OF DIAMONDBACK TERRAPINS (MALACLEMYS TERRAPIN)

Brackish, coastal wetlands are being developed, degraded, and destroyed at an accelerating rate as a direct effect of urbanization. Diamondback terrapins (Malaclemys terrapin) exist as geographic populations that occupy brackish waters along North America's Atlantic and Gulf coasts. Facing both terrestrial (i.e., loss of habitat) and aquatic (i.e., bycatch in fisheries) pressures, this obligate estuarine reptile is currently listed as a Species of Special Concern in several states that have conducted inventory and monitoring efforts, while the status of the species is unknown in other provinces. We surveyed a suite of 14 polymorphic microsatellite DNA markers in 4 collections of terrapins (over 300 individuals) from coastal NC in order to provide the first delineation of fine-scale population structure for this species. We found that the spatial pattern of genetic differentiation suggests significant gene flow among collections, despite strong evidence of site fidelity in ecological (i.e., mark-recapture) data. We observed relatively large levels of genetic diversity and compared patterns of population structure found in the NC collection to those observed in additional regional collections from Cape Cod (MA), Chesapeake Bay (MD), and the Everglades (FL). Results from our analysis will assist managers in defining appropriate units of management for this species.

CO52-4 **REFSNIDER, JEANINE M. and Andrew M. Simons** University of Minnesota, Conservation Biology Program, 100 Ecology, 1987 Upper Buford Circle, St. Paul, MN, 55108 (refsnij@umn.edu)

USE OF EPHEMERAL WETLANDS DURING NESTING FORAYS BY BLANDING'S TURTLES AND IMPLICATIONS FOR HABITAT CONSERVATION

Female Blanding's turtles in east-central Minnesota were intensively radio-tracked throughout the 2003 nesting season to determine their habitat use and movement patterns during nesting forays. Nesting forays averaged 8.7 days for turtles tracked over the entire duration of the foray. All females traveled through prairie, pasture, or rural residential areas during nesting forays, and frequently spent nights under dense vegetative cover, as has been reported in other populations. However, females here were also found to make regular use of small ephemeral wetlands, such as isolated potholes and low spots that temporarily flooded after heavy rains. Ninety-one percent of females entered at least one small ephemeral wetland, and 37% used two or more such wetlands during nesting forays. Females spent at least part of the day in ephemeral wetlands in 86% of the total days spent on nesting forays. Nesting females may use ephemeral wetlands as refuges from high ambient temperatures or for intake of water that will be used to soften or stabilize soil during nest-digging. This research suggests that small ephemeral wetlands are an important component of Blanding's turtle nesting habitat in Minnesota, and preservation of these wetlands should be considered when planning management strategies for this species.

CO52-5 **BAIN, RAOUL H., Martha M. Hurley, and Minh Le** Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th Street, New York, NY, 10024 (RHB, MMH, ML). Center for Environmental Research and Conservation, 1200 Amsterdam Avenue, Columbia University, New York, NY 10027 (ML). (bain@amnh.org)

BIOGEOGRAPHY OF THE HERPETOFAUNA OF INDOCHINA: IDENTIFYING IMPORTANT AREAS FOR AMPHIBIAN AND REPTILE CONSERVATION

Indochina (Vietnam, Lao PDR and Cambodia) lies within the Indo-Burma biodiversity hotspot and within the last decade has been recognized as a center of avian and large mammal diversity. However, our understanding of the region's other taxonomic groups remains poor. In the first modern attempt to quantify the diversity and distribution of Indochina's herpetofauna we analyzed patterns of species occurrence in Indochina's major geographic regions. Results indicate that the extent of species overlap among regions (estimated by complementarity indices) varies widely among the major herpetofaunal lineages and that patterns of complementarity among areas are not concordant among lineages. We also analyzed the occurrence of both regional endemics (species found in only one geographical area) and global endemics (species occurring only in Indochina). Results show that the relative contributions of regional and global endemic species to an area's faunal distinctiveness differs among both Indochina's geographic regions and the herpetofaunal groups. These results are a first step towards quantifying the biogeographical relations of the region's amphibians and reptiles. They also have strong implications for conservation recommendations at national, regional, and global scales. Our results can be pooled with data from better known taxa to elucidate critical Indochinese conservation areas with greater resolution.

CO52-6 **BISHOP, DAVID C. and Carola A. Haas** Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA 24061 (dabishop@vt.edu)

USING MOVEMENT BEHAVIOR TO DETERMINE PROTECTION AREAS FOR FLORIDA BOG FROGS

Knowledge of the movement behavior of a rare species is essential for determining adequate protection areas and appropriate management guidelines. However, attaining this information can be difficult for small amphibians. We studied the movements of Florida bog frogs (Rana okaloosae) at Eglin Air Force Base in northwest Florida. The small size (< 9 g) of the bog frog severely limits the ability to use radio–telemetry to follow individuals, a factor which makes movement studies labor intensive and biased towards males, which are easier to locate. Other problems include determining how many capture locations are necessary to characterize movements, and which home range estimator should be used. In the stream habitats typically used by bog frogs, fixed kernel and minimum convex polygon home ranges often include upland habitat, which is rarely used by the bog frog. We suggest that maximum movement distances (i.e. the distance between the two farthest capture locations) may be the most useful measurement for establishing core protection areas for bog frogs and other species occurring in linear habitats

CO52-7 **BALDWIN, ROBERT F., Aram J.K. Calhoun, and Phillip G. deMaynadier** BALDWIN, ROBERT F., Aram J.K. Calhoun, Phillip G. deMaynadier. Program in Ecology and Environmental Science, 5722 Deering Hall, University of Maine, Orono, ME 04473(RFB), . rob_Baldwin@umenfa.maine.edu 207-581-2972, Department of Plant, Soil and Environmental Sciences, University of Maine (AJKC), Non-game and Endangered Species Program, Maine Department of Inland Fisheries and Wildlife, 650 State St., Bangor, Maine 04401 (PGdM). rob_Baldwin@umenfa.maine.edu

POST-BREEDING HABITAT SELECTION BY THE WOOD FROG, RANA SYLVATICA IN SOUTHERN MAINE, U.S.A

The post-breeding isolated and forested wetland habitats of the wood frog (Rana sylvatica) are declining. Radiotelemetry (Holohil BD-2A) was employed to detect habitat selection at 2m and 20m scales, and to record movements and seasonal shifts in wetland emphasis. Adult frogs (43) from 4 neighboring populations were tracked an average of 25.5 days each (1-83 days), mid-April (post-breeding) through mid-November. Canonical variates analysis was used to determine discrimination rules based on 19 significant variables related to forest and wetland structure. The model describes a seasonal shift from use of breeding pools (for up to 13 weeks post-breeding) to neighboring forested wetland habitats (maximum strait-line migration distance 340 m) and indicated that wood frog selection was general at the 20m scale (generally within wetland macrohabitats), but at the 2m scale, frogs avoided the most aquatic portion of the gradient. Activity level and form material shifted with season (upland tree leaf structures in spring, sphagnum ‘caves’ and ‘wraps’ during summer). Low-light and high-moisture conditions were preferred during summer. Median canopy openness for all plots was 25%. During migration, deep leaf-litter stopover sites were used for extended periods (up to 17 days). Forested wetlands, habitat connectivity and forest floor structure are important components of conservation plans

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MODELING FOUR-TOED SALAMANDER (HEMIDACTYLIUM SCUTATUM) NESTING HABITAT

Conservation of amphibian populations requires knowledge of species-habitat relationships. Four-toed salamanders (Hemidactylium scutatum) are listed as Endangered in Indiana, Threatened in Illinois, and Rare or of Special Concern in Maine, Massachusetts, Vermont, Ohio, Wisconsin, Missouri, and Minnesota. Little is known of four-toed salamander ecology, despite the species' extensive range. Infrequent sightings of four-toed salamanders may indicate either low numbers or that detection is difficult due to the species' habits. We examined habitat relationships for nesting four-toed salamanders at the nest, wetland, and landscape scales. Nests were detected by conducting shoreline surveys of 65 wetlands randomly selected from within public lands in Maine. At the nest scale, variables best predicting nest presence are: steeper shores, greater near shore water depth, deeper nesting vegetation, presence of moss, deciduous forest vegetation class, substrate of dead plant matter, and the presence of (Spirea tomentosa). At the wetland and landscape scale, wetlands with nests are best predicted by: higher pH, flow, shrub-scrub vegetation class, the presence of (Calamagrostis canadensis), and the absence of (Kalmia angustifolia). The definitions of breeding habitat we present will likely increase detections of this species and improve monitoring and management of four-toed salamanders and their habitat.

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POND RESTORATION FOR AMPHIBIANS: HOW TO COMBINE HIGHWAY CONSTRUCTION AND CONSERVATION BIOLOGY?

The success of many pond restorations is poorly documented. Following highway construction, a restoration programme started in 1999 in western France allowed the assessment of restoration efforts and changes through time. A survey was carried out on the amphibian community in eight ponds before they were destroyed. Substitutive ponds were created according to precise floristic and pedological criteria, based on previous pond characteristics and species composition. Data are presented on species richness and ecological factors for the new ponds and compared to levels prior to pond destruction. Species richness and abundance declined over two consecutive years following the construction of the substitutive ponds but increased thereafter, recovering in most of the cases to their original levels. Fauna and flora indexes were correlated until a threshold, after which over-vegetation had negative effects on the establishment of amphibian populations. Likewise, an increase in the number of vegetation strata was positively correlated with species richness. Population models, incorporating landscape characteristics, were employed to assess current and long term population viability. The success of the restoration is specific and amphibian species present different colonisation capacities, improving our understanding of the maintenance of species richness in aquatic environments.

CO53-1 **DREW, JOSHUA A.** Boston University Marine Program, Marine Biological Laboratory 7 MBL St. Woods Hole, MA (jdrew@bu.edu)

TRADITIONAL ECOLOGICAL KNOWLEDGE AND ITS APPLICATION TO MARINE BIOLOGY

Traditional Ecological Knowledge (TEK) is a meta-term representing multiple bodies of knowledge accumulated through many generations of close interactions between people and the natural world. Traditional Ecological Knowledge, and its application via customary ecological management practices, can prove useful in modern conservation programs. I show how TEK can be disaggregated into three component parts, and how these can be applied to marine conservation. I present examples of the use of Folk taxonomy and systematics in Micronesia, species knowledge for conservation in Kiribati and trophic linkages for reserve design in Belize as conservation programs which integrate TEK. The use of TEK represents an opportunity for Western scientists to participate in an equitable exchange of knowledge and responsibility, as well as offering indigenous peoples an opportunity to develop their scientific infrastructure.

CO53-2 **DOUKAKIS, PHAEDRA, Mananjo Jonahson, Bemahafaly Jean de Dieu Randriamanantsoa, Volanirina Ramahery, and Andrew Cooke** The Pew Institute for Ocean Science, University of Miami, 126 East 56th Street, NY,NY 10022 (pdoukakis@rsmas.miami.edu)(PD); Wildlife Conservation Society Madagascar, Villa Ifanomezantsoa, Lot II A 78 D Soavimbahoaka, BP 8500 Antananarivo 101 (MJ, BJD, VR, AC)

APPROACHES TO MARINE CONSERVATION IN ANTONGIL BAY, MADAGASCAR

Historically, biodiversity conservation efforts in Madagascar have been largely terrestrial and freshwater focused, with marine systems only recently emerging as a conservation priority. Antongil Bay, located in northeastern Madagascar, is one of the few marine systems given conservation attention. Adjacent to the largest protected tract of eastern rainforest in the country, Parc National Masoala (PNM), the Bay supports coral reef marine protected areas, populations of marine mammals, and economically important local and commercial fisheries. By establishing resource monitoring programs with area fishers and communities, we have obtained baseline data on marine resource composition and use. Based on this information, fisheries and coastal zone management strategies have been developed that focus upon community initiatives (gear and spatial management) and alleviating conflict between local and commercial fishers. Within coral reef marine parks, ecological monitoring has been on-going since 1998. The data from these surveys reveal information on live coral cover and fish biomass within and outside of the protected areas as well as over time and can inform management decisions. Lessons learned in Antongil Bay are considered within the context of marine conservation in Madagascar in general

CO53-3 **MARNANE, MICHAEL J., Joni T. Wibowo, Rizya L. Ardiwijaya, Yudi Herdiana, Shinta T. Pardede, Ahmad Mukminin, and Sutris Harianta** Wildlife Conservation Society, Jl. Pangrango No.8, Bogor, Indonesia. (mmarnane@wcs.org)

REDESIGNING CORAL REEF MANAGEMENT TO ACHIEVE GREATER COMMUNITY COMPLIANCE IN KARIMUNJAWA NATIONAL PARK, INDONESIA

Ecological assessments of Karimunjawa National Park, Indonesia, found that the present system of management has so far been ineffective in conserving coral reef resources. Socioeconomic surveys indicated that this lack of effectiveness was due mostly to a lack of acceptance of, and compliance with, management regulations. In order to design a more effective management system for the park, data were collected on the distribution of reef resources, patterns of resource use, and perceptions of fishers about which types of management would be most acceptable and receive the greatest compliance. The distribution of biodiversity and fisheries stocks was relatively homogenous among all reefs within the park. However, patterns of resource use showed markedly different results, with distinct “fishing hotspots” identified within each area and season. Surveys of fishers’ perceptions indicated that gear restrictions were the most preferred method of management whilst no-take zones were the least preferred method and would likely achieve only a low level of compliance. These results suggest that whilst biological factors are important in reserve design, in highly populated areas with limited resources for enforcement, a management system that places a higher level of emphasis on socioeconomic factors is likely to achieve greater biological conservation success.

CO53-4 **WILDER, ROBERT** The Nature Conservancy, Coordinator, Community-Based Restoration Program. 4078 Manchester Avenue, Encinitas, CA 92024 (rwilder@tnc.org)

DEVELOPING DIVERSE COMMUNITY-BASED MARINE AND COASTAL RESTORATION AT THE NATURE CONSERVANCY

The new Community-Based Restoration Program (CRP, a partnership with NOAA) has begun producing innovative results nationwide for the Marine Initiative in The Nature Conservancy (TNC). Through our current TNC-NOAA partnership, we have leveraged funding for 25 restoration projects at 22 sites across 14 states. This work spans a wide ranges of species, systems, and states from rivers in AK, OR, CA, VA to marshes in FL, TX, MS, CA, and WA to seagrass in CA to shellfish in NY,VA, NC, DE, and coral reefs in FL, HI. The work is now growing strategies such as building habitats, restoring hydrological regimes, removing invasive species and more. Most recently we are also linking CRP efforts to related marine ecoregional planning that is already underway, and to a network of shellfish sites. Three years' of projects are now starting up, are underway or completed--some of which are partnerships with local partner NGOs. Projects are selected with an ongoing emphasis on proposals that are for community-based tangible restoration, protective of marine habitats/ ecosystems, and that can serve as models for future action. Looking ahead the practical lessons learned in marine conservation at diverse CRP sites may be applied to leverage greater results around the U.S., and globally to boot.

CO53-5 **LEWISON, REBECCA, Sloan Freeman, and Larry Crowder** Duke University Marine Laboratory, Nicholas School of the Environment and Earth Sciences, 135 Duke Marine Lab Road, Beaufort, NC 28516 (rebecca.lewison@duke.edu)

QUANTIFYING THE EFFECTS OF FISHERIES ON PROTECTED SPECIES: THE IMPACT OF PELAGIC LONGLINES ON LOGGERHEAD AND LEATHERBACK SEA TURTLES

Getting a handle on what happens to threatened and endangered sea turtles when they are out at sea has been a challenge to conservationists, scientists and fisheries managers. Among a suite of mortality sources including beach habitat loss, and egg harvest by humans and feral predators, accidental harvest in fishing gear intended for a commercially valuable target species has been implicated as a putative cause of observed declines in several sea turtle populations. Here, we quantify the incidental catch (termed bycatch) of loggerheads (Caretta caretta) and leatherbacks (Dermochelys coricea) from the pelagic longline fishery using international fishing and observed bycatch data. Despite infrequent rates of encounter, the analyses show that more than 200,000 loggerheads and 50,000 leatherbacks were likely caught in 2000. Based on the estimates of the percent of caught turtles that die, this means thousands of turtles die each year from longline gear alone. Given 80-95% declines for Pacific loggerhead and leatherback populations over the last 20 years, this bycatch level is not sustainable in the Pacific and in other ocean regions. The large-scale, synthetic approach presented illustrates the importance of ocean-scale assessments and international management action to the conservation of sea turtle and other pelagic species.

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REDUCING THE ECOLOGICAL COST OF THE U.S. ATLANTIC PELAGIC SWORDFISH LONGLINE FLEET: TOOLS FOR INCORPORATING SPATIAL DISTRIBUTION INTO TIME-AREA CLOSURE DESIGN

Spatially-explicit management strategies are being used with increasing frequency to reduce fisheries bycatch, but there have been few attempts to evaluate the potential costs and benefits of these conservation techniques. We used two reserve-selection approaches to assess the efficacy of reducing bycatches of leatherback sea turtles Dermochelys coriacea, and blue sharks Prionace glauca in the Atlantic swordfish longline fishery. The rank optimization approach selects areas where the fleet has the highest bycatch:catch ratio as candidates for closure. Up to a 75% reduction of leatherback or blue shark bycatch could be achieved with a 20%-25% reduction in catches. These closed areas are widely dispersed, however, and it would be impractical to close fishing in so many isolated areas. In contrast, the spatial optimization approach preferentially chooses adjacent areas of high bycatch and low catches. We ran two algorithms (greedy heuristic and simulated annealing) with and without spatial constraints. The simulated annealing algorithm outperformed the greedy heuristic, meeting a greater proportion of the desired conservation targets more often. When we specified a high spatial constraint, the algorithms selected closed areas near the Grand Banks. These methods offer managers objective and simple means to maximize conservation benefits while minimizing costs to a fishery.

CO53-7 **ACOSTA, CHARLES, Athula Herat, Deep Ramanakaya, and Kevin Kirby** Department of Biological Sciences, Northern Kentucky University, Highland Heights, Kentucky (acostac@nku.edu)(CA, MD) Department of Physics & Geology, Northern Kentucky University (AH, DR)

COMPUTATIONAL MODELING AND VISUALIZATION OF DISPERSAL DYNAMICS IN MARINE RESERVES

There is a critical need for quantitative models to aid in rapid ecological assessments of potential sites for conservation. These assessments are important for determining the efficacy of reserve design aimed at protecting target species from overexploitation or localized extinctions. Efficacy of a given reserve may be measured as “spillover” while allowing for population buildup or sustaining source populations in a metapopulation linked by larval propagules. We evaluated several mathematical models to describe and predict the role of dispersal on spatial population dynamics. We then developed a flexible computer algorithm to model population fluctuation within a protected area and between protected and fished areas. The model was parameterized and tested using a seven-year database of marine populations of spiny lobsters and queen conch in coral reef habitat of the Glover’s Reef Marine Reserve, Belize. The model performed well with minimal spatially-explicit data and indicated a high degree of predictability of equilibrium population size and transfer rate across boundaries. The next step will be to construct an accessible platform in which users can conduct novel simulations using their own databases for other species and habitats.

CO53-8 **CURTIS, JANELLE M.** Project Seahorse, Department of Biology, McGill University, 1205 Dr. Penfied Avenue, Montreal, Quebec, H3A 1B1 (janelle.curtis@mail.mcgill.ca).

PREDICTING POPULATION-LEVEL RESPONSES TO GENERIC CONSERVATION STRATEGIES FOR SEAHORSES

Differences in life history traits affect the way that species respond to alternative conservation strategies. Seahorses (genus Hippocampus) are vulnerable to high exploitation rates because of their characteristic life histories (e.g. monogamy, paternal care, low mobility). Limited biological information, however, hinders both population and species assessments. In the absence of sufficient data for most species, and given the difficulties of identifying species, generic guidelines for seahorse exploitation and trade are potentially effective interim conservation tools. I collected and synthesized life history and ecological data for two European seahorse species. Using population viability analyses, I predicted population-level responses to strategies that are used or considered for seahorse conservation, including size- and sex-selective exploitation and spatial closures. Despite similarities in life history characteristics, species will respond differentially to at least some generic management strategies. Thus further research is required to validate the effectiveness of strategies proposed for the entire genus (e.g. generic minimum size limit for trade). Moreover, my results suggest that the best biological strategies for maintaining viable populations may be inconsistent with the cultural uses and economic values of seahorses. Both socio-economic factors and biological responses of exploited populations need to be considered for conservation strategies to be effective.

CO53-9 **STRINDBERG, SAMANTHA, Peter J. Ersts, and Howard C. Rosenbaum** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (SS) (sstrindberg@wcs.org); Wildlife Conservation Society, Marine Program, 2300 Southern Boulevard, Bronx, NY 10468, USA (HCR), American Museum of Natural History, Center for Biodiversity and Conservation, 79th St. and Central Park West, New York, NY 10024, USA (HCR, PE).

DISTRIBUTION AND ABUNDANCE OF HUMPBACK WHALES ON A WINTERING GROUND IN THE SOUTHEASTERN ATLANTIC: A COMPARISON OF ANALYSIS TECHNIQUES USED TO GUIDE CONSERVATION INITIATIVES

Historical records and recent surveys suggest that the coastal waters of Gabon serve as an important breeding and calving ground for humpback whales in the southeastern Atlantic Ocean. Extensive hydrocarbon exploration and production activities occur in the coastal waters of Gabon and appear to overlap with large stretches of the humpback whale wintering habitat. The first comprehensive aerial line transect surveys of Gabon's entire coast was completed in 2002. The aspects of the survey design that are critical to accurate and precise estimation of abundance when applying a standard line transect analysis are highlighted. The results from the standard analysis are contrasted to those obtained from spatial modeling that incorporates explanatory variables into the analysis. The latter analysis permits the examination of whale densities and distribution and their association with environmental conditions or anthropogenic factors. The results of the spatial modeling may give some guidance in the location, size, and identity of critical habitats for this species and the subsequent recommendations for the development of recommended marine conservation initiatives for sections of the coastline of Gabon.

CO53-10 **VANBLARICOM, GLENN R. and Carlos M. Alvarez-Flores** Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, MS 355020, Seattle, Washington 98195-5020 (glennvb@u.washington.edu) (GRVB). Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, 7600 Sand Point Way NE, Seattle, Washington 98115 (CMA-F).

EVALUATION OF FACTORS INFLUENCING RECENT FLUCTUATIONS IN NUMBERS OF SOUTHERN RESIDENT KILLER WHALES OFF WASHINGTON AND BRITISH COLUMBIA

Southern resident (SR) killer whales (Orcinus orca [L.]) began to decline sharply in numbers in 1996. Possible risk factors associated with the decline include changes in prey abundance, distribution, and availability, increasing rates of disturbance by vessel traffic, ongoing exposure to anthropogenic chemical contamination, natural fluctuations in habitat quality, and stochastic demographic processes. We report results of analyses of covariations of the SR population with risk factors for which data time series are available, with the intention of narrowing the focus of management effort on those factors most likely contributing to SR declines. We utilized program MARK to estimate parameters of age and sex specific survivorship and to evaluate the importance of covarying risk factors. Survivorship parameters from MARK output were used to construct an individually-based population dynamics model for SRs, allowing evaluation of the role of stochastic demographic factors in SR population fluctuations. Models of covariation were evaluated using the Akaike Information Criterion (AIC). Models incorporating whalewatch fleet size were ranked highest by AIC in the covariate analysis. Models including salmon abundance were also ranked highly. Temporal trends in SR survivorship rate were weaker than expected for some age/sex categories, and stochastic demographic factors likely contributed to SR declines.

CO54-1 **SIEX, KIRSTIN S.** Wildlife Conservation Society, Africa Program, 2300 Southern Blvd., Bronx, N.Y. 10460 (ksiex@wcs.org)

HABITAT DESTRUCTION, POPULATION COMPRESSION AND OVERBROWSING BY THE ZANZIBAR RED COLOBUS MONKEY PROCOLOBUS KIRKII

One of last remaining populations of Zanzibar red colobus has been compressed by human habitat destruction into small patches of perennial agriculture and regenerating secondary forest. Data collected in 1992-1999 were used to determine if population compression of this species has led to overbrowsing of food trees. Overbrowsing would further lower the carrying capacity of this altered habitat and have dire consequences for the conservation of this primate, one of Africa's most endangered. Red Colobus data were collected using scan and ad libitum sampling during full-day follows of 7 social groups. Data on food availability and overbrowsing were collected via transects for enumeration of food trees and monthly samples of phenology plots. The compressed population caused significantly higher levels of damage than did an adjacent non-compressed population. Regression models showed that higher levels of damage occurred during the long dry season and in areas with a lower quantity and quality of food resources per capita. These findings suggest management recommendations such as fostering natural regeneration, enrichment planting, and extending habitat corridors to seasonally important mangrove swamps. These actions could increase the carrying capacity of this habitat and prevent the potential development of crop-raiding as a foraging strategy by this species.

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CONSTRAINTS ON ROE DEER REINTRODUCTION IN DRY MEDITERRANEAN HABITATS

Roe deer Capreolus capreolus were hunted to extinction in Israel, at the beginning of the 20th century. A reintroduction program is now underway, based on European populations, the only available source of this species. However, the long, hot and dry Mediterranean summer, together with scant availability of free water sources, presents a major challenge for the survival of these deer. Thus, a feasibility study is essential prior to any attempted reintroduction. To study these shy, solitary and high-strung deer, we hand reared four does. When the deer matured, they were released into a natural habitat (approximately 100 acres), and are now available for intimate research, addressing their water and energetic requirements, and diet selection. Based on body mass measurements throughout the year, in two different habitats, we show that the Mediterranean habitat can supply the energetic demands of non-lactating roe deer, with a potential bottleneck in autumn Δ(_Mb=-6.46<+/->0.42%, paired-t = 14.4, $p < 0.001$). Field observations and doubly labeled water studies indicate that the deer consume approximately 1.6 liters of free water and 0.5 liters of water from food per day, during the summer. This suggests that free water sources are necessary if roe are to be successfully reintroduced in Israel and other dry Mediterranean countries.

CO54-3 **ZHANG, LI, Lichao MA, and Limin Feng** Key laboratory for Biodiversity Science and Ecological Engineering, Ministry of Education. Institute of Ecology, Beijing Normal University, Beijing 100875 (azhang@ifaw.org)

THE FLACCIDITY OF NATURE RESERVES- WITH SPECIAL REFERENCE TO ASIAN ELEPHANT IN CHINA

In China, the traditional conservation strategy can preserve biodiversity effectively within nature reserves, but may fail to mitigate the conflicts between rural development and wildlife conservation. This paper analyzes the magnitude of the conflict and its development in time, focusing on elephant conservation and land resource management within and around the reserves. We suggest that regulations alone can satisfy neither the demands to maintain biodiversity and eco-service nor the demands to achieve human being's welfare. More innovative tools such as informed land planning and integrated conservation development projects should be adopted to reduce the agricultural interface with elephant range, and to alleviate the damage caused by the conflict.

CO54-4 **KAR GUPTA, KABERI** Department of Anthropology, Arizona State University, Tempe, AZ 85287-2402 (kaberi@asu.edu)

CONSERVATION, DISTURBANCE AND SOCIAL STRUCTURE IN A NOCTURNAL PROSIMIAN PRIMATE, SLENDER LORIS (LORIS TARDIGRADUS)

Previous studies have shown that logging alters tropical forest structure, in turn changing primate population density. Little is known, however, about the impact of fragmentation on behavioral ecology of primates. This study addresses the effect of landscape fragmentation on habitat use by the slender loris (Loris tardigradus) in Kalakad-Mundanthurai Tiger Reserve (KMTR), southern India. Mundanthurai plateau contains deciduous forest with patches of plantations, grasslands, moist mixed, riverine and scrub forest. I examine the influence of habitat and patch characteristics on home range use. 28 adult lorises were radio-collared during 2002-2003, and were followed nocturnally and monitored at sleeping sites diurnally. I estimated home range from GPS locations of active animals and sleeping sites. Home ranges varied between 2-30 ha in males and 1.5-2 ha in females. I recorded three male types based on range size, association with females and morphometry: territorial paired and bachelor males, and roaming males. I measured habitat structure (canopy structure, tree and climber density, patch type, size) and disturbance within home ranges. Closed canopy patches were occupied by females and associated territorial males whereas roamer males were relegated to open patches. Human disturbance fragments the canopy and can therefore modulate social structure and population dynamics.

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POPULATION ESTIMATION OF A HIGH DENSITY BLACK BEAR POPULATION IN THE TEMPERATE RAINFOREST

We estimated the population density of black bears on Kuiu Island, Alaska. Kuiu is in the temperate rainforest, and therefore density could not be estimated through traditional means (capture-mark-resight). The genetic tagging method was eliminated due to costs and low capture probability. Photographic capture-recapture was also dismissed as a possible method due to the homogeneity of bear coloration. We used tetracycline biomarking – due to low financial and labor costs. We placed tetracycline-laced baits across the northern part of Kuiu Island (673km2) in 2000 and 2002. As a bait is consumed, the tetracycline is laid down in the bones and teeth of the bear. We estimated the numbers of marked bears on the island to be 134 in 2000 and 200 in 2002. Hunters turned in bone samples from their bears; which serve as the recapture sample in a population estimation model. In both years, we estimated the density of bears to be 1.5 bears/km2, with a CV of 31%. This is the highest density of black bears reported in the literature. Despite this density, this population is subject to increasing trophy hunting. Commercial clear-cutting by the USFS is expected to increase due to the Tongass' exemption to the roadless rule.

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LONG TERM TRENDS IN CARNIVORES IN THE SERENGETI NATIONAL PARK, TANZANIA

Information on wildlife densities in protected areas is key to their effective management, yet there is a paucity of such information for carnivore communities. Here we present results from censuses of carnivores on the Serengeti plains, conducted in the 2002/3 wet and dry seasons, and compare with previous counts in 1977 and 1986. We used distance based methodologies where all carnivores seen and their estimated distance from the transect line recorded, whereas previous surveys used fixed width transects. We demonstrate that this methodology provided useful estimates of commonly seen carnivores: lions; spotted hyaena and golden jackal, but was less effective for rarer species. We go on to present a methodology for correcting information from fixed width transects using distance based information and then show that there have been marked changes in the carnivore densities over the last 27 years. Spotted hyaenas appeared to increase in 1986, although numbers in 2002/3 and 1977 were similar. Golden jackals showed a marked decline since 1986. However, the pattern for lions was more complicated, suggesting that lions have declined outside the park, yet increased inside. These changes are related to overall increases in prey biomass and the increasing human pressures on the parks borders.

CO54-7 **MCALPINE, CLIVE, Hugh Possingham, John Callaghan, Michiala Bowen, Daniel Lunney, Jonathan Rhodes, David Mitchell, and David Pullar** School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072 (c.mcalpine@uq.edu.au);The Ecology Centre, The University of Queensland, Brisbane, Australia 4072;Australian Koala Foundation, GPO Box 2659, Brisbane, Australia 4001;School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072; New South Wales Department of Environment and Conservation, PO Box 1967, Hurstville, New South Wales, 2220 Australia; School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072;Australian Koala Foundation, GPO Box 2659, Brisbane, Australia 4001; School of Geography, Planning and Architecture, The University of Queensland, Brisbane, Australia 4072

CONSERVATION AND RESTORATION OF KOALA POPULATIONS IN FRAGMENTED LANDSCAPES (NOOSA, AUSTRALIA)

Local population decline and extinction of the Koala, an Australian fauna icon, is a major problem facing wildlife and land managers. We develop, based on expert knowledge and landscape ecological theory, five alternative a priori models for predicting Koala presence/absence in Noosa Shire, a coastal rural-urban area in southeast Queensland. The empirical testing and ranking of the models indicates strongest support for the global, multi-scaled model, with Koala presence best predicted by the neighbourhood effect, area of suitable habitat, density of sealed roads, the number of habitat patches, the proportion of preferred tree species, and log focal patch size, ranked in that order. We conclude that Koalas are more likely to persist in landscapes with >50% high quality habitat configured in large patches (>100 ha), and with a low density of sealed roads. The major conservation outcome has been to demonstrate that a combined, multi-scaled model gives the best explanation of the decline of Koala populations.

CO54-8 **PORZECANSKI, IGNACIO, Jorge Acosta-Soto, and Mercedes Casciani** School of Natural Resources, U. Florida, Gainesville, FL (IP) (iporzecanski@hotmail.com) PROBIDES, Rocha, Uruguay (JA-S, MC)

MAKING ROOM FOR WILDLIFE: ESTABLISING A CONSERVATION CORRIDOR IN THE LAGUNA MERIN WETLANDS (URUGUAY-BRAZIL)

The Laguna Merín watershed is a vast area of more than 2 million hectares located on the border between Uruguay and Brazil. It includes natural riverine and lacustrine wetlands in various degrees of modification, and thus presents a number of specific challenges to conservation efforts. Practically all the land feeding the watershed is held in private hands and is under farming regimes of varying intensity. Relatively large patches of wetland, floodplains, forest, shrubland and beach, however, remain unchanged, and these fragments offer suitable habitats for a great variety of wildlife, including neoarctic and neotropical avian migrants. Using GIS technology and ground surveys, we analyzed land use practices and present a plan for establishing a conservation corridor in this area. We find that as a result of various policies, more than 50% of existing wetlands in the sixties have been incorporated into the rice-pasture rotation. We determined that between 1985 and 2000, the cultivation of rice in rotation with pastures increased from 73,000 hectares to 120,000 hectares. We propose a protected area to be established along the margins of the Laguna Merín and its watershed, neighboring a very active and important agricultural area. This entails a process of monitoring, raising the awareness of the local farmers in both countries, alternatives to rice-pasture rotation, the regulation of irrigation/drainage systems, and the design of an adequate legal framework. A forum for multi-national discussions has been initiated.

CO54-9 **WIRES, LINDA R. and Francesca J. Cuthbert** Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota. 200 Hodson Hall, 1980 Folwell Ave. St. Paul, MN 55108-6124 (LRW, FJC) (wires001@umn.edu).

NATURAL WETLAND USE BY FISH-EATING BIRDS AND AQUACULTURE IN MINNESOTA: CONTEXT FOR CONTROVERSY

In Minnesota, natural wetlands are utilized for foraging by fish-eating birds and aquaculturalists for fish production. Loss of cultured fish to double-crested cormorants, American white pelicans and great blue herons is of concern to producers and presents a serious natural resource conflict. As a first step towards minimizing losses, we surveyed producers to determine methods used to prevent losses and examined distribution and abundance of fish-eating birds in relation to fish production. We determined producers experiencing greatest losses maintained large and/or multiple natural ponds in west-central Minnesota. Losses were highest in spring and fall, indicating migrant birds pose the biggest problem for producers. Most (96%) reported mechanical or physical alterations at ponds were not economical or effective at protecting fish. Shooting was considered the best predator control strategy. To minimize losses to fish-eating birds, we identified actions for producers to take, including: maintain aquaculture ponds beyond migratory routes and breeding areas of fish-eating birds; locate important cormorant roosts and staging areas and explore potential for dispersal; monitor ponds and coordinate efforts to disperse birds at critical times; amplify protection efforts at ponds with fish size ranges vulnerable to avian predators; and use ponds where avian predators can be effectively monitored.

CO54-10 **MAHABALESHWARKAR, MUKUL, Neelesh Dahanukar, and Erach Bharucha** RANWA, C – 26 / Ketan Heights, Kothrud, Pune – 411038, India (mookool@eth.net) (MM, ND). Bharati Vidyapeeth Institute of Environment Education and Research, Katraj – Dhankawadi, Pune – 411 043, India (EB)

SEASONAL MONITORING OF POPULATION DYNAMICS OF WETLAND BIRDS: CRITICAL APPROACH FOR DESIGNING AND IMPLEMENTING WETLAND MANAGEMENT STRATEGIES

Seasonal monitoring of avifauna in six important inland wetlands - Veer, Bhigwan, Jayakwadi, Mayni, Nandur Madhyameshwar and Shirwata situated in different ecologically distinct settings of Maharashtra state (India) was conducted for one year. Shannon diversity index and evenness index varied significantly across sites ($F = 3.24$ and 3.10 respectively, $p < 0.05$), indicating distinctiveness in their ecological settings and across months ($F = 3.19$ and 3.03 respectively, $p < 0.05$) indicating seasonal variation in the species diversity due to migration of the water birds. However, species richness index did not vary significantly across sites ($F = 1.97$, $p = 0.11$) indicating that even though situated in different ecological settings, these wetlands probably possess potential of sustaining fairly static species turnover. The species richness varied significantly across months ($F = 8.40$, $p < 0.001$). The similarity between the number of individuals and type of bird species in two wetlands increase with increase in the similarity between the abiotic factors ($R2 = 0.6056$, $p <0.001$). Above interpretations imply that the avian fauna of wetlands probably follow discrete patterns that should be monitored seasonally and implicated while designing the locale specific management strategies such as controlled fishery and grazing, pollution and water level management.

CO55-1 **KARANTH, ULLAS, Praveen Bhargav, and Sanjay Gubbi** Wildlife Conservation Society, 2300, Southern Boulevard, Bronx, NY-10460 (ukaranth@wcs.org) (UK). Wildlife First, 1235 (First Floor), 26A Main Road, Jayanagar 4th T Block, Bangalore-560 041, India (PB). Centre for Wildlife Studies, 26-2, Aga Abbas Ali Road (Apt: 403), Bangalore-560 042, India (SG).

SHOT DOWN BY FRIENDLY FIRE: ECOLOGICAL CONSEQUENCES OF WORLD BANK-GEF CONSERVATION INTERVENTIONS IN NAGARAHOLE, INDIA

Conservation donors are currently targeting substantial investments at community-based conservation projects, which hope to engender increased public support for nature reserves, in collaboration with governments and/or non-governmental partners in the developing world. This case study (1994-2004) critically examines the ecological consequences of the internationally funded 'India Eco-development Project' implemented in Nagarahole, India (1997-2003). Prior to project initiation, based on our analysis of its design and investment scale (8.5 million dollars/5 years), we predicted that this project would engender large-scale corruption and inefficiencies among both governmental and non-governmental partners, and consequently, lead to reduced reserve protection and increased ecological damage. We show that during project implementation (1997-2003), wildlife protection efforts slackened in Nagarahole, and, consequently, intensities of tiger/elephant poaching, timber theft and arson increased. Habitats were mismanaged and connectivity was lost. In addition to ecological damage, 'sample results' from an anti-corruption investigation estimated the financial losses from timber theft at $13 million, and monetary fraud at $ 440,000, over a 3-year period. This project was terminated (after 63% project expenditure was incurred) because of a vigorous conservation campaign against it. However, similar "conservation projects" remain popular with governments, NGOs, and donors, thereby posing a widespread, unrecognized potential threat to biodiversity conservation.

CO55-2 **LING, STEPHEN** Renewable Resources Assessment Group, Env. Science and Tech., Imperial College, RSM Building, Prince Consort Rd, London SW7 2BP, UK (stephen.ling@imperial.ac.uk.)

BIOECONOMIC ANALYSIS OF THE SUSTAINABILITY OF HUNTING

Bioeconomic models, based on appraisals of the costs of hunting and the demand for its products, can indicate both the dynamic and equilibrium stabilities of a harvested population. By introducing a spatial element into my models, I have shown that the maximum sustainable offtake may be far lower than that predicted when spatial structure is not considered. Spatial effects can also alter the expected impacts on vulnerable species in multi-species systems. The data requirements for reliable predictive models are both extensive and methodologically challenging. The practicability of predictive models depends on the extent to which their components are generalisable across various hunting scenarios or need to be investigated in each new case. Even if not practical on a site-specific level, these models can be used to test the performance of alternate conservation management interventions to better define which strategies are suitable in which scenarios.

CO55-4 **SINCLAIR, J. ROSS, Greyd Sokame, and Andrew L. Mack** Wildlife Conservation Society Papua New Guinea Program, PO Box 277, Goroka, Papua New Guinea, (rsinclair@global.net.pg).

THE USE OF WILDLIFE FOR CULTURAL PURPOSES IN PAPUA NEW GUINEA

Wildlife sold in Papua New Guinea is predominantly for cultural purposes not bushmeat. We report results from the first two years of an on-going study into the use of wildlife for cultural purposes in PNG. To estimate the number of animals used for ornamentation, we analysed digital pictures of 137 individuals from 27 cultural groups at the 2003 Goroka Show. One member from each group was also surveyed with an oral questionnaire. We estimate adornments contained 8187 (1280-52194 95% CI) birds and 1901 (297-12066 95% CI) mammals. The most abundant birds were birds of paradise (46%), with 60% of mammals being Spotted Cuscuses (Spilocuscus maculatus). Several vulnerable species were used, including 962 (150-3232 95% CI) Vulturine Parrots (Psittrichas fulgidus) and 237 (53-421 95% CI) Goodfellow's Tree-kangaroos (Drendolagus goodfellowi). Most performers hunted (78%) and/or purchased (56%) wildlife; bird plumages costing a mean of US$8.48 (SD=$6.74, range $0.77-$27.61, n=18). Wildlife ornamentation can last up to 50 years, with 75% of those questioned stating adequate storage is the main determinant of its longevity. We reason better preservation of skins means less animals killed, and make recommendations for the conservation of animal skins. In 2003 we distributed these recommendations and a fumigant to performers.

CO55-5 **WALKER, NATHALIE** University of Oxford,Queen Elizabeth House, 21 St. Giles, Oxford, OX1 3LA, UK. (nathalie.walker@qeh.ox.ac.uk)

CONSERVATION APPROACHES IN THE ECUADORIAN CHOCO: PROTECTED AREAS VERSUS COMMUNITY FOREST MANAGEMENT

Views about the capability of sustainable use to conserve tropical forests have become increasingly polarized. The ecological, economic and social arguments are considered within a region that has been subject to internationally funded initiatives for both community forest management and the creation of protected areas. The Ecuadorian forests of the Choco biodiversity hotspot are highly threatened, particularly by oil palm and logging companies. Much of the remaining forest is under community ownership. Conservation strategies were analyzed by interviewing representatives of national and international NGOs, participant communities, local and national government and logging and oil palm companies. Community forestry projects are aiming for Forest Stewardship Council certification and whilst their long-term sustainability has yet to be proven, they have led to the development of new national forest laws, influenced logging companies to seek certification and active management has prevented invasions by colonists and companies. The creation of protected areas has connected existing reserves and saved forests from being purchased by oil palm companies but reserves are threatened by human invasions. Threatened forests require protection but marginalized communities need development assistance. The conservation approaches fulfill different needs and can work synergistically when applied in an appropriate, coordinated effort.

CO55-6 **WILLIAMS-GUILLEN, KIMBERLY, Cheryl Asa, Gerardo Camilo, Patricia McDaniel, and Orlando Dixon** BOSAWAS Biodiversity Project, Saint Louis Zoo, Colonia Independencia, Casa #238, del Zumen 6 cuadras al sur 20 varas abajo, Managua, Nicaragua (KWG, OD) (kimwilliamsg@yahoo.com). Saint Louis Zoo (CA, PM), 1Government Drive, Saint Louis, MO 63110, USA. Department of Biology, Saint Louis University (GC), 3507 Laclede Ave., Saint Louis, MO 63103. International Center for Tropical Ecology (KWG, PM), Department of Biology, University of Missouri Saint Louis, B216 Benton Hall, 8001 Natural Bridge Rd, Saint Louis, MO 63121.

SUBSISTENCE HUNTING BY MISKITO AND MAYANGNA INDIGENOUS PEOPLE IN BOSAWAS BIOSPHERE RESERVE, NICARAGUA

Hunting in tropical forests is thought to be one of the greatest threats to biodiversity conservation. However, subsistence hunting may not be detrimental to wildlife populations when offtake does not exceed harvested species' maximal production rates. The BOSAWAS Biosphere Reserve in northern Nicaragua comprises one of the largest tracts of rainforest in Central America, with populations of many threatened and endangered species; 13,000 indigenous Miskito and Mayangna people also live in BOSAWAS. In collaboration with the indigenous people, we are conducting a 1-year study to determine the sustainability of subsistence hunting. To determine species harvest/consumption rates, we monitored wild meat consumption in 180 households in 3 communities; to determine catchment area and age/sex structure of hunted populations we monitored the activities of hunters in these communities. Small, rapidly reproducing species (pacas, agoutis, armadillos) comprise the majority of hunted animals. Preliminary results suggest the Mayangna hunt more than the Miskito. Both groups hunt

CO55-7 **WALPOLE, MATTHEW J., and Robert J. Smith** Durrell Institute of Conservation & Ecology (DICE), University of Kent, Canterbury, Kent CT2 7NS, UK. (m.j.walpole@kent.ac.uk)

PRIVATISATION OR COMMUNITY EMPOWERMENT? CONFLICT, ECONOMICS AND ACCOUNTABILITY IN KENYA'S MASAI MARA

Communities living adjacent to protected areas suffer disproportionately from conflict with wildlife, yet receive few benefits from conservation-related activities such as tourism. This has generated calls for greater participation and empowerment of local communities, and both the devolution of protected area management and revenue-sharing are popular strategies. However, experience in Kenya's Masai Mara National Reserve suggests that devolution to increasingly sub-divided local management units has not benefited the disenfranchised poor due to corruption, elitism and a lack of accountability. An experiment in private sector management of a c.500 km2 portion of the Reserve, initiated in mid-2001, was compared with local government and community-based management. Results revealed that community revenue-sharing targets are achievable under private sector management, even in years of poor tourism visitation. Moreover, expectations would be exceeded if the scheme were expanded over surrounding areas currently managed by communities, and would easily offset the costs of living with wildlife. This suggests a trade-off between financial returns and empowerment for communities, which is reflected in political difficulties suffered by the privatisation scheme. However, such a trade-off need only be short-term, and the conservation benefits of improved environmental management demonstrated by the scheme strengthen its validity as a sustainable partnership model.

CO55-9 **SITATI, NOAH W. and Matthew J. Walpole** WWF East Africa Regional Programme Office, Box 62440-00200, Nairobi, Kenya (n_wasilwa@hotmail.com) (NWS), Durrell Institute of Conservation & Ecology (DICE), University of Kent, Canterbury, Kent CT2 7NS, UK (NWS, MJW).

COMMUNITY-BASED HUMAN-ELEPHANT CONFLICT MITIGATION IN TRANSMARA DISTRICT, KENYA

Human-elephant conflict (HEC) is a serious threat to elephant conservation efforts, and the identification and implementation of suitable mitigation methods is required. Collaborative research in Transmara District, Kenya, revealed that African elephant crop raiding was clustered, its occurrence and intensity being predicted on the basis of proximity to towns and area under cultivation. Incidences of elephant attacks on humans were less predictable, often occurring as people walked home from bars late at night. A comparison of raided and non-raided farms revealed that active defences and communal guarding strategies were more likely to keep elephants away from farms than passive barrier methods. These findings were used to develop and deploy a range of mitigation trials. Continuous monitoring revealed spatial and temporal changes in the intensity of HEC as a result of these trials. The overall number of incidents declined but the pattern was complex. Strong barriers did not reduce HEC, whilst simple rope barriers coated with chilli grease did. A combination of active methods (watchtowers and early warning systems) was very successful. Closure of bars located within elephant routes minimised elephant attacks on humans. The long-term solution to minimising HEC is through community participation, awareness creation and proper land use planning.

P01-01 **BOYCE, JENNIFER** NOAA Restoration Center, 501 West Ocean Blvd., Suite 4470, Long Beach, CA 90802, 562-980-4086 (Jennifer.Boyce@noaa.gov)

RESTORING BALANCE: REMOVING THE BLACK RAT FROM ANACAPA ISLAND

In 1990, the tanker American Trader, spilled approximately 400,000 gallons of oil into the Pacific Ocean, offshore of Huntington Beach, California. A settlement was reached with the defendants in 1994. A Trustee Council comprising representatives of the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration and the California Department of Fish and Game was established to oversee a portion of the settlement (nearly $3 million) by developing and implementing a Restoration Plan for seabirds injured by the spill. The flagship project of the Plan is the restoration of seabird habitat on Anacapa Island through the eradication of non-native black rats. Seabirds on Anacapa Island were documented to be severely impacted by the presence of the rats. This precedent setting multi-year project involved the aerial application of the rodenticide brodifacoum throughout the entire island. Precautions to protect non-target wildlife included translocation and captive holding of predatory birds and endemic deer mice for release post-bait application. As of November 2003, there are no signs of rats on Anacapa. Initial monitoring results revealed (1) initial signs of rapid recovery by murrelets (2) the first confirmed successful breeding of Cassin's Auklets and (3) successful reestablishment of endemic deer mice.

P01-02 **CRAINE, IAN and Mart Gross** Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, Ontario, Canada, M5S 3G5 (IC,MG) (crainei@zoo.utoronto.ca)

INTRODUCED CHINOOK SALMON NATURALIZING IN LAKE ONTARIO: FACTORS CONTRIBUTING TO SUCCESS AND IMPACTS ON STREAM ECOSYSTEMS

Pacific salmon, particularly chinook, have been stocked annually into Lake Ontario since 1968 to act as biocontrol agents on the invasive alewife and smelt and to revitalize the sports fishery. In the mid-1990s chinook natural production appeared to become abundant and widespread. The reason for the increase in natural production and its effects on native biodiversity and the tributary ecosystems are under investigation. We estimated from stream electrofishing surveys conducted in 2002 and 2003 that approximately 1-2 million naturally-produced smolts are entering Lake Ontario every summer adding to the 2.5 million smolts released from hatcheries. Using patterns of growth rings in scales and otoliths we determined that 55% of the spawning adults in presumed hatchery-dominated populations are of natural origin. Chinook naturalization is facilitated by recent reductions in lake contaminant levels and an increase in thiamine levels in their eggs. However, the levels of organochlorine contaminants transported each autumn by spawning chinook into the Credit River, a major urban river of southern Ontario, were significant. Monthly monitoring over 13 months revealed that as the carcasses decayed, measures of PCB in the water column were 9 times the level recorded at the control stations placed just above a spawning barrier.

P01-03 **FRY, TRICIA L. and R. Scott Lutz** University of Wisconsin-Madison, 226 Russell Labs, 1630 Linden Dr., Madison, WI 53706. (tfry@wisc.edu)

SPATIAL DISTRIBUTION AND ABUNDANCE OF RED IMPORTED FIRE ANTS (RIFA) IN RELATION TO DISTURBANCE

We sought to rigorously evaluate the present spatial distribution of RIFA using the idea that disturbance plays an important role in RIFA colonization. We hypothesized, that RIFA abundance would increase as intensity of disturbance increased. We determined the spatial distribution of RIFA using intensive mound surveys. Our research was conducted on the Rob and Bessie Welder Wildlife Refuge, Sinton, Texas during 2003. We searched 5 0.3 ha plots for fire ant mounds on both clay and sandy substrates and across a disturbance gradient. We recorded the location of mounds with a Trimble GeoExplorer and collected data on soil temperature, moisture, and distance to nearest edge at each mound. We found that mound distribution followed complete spatial randomness, using Ghat, Fhat, and Khat spatial point pattern analysis. Mound abundance fluctuated with disturbance but we failed to accept our hypothesis. We observed that soil texture and moisture significantly influenced fire ant abundance. Our research uses spatial analysis as an effective tool in understanding the distribution of an invasive species along with identifying environmental characteristics that warrant its success and potential pathways of invasion.

P01-04 **JACOBSON, KARI A.** Conservation Biology Graduate Program, University of Minnesota, 199 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (jacobska@umn.edu)

NON-NATIVE PLANT INVASIONS IN RESTORED PRAIRIES: HOW ARE THEY MITIGATED OR AIDED BY NATIVE FUNCTIONAL GROUP DIVERSITY AND DISTURBANCE?

That aggressive plant species can invade apparently intact prairies suggests that some unknown combination of factors is creating a breach in the invasion-resistance of these systems. Invasion resistance of a prairie community depends on its functional group diversity and its level of disturbance because they limit the amount of resources available to invading plants. Control measures (e.g., burning) often reduce the competitive abilities of those functional groups most similar to the invader. Aggressive perennials are more resistant to these control measures than are natives of the same functional group. The purpose of this study is to better understand how functional group diversity and disturbance affect the rate of invasion of a non-native cool-season species, smooth brome (;Bromus inermis;), by seed and rhizome into prairie plots planted with different functional groups. The data show that warm-season species are most effective at preventing brome from invading by rhizome, and that disturbance is not an important factor in brome germination. Native cool-season species may compete more directly for resources with invasive cool-season plants, but they do not match the competitive strength of warm-season plants and they are too susceptible to herbivory to provide the competitive environment needed to prevent the spread of brome.

P01-05 **MANOR, REGEV and David Saltz** Mitrani Department of Desert Ecology, Blaustein Institute for Desert Research, Ben Gurion University, Sde Boker Campus 84990, Israel. (regevm@bgumail.bgu.ac.il)

RESISTANCE OF ARTIFICIAL PINE STANDS TO INVATION BY HOUSE MICE

Afforestation by alien trees is expected to decrease native species biodiversity that may reduce the resistance of the local community to invasion. We investigated the relationship between cover of planted pine stands, the native plant and small-mammal community, and the invasive house mouse (Mus musculus), in Mediterranean maqui, Israel. We trapped rodents in 25 plots with varying levels of pine cover. In each plot we assessed understory heterogeneity structure using the Simpson index for four classes of vegetation. In each plot we tracked changes in the small-mammal community over time by trapping in the early and late summer. There was a negative correlation between pine and maqui cover that was evident when pine cover exceeded 50%. Based on model selection criteria the heterogeneity of the plant community was influenced by both pine and maqui cover and their interaction. The density of native rodents was correlated with percent cover of the maqui community, regardless of pine cover. In areas with high native rodent densities the densities of the house mouse were lower and declined from early to late summer. Results suggest that high densities of introduced pine affect plant and animal community structure, which, in-turn, reduce the community resistance to invasion.

P01-06 **SANTOS, ADILSON ROQUE dos, Helena Bergallo, and Carlos Frederico D. Rocha** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 20559-900, Rio de Janeiro, RJ, Brazil, (bergallo@uerj.br) (HGB, CFDR). Diretoria de Projetos da Fundação Parques e Jardins, Praça da República s.no., Campo de Santana, 20211-350, Rio de Janeiro, RJ, Brazil (ARS).

NATIVE AND EXOTIC PLANTS IN URBAN LANDSCAPE GARDENING IN RIO DE JANEIRO CITY, BRAZIL

Brazilian urban landscape gardening started in the 1700s, French and English influences dictating most garden components. In the middle 1900s, Brazilian urban gardening started to incorporate some native species and to adopt landscaping arrangements differing from those of Europe. However, it still made wide use of exotic plants, which dominated urban gardening in Rio de Janeiro City. Recently, Rio de Janeiro municipality started using native species. In this study, we analyzed the composition, frequency and distribution of native and exotic plants in the 33 City administrative regions (CAR). In each CAR, we are sampling 10% of the streets. We have already recorded 309 individuals of 39 plant species, of which 11 were native and 28 exotic. The proportion of exotic individuals (84 %) was high. The dominant exotic species was *Terminalia catappa* (Combretaceae), accounting for 27.4% of all individuals sampled. Among natives, *Tabebuia impetiginosa* (Bignoniaceae) dominated (4.8% of all individuals recorded and 30.4% of natives). Our data indicate that Rio de Janeiro urban gardening is still dominated by exotic plants, many known to be invasive in other areas, contrasting with the surrounding forested environment enclosing the City, and that there is no general pattern of species composition among the CARs.

P01-07 **SPEARMAN, LAUREN A. and Daniel Otte** Rutgers University, Ecology & Evolution Graduate Program, Department of Ecology, Evolution & Natural Resources, 1st Floor, 14 College Farm Road, New Brunswick, NJ 08901-8551 (spearman@eden.rutgers.edu) (LAS). Academy of Natural Sciences, Entomology Department, Center for Systematic Biology and Evolution Division, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103 (DO)

A CASE STUDY IN OVERCOMING THE TAXONOMIC IMPEDIMENT: THE MANTIDS OF SOUTHERN AFRICA

The lack of scientific names, difficulty identifying species, inaccessibility of taxonomic literature and collections, and the dwindling number of systematists are the various problems cumulatively known as the taxonomic impediment. The taxonomic impediment is a clear threat to conservation, cited as among the greatest difficulties to studying and protecting insects. Many insects are lost with their habitat before their existence is even documented. In efforts to overcome the taxonomic impediment and document the mantids of southern Africa, the authors have recently completed a World Mantid Species Catalogue, the backbone to Mantid Species File online (MSF). MSF will consolidate collection data and taxonomic literature, creating an online searchable database. MSF includes identification tools such as specimen photos, diagnostic keys and distribution maps. The construction of MSF will begin with the mantids of southern Africa. Africa contains the richest mantid fauna in the world, with nearly half of all known species. The southern African mantid fauna is highly diverse, comprising 7 of the 9 families worldwide (60 genera, 250 species). South Africa contains two biodiversity hotspots, necessitating extensive invertebrate documentation. Overcoming the taxonomic impediment for mantids in southern Africa will be a case study for other understudied terrestrial invertebrate conservation efforts.

P01-08 **TONIOLO, VIOLA, Diana Stralberg, Gary Page, and Lynne Stenzel** PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA 94970 (dstralberg@prbo.org)

MODELING POTENTIAL IMPACTS OF NON-NATIVE SPARTINA SPREAD ON SHOREBIRD POPULATIONS IN SOUTH SAN FRANCISCO BAY

San Francisco Bay holds 70% of California's mudflats and provides habitat to more wintering and migratory shorebirds than any other wetland along the Pacific coast of the contiguous U.S. The Bay's mudflats are currently threatened by the spread of a non-native cordgrass, *Spartina alterniflora*, and associated hybrids, which grow at lower elevations than the native *S. foliosa* and can render large mudflat areas effectively unavailable to shorebirds for foraging. Using shorebird and benthic invertebrate survey data, tidal benchmark data, and GIS-based habitat data, we analyzed the potential effect of *S. alterniflora* on shorebird habitat in the South Bay, creating grid-based spatial models of shorebird habitat value and potential *S. alterniflora* spread. We developed 12 potential scenarios of habitat value loss for shorebirds, based on assumptions about invertebrate density, inundation tolerance of *S. alterniflora*, and temporal availability of mudflat resources. Predictions of habitat value loss ranged from 10% to 70%. We identified the upper mudflats, due to their greater exposure time, and the east and south shore mudflats, due to the high numbers of birds detected there, as the areas of highest value to shorebirds in the South Bay. These areas also coincide with the areas of greatest Spartina invasion potential.

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USING GIS MODELLING TO DEFINE A TARGET NATURAL HERITAGE SYSTEM

Urban expansion in the Greater Toronto Area has had a profound impact on biodiversity. To address this problem The Toronto and Region Conservation Authority (TRCA) took a systems approach to terrestrial natural heritage and applied principles of conservation biology to this fragmented landscape. The approach included the development and application of a vector-based GIS landscape analysis of habitat patch characteristics that is correlated with the presence or absence of sensitive vertebrate and plant species. Given the degree of habitat loss in the landscape it was apparent that the traditional approach of protecting the best of what remains would be inadequate for biodiversity conservation and ecological function. As a result a raster-based GIS modelling process was developed to design an improved natural heritage system that sets measurable targets for ecological restoration and land acquisition. The TRCA is working with neighbouring conservation authorities and municipal planners to expand this approach into other parts of south-central Ontario. The goal is to incorporate a mapped network of natural heritage systems and policies to achieve system targets in municipal official plans.

P01-10 **ZAPATA-RÍOS, GALO, Víctor Utreras B., Eddy Silva, Jeffrey P. Jorgenson, Luis Sandoval, and Javier Vargas** Wildlife Conservation Society – Ecuador Program, San Francisco 441 y Mariano Echeverría, P.O. Box 17-21-168, Quito – Ecuador, (gazr@wcsecuador.org)

INTENSITY AND EXTENT OF HUMAN ACTIVITIES IN YASUNI BIOSPHERE RESERVE, ECUADOR, AND IMPLICATIONS FOR WILDLIFE CONSERVATION

Yasuni Biosphere Reserve (YBR) is Ecuador's largest protected area. The threats faced by wildlife and their habitat in the YBR are numerous and include colonization, excessive hunting and fishing, commercial timber harvesting, and oil industry activities. These activities constitute severe threats to species biodiversity and ecosystem function. Long-term field research is necessary to document wildlife population declines. We used GIS and field surveys to locate and map the intensity and extent of human impacts in the study area. Petroleum extraction and agricultural development are especially acute along the northwestern periphery of YBR. Due to overhunting, the distribution and relative abundance of many of large wildlife species is greatly reduced. The negative impacts of hunting are widespread, especially along roads and rivers, and will only increase as the Ecuadorian government is planning to build additional roads inside the reserve to facilitate oil production. Human activities are projected to expand greatly over coming years. There is still an important opportunity to maintain species diversity, relative abundance of wildlife species, and ecological functionality in the landscape of YBR. The long-term persistence of wildlife, however, will largely depend on the success of conservation activities in human dominated lands.

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CLIMATE SENSITIVITY OF ATLANTIC WHITE CEDAR FROM MARYLAND TO MAINE

Atlantic white cedar (AWC, Chamaecyparis thyoides) is a wetland tree species with ecological and commercial importance. Numbers of AWC swamps have declined over the last two-centuries due to human impacts. Understanding how climatic sensitivity affects its growth is particularly important considering the likelihood of rapid climate change in the coming century. Tree-ring analysis provides a way to study how climate affects tree growth, as reflected in variations in annual relative ring widths. AWC reaches its northern range limit in the northeastern United States which, we hypothesize may make it very sensitive to temperature in this region. Eleven populations of AWC were sampled from Maryland to Maine, collecting cores from 20 trees at each site. In the seven northernmost populations, variations in AWC relative ring widths were strongly correlated to temperatures over the prior and current growing season, with consistent winter and early spring correlation. The two southernmost sites sampled showed a decreased sensitivity to temperature, with Maryland showing no correlation with winter or spring temperatures. The decreased temperature sensitivity in southern populations is similar to patterns found in loblolly pine. (Cook et al., 1998). This information may be helpful in guiding future conservation and management strategies.

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EXPLANATORY SIGNIFICANCE OF SOIL PH IN THE DISTRIBUTION OF PRESENT AND HISTORIC SCHWALBEA AMERICANA POPULATIONS IN NEW JERSEY

Recent field studies of the population of the endangered Schwalbea americana L. (American chaffseed; Scrophulariaceae), in New Jersey, suggest that low soil pH may inhibit germination of the species. Following recent increases in this population, individuals no longer appeared to be distributed evenly throughout the site as was previously thought, but instead exhibited a relatively discrete, clustered pattern. Stratified sampling of soil conditions within and around these clusters found that Schwalbea only occurred in areas with a pH of 4.1 or higher, with surrounding areas having lower values. Similar variation was observed at historic sites, with ditchbanks having higher pH than other areas. This may explain the failure of numerous seed experiments that have been conducted over the past ten years in adjacent areas and historic sites. In contrast to the 90-100% germination rates observed in the greenhouse, only 35 of 10,000 seeds have successfully germinated in these areas, suggesting the presence of some additional, inhibitory factor(s). Soil pH may also explain the historic distribution of the species, which was known to occur on numerous canal and roadside ditches, and is likely to serve as a valuable indicator of suitable sites for restoration in the future.

P02-03 **LARSEN, FRANK WUGT** Zoological Museum, University of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen O, Denmark (fwlarsen@zmuc.ku.dk)

IS THE HIGHER-TAXON APPROACH USEFUL FOR CONTINENTAL PRIORITY-SETTING AND DOES SPATIAL SCALE INFLUENCE THE RESULTS?

The higher-taxon approach may provide a pragmatic shortcut for rapid identification of priority areas for conservation. However, no continent-wide study has examined the use of higher-taxon data to identify complementarity-based networks of priority areas nor has the influence of spatial grain size been assessed. We used data for 939 mammals in sub-Saharan Africa to i) assess the performance of higher-taxon data for continental priority-setting, and to ii) assess whether spatial grain size in terms of the size of selection units (1 x1 , 2 x 2 and 4 x4 quadrates) used for the analysis influence the results. Independent of spatial grain size, priority areas based on genus data are more effective than random, while priority areas based on family data are less effective than random. Compared to selection with species data, genus-based priority areas represents only between 5–14% fewer species, but represent somewhat fewer of the threatened species (6–31%) and range-restricted species (7–42%) that are normally considered most valuable for conservation. Only for the 4 grain size, genus-based priority areas represent species with almost the same effectiveness as species-based priority areas, while they perform considerable less effective than species-based priority areas for the 1 and 2 grain size.

P03-01 **BILA-ISIA, INOGWABINI** Wildlife Conservation Society, Forest Elephant Program, Central Africa, Democratic Republic of Congo, via Stephen Blake, WCS, 1700 CT Ave. NW, Ste. 403, Washington DC 20009 (Inogwabini@uuplus.com)

NEST BUILDING IN THE PAN PANISCUS IN THE WESTERNMOST TIP OF THE SALONGA NATIONAL PARK, CENTRAL DEMOCRATIC REPUBLIC OF CONGO

Nests of the bonobo (Pan paniscus) of the Salonga National Park (Central Democratic Republic of Congo) were studied with respect to types of nests material, plant species used, nest heights and nest site surface area. Results were: (1) bonobos of Salonga forests built both tree and ground nests, (2) bonobos used 31 plant species in nest building, with a marked inclination to use ;Polyalthia suaveolens, Anonidium manii; and ;Scorodophloeus zenkeri;. Nests occupied mean sites that did not significantly differ across sites (i.e. 1622.5 m2 and 1305 m2, $t = 0.387$, $p < 0.05$, $df = 17$). However, there were intra-site variations. The mean nest height = 15.19 m above the ground (Height range = [0 – 25] m, SD = 5.1 m). The ground nests represented 5.6% of the total observed nests in the four study sites. Trees in which bonobos nested had a mean DBH = 29.78 cm, range = [8.9 – 77.0] cm (SD = 16.29 cm).

P03-02 **CADENA-SALGADO, MARTÍN and David Valenzuela Galván** Departamento de Ecología y Conservación de los Recursos Naturales, Centro de Educación Ambiental e Investigación Sierra de Huautla, Universidad Autónoma del Estado de Morelos. Av. Universidad No. 1001, Col. Chamilpa, Cuernavaca, Morelos, México, CP 62210. (cadenamartin@hotmail.com)

CONSERVATION OF RODENT COMMUNITIES IN A MEXICAN TROPICAL DRY FOREST: EFFECTS OF VEGETATION DISTURBANCE AND CLIMATIC SEASONALITY

Tropical dry forests (TDF) are a key ecosystem for conservation of Mexican mammals and it is important to generate basic population dynamics information useful in planning conservation strategies for this group and this forests. We evaluated the effects of climatic seasonality and habitat disturbance on the population dynamics of rodent communities in three perturbed sites (PS) and three non-perturbed sites (NPS) in the Sierra de Huautla Biosphere Reserve, Morelos, México the last big remnant of this type of forest in central México. At each site we trapped rodents monthly from August 2002 to May 2003 and obtained an estimate of tree and herbaceous diversity. In 13,496 trap-nights we captured 7 rodent species. However, 98% of total captures corresponded to only 4 species. NPS have higher tree diversity than PS but diversity and biomass of herbaceous did not differ between sites, as was the case for rodent diversity. We found a consistent trend of higher rodent density and biomass in early dry season than the rest of the year and also NPS presented higher values of these parameters during the dry season than PS. Apparently, disturbance magnifies the seasonal effect making PS more stressing during the dry time than NPS.

P03-03 **GUILHERME TROVATI, ROBERTO, Claudia Bueno de Campos, and Bernardo Alves de Brito** ROBERTO GUILHERME TROVATI Laboratório de Ecologia Animal / LEA – ESALQ / USP, Av. Pádua Dias, 11, Caixa Postal 9 – CEP 13418-900, Piracicaba – SP (gtrovati@ig.com.br)

DIET OF THE SYMPATRIC CARNIVORES (MAMMALIAN, CARNIVORE) IN CENTRAL REGION IN TOCANTINS BRAZIL

The diet habits of carnivores of the central region of the Tocantins, they were analyzed with a collect in an aleatory way of 36 samples of feces in APA of the Lajeado and APA of the Tocantins river, during the period from 2000 to 2001. Two families were represented in this study: canids and felids, being 18 samples of feces of each one. For a total of eight identified species, they were found 7 alimentary items. The analysis of the frequency of occurrence of the items for the carnivorous order, demonstrated a diet onivore, even so when the analysis was accomplished for the families, it could enroll a significant difference among the alimentary niches, not existing niche overlap, being like this no similar. This way, it is noticed that the canids are more generalists and the felid are more specialist with relationship to the diet habits. In agreement with the analyses, the ;Panthera onca; is the species most specialists studied and the ;Herpailurus yagouaroundi ; is the felids that it maintains a more similar diet the one of the canids.

P03-04 **GUTHRIE, CARLA G.** Section of Integrative Biology, Patterson Laboratories, University of Texas, Austin, TX 78712 (cguthrie@mail.utexas.edu)

IMPACTS OF FOREST REGENERATION ON A LIGHT–GAP DEPENDENT INVERTEBRATE COMMUNITY

Gap dependent communities exhibit varying degrees of spatial isolation depending on forest type and land-use history. Though dispersal is an important mechanism leading to colonization and maintenance of diversity within these communities, too much dispersal, according to metacommunity theory, acts to reduce local and regional diversity with consequential effects on patterns of species abundance and composition. Differing land-use histories in the forests of Corcovado National Park, Costa Rica, provided a chance to investigate predictions of metacommunity ecology as a result of increased dispersal due to the coalescence of habitat patches. Using an aquatic invertebrate community that inhabits inflorescences of *Heliconia imbricata*, samples were collected from two forest areas, an area with a natural density of H. imbricata patches and one four times as dense (~800 patches/km2). Preliminary analysis reveals a shift in species composition as a result of patch density (MRPP $p<0.0001$), as well as lower species richness and greater evenness among communities in the high density area. These data emphasize the importance of retaining the natural frequency of habitat patches for spatially-structured populations and communities. Given that forest regeneration follows a successional pathway, it is possible that the impacts of increased dispersal on gap communities may be temporary.

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DIVERGENT PLANT COMMUNITY TYPES ACROSS STRONG SOIL ACIDITY GRADIENTS ON THE HOLYOKE RANGE, MASSACHUSETTS

Variation in soil chemistry across different bedrock types can strongly influence plant communities. Previous research on the Holyoke Range (Hampshire Co., Massachusetts) showed that ;Quercus; spp., ;Acer rubrum; and ericaceous shrubs dominated acid sandstones, while adjacent igneous bedrock was characterized by ;Acer saccharum; and higher herbaceous species diversity. Gradients in soil acidity, base cation (Ca, Mg) and nitrogen (N) supply could explain these bedrock - plant associations. We experimentally altered soil acidity and nutrient supply in understory plots to investigate constraints on juvenile tree abundance. Base (dolomite) and acid (alum) salts were applied, independently or together with nitrogen (Urea), to 240 naturally established saplings of *A. saccharum*, *A. rubrum* and *Q. prinus*. Stem extension was measured the year following treatments. *A. saccharum* growth was 30% greater than control saplings following base addition, 30% lower after acidification, and unresponsive to N-addition. *A. rubrum* and *Q. prinus* saplings showed 25 to 300% higher growth rates under increased acidity, N-addition or acidity-N interaction. Anthropogenic soil acidification may cause a decline in plant species characteristic of low acidity sites. However, base cation rich sites may buffer against acidity and maintain plant communities that are increasingly rare in the matrix of acidified Northeastern forests.

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COMPARISON OF VEGETATION AND SOIL COMPOSITION OF SELECT SANDHILL PLANT TES POPULATIONS ON THREE MILITARY INSTALLATIONS

Fall-line sandhill communities of the southeastern U.S., have become fragmented by agriculture and urban/suburban development, resulting in a mosaic of pine-oak woodlands. Independent of surrounding landscape condition, these Fall-line sandhill communities have retained some level of ecological integrity, providing habitat for many Plant Species of Conservation Concern. We selected ten sandhill threatened, endangered, and sensitive (TES) plant species populations for survey: *Astragalus michauxii, Baptisia lanceolata, Carphephorus bellidifolius, Chrysoma pauciflosculosa, Liatris secunda, Nolina georgiana, Phaseolus polystachios, Stylisma pickeringii, Warea cuneifolia, and Warea sessiilifolia.* Twenty co-occurring populations of these TES plants were studied at three federal installations: the Savannah River Site in South Carolina and Fort Gordon and Fort Benning in Georgia. Assessments included surveys of ground-layer vegetation, canopy composition and soil characteristics in sandhill communities with and without the selected TES plants. Initial observations show that TES plant abundances vary among and between installations, perhaps in response to canopy openness and cover of co-occurring vegetation. Additional data on soil moisture, soil texture, slope, and aspect are compared to evaluate patterns on a landscape and community level.

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ACORNS, RODENTS, AND GYPSY MOTHS: IMPACTS ON RATTLESNAKE REPRODUCTION IN OAK FORESTS

The timber rattlesnake (Crotalus horridus), an endangered species in several northeastern states, has a low female reproductive rate characterized by a late age of sexuality maturity and infrequent birthing events at multi-year intervals. Reproduction in some years appears to be synchronized within regional populations, with a high proportion of adult females either gravid or nongravid. We examined effects of acorns, a key rodent food source, on rattlesnake reproduction, using a long-term (ca. 30 yr) rattlesnake reproductive index (RI; snake litters seen/yr) and acorn data for the same time period and geographic area. An outbreak of the gypsy moth (Lymantria dispar), an invasive pest that curtails acorn production, provided a natural experiment for comparing RI in intact versus disturbed (acorn limited) oak forests. During 17 years prior to gypsy moths, the rattlesnake reproductive index was significantly correlated with the red oak (Quercus rubra) acorn crop from 2-years earlier. This finding is consistent with our prediction for a tritrophic interaction involving acorns, rodents, and rattlesnakes in which acorn abundance in year i affects prey levels and rattlesnake mating in year i+1 and ultimately, due to long-term sperm storage and delayed ovulation in C. horridus, the level of rattlesnake reproduction in year i+2.

P03-08 **MILLER-RUSHING, ABRAHAM J. and Richard B. Primack** Boston University, Department of Biology, 5 Cummington Street, Boston, MA 02215 (ajmr@bu.edu)

RESPONSE OF FIRST FLOWERING DATE TO TEMPERATURE IN A FLORA OF EASTERN MASSACHUSETTS

In order to determine which plant species are the best indicators of climate change, we analyzed a previously unstudied 15-year (1888-1902) record of the dates of first flowering for 296 plant taxa in Concord, Massachusetts. We found that overall, summer-flowering species showed more variation in flowering time than did spring-flowering species, but spring-flowering species tended to be more correlated to winter-spring temperature (i.e., the mean temperature from January to the month of flowering). Thus, even though spring-flowering species had less variable dates of first flowering than did summer-flowering species, the variation in spring-flowering species was more linked to temperature. We also found that growth form (e.g., annual, perennial herb, etc.) significantly affected the relationship between flowering time and year-to-year variation in first flowering date. In addition to being affected by temperatures in the one or two months just before flowering, as would be expected, Concord plants were often significantly affected by January temperatures. In order to utilize Concord's wealth of botanical records and link this analysis with long-term and current climate change, we plan to continue this study by examining more phenological records from the mid-1800s (those of Henry David Thoreau), the late 1990s, and present day.

P03-09 **POSA, MARY ROSE C. and Navjot S. Sodhi** Department of Biological Sciences, 14 Science Drive 4, National University of Singapore, Singapore 117543 (MRCP, NSS),(g0203579@nus.edu.sg). Institute of Biology, University of the Philippines, Diliman, Quezon City, Philippines 1101 (MRCP).

EFFECTS OF ANTHROPOGENIC LANDSCAPE CHANGES ON PHILIPPINE FOREST BIRDS AND BUTTERFLIES

Despite the enormous amount of forest loss in the Philippines, there has been little known on the effects of habitat degradation on its fauna. We determine how bird and butterfly species have responded to the anthropogenic conversion of their natural forest habitat. Using point counts and transects, we surveyed the distributions and abundances of both taxa across a gradient of disturbance consisting of closed and open canopy forest, suburban, rural and urban areas within the Subic Bay Freeport Zone in Luzon. For both taxa, 25 to 40 percent of the forest species were detected in the suburban and rural habitats, but their relative abundances were lower, dropping to negligible numbers in the urban site. Most of the forest birds and butterflies recorded were endemic, indicating that they may be primarily dependent on forested habitats. Species richness and diversity indices peaked at different sites for either taxa. These response patterns could be related to the underlying local habitat structures. The data from this study will be used to make recommendations for the conservation of forest birds and butterflies in the Philippines.

P03-10 **PRIMACK, DANIEL H., Carolyn Imbres, Richard B. Primack, Abraham J. Miller-Rushing, and Peter Del Tredici** Biology Department, Boston University, 5 Cummington Street, Boston, MA 02215 (DHP, CI, RBP, AJMR); Arnold Arboretum of Harvard University, 125 Arborway, Jamaica Plain, MA 02130 (PDT) (primack@bu.edu)

HERBARIUM SPECIMENS COMBINED WITH CURRENT OBSERVATIONS DEMONSTRATE EARLIER FLOWERING TIMES IN RESPONSE TO CLIMATE CHANGE

Museum specimens collected in the past may be a valuable source of information on the response of species to climate change. To test this idea, we compared the flowering times during the year 2003 of 226 living plants growing at the Arnold Arboretum in Boston with 371 records of flowering times from 1885 to 2002 using herbarium specimens of the same individual plants. During this period, Boston has experienced a 3ºC increase in mean annual temperature. Flowering times are getting progressively earlier, with plants flowering 8 days earlier in 1980 to 2002 than they did from 1900 to 1920. Plants also flower earlier in years with warmer average temperatures in the months of February, March, April, and May. Plants with a long flowering duration appear to be as useful for detecting responses to climate change as plants with a short flowering duration. Additional studies using herbarium specimens to detect responses to climate change could examine specimens from specific, intensively collected localities, such as mountain peaks, islands, and unique habitats.

P03-11 **PRIMACK, RICHARD B., Abraham J. Miller-Rushing, Trevor Lloyd-Evans, and Paul Satzinger** Boston University, Department of Biology, 5 Cummington Street, Boston, MA 02215 (primack@bu.edu) (AJMR, RBP, PS). Manomet Center for Conservation Sciences, 81 Stage Road, P.O. Box 1770, Manomet, MA 02345 (TLE).

WHAT IS THE BEST INDICATOR OF MIGRATORY BIRD SPECIES RESPONSE TO CLIMATE CHANGE?

Many studies have shown that migratory birds are arriving earlier in the spring as climate changes worldwide. Most studies have used the date on which the first bird of a species is observed, a measure subject to effects of population fluctuations and sampling intensity, to gauge bird response to climate change. In order to determine the relative abilities of first and mean arrival dates to demonstrate spring migration response to climate change, we examined a 33-year record of initial banding dates (1970-2002) for 32 migratory bird species in southeastern Massachusetts. We found that mean arrival date is a more sensitive and accurate measure of species response to climate change than is first arrival date. Twelve species showed significantly earlier arrival times using mean arrival date for the species, but only two species showed earlier arrival time when using date of first arrival. First arrival date is less accurate because it is strongly affected by local weather, sample size and extreme outlier values. If population size or sampling intensity is changing over time, first arrival dates could even present a false pattern of changing migration times. If mean arrival values are used, the evidence that migratory bird species are responding to climate change will be stronger.

P03-12 **REYNOLDS, MARK, Gretchen Lebuhn, Rich Hatfield, Erin Rentz, Ed Conner, and Jessica Cleeves** The Nature Conservancy, 201 Mission Street, 4th Floor, SanFrancisco, CA 94925 (mreynolds@tnc.org) (MR); San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132 (GL, RH, ER, EC, JC).

BIODIVERSITY OF SIERRA NEVADA MEADOWS – LANDSCAPE CONTEXT, HABITAT QUALITY AND ANNUAL VARIATION

Montane meadows of the Sierra Nevada are some of the most productive and imperiled habitats in western North America. The Nature Conservancy has recently established the Northern Sierra Project with goals of preserving more than 55,000 acres of currently unprotected mountain meadow habitats. Understanding natural and human influences on quality of montane meadow habitats for biodiversity in the Sierra Nevada is critical to evaluating the success of conservation actions, including direct preservation, mitigation and restoration. Meadows in the northern Sierra vary in size,shape, elevation, hydrology, vegetation, landscape context and current and historical management. To identify meadow characteristics which are most consistently correlated with high biodiversity we sampled species diversity and abundance of plants, birds, and bumblebees across a range of meadow types. Large, wet, well connected meadows in close proximity to other wet meadows generally had higher species richnesses, species diversities, and abundances for all taxa Meadows ranking high in bird species richness ranked high in multiple years; plant and bumblebee diversity varied significantly with annual precipitation. Landscape context, specifically the distance of meadow to its nearest neighboring wet meadow, was an important determinant ofspecies diversity across taxa. We hope to use these biodiversity metrics to prioritize conservation action, to calibrate habitat restoration, and to measure conservation success.

P04-01 **CANONICO, GABRIELLE C. and Michele Thieme** University of Maryland, Graduate Program in Sustainable Development and Conservation Biology, College Park, MD(GCC) (canonico@wam.umd.edu). World Wildlife Fund, Conservation Science Office, 1250 24th St., NW, Washington, DC (MT).

POTENTIAL IMPACTS OF INTRODUCED TILAPIA (FAMILY: CICHLIDAE) ON NATIVE BIODIVERSITY

The common name “tilapia” refers to a group of tropical freshwater fishes in the family Cichlidae that are indigenous to Africa and part of the Middle East. Tilapia have been moved outside of their natural range for decades. They are regarded as an important source of protein, and are well-suited to aquaculture because they are highly prolific and tolerant to a range of environmental conditions. However, research has demonstrated that tilapia species are highly invasive in all areas in which they gain access. We undertook a literature review to determine the potential impacts of tilapia on native fishes and their habitats. Long-term studies with pre- and post-introduction datasets were difficult to obtain, but we reviewed seven cases in which tilapia had been introduced and associated impacts had been documented at some level. The results indicate that tilapia may threaten native species through aggressive spawning behavior and trophic interactions, and can occupy not only freshwater, but also brackish and saltwater environments. Recommendations include exclusion of non-native tilapia species from areas where they have not yet been introduced, development of culture and stocking practices utilizing native fish species, and establishment of best management practices for tilapia aquaculture.

P04-02 **HETT, ANNE KATHRIN, Leonardo Congiu, Lorenzo Zane, and Arne Ludwig** Institute for Zoo and Wildlife Research, Department of Evolutionary Genetics, 10315 Berlin, Germany (hett@izw-berlin.de) (AKH; AL); Dipartimento di Biologia, Sezione di Biologia Evolutiva, Università di Ferrara, 44100 Ferrara, Italy (LC); Dipartimento di Biologia, Sezione di Genetica, Università degli studi di Padova, 35121 Padova, Italy (LZ).

CONSERVATION GENETICS OF THE ADRIATIC STURGEON

The Adriatic sturgeon, ;Acipenser naccarii; is a diadromous fish endemic for the Adriatic Sea, and presently considered to be at risk of extinction. A few decades ago, it was widely distributed in nearly all tributaries and used for caviar and meat production. Its abundance has dramatically decreased from 2,000 kg/year in 1970 to about 200 kg/year in 1991. Since 1988, when artificial reproduction started, a few thousand fishes were released into the Po River. Until now, no detailed screening of genetic variability and relatedness between and within the last two populations has been performed. Therefore, we investigated both mitochondrial and nuclear DNA. Our analyses sorted individuals into three distinguished mtDNA-haplogroups. Two haplogroups were correlated to geographic distribution, whereas the third one was very closely connected to ;A. gueldenstaedtii;. Comparing microsatellites and AFLP their distribution was strongly correlated to geographic distribution and supported the differentiation between ;A. naccarii; and ;A. gueldenstaedtii;. As of today, both populations are considered to represent different ESUs, with specimens from the Po River being further subdivided into two MUs. Because both populations are genetically differentiated, stocking of Po sturgeon into the Buna River would jeopardize the genetic differences between both populations, and should thus be avoided.

P04-03 **MATHEWSON, KEVIN** The Ford Foundation, 320 East 43rd Street, New York, NY 10017 (k.mathewson@fordfound.org)

RECENT UNEXPLAINED MASS MORTALITY OF MARINE FAUNA : A LOOK AT OCEAN NUCLEAR WASTE DUMPS AS POSSIBLE SOURCES OF STRESS

The ocean environment is subject to a vast array of anthropogenic stress with intricate and compounded disruptive effects on marine life, including an upsurge of unexplained mass mortality of marine fauna. This study focuses on whether persistent incidents of unexplained death in the vicinity of nuclear waste dumps on the ocean bottom may be related to the presence of nuclear waste. The study presents a partial inventory of dump sites off the coasts of western Europe and North America, lists incidents of unexplained mass deaths, many with characteristics that could be consistent with various aspects of animal radiation sickness, and describes a possible mechanism for the dissemination of toxic radioactivity in local marine environments based on recent satellite photography which has conclusively demonstrated what has long been surmised: that storm winds are capable of stirring up water from the depths. The authors recognize that the incidents under consideration represent only a tiny fraction of anomalous mass deaths of marine mortality in recent years, and that other stressors must be taken into account; but maintain that more research is necessary to rule out radiation sickness as a factor in the growing tally of unexplained deaths in certain areas. Maps show concentrations of nuclear waste of the coast of western Europe where many of the incidents in question have occurred.

P04-04 **WANG, SUSAN, Tom Jagielo, Jack Tagart, Farron Wallace, Glenn VanBlaricom, and David Beauchamp** University of Washington, Washington Cooperative Fish and Wildlife Research Unit, 1122 NE Boat Street, Box 355020, Seattle, Washington 98195 (eyrego@u.washington.edu) (SW, GVB, DB). Washington Department of Fish and Wildlife, 600 Capitol Way N., Olympia, Washington 98501-1091 (TJ, JT, FW).

GROUNDFISH HABITAT ASSOCIATIONS FROM VIDEO SURVEY WITH A SUBMERSIBLE OFF THE WASHINGTON STATE COAST

Understanding habitat associations of groundfish species is necessary for effective assessment and management of their populations, in particular those that have been declared overexploited. In August 2002, we conducted a survey of untrawlable areas on the Washington continental shelf, using a submersible to monitor groundfish populations and their habitat use. We observed a diversity of habitat types ranging from flat sand-mud to high relief boulder piles and rock ridges, as well as habitat characterized by structure-providing invertebrates, including sponges and crinoids. Patterns of habitat association were evaluated for three commercially important and currently overexploited species: Yelloweye rockfish (*Sebastes ruberrimus*), Canary rockfish (*S. pinniger*), and Lingcod (*Ophiodon elongatus*). Yelloweye rockfish were closely associated with the presence of boulder habitat, while Canary rockfish and Lingcod showed more general use across all habitat types. However, assessment of these associations at three spatial scales (micro-, macro-, and mesoscale, e.g. <1 m, 1-10 m, and 10-1000 m) suggests that the strength of these relationships changes at different scales of habitat characterization. These investigations will contribute to the development of effective fishery management policies and provide a basis for further groundfish habitat studies on the Washington coast.

P05-01 **ARPONEN, ANNI and Atte Moilanen** Department of Ecology and Systematics, P.O.Box 65 (Biokeskus 3, Viikinkaari 1), 00014 University of Helsinki, FINLAND, (Anni.Arponen@Helsinki.Fi)

ON MAXIMUM COVERAGE RESERVE SELECTION

I develop the use of the maximum coverage principle in reserve selection. Reserve selection algorithms most often utilize the minimum set principle – the aim is to find a network, which satisfies biodiversity targets with minimum cost. Maximum coverage approach employs another principle; one aims at getting highest value out of the reserve network given a maximum allowed cost. Maximum coverage has been used less frequently than minimum set analysis, probably because (1) it is politically more acceptable to seek minimum cost solutions and (2) for maximum coverage to work properly, one needs to value the biodiversity in the reserve in a reasonable manner. Most reserve selection studies have (unreasonably) assumed equal weight for all species. I present a hierarchical way of valuing biodiversity in reserve networks, which considers local and global rarity, taxonomic weighting, local threats to biodiversity and the predicted species persistence in the reserve network. Weighting species reasonably also allows one to account for the value of over- and under-representation of species (relative to a target level). For example, it might suggest replacing an expensive and vulnerable site with a single rare species by a species-rich and less expensive site that does not include the rare species.

P05-02 **BLEISCH, WILLIAM, Xie Yan, Weijie Deng, Mike Harding, Sung Wang, and Yingyi Zhang** Institute of Zoology, Chinese Academy of Sciences, 25 Beisihuanxilu, Beijing, China (YX, SW) Ecology, Land and People 33 Upland Road, Ipswich, Suffolk, IP6 9JY UK (MH) Fauna and Flora International China Programme, 95 Xinxiang, 25 Beisihuanxilu, Beijing, China (YZ, WB) (bill.bleisch@fauna-flora.org)

A BIODIVERSITY STRATEGY AND ACTION PLAN FOR A CHINESE MUNICIPALITY

Economic development and urbanization are proceeding rapidly in many regions of China, with the result that modern development is superimposed on a landscape supporting globally significant biodiversity. Dujiangyan Municipality, covering 120,800 ha, contains a World Heritage Cultural Site and Longxi-Hongkou National Nature Reserve, the southern-most in the Minshan B cluster of reserves for Giant Panda and subtropical forest. Tourism has developed rapidly in the municipality and now competes with traditional agriculture and industry. After an intensive analysis to identify stakeholders in biodiversity exploitation and conservation, over 40 government agencies whose activities affect natural resources co-operated to produce a consensus Biodiversity Strategy and Action Plan (BSAP) for the municipality. To develop the BSAP, training workshops were held to improve local understanding of the value of the region's biodiversity and its relationship with various sectors. Stakeholder analysis, village interviews, resource mapping, problem analysis, and development of a management plan for Longxi-Hongkou National Nature Reserve were carried out with broad participation. This participation has been key to the integration of the BSAP into the local government's agenda and plans. To our knowledge, this is the first local BSAP in China and the first BSAP that has been well integrated into local government planning.

P05-03 **BUOT, INOCENCIO JR. and Katsuhiro Osumi** Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Banos, College, 4031 Laguna, Philippines (iebuot@yahoo.com) (IB). Kansai Research Center, Forestry and Forest Products Research Institute, Nagai-Kyutarou 68, Momoyama, Fushimi, Kyoto 612-0855, Japan (KO)

ECOSYSTEM LANDSCAPE MONITORING ON MOUNT AKIKI, CORDILLERA MOUNTAIN RANGE, PHILIPPINES

The Cordillera biogeographical zone, Luzon Island, Philippines is a unique region of Asiatic, Malesian and Australasian floristic elements. However, there has been a remarkable proliferation of pines in higher altitudes endangering species richness of the ecosystem. Thus, an altitudinal vegetation zonation study of tree vegetation using line and quadrat techniques was done at elevations 1650 to 2750 meters above sea level on the southwestern slopes of Mount Akiki (2760 meters high), Cordillera mountain range. Data were subjected to cluster and principal component analyses. Results indicate the development of pure pine forests up to 2200 meters above sea level and its continued encroachment in oak forests up to 2600 meters above sea level. Mount Akiki is a popular destination of mountain climbers and local people also regularly pass by en route to the town center. Incidence of fire is common triggering expansion of pine forests. To prevent further biodiversity loss, strict ecosystem landscape management has to be implemented by the government. Concerted efforts in protecting the buffer zone between 2200 to 2600 meters above sea level now dominated by pines and oaks from fire incidence, is imperative to conserve the unique flora in the forest landscape.

P05-04 **CORTES-BURNS, HELEN and Sahotra Sarkar** Biodiversity and Biocultural Conservation Laboratory, Section of Integrative Biology, University of Texas at Austin, Waggener Hall 316, Austin, TX 78712 -1180 (h_cortesburns@mail.utexas.edu)

PRIORITIZING MARINE SITES FOR CONSERVATION: AN ANALYSIS OF THE NORTHERN GULF OF MEXICO

This study develops a preliminary set of conservation area networks to protect biodiversity along the northern Gulf of Mexico. As surrogates for biodiversity we use 11 habitat classes, the distributions of fish species and 22 mammal species, supplemented by 6 environmental parameters. To select these networks we modify existing procedures for selecting terrestrial networks (incorporated in ResNet): (i) we use expected levels of surrogate presence, rather than presence-absence data to account for local abundances of species and habitats; and (ii) we incorporate explicit connectivity constraints to ensure that both larval and adult habitats are protected (when relevant). We study targets of representation of 10 -60 % of the habitat in the networks, rather than the customary 20 %. We compare our results to those obtained by simulated annealing (Beck & Odaya 2001). We find that, if we use the same surrogates and targets as used in the earlier studies, our results are more economical (they achieve the required representation in fewer sites). However, to represent all the surrogates for which data can be obtained requires increasing the number of protected sites. We thus conclude that conservation in the northern Gulf of Mexico will require more resources than previously believed.

P05-05 **DOHERTY, DEIRDRE A.** John Muir Institute of the Environment, University of California, Davis, CA 95616 (dadoherty@ucdavis.edu)

HUNTING PREFERENCES, PATTERNS AND PRESSURE IN CENTRAL AMERICA

Hunting, one of the greatest threats to tropical wildlife, results in a biased removal of species based on hunter related factors, including dietary preferences, culture, mode and ease of acquiring animals, and travel distance. I assessed hunting preferences, patterns and pressure over a large spatial scale in Southern Belize, including a significant tract of Central American forest (Columbia River and Deep River Forest and Bladen Nature Reserves). I interviewed individuals from villages bordering the reserves, and analyzed demographic and landscape factors with respect to cartridge procurement, an estimator of hunting. Individuals from 19 villages reported that most hunting was done with shotguns and flashlights, and preferred meat species were paca, collared and white-lipped peccary, red brocket and white-tailed deer, armadillo, great currasow and crested guan. From 1997 to 2000, 618 people from 57 villages purchased a total of 41,186 cartridges. I found that cartridge purchases differed statistically significantly between months, and were significantly greater from larger villages, villages bordering reserves, and from Maya villages. However, there were no statistically significant differences between wet and dry seasons, years, or from villages located on the main road. It is imperative to understand the human characteristics of hunting to effectively develop conservation policies.

P05-06 **DROEGE, MARY, Marc Lapin, Kathy Doyle, and James Graves** The Nature Conservancy, Southern Lake Champlain Valley, 115 Main Road, West Haven, VT 05743 (MD) (mdroege@tnc.org). Champlain Valley Clayplain Forest Project, 239 Cider Mill Road, Cornwall, VT 05753 (ML). Green Mountain College, Department of Science, 1 College Circle, Poultney, VT 05764 (KD, JG)

CLAYPLAIN AND FLOODPLAIN FOREST RESTORATION PLANNING IN THE HUBBARDTON AND LOWER POULTNEY RIVER WATERSHEDS, VERMONT AND NEW YORK, USA

Valley Clayplain Forest was the dominant natural community on the clay soils of the Lake Champlain Valley before European settlement. Because clay soils are highly prized for agriculture, the natural community has been almost entirely cleared and now persists on approximately 10% of its potential land base in the Vermont portion of the valley. This now rare natural community is under threat of further fragmentation by development. In the southern Champlain Valley, the watersheds of the Hubbardton and Lower Poultney Rivers (90 square kilometers) were the focus of an intensive year long restoration planning process. The purpose of this planning was to identify stressors to natural succession; to articulate goals and objectives; to prioritize restoration at the landscape and site scale, and to design baseline and measures of success monitoring. Methods included vegetation sampling, spatial analysis of existing clayplain forest, and partner participation. Results of the spatial analysis showed that in our study area 25% of clay soils were forested, a striking improvement to the Champlain Valley as a whole. Local, state, federal and NGO support is strong for clayplain restoration in our study area, together with the results of this planning process, we are confident of plan implementation.

P05-07 **GONZÁLEZ-ABRAHAM, ANTALIA, Sophie Calmé, and Birgit Schmook** El Colegio de la Frontera Sur, Avenida Centenario Km 5.5, AP 424, Chetumal, Quintana Roo, Mexico (antalyag@hotmail.com).

DO FOREST ACTIVITIES AND WILDLIFE CONSERVATION MATCH? THE EXAMPLE OF THE RURAL COMMUNITY OF CAOBAS, QUINTANA ROO, SOUTHERN MEXICO

Species like tapirs, white-lipped peccaries and jaguars occupy large territories, therefore non-protected forests are crucial for their conservation. However, in most areas these forests are heavily exploited for timber, palm, gum, fuel-wood, and traditional hunting. This study aimed at determining how these activities are spatially and temporally organized in Caobas (68000 Ha). We interviewed 55 household-heads in order to know the activities they practice in the forest, their frequency, duration, and seasonality. These data allowed to calculate a perturbation index for each activity. We accompanied each interviewee to the forest, and mapped the areas he used for the different forest activities during the two last years. Maps of these forest activities were generated and overlapped to improve understanding of their spatial distribution, and taking into account their indices of perturbation. Activities that generate the most perturbation for prolonged periods are timber harvesting and hunting. Unfortunately, these activities do not coincide spatially and temporally, as hunters know that skidders scare wildlife. In this highly seasonal forest, with water scarcity during the dry season, internal community rules fostering effective planning of forest use by allowing wildlife access to water points, would be one of our recommendations for wildlife protection.

P05-08 **GRANTHAM, HEDLEY S., Andrew J. Beattie, and Robert L. Pressey** Key Centre for Biodiversity and Bioresources, Macquarie University, North Ryde, Sydney, 2109, Australia (HSG, AJB), (hgrantha@rna.bio.mq.edu.au.) Department of Environment and Conservation, PO Box 402, Armidale, 2350, Australia (RLP).

BIODIVERSITY SURROGATES: DO THEY WORK?

Biodiversity surrogates are essential for regional conservation planning due to the time and cost of exhaustive biodiversity inventories. Surrogates can be broadly categorized as environmental (e.g. vegetation types for species) or taxonomic (one species group for another). All surrogates are imperfect representations of biodiversity, but some are better than others. Surrogates therefore need to be evaluated and their limitations recognised. Various methods have been suggested for testing surrogates with each having its particular advantages, assumptions and limitations. Here I examine two land types (environmental surrogates), one based on biotic data (forest ecosystems) and one based on abiotic data (environmental units). The test data sets consist of species of conservation concern, and indicate the likelihood of species falling through a conservation net based on land types. We apply several methods for testing the surrogates and outline their respective limitations and assumptions. The results show that the effectiveness of the surrogates varies, depending on the method of testing, measurement used, test data set and the study area. These differences should be taken into account when testing surrogates and call into question the efficacy of many widely used surrogates.

P05-09 **HEDEMARK, MICHAEL and Arlyne Johnson** Wildlife Conservation Society- Lao PDR Program,PO Box 6712,Vientiane Laos (mhedemark@WCS.org)

IMPLICATIONS OF HUMAN USE PATTERNS ON MANAGEMENT OF PROTECTED AREAS IN LAO PDR

Wildlife populations in Lao PDR are critically low as a result of over harvest and habitat fragmentation. To address these threats, the government has established a system of National Protected Areas (NPAs) that covers 14% of the country and has disseminated regulations to manage wildlife and NPAs. The effectiveness of NPA management to reduce threats is largely dependent on two factors, i) the ability to actively manage human use, and 2) the size of area that is “passively managed” by inaccessibility to human use. We used GIS to buffer roads and villages in NPAs to 5 km as an index of human use. We found the area under passive management covers 51% of the NPA system, and that 7 out of 20 NPAs are highly fragmented. At the same time, active management skills are low as is sustainable funding, which will likely impede national targets to sustainably manage natural resource use for poverty alleviation in the 1100 villages living on NPA borders. To address this problem, it is critical that national strategies redouble efforts to increase active management of the NPA system.

P05-10 **LOPEZ, ROEL R., Philip A. Frank, Nova J. Silvy, and H. Resit Akçakaya** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843-2258 (roel@tamu.edu) (RRL, NJS). U.S. Fish and Wildlife Service, National Key Deer Refuge, Big Pine Key, FL 33043 USA (PAF). Applied Biomathematics, Setauket, NY 11733 (HRA).

INTEGRATING HABITAT MODELS IN CONSERVATION PLANNING: ASSESSING RISK OF URBAN DEVELOPMENT TO THE FLORIDA KEY DEER

Because household development is accelerating global threats to biodiversity, models integrating human and biological systems are critical for endangered species conservation. Here we describe a PVA model integrating the demographics of the federally-endangered Key deer. (;Odocoileus virginianus clavium;) with household development. Rapid development and urbanization in the Florida Keys is altering the landscape and threatening the viability of the Key deer. We developed a demographic, stage-based, stochastic model using RAMAS Metapop and ArcView Spatial Analyst to evaluate proposed development scenarios in terms of risk to the Key deer population in a Habitat Conservation Plan for Big Pine and No Name keys. The model predicted a low risk of decline (<5% risk of falling below 25 individuals in 50 years) for the Key deer population under current conditions, which increased with greater development. Model results were most sensitive to the maximal growth rate estimate (Rmax), and the probability and hypothesized impacts of severe hurricanes (Category 4-5). The Key deer model was used as a planning tool in the Key deer Habitat Conservation Plan and to resolve land use issues among stakeholders. This approach to PVA modeling could facilitate incorporation of human and biological systems in future endangered species conservation efforts.

P05-11 **MAYFIELD, MICHAEL, Víctor Sánchez-Cordero, and Sahotra Sarkar** Biodiversity and Biocultural Conservation Laboratory, Section of Integrative Biology, University of Texas at Austin, Austin, TX 78712 -1180., (felix@uts.cc.utexas.edu); Departamento de Zoología, Instituto de Biología, UNAM, Aptdo. Postal 70-153, México, D.F. 04510.; Section of Integrative Biology and Department of Philosophy, University of Texas at Austin, Waggener Hall 316, Austin, TX 78712 –1180.

THREE DECADES OF HABITAT LOSS AND FRAGMENTATION IN MEXICO: IMPLICATIONS FOR THE DESIGN OF CONSERVATION AREA NETWORKS

Habitat loss and fragmentation affect biodiversity adversely by increasing isolation and decreasing the viability of biota. Using a primary vegetation cover of Mexico (37 vegetation classes) to represent habitat, we analyzed changes between 1976 (± 3 years), 1993, and 2000. Habitat decreased from 1 309 095 km^2 to 1 216 235 km^2 to 1 017 099 km^2. Using modeled distributions of 86 endemic mammals on a 0.05º × 0.05º scale (with GARP) as biodiversity surrogates we constructed 100 conservation area networks at each time slice (using ResNet). The average area of networks representing 10 % of the surrogate distributions increased from 125 875 $km.^2$ to 126 480 $km.^2$ to 162 480 $km.^2$ That average areas increased shows that patterns of habitat change are not uniformly distributed; rather, they preferentially affect areas of high biodiversity value. We compared this result with the performance of seven indices of habitat fragmentation (using FRAGSTATS). There was no consistent correlation with the effects of habitat fragmentation *per se* (that is, effects of fragmentation independent of loss). We conclude that the increase in the area required in conservation area networks is due to the fact that areas of high biodiversity content are being increasingly lost.

P05-12 **MORRIS, JULIE K., Susan K. Jacobson, and Richard Flamm** Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611 (jkmorris@ufl.edu), (JKM and SKJ), Florida Fish and Wildlife Conservation Commission. Florida Marine Research Institute. 100 Eighth Avenue SE. St. Petersburg, FL 33701-5020 (RF)

SURVEY RESEARCH ON FLORIDA BOATERS AND MANATEE MANAGEMENT

Watercraft collisions are the most common human-related cause of endangered manatee (Trichechus manatus latirostris) mortality, accounting for approximately 25-30% of manatee deaths annually. Educational interventions for boaters are one strategy for reducing watercraft collisions. We conducted a quantitative evaluation of an educational intervention by Tampa Bay Manatee Watch, in Tampa Bay Florida. A telephone survey was conducted in the summer of 2002 of boaters in Tampa Bay. We compared the attitudes, knowledge and behavioral intentions of boaters who had received educational materials from Manatee Watch (treatment group) with boaters who had not (control group). There were no significant differences in attitudes, knowledge, or behavioral intentions between the two groups. In addition, we tested the association of experience with manatees and boating with boaters' knowledge, attitudes and behaviors. There was no relationship between experience and knowledge or between experience and behavior. Years of boating experience and the number of times seeing manatee while boating negatively influenced attitude. To increase the effectiveness of the program we recommend: targeting audience attitudes, addressing ownership and empowerment feelings in boaters, increasing the duration of the intervention and adopting a multi-faceted approach.

P05-13 **OKON, DAVID** Korup National Park, PO Box 36, Mundemba, Ndian Division, Cameroon (dtokon62@yahoo.co.uk)

KORUP NATIONAL PARK AND THE ABUNDANCE OF DIURNAL PRIMATES

Korup National Park, created in 1986, lies within a >forest area noted for its high levels of species richness, diversity and endemism. Hunting, however, can be intense and widespread within and around the park and may be one of the most influential factors affecting primate abundance. A monitoring programme was initiated in 2001 to survey diurnal primates along four transects in the southern portion of the park. Results are compared to data from surveys conducted in the northeastern portion of the park and in the support zone outside park boundaries. Between 2001-2003, monitoring results show that although primate densities remain relatively low, there is a general increase in primate populations in the Park over time and that densities inside the park are higher than in the unprotected support zone. The current and future state of Korup National Park is also discussed.

P05-14 **PAGNI, LEE E., Jordi Honey-Rosés, and Bill Toone** 3022 N. Santa Rita Ave., Tucson, AZ 85719, USA (leeontour@yahoo.com) (LEP). World Wildlife Fund Mexico, Av. Mexico No. 51 Col. Hipodromo, Mexico, D.F. 06100, Mexico (JHR). Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551, USA (BT)

COLLABORATING FOR CONSERVATION: AN ANALYSIS OF NGO ROLES IN THE COMMUNALLY OWNED MONARCH BUTTERFLY BIOSPHERE RESERVE, MEXICO

The migration of the monarch butterfly from the Eastern United States and Canada to Mexico is listed by the IUCN as an endangered phenomenon due to the severe loss of overwintering habitat in Mexico. This habitat is formally protected within the Monarch Butterfly Biosphere Reserve (MBBR), established in 1986 and enlarged to 56,259 hectares in 2000. The MBRR is managed in two distinct zones, the core zone and the buffer zone, both of which are mostly owned by communal land organizations. The core zone is owned by 38 communities and individuals while the buffer zone is owned by 93 communities and private properties. This division of ownership has presented difficulties for management of the MBRR, particularly in coordinating and enforcing regulations and management regimes. Such socio-political complexity creates a need for non-governmental organizations (NGOs) to fill critical niche roles in management, science, and education. This paper presents an analysis of NGO roles in the MBRR as related to objectives required to achieve conservation.

P05-15 **POPPLETON, KRISTEN I., Anthony B. Gamble, Dale R. Trexel, and Mary A. Williams** Conservation Biology Program, 199 McNeil Hall, 1985 Buford Avenue, St. Paul, MN 55108 (kiverson@umn.edu)

SHARED VALUES? A SYNTHESIS OF OPEN SPACE CONSERVATION STRATEGIES IN THE SEVEN COUNTY METRO AREA

Growth and development of Minnesota's Twin Cities metropolitan area have led several governmental and nonprofit groups to develop landscape conservation priorities for the region. Setting conservation priorities can take different forms depending on the purpose and goals of the user. We examined the implementation of stated conservation priorities by two governmental and one local nonprofit organization. A comparison was conducted of stated priorities. In addition spatial applications of their "priority" areas were compared and contrasted using GIS. Some overlaps and gaps in conservation priorities were identified. Areas of overlap present opportunities for collaboration in conservation of open space in urban areas. We discuss the pros and cons of having multiple entities prioritizing the landscape and the implications for landscape conservation in the Twin Cities.

P05-16 **ROTHLEY, KRISTINA D. and Charlene Rae** Simon Fraser University School of Resource and Environmental Management, 8888 University Drive, Shrum Classroom Building Burnaby, BC, V5A 1S6, Canada (krothley@sfu.ca)

USING A GRAPH-BASED METRIC TO EXPLORE TRADEOFFS BETWEEN CONNECTIVITY AND AREA FOR RESERVE NETWORKS

It is desirable to efficiently assess the connectedness of existing and potential protected area networks. There can be no single connectivity score, however, as connectivity depends on an organism's ability to cross barriers, perceptivity, and risk averseness in non-habitat. Connectivity must also be balanced against other considerations such as size and cost. We used a graph-based metric of connectivity to explore tradeoffs between maintaining connectivity and minimizing total area for a protected area network for the Resort Municipality of Whistler, BC. We used a multi-species approach and looked at tradeoff curves for organisms with varying dispersal abilities. We first generated the tradeoff curves using the graph-based metric to determine the connectivity importance of individual patches. We then performed an analogous set of analyses using patch size as a surrogate measure of importance. The differences between the tradeoff curves that occurred as a result of differences in assumed dispersal abilities support the importance of the need to take a multi-species view when analyzing the connectedness of potential reserve networks. Patch size was a poor predictor of the importance of a patch for maintaining landscape connectivity. Uncertainty in underlying spatial datasets may influence the outcome and reliability of these analyses.

P05-17 **SHAM, ASFAR** Zanzibar youth promotion centre (ZYPC) and my contact address is as follows: PO BOX 989, TEL 025 747 423264 OR 434190, ZANZIBAR, TANZANIA (asfarniho51@hotmail.com)

CONSERVATION OF PEMBA FLYING FOX CONSERVATION PROJECT

Pemba Flying Fox (Pteropus voetzokowi) has been recorded in the IUCN red list as endangered species. The Conservation of endemic Pemba Flying Fox is implemented in partnership between the Department of Commercial Crops, Fruits and Forestry (DCCFF) and Community adjacent Ngezi Nature Forest Reserve in Zanzibar. The project conduct a range of activities that include formation of new environmental clubs, strengthening of old clubs and production of video tape. Other activities are preparation and installation of notes board to roost areas, school visit, and production of posters for community awareness and identification of new roost sites.

2.1 Formation of Pemba flying fox conservation club. New roost sites observed in many places where no clubs exist before. New clubs were established giving the priorities to the areas where there is high number of bats, also where the community is interested for club establishments. For the purpose of raising conservation awareness, and enhance better management of Pemba flying fox eight new clubs were established. Besides the establishment of new clubs, training and technical advise such as habitat enrichment and clubs roles and responsibilities were provided to potential clubs such as Kidike and Kisiwa Panza. This was done specifically to strengthening clubs capacity in conservation and management of endemic Pemba flying Fox.

2.2 Video cassette production. Shooting of most important sites for these bats were done. The main areas covered include important roosting sites for Pemba Flying Fox, Community as clubs involved in conservation of these animals, meetings and discussions conducted during various occasions of the conservation programme of the bats.

2.3 Installation of notes board. Notice board has been prepared and installed at Mbiji roosting site. This is a new identified roost in the Southern block at Mungu yuko village. It is a natural high forest in hilly areas where the flying fox habitat was under threat .The board contains an information on the importance of the bats and their conservation status. The idea is to raise awareness to the community concerning the conservation of endemic and endangered flying fox.

2.4 School visit. School visit is an important activity for Conservation of endermic Pemba flying Fox. Four hundred students and four teachers from Pemba schools visited Kidike conservation club with the intention of gaining more understanding and practical skills on what had been taught in classes regarding conservation of Pemba flying fox. Students enjoyed the trip and were interested in conservation of species and habitat.

2.5 Productions of posters for community awareness. Initial stage of designing posters for Pemba flying fox conservation has been done and will be finalized late June 2004. The posters aimed at raising awareness to the community, with special massage that “Flying fox is a treasure of Pemba.”

2.6 Identification of new roost sites. Many areas with indigenous forest have been visited to monitor whether new roost sites exists. With the participation of near by community new roost sites were identified in addition to old known sites. In three villages of the southern region at Mbiji, Matumbini and Kengeja, also six new sites in northern region as Kivumoni and Kipangani in Mtambwe , Ruwi , Mihogoni ,Gando and Kishukashi where as in Eastern block two sites identified as Kengeja likoni and Nanguji .Also old bat roost were visited as part of monitoring population distribution of Pemba flying fox. The following were the site visited and their condition:

Table 1. Indicates number of sites visited and their condition.

Name of the site	Codes N0.	Site condition	No of fox present.
Kivumoni Mtambwe	PFF01	In big trees near the hilly side	800.
Kiuyu Minugwini	PFF02	In mango trees near the village	50.
Wingwi mjanaza	PFF03	At the grave yard	Nil
Micheweni (msitu mkuu)	PFF04	In high natural forest	1000
Ndagoni	PFF05	In the grave yard	Nil
Kilindi	PFF06	In the grave yard	Nil
Mgelema	PFF07	In high forest area	Nil
Kichunjuu	PFF010	In hard wood forest near clove vegetation	1400
Michenzani kizungu	PFF09	In a big tree(Terminalia)	60
Michenzani Tovuku	PFF08	In big tree near michenzani school	50
Makombeni	PFF011	In a grave yard	Nil
Ngomeni	PFF012	In hard wood near clove vegetation	Nil
Kukuu kangani	PFF013	In grave yard	90
kojani	PFF014	In natural forest	1000
kidike	PFF015	In grave yard	2400

3.Achievement

(a) About 90% of the old roost sites were visited where by some bats were found and some migrated probably due to food shortage.

(b) Eleven new roost sites were discovered, as this implies to increase colonies of bats resulted from community participation in conservation of Pemba flying fox.

(c) In addition to old clubs, six new conservation clubs were established in some villages.

4. Constraints

(a) Lacks of reliable transport (Motorbike). Vehicles from other institutions are used to carryout project activities. Hence make conservation difficult to be timely implemented.

(b) Most conservation section staff were involved in the National Agricultural Census at the time where the flying fox conservation activities were carried out. This lead to some delays to Pemba flying fox project activities.

(c) Habitat destruction is still prevailing in some roosts and we still lack control over these areas because most of these areas are privately owned.

P05-18 **THIEME, MICHELE, Bernhard Lehner, and Robin Abell** World Wildlife Fund, 1250 24th St. NW, Washington, DC 20037 (michele.thieme@wwfus.org)

ASSESSING THREATS TO AFRICA'S FRESHWATER ECOREGIONS

To set priorities for freshwater conservation at large-scales (i.e., global and continental), there is a need for systematic and accurate assessments of threats to freshwater systems. WWF has recently completed this type of threat analysis in its priority-setting exercise of Africa's freshwater ecoregions. We evaluated threats from four broad categories: land-based threats, aquatic habitat threats, biota threats (exploitation and exotics), and future threats. To examine threats that originate in the terrestrial landscape, we combined landcover data (MODIS landcover, classes "urban" and "cropland") with population data (density > 10 people/km2) to determine the percentage of degraded land within each ecoregion. Aquatic habitat and biota threats were largely evaluated using expert opinion and literature review. The likelihood of future threats was evaluated based on planned infrastructure in each ecoregion; an analysis of climate impacts based on the global water model WaterGAP; and an analysis of projected population densities. Blocks of ecoregions in West Africa, Southern Africa, the Rift Valley, northern and eastern Madagascar, and along the northern edge of the continent are considered critical or endangered. Much of the Congo Basin, upper portions of the Zambezi Basin, parts of eastern Africa, several islands, and several xeric ecoregions remain relatively intact or relatively stable.

P05-19 **WEINBAUM, KAREN, Melinda Laituri, Leonard Usongo, and Zacharie Nzooh** Colorado State University, Dept. of Forestry, Rangeland and Watershed Stewardship #1472, Fort Collins, CO 80521-1472 (weinbaum@cnr.colostate.edu) (KW); Colorado State University, Dept. of Forestry, Rangeland and Watershed Stewardship #1472, Fort Collins, CO 80521-1472 (ML); World Wide Fund For Nature, Cameroon Programme Office, P.O. Box 6776, Yaounde, Cameroon AFRICA (LU); World Wide Fund For Nature, Cameroon Programme Office, P.O. Box 6776, Yaounde, Cameroon AFRICA (ZN)

PRELIMINARY ASSESSMENT OF TRANSBOUNDARY MOVEMENTS OF FOREST ELEPHANTS (*LOXODONTA CYCLOTIS*) IN THE SANGHA TRINATIONAL PARK, CENTRAL AFRICA

Despite the ecological, economic, and social importance of forest elephants (*Loxodonta cyclotis*) in Central Africa, data still lack on elephant abundances, population trends, seasonal movements, and general ecology, due in part to logistical constraints of mammal censusing in dense forest, and to political strife that often disrupts studies in Central African countries. The majority of elephant range is outside of protected areas, suggesting the importance of studies on seasonal and cross-border movements. In this study, the “reconnaissance survey” technique, developed for African humid forest data collection, was used to obtain elephant dung counts and GPS coordinates along both sides of the Sangha River (forming the border between Cameroon, Central African Republic, and Congo, and three respective national parks), and was compared to a new method of surveying elephant signs by boat. Data were analyzed in ArcGIS/Spatial Analyst, which was used to identify dung density hotspots as indicators of major elephant corridors. Data locations from two elephants radio-collared in the region at the same time were also used to correlate real-time movements with corridors identified by the two sampling techniques. Wildlife managers in the region will be able to use these findings to focus limited anti-poaching and monitoring efforts.

P06-01 **BLOMQUIST, SEAN M., Michael J. Sredl, and Daniel A. Cox** Nongame Branch, Arizona Game and Fish Department, Phoenix, AZ 85023 (sean.blomquist@umit.maine.edu) (SMB, MJS, DAC), Department of Wildlife Ecology, University of Maine, 5755 Nutting Hall, Orono, ME 04469 (SMB)

CONSERVATION AND MANAGEMENT OF CHIRICAHUA LEOPARD FROGS IN THE BUCKSKIN HILLS

The Buckskin Hills of Coconino National Forest (CNF) contains a genetically unique, isolated population of the federally threatened Chiricahua leopard frog (Rana chiricahuensis). Only fourteen stock tanks are known to be occupied in the past 10 years. We repeatedly surveyed known populations to monitor frog presence and reproduction, surveyed every body of water within approximately 5 km of known and historical populations to identify threats and detect sites with frogs, and mitigated the effects of drought and invasive crayfish. We removed over 12,000 crayfish from 8 stock tanks as predator management. We hauled a total of 132,000 L of water to 3 tanks, renovated 3 tanks, and took 17 frogs into captivity to prevent loss of Buckskin Hills frogs. Successful conservation of frogs in the Buckskin Hills will require local and regional strategies. Locally, management actions are needed that will benefit extant populations and facilitate establishment of new populations, and possible future actions include removal of green sunfish and bass and experimental introduction of native roundtail chub to control crayfish. Regionally, management actions that will establish additional populations of Buckskin Hills frogs in high quality, self-sustaining aquatic systems are needed and should be developed as part of the recovery plan.

P06-02 **Baldwin, Robert F., PHILLIP G. DEMAYNADIER and Aram J.K. Calhoun.** Baldwin, Robert F., PHILLIP G. DEMAYNADIER and Aram J.K. Calhoun. Program in Ecology and Environmental Science, 5722 Deering Hall, University of Maine, Orono, ME 04473(RFB) (rob_Baldwin@umenfa.maine.edu) 207-581-2972, Department of Plant, Soil and Environmental Sciences, University of Maine (AJKC), Endangered Species Program, Maine Department of Inland Fisheries and Wildlife, 650 State St., Bangor, Maine 04401 (PGD).

PRIORITIZING CONSERVATION ACTION FOR POOL-BREEDING AMPHIBIANS USING A LANDSCAPE-SCALE THREAT ANALYSIS

Four southern Maine townships were the focus of a gap and threat analysis of vernal pool ecosystems using fine-scale data on pool location and associated conservation threats and assets to predict where on the landscape conservation action should be prioritized. Delineation from recent 1:12000 CIR photos indicated that 542 vernal pools (mean 0.07ha) were densely distributed (1.77 km2) and statistically clustered. Greater than 50% of delineated pools were not represented on National Wetland Inventory (USFWS) maps for the region. Forty-six percent of pools were below the size threshold (0.04 ha) necessary to trigger minimal regulatory protections. Non-breeding habitat for wood frogs (Rana sylvatica) and spotted salamanders (Ambystoma maculatum), calculated using literature-based migration and dispersal estimates, represented 9/10ths of the total land area, of which 20% was currently protected by a combination of state wetland regulations and conservation assets of various degree of efficacy (shoreland zones, fee and easement lands, etc.). A raster-based threat analysis combined habitat values (breeding and non-breeding weighted by landscape resistance), with habitat risk (development pressure index based on U.S. Census block and town-level growth rate data) resulted in landscape triage proportions of 5.1% (high threat), 44.4% (medium threat) and 50.5% (low threat). Conservation partners should consider focusing high expense, ‘emergency care’ efforts (e.g. fee acquisition) towards protection of the relatively small proportion (5.1%) of land area under imminent risk. A more carefully-planned approach, involving such tools as improved detection, expanded wetland legislation, landowner outreach, municipal land-use planning, and targeted acquisitions, is recommended for preventing the majority of the vernal pool-associated landscape (94.9%) from slipping toward high threat status. Our results support the benefits of moving from reactive, individual pool-based protection to proactive regional-scale conservation measures in rapidly developing landscapes.

P06-03 **HOLMAN, HEIDI, Jaime Edwards, Barb Perry, and John Levell** Conservation Biology Program, Univeristy of Minnesota, St. Paul, MN 55108 (HLH) (holm0512@umn.edu). Minnesota Department of Natural Resources, 2300 Silver Creek RD., Rochester, MN 55906 (JE, BP, JL).

THE USE OF AGRICULTURAL LAND BY HEADSTARTED JUVENILE WOOD TURTLES (GLYPTEMMYS INSCULPTA)

The wood turtle (Glyptemmys insculpta) has been described as a species that utilizes ecotones, heterogeneous edge habitat. Past studies have shown that adult wood turtles utilize agricultural lands during the months of July and August. Previously recorded impacts of agriculture include a decreased population percentage of juveniles including the absence of those ages 0-4. A radio-telemetry study was conducted on adult and juvenile wood turles in an agricutlrual landscape of Minnesota to evaluate the habitat use of both age classes. Headstarted juveniles utilized the agricultural fields at a higher proportion than adults. The absence of juveniles in previous studies resulted from the actual scarcity of individuals or cryptic nature of their size. The distance of the agricutlural fields from the river edge could play a factor in the use of agricutlrual areas.

P06-04 **HOMAN, REBECCA N., Bryan S. Windmiller, and J. Michael Reed** Department of Biology, Tufts University, Medford, MA, 02155 (RNH - homanr@denison.edu); Hyla Ecological Services, P.O. Box 182, Lincoln, MA, 01773 (BSW), Department of Biology, Tufts University, Medford, MA, 02155 (JMR)

DEMOGRAPHIC CLUES ABOUT DIFFERENCES IN THE RELATIVE VULNERABILITIES OF TWO SYMPATRIC AMBYSTOMA SPECIES

Throughout northern and eastern North America, blue-spotted salamanders (;Ambystoma laterale;) are considered vulnerable, whereas spotted salamander (;A. maculatum;) populations are apparently secure. These pond-breeding amphibians often share both terrestrial and wetland habitats, creating the potential for comparative studies of mechanisms related to their differential vulnerabilities. We studied a sympatric population of both species for five years to examine breeding population sizes, sex ratios, reproductive success, breeding frequency, and adult survival. We evaluated differences between species in risk from upland habitat loss, a significant threat to amphibian persistence worldwide. Although blue-spotted salamanders consistently had a larger breeding population size, and annual adult survival similar to spotted salamanders, other demographic parameters suggested that they would be more susceptible to habitat loss. Blue-spotted salamanders, whose population included a large percentage of polyploid hybrids, had more highly skewed sex ratios than did spotted salamanders (female:male, means of 28.4 and 0.96, respectively), lower fecundity (75-101 and 116-150 eggs/female, respectively), and lower recruitment (1.3 vs. 5.9 juveniles/female/year, respectively). Blue-spotted salamanders may be relatively vulnerable to extirpation as habitat is lost, because their lower relative reproductive success may result in a poor ability for population recovery following a disturbance.

P06-05 **LITZGUS, JACQUELINE and TIMOTHY MOUSSEAU** Department of Biological Sciences, University of South Carolina, Columbia, SC 29208 (litzgus@biol.sc.edu)

HOME RANGE AND SEASONAL ACTIVITY OF THE SPOTTED TURTLE (CLEMMYS GUTTATA): IMPLICATIONS FOR MANAGEMENT OF SOUTHEASTERN POPULATIONS

Information about animal movement patterns is critical to understanding their life histories, and such information is essential to the design of conservation plans for threatened species. Using radiotelemetry, GPS, and ArcView software, we examined seasonal activity, habitat use, movements, and home range size of a Southeastern population of the spotted turtle (Clemmys guttata), a declining species. Data collected over three years revealed an annually-repeated pattern of activity. Habitat use differed annually, seasonally, and between the sexes. Home ranges overlapped, and there was an area of concentrated overlap in early spring, indicating an aggregation of turtles, likely for breeding. Home range size for males was smaller (~5 ha) than that of gravid females (~16 ha). Movement data did not fully support the reproductive strategies hypothesis. As predicted, gravid females moved greater distances than males during the nesting season. In contrast to the hypothesis, males did not move their greatest distances in spring at which time mating mainly occurs because turtles aggregate so males do not need to travel to find mates. The current study is important because it provides information on the role of natural and anthropogenic disturbances in maintaining habitat heterogeneity and the early-successional communities preferred by spotted turtles.

P06-06 **MCKAY, JEANNE and Richard A. Griffiths** The Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, Kent CT2 7NS, ENGLAND (J.McKay@kent.ac.uk)

CONSERVATION OF THE AXOLOTL AT LAKE XOCHIMILCO: IS THERE A ROLE FOR CAPTIVE BREEDING PROGRAMS?

Despite the resurgence of interest in global amphibian declines, little attention has been paid to species threatened by consumptive use. Endemic to the remnant channels of Lake Xochimilco, the axolotl (Ambystoma mexicanum) is threatened by habitat loss, introduced predators and pollution. Traditionally it has also been widely used for food and medicinal purposes. However, the extent of the current illegal trade is unknown. Despite its apparent rarity, a survey of local markets revealed that wild-caught axolotls were available for sale, primarily for the pet trade and research. Although vendors trading illegally were knowledgeable about the traditional uses of axolotls they had little understanding of their ecological importance and maintenance requirements. Even though axolotls are available from commercial breeding facilities, a comparison of legal and illegal price structures, and axolotl rearing techniques, suggested that it was still cost effective for fisherman to capture and sell wild axolotls. Moreover, until the threats of facing axolotls can be neutralized there is little potential for restocking suitable areas with captive bred animals. However, captive breeding colonies of axolotls may serve a useful role as foci for public education programs.

P06-07 **MOORE, ROBIN. D., Henry R. Mushinsky, and Earl. D. McCoy** University of South Florida, College of Arts and Sciences, 4202 East Fowler Avenue, Tampa, Fl 33620 (rmoore@cas.usf.edu)

ENDEMIC OR EPIDEMIC? DISEASE AND THE GOPHER TORTOISE

In an era of emerging infectious diseases, understanding the associated ecological consequences is a significant conservation challenge. Threatened populations already at risk from human development can be further impacted by disease. Upper Respiratory Tract Disease (URTD) has recently emerged in wild populations of the gopher tortoise (Gopherus polyphemus), bringing with it major conservation implications. Supporting over 360 animal species in its burrows, the tortoise is an ecologically critical component of xeric upland habitats in the southeastern United States. Little is known about the ecology of the disease, nor its full impact on tortoise populations and, indirectly, the associated suite of burrow-dwelling species. Anthropogenic disturbances such as tortoise relocations and habitat alteration coincide with the emergence of the disease – making it unclear if URTD occurs naturally but has been exacerbated by human encroachment, or if the disease has materialized only recently. Thus, a multidisciplinary research project funded by the National Science Foundation is investigating the impact of the disease on wild tortoise population dynamics and health, and specifically on the influence of anthropogenic disturbance on disease transmission. We will present GIS images tracing the concurrence of urban development with the incidence of disease in tortoise populations throughout central and northern Florida.

P06-08 **PIHA, HENNA, Céline Teplitsky, Anssi Laurila, and Juha Merilä** Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland, (HP)(henna.piha@helsinki.fi). Department of Population Biology, Evolutionary Biology Center, Uppsala University, Uppsala, Sweden (CT). Department of Population Biology, Evolutionary Biology Center, Uppsala University, Uppsala, Sweden (AL). Ecological Genetics Research Unit, Department of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland, (JM).

THE COSTS OF PESTICIDES AND PREDATION RISK ON TADPOLES

Pesticides are among the plausible factors contributing to amphibian population declines. However, some of their negative effects become apparent only when combined with other stressors, such as predation. To study how <en> and at which stages of tadpole development <en> pesticides may affect the costs of predator-induced defenses, we exposed ;Rana temporaria; tadpoles to sublethal concentrations of fenpropimorph and metribuzin in the absence and presence of caged predators. Fenpropimorph decreased the ability of the tadpoles to mount a morphological defense, and slowed down their development in the presence of predators. In the case of metribuzin, the costs of combined stressors were not apparent at the tadpole stage, but the individuals exposed to both of the stressors metamorphosed at a smaller size. These results show that low pesticide levels can have significant negative fitness effects on amphibians when combined with predation risk. The costs may become apparent at the larval or later stages of development. As a wide range of aquatic organisms other than amphibian larvae exhibit induced defenses, our results indicate that similar costs may be present with a number of other taxa, and that incorporating this approach into future conservational studies could be useful.

P06-09 **RODRIGUEZ-PRIETO, IÑAKI and Esteban Fernandez-Juricic** Departamento de Ecologia Evolutiva, Museo Nacional de Ciencias Naturales, CSIC, Jose Gutierrez Abascal 2, 28006 Madrid, Spain, (ikrodpri@wanadoo.es) (IRP). Department of Biological Sciences, California State University-Long Beach, Peterson Hall 1-109, 1250 Bellflower Blvd., Long Beach, CA 90840 (EFJ).

ASSESSING AND PREDICTING THE EFFECTS OF RECREATIONAL ACTIVITIES ON THE ENDEMIC AND VULNERABLE IBERIAN FROG (*RANA IBERICA*) THROUGH POPULATION AND INDIVIDUAL LEVEL APPROACHES

There is widespread concern about the global decline of amphibians, but little is known about whether and how human disturbance would affect populations. The goal of this study was to assess the effects of recreational activities on Iberian frogs (*Rana iberica*), an endemic and vulnerable species of the Iberian Peninsula, through observation and manipulative approaches. At the population level, we found that frog abundance decreased with the proximity to recreational areas. At the individual level, the behavioral responses of frogs to repeated disturbance events increased the time to resume pre-disturbance activities, but did not affect flight initiation distances. We simulated different levels of human visitation to the banks, and found 80% and 100% decrease in bank use with a five-fold and a twelve-fold increase in pedestrian rate, respectively. Recreational activities are negatively affecting Iberian frogs through a loss in the spatial and temporal availability of resources. We recommend setting up buffer areas >2 m from the streams and visitor rates lower than 5 visits per hour (either groups or individuals). The role of recreational activities should be considered further as a potential factor affecting local amphibian declines.

P06-10 **ROTHERMEL, BETSIE B.** Division of Biological Sciences, University of Missouri, 105 Tucker Hall, Columbia, MO 65211 (rothermel@srel.edu)

DEMOGRAPHIC RESPONSES OF JUVENILE SALAMANDERS (*AMBYSTOM* SPP.) TO FOREST FRAGMENTATION: INSIGHTS FROM AN ENCLOSURE STUDY

Few studies have estimated demographic rates of adult or juvenile life stages of amphibians with respect to differences in terrestrial habitat quality or land use. I investigated the demographic consequences of forest fragmentation by adding individually marked, recently metamorphosed spotted salamanders (*Ambystoma maculatum*) and marbled salamanders (*A. opacum*) to terrestrial enclosures in old fields, forest interior, and edge habitats in mid-Missouri, USA. I sampled the enclosed populations for two years, obtaining data on juvenile growth and survival rates. Most mortality occurred during the first summer post-metamorphosis. Only 3% of juveniles added to old-field enclosures were ever recaptured. Although soil moisture tended to be higher in fields, juveniles may have experienced heat stress and desiccation due to high temperatures. Survivorship of *A. opacum* was higher than *A. maculatum*, perhaps due to a difference in timing of metamorphosis between the two species. Growth and minimum number alive did not differ significantly between edge and interior forest enclosures, suggesting proximity to forest edge did not negatively influence demographic traits. Despite intensive trapping, populations in the enclosures could not be completely censused in each sampling period. Thus, I explored and will discuss using capture-recapture models (e.g., Cormack-Jolly-Seber) to estimate survival in this experimental context.

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WATER MANAGEMENT AND CONSERVATION IN A SOUTHERN AFRICAN RIVER BASIN: A SCENARIO PLANNING APPROACH TO UNCERTAINTY

Water management is undergoing a paradigm shift in South Africa. Thirty years ago, the sector's focus was on getting water to farms and industries, with technical interventions such as dams and diversions assuring supplies. Today, an innovative water law recognizes the limits of the region's water supplies, and gives priority to basic human needs and ecosystems that sustain and are sustained by water provision. In a generation, understanding has come far, but will the next thirty years see the implementation of this learning? New institutional arrangements, the threat of climate change, and loss of ecosystem resilience as a result of past management spell an uncertain future for water resources in South Africa. Where such uncertainty exists, scenario planning can stimulate thinking and guide decision-making. We developed a set of political and socio-economic scenarios for the region's major river basin to explore the context in which water managers and users must meet the water law's social, ecological, and economic goals, and tested these scenarios within a hydrological model. This analysis indicated the extent to which trade-offs will need to be made in alternative futures, and revealed the location of thresholds, beyond which some goals will be impossible to achieve.

P07-02 **YOKOMIZO, HIROYUKI, Patsy Haccou, and Yoh Iwasa** Department of Biology, Faculty of Sciences, Kyushu University, Fukuoka 812-8581, Japan. (yokomizo@bio-math10.biology.kyushu-u.ac.jp) Institute of Biology, Leiden University, PO Box 9516, 2300 RA Leiden, The Netherlands. Department of Biology, Faculty of Sciences, Kyushu University, Fukuoka 812-8581, Japan.

CONSERVATION EFFORT AND ASSESSMENT OF POPULATION SIZE IN FLUCTUATING ENVIRONMENTS

We consider optimal conservation strategies for endangered populations. In decision-making of conservation, we must cope with many kinds of uncertainties in survivorship or population size. Assumptions are: the survivorship is affected by unpredictable environmental fluctuation and can be improved by conservation effort, and the exact value of the initial population size is also unknown. The conservation strategy involves two aspects: assessment effort to improve the estimate of the initial population size and conservation effort. Both types of effort imply economic costs. The optimal management strategy minimizes the weighted sum of extinction probability and the economic cost of the conservation and the assessment effort. Main results are: [1] Both the optimal assessment and conservation efforts increase with the value of the population, with the mean decrease in the logarithmic population size and with the variance of initial population size. [2] In contrast, the optimal assessment effort decreases with variance of environmental fluctuation but the optimal conservation effort has a peak at an intermediate variance of environmental fluctuation. The optimal conservation and assessment efforts differ in their dependence on some parameters.

P08-01 **CALLMANDER, Martin W., George E. Schatz, Trisha Consiglio, and Porter P. Lowry II** University of Neuchatel, Laboratoire de Botanique Evolutive, Case Postale 2, 2007 NEUCHATEL,Switzerland. (callmander@unine.ch). Missouri Botanical Garden, P.O. Box 299, 63166-0299 St. Louis, MO. Département de Systématique et Evolution, Muséum national d'Histoire naturelle, 16, rue Buffon, 75005 Paris, France.

APPLICATION OF IUCN CRITERIA AND RED LIST CATEGORIES AND ASSESSMENT OF PRIORITY AREAS FOR PLANT CONSERVATION IN MADAGASCAR: A CASE STUDY WITH THE FAMILY PANDANACEAE

A major problem in establishing protocols for efficiently protecting and conserving Madagascar's biodiversity is the lack of essential biological information. Species of Pandanaceae are an important component of Malagasy forests. Data gathered in the field and laboratory were used to review and revise the taxonomic framework of Pandanaceae, which provides a robust foundation for further conservation research on a comprehensive data set of the ca. 100 Malagasy endemic species including analyses of their distribution and estimates of their risk of extinction using the IUCN guidelines. These estimates were obtained using the novel set of methods developed by staff of the Missouri Botanical Garden (MBG) and Royal Botanical Garden (KEW). The most update recent maps of remaining Tropical Forest vegetation were used to reflect the "true" extent of Occurrence (EO) of the endangered genus Martellidendron, which grows only in the lowland forest of Madagascar. Information on risk of extinction based on IUCN criteria of all endemic Pandanaceae species is illustrated. This study also contributes directly to the Analysis of Priority Areas for Plant Conservation project being conducted by MBG to identify Madagascar's major floristic regions and priority areas within each region, and will thus be of direct use for Madagascar's critical conservation efforts.

P08-02 **CHOW, JEFFERY and Laura Snook** Center for International Forestry Research, P.O. Box 6596 JKPWB, Jakarta 10065, Indonesia (LS). Resources for the Future, 1616 P Street NW, Suite 600, Washington, DC 20036 (chow@rff.org)(JC)

SUSTAINING MAHOGANY FORESTRY: REGENERATION WITHIN ANTHROPOGENIC CANOPY GAPS IN THE SUBTROPICAL MOIST FORESTS OF BELIZE

Big-leafed mahogany (;Swietenia macrophylla; King) is currently being depleted throughout its range because selective logging of adults removes seed trees while advance regeneration is not present in the understory. This study asks whether enrichment plantings within the gaps created from selective logging could facilitate mahogany regeneration, and seeks to answer these questions by evaluating the survival and growth of seedlings and seeds sown in logging gaps in Belize. The objectives of this study were: 1) to determine whether survival and growth varied with the size of the logging gap; 2) to compare the survival and growth from sown seeds and planted seedlings; 3) to evaluate to what degree pest damage or lianas affect growth in the enrichment plantings. Growth seemed to have been greater in gaps that were larger at the time of planting, but establishment and survivorship did not vary significantly with gap size. Predictive power of relationships between growth and gap size was poor. The percentage of seedlings surviving was greater than the proportion of seeds that yielded a surviving seedling. Seedlings within these gaps have yet to show significant impact by pests or vines. Continued monitoring should shed more light on the usefulness of this management method.

P08-03 **FUREDI, MARY ANN and James B. McGraw** West Virginia University, Department of Biology, P. O. Box 6057, Morgantown, WV 26506, USA, (mafuredi@aol.com)

CAUSES AND CONSEQUENCES OF BROWSING BY WHITE-TAILED DEER ON AMERICAN GINSENG

Keystone herbivores, like white-tailed deer *Odocoileus virginianus*, may alter the population dynamics of forest plants through selective foraging. This can be problematic when rare plants are the food targets. The focus of this study was American ginseng *Panax quinquefolius*, one species whose rarity may be exacerbated by deer browsing. The purposes of this study were to; 1) determine how plant characteristics and microsite conditions affect deer browsing, and 2) how deer browsing, in turn, affects ginseng. The effect of plant traits and microsite on browse probability varied among populations. Overall, large, reproductive plants equal to or greater in height than companion species were more susceptible to browsing than small non-reproductive ones. Plants located in open areas adjacent to deer paths were more likely browsed than those in protected areas away from deer traffic. Browsing in one year resulted in a decrease in relative growth rate and sympodium height the following year. Browsing did not influence survival of ginseng. Our findings showed that apparency does play a role in influencing selection by deer and that browsing can potentially alter the size distribution, reproductive success, and potentially the viability of natural populations.

P08-04 **GEORGES HERBERT, CHEKUIMO TAGNE, Kunin Williams Edwards, Pocock Michael, and Aston Rebecca** (1)C.B.C.S, P. O. Box 8047 Yaounde-Cameroon (azpa01@yahoo.com), (2)2Faculty of Biological Sciences, School of Biology, Centre for Biodiversity and Conservation, Leeds University, Leeds LS2 9JT, UK.

FRACTAL PATTERNS IN SPECIES DISTRIBUTIONS OF SOME BRITISH SCARCE PLANTS

The analysis, measurement, and management of species abundance is central to ecology and conservation biology, but it has proved difficult to find a single index that adequately reflects the commonness or rarity of species across a range of spatial scales. The spatial distribution and fractal structure of two British scarce plants, *Lobelia urens* (heath lobelia) and *Phyteuma orbiculare* (round-headed rampion), have been examined at several different scales. The two species have similar degrees of local patchiness at scale coarser than 50 km and have contrasting coarse-scale between 50 km and 1 km scales, but differed consistently in the slopes of their scale-occupancy curves distributions at scale finer than 1 km. The slope of the log-log plot of *L urens* is not constant, but varies systematically with spatial scale, and from habitat to habitat at the same spatial scale. Abundance estimates suggest that the species *P. orbiculare* is found to be clumped at all scales, whereas *L. urens* is dispersed at intermediate scale. Fractal dimension analysis suggests that this changes through scale. The distribution varied in their pattern from highly clumped to randomly dispersed. Fairly predictions of *L. urens* can be made from 50 m and 200 m.

P08-05 **LE CADRE, SOLENN, Nathalie Machon, and Jacques Moret** UMS 2699 Inventaire et Suivi de la Biodiversité, Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (LCS, NM, JM) (lecadre@mnhn.fr) UMR 5173 CNRS MNHN Conservation des Espèces, Restauration et Suivi des Populations. Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (NM).

SEXUAL REPRODUCTION AND ALLEE EFFECT IN ;ACONITUM NAPELLUS; L. SUBSP. ;LUSITANICUM;, A RARE AND PROTECTED SPECIES IN NORTHERN FRANCE

Allee effect raises risks of extinction of small populations. Its mechanism bases on the avoidance by pollinators of flowers in low density patches. ;Aconitum napellus; L. subsp. ;lusitanicum; is a rare and protected ;Ranunculaceae; in the Parisian region (France). It can reproduce both sexually with the help bumblebees and asexually. Our concern was to determine if Allee effect occurred in small populations and quantify thresholds of density and isolation at which population could not reproduce sexually. Results showed that manual pollen supplementations were always more productive than free pollinations and particularly in the low density patches. In natural populations, seed set was positively correlated to flower density in the neighborhood and negatively to patch isolation. Studies on bumblebee behavior showed fewer visits on flowers in low density patches than in high ones. Moreover, differences observed between inbred and outbred matings gave evidence of inbreeding depression in the small populations. Allee effect seems to have a significant impact on sexual reproduction of aconites in small populations but clonal reproduction could take over when sexual reproduction is insufficient. Diagnosing critical thresholds at which reproductive failure occurs give essential information for the definition of efficient restoration plans.

P08-06 **MCGRAW, JAMES B.** Department of Biology, P. O. Box 6057, West Virginia University, Morgantown, WV 26506-6057. (jmcgraw@wvu.edu)

BERRY RIPENING AND HARVEST SEASON IN AMERICAN GINSENG: A RANGE-WIDE ASSESSMENT

Harvest seasons represent an opportunity to manipulate population growth parameters to achieve a management end. In the uncommon plant, American ginseng, harvest seasons were set by individual states in response to a mandate to ensure harvest sustainability after the 1973 listing of the species on CITES Appendix II. The geographic pattern of harvest dates suggests that it is unlikely that harvest season is optimized, however no range-wide data on berry ripening are available to guide a revision to the harvest regulations. In this study, a coordinated network of ginseng monitors censused 2035 berries on 402 plants in 31 populations from 9 states or provinces. Overall, 80%, 44% and 13% of the berries remained green (unripe) on August 15, September 1, and September 15, respectively. Although two Missouri populations matured fruits early, no consistent geographic pattern of ripening was found corresponding to latitudinal or longitudinal gradients that would warrant different seasons for different states. Berry ripening data, combined with germinability testing of seeds matured at different dates, suggests a uniform harvest onset date of September 1 would significantly improve population recovery from harvest. A later date of onset could preclude harvesters from planting seeds, an action that also improves recovery.

P08-07 **MURPHY, HELEN T. and Jon Lovett-Doust** Department of Biology, University of Windsor, Windsor, Ontario, N9B 3P4, Canada, (murph15@uwindsor.ca)

LANDSCAPE- VS SITE-LEVEL EFFECTS ON DEVELOPMENTAL INSTABILITY: FLUCTUATING ASYMMETRY ACROSS THE RANGE OF HONEY LOCUST, ;GLEDITSIA TRIACANTHOS; (FABACEAE)

Developmental instability is typically measured as patterns of fluctuating asymmetry (FA), small departures from perfect symmetry in structural morphology. Although the mechanisms producing developmental instability remain unclear, the disruptive effect of “stressors” during development is assumed to induce deviations from symmetrical phenotypes. Associations between developmental stress and FA are particularly interesting from the perspective of conservation of fragmented and geographically marginal populations, which are thought to be exposed to higher levels of genetic and environmental stress. We measured two leaf FA parameters at 18 populations across the range of the native tree ;Gleditsia triacanthos; (Honey Locust). Highly significant effects of both landscape (region) and site were found for the two FA traits. Sites closest to the range centre had amongst the highest FA levels for both indices. Neither FA index correlated with latitude or climatic factors. Nor did FA values generally increase in smaller populations. These results suggest that sites of high and low quality occur in a mosaic throughout the geographic range, independent of any fragmentation effects. Thus the relationship between habitat fragmentation and plant performance may be more nuanced than currently perceived.

P08-08 **SCHLÜTER, EVEROSE and J. Michael Reed** Tufts Institute of the Environment, Tufts University, Medford, MA 02155 (everose.schluter@tufts.edu)(ES); Department of Biology, Tufts University, Medford, MA 02155 (JMR)

THE ROLE OF COARSE WOODY DEBRIS IN MAINTAINING FOREST MOSS COMMUNITIES

Maintaining biodiversity in an industrial forest requires identifying species in jeopardy of disappearing as a result of tree harvest, as well as determining the conditions necessary to sustain them. We studied the role that coarse woody debris plays in the presence, succession, and persistence of forest moss communities in an industrial forest in western Maine, U.S.A. We surveyed all downed logs (> 8 cm in diameter) within 500 m2 plots in deciduous (N = 10 sites) and coniferous (N = 10 sites) mature industrial forest. For each log we recorded moss species presence and cover, log type, log size, and log decay class. In addition, we sampled tree stumps to determine if moss communities differed among naturally-occurring and sawn stumps and downed logs. Moss community composition varied by log size and decay class. Species richness and cover were higher on larger logs and on logs of deciduous type. More decomposed logs supported different moss communities from those on less decayed logs. In addition, stump communities were similar to log communities, especially when compared with early decay stage logs. Based on our results, the retention of downed trees of varying sizes and decay stages is necessary for moss community persistence and succession.

P09-01 **ANDERSSON, ERIK, Jakob Lundberg, Grainne Cleary, and Thomas Elmqvist** Natural Resource Management, Department of Systems Ecology, Stockholm University,106 91 Stockholm SWEDEN (erik.andersson@ecology.su.se)

SUSTAINING URBAN LANDSCAPES: THE FUNCTIONAL ROLE OF A MOBILE LINK SPECIES IN OAK FOREST REGENERATION

In the light of increasing urbanization and loss of green areas, a central question is how the biodiversity necessary for generation of ecosystem services can be maintained. We assessed the capacity of oak populations (Quercus robur) to regenerate in an urban environment and addressed the role of animal dispersal in sustaining this capacity. Our study was located in the Stockholm metropolitan area, Sweden. Acorn predation experiments showed that post-dispersal predation rates were high in oak and coniferous forests but lower in open and edge grasslands. The eurasian jay (Garrulus glandarius) has been identified as a keystone species for the dispersal of oaks and acts as a mobile link between habitats. We studied habitat preferences, breeding success and population density of jays. Although present in most forest habitats, the jay showed a preference for coniferous forest during the breeding. We discuss the strength of interaction between oak and the acorn-dispersing jay and the management implications for urban green areas. The dispersal of acorn into the surrounding landscape enhances the gene pool of oaks and buffer disturbance across scales and habitats. We argue that particular attention to mobile links in conservation efforts would contribute to the prevention of ecosystem degradation and biodiversity loss in increasingly fragmented landscapes.

P09-02 **BURKE, R.L.** Department of Biology, Hofstra University, Hempstead, NY,11549 (biorlb@hofstra.edu)

TERRAPIN CONSERVATION IN A NATIONAL PARK IN NYC: WHAT IS NATIVE AND WHAT SHOULD BE PROTECTED?

Diamondback terrapins (Malaclemys terrapin) are medium-sized estuarine turtles whose populations are declining throughout most of their range. One of the largest populations is in Jamaica Bay Wildlife Refuge, 24 km away from New York City and ca. 18 million people. Terrapins are key natural and environmental resources in Jamaica Bay Wildlife Refuge, and are thus important to the Refuge's mission. Both nesting terrapins and emerging hatchlings are commonly observed by Refuge visitors. Thus JBWR offers opportunities for both preserving a valuable natural resource and providing important environmental education. Human activities have caused dramatic changes in Jamaica Bay, some have benefited and some harmed terrapin populations. Ruler's Bar Hassock itself was built from dredge spoil but now is the major terrapin nesting site (ca. 2000 nests/year). Both raccoons and rats have been introduced to islands. Raccoon management is controversial because of uncertainty as to whether raccoons are "native" and whether terrapin populations deserve special protection. If raccoons are native, then the large terrapin population is not. If maintaining the large terrapin population is desirable, then raccoons should be managed. No management plans could possibly recreate past conditions for these species, thus an artificial goal must be chosen.

P09-03 **DAVIS, CAROLYN M.** National Park Service, National Natural Landmarks Program, 791 Baltimore St, Gettysburg, PA (carolyn_davis@nps.gov)

THE NATIONAL NATURAL LANDMARKS PROGRAM IN THE NORTHEAST UNITED STATES; ENCOURAGING CONSERVATION AMONGST URBAN LANDSCAPES

The National Natural Landmarks program, administered by the National Park Service, works with public and private landowners to encourage preservation of outstanding natural areas. While many National Natural Landmark sites are situated remotely, others, especially in the northeastern United States, are nestled within urbanized areas. National Natural Landmarks can be found within close proximity of major cities like Philadelphia and New York City. These urban sites are of exceptional value not only for their significant biological or geological resources that warranted their original designation, but also for their ability to connect urban populations with the natural environment. They provide opportunities for scientific discovery, outdoor activities, habitat for wildlife, and personal inspiration. While there are many advantages to an urban setting, there are also associated threats and issues resulting from proximity to densely populated areas. These include development pressure, pollution, habitat fragmentation, exotic species, and overuse by visitors. The National Natural Landmarks program offers technical assistance to landowners to aid in dealing with these potential impacts.

P09-04 **DOOLING, SARAH, Ken Yocom, Gregory Simon, William Webb, and Jack DeLap** Department of Urban Design and Planning, Box 355740, University of Washington, Seattle, WA 98195-5740 (sdooling@u.washington.edu); Program on the Built Environment, CAUP, University of Washington, Seattle, WA 98195 (KY); Geography Department, University of Washington, Seattle WA 98195 (GS); College of Forest Resources, University of Washington, Seattle, WA 98195 (WW, JD). All participants are NSF funded IGERT-URBAN ECOLOGY Fellows

THE HISTORY OF URBAN PARK DEVELOPMENT IN SEATTLE 1900-2000: AN EMERGENT PHENOMENON?

There is a long history of park designation and planning in Seattle, beginning with the Olmsted Plan of 1903. Using the analytical framework of emergent theory, we present an argument for the process of park development in Seattle as a non-linear, unpredictable pattern within an urban landscape from 1900-2000. The first part of our analysis measures the temporal and spatial distribution of park-owned land over one hundred years. The second part of our analysis describes more specifically the three distinct eras of park development, by detailing environmental events and social movements, both at the national and local scales, which directly impacted park use, distribution, and acquisition. Changes in the spatial configuration of parks, when observed over a 100-year time frame, demonstrate qualities consistent with emergent phenomenon – that is, they exhibit non-linear, unpredictable rates and patterns of change. Our research demonstrates the evolution of Seattle's park system is a result of the interactions between economics, politics, culture, and the biophysical factors organized into three distinct eras over time. Additionally, we identify threats to established Seattle parks and recommend strategies for creating and maintaining urban parks while accommodating increases in human population density and urbanization.

P09-05 **HEDBLOM, MARCUS and Bo Soderstrom** Department of Conservation Biology, SLU, P. O. Box 7002, SE-750 07 Uppsala, SWEDEN (marcus.hedblom@nvb.slu.se)

DETECTING THRESHOLD LEVELS OF URBAN FORESTS IN SWEDEN USING GIS

Sweden is one of the most urbanized countries in the world. Present densification of the urban environment in cities add pressure on green areas. Critical threshold levels between 10 and 30 per cent of remaining habitat on landscape level have been proposed below which loss of species will be greater than habitat loss alone. Although widely cited this threshold level has seldomly been empirically tested. We performed a GIS analysis of all cities in Sweden with more than 10000 inhabitants (100 cities representing 65 per cent of the total Swedish population). On average 20 per cent of the cities comprised urban forest (variation 1 to 40 per cent). It is thus possible that a threshold has already been reached for many species dependent on urban forests. However, urban forests do not function as true islands but depend on the quality of the surrounding city and landscape matrix. Residential districts, cemeteries and country estates in Sweden probably offer resources and facilitates landscape movement to individuals in urban forest habitats. Urban areas offer an excellent opportunity to test critical threshold levels in different landscape matrices.

P09-06 **HOGLE, INGRID B., Joshua H. Viers, James F. Quinn, Mark W. Schwartz, Becky Waegell, and Kaylene Keller** Information Center for the Environment, University of California-Davis, One Shields Avenue, Davis, CA 95616 (ibhogle@mindspring.com) (IBH, JHV, JFQ). Cosumnes River Preserve, 13501 Franklin Blvd, Galt, CA 95632 (BW). Jones & Stokes Associates, 2600 V Street, Sacramento, CA 95818 (KK).

SPATIAL ANALYSIS OF PERENNIAL PEPPERWEED INFESTATION IN A SEASONAL FLOODPLAIN

Rapid on-going expansion of Lepidium latifolium (perennial pepperweed) populations threatens to create vegetation monocultures in riparian and wetland habitats throughout California. Understanding site characteristics that promote spread of Lepidium latifolium can help resource managers target and prioritize areas for weed control and future habitat restoration. This approach will help ensure the viability of native floodplain vegetation. We present a site-specific, GIS-based model that estimates correlations between rates of Lepidium latifolium spread and site history, hydrological characteristics, disturbance regimes, soil properties, and existing plant community types. Two years of monitoring Lepidium latifolium on a recently restored seasonal floodplain at the Cosumnes River Preserve in Sacramento County indicate that elevation, size of previous year's population, and distance to nearest disturbance vector (road or levee breach) all affect change in stem numbers per patch. These physical and environmental site characteristics are being used to assess future infestation risk and to target areas for management.

P09-07 **KLEPPEL, GARY S.** DEPARTMENT OF BIOLOGICAL SCIENCES, UNIVERSITY AT ALBANY, SUNY, 1400 WASHINGTON AVENUE, ALBANY, NY 12222. Biodiversity, Conservation and Policy Program, Department of Biological Sciences, University at Albany, SUNY, Albany, NY 12222 (RS)(gkleppel@albany.edu)

ECOLOGICAL IMPACTS OF ALTERNATIVE URBAN TYPOLOGIES: THE ROLE OF ECOLOGICAL DESIGN ON RAPIDLY URBANIZING LANDSCAPES

Urbanization is a leading cause of ecosystem degradation in the US. We tested the null hypothesis that urban typology (development style) has no affect on ecosystem function. Species-area relationships, demographic and land cover data for South Carolina's coastal counties were used with population:urban-area ratios to estimate the impact of typology (suburbs and small towns) on watershed development and tidal creek benthic invertebrate species richness, S, from 1995 - 2025. Suburban typology will result in development of 84 percent of the watersheds and a 24-40 percent decline in S in the fastest growing counties. If in-migrants are distributed in small towns, only 10.2 percent of the watersheds are developed and S declines only 5-10 percent. Wetlands in upstate New York that drain suburbs exhibit more extensive invasive plant cover, higher conductivities and lower ecological efficiencies than wetlands that drain small towns. Suburbs have larger areas of impervious surface and less buffer between the urban landscape and wetlands than small towns. Small towns, though economically and ecologically viable alternatives to suburbs, are illegal under most zoning ordinances. Modifications to current ordinances are needed to create urban landscapes governed by the ambulation-scale, with buffers (as public parks) to protect receiving waters.

P09-08 **KOTZE, D. JOHAN and Susanna Lehvävirta** Department of Biological and Environmental Sciences, PO Box 65 (Viikinkaari 1), FIN-00014, University of Helsinki, Finland (johan.kotze@helsinki.fi)

OF SHARP EDGES, HEAVY TRAMPLING AND A LACK OF DEAD AND DECAYING WOOD IN URBAN WOODLANDS – HOW TO CHANGE CITY GREEN SPACE FOR THE BENEFIT OF CARABID SPECIES

Green space in urban areas is characterised by abrupt habitat edges, intensive human trampling and a lack of dead and decaying wood. We studied the joint effects of distance from the woodland edge and different levels of human trampling on ground beetles (Carabidae) with an observational layout, and the effect of downed logs on these beetles with an experiment, in Helsinki, Finland. Results suggest curvilinear responses of beetle abundance and species richness. They were low at the woodland edge, significantly higher between 7-22 m into the patch, and again lower further into the patch. Both carabid abundance and species richness were low at low levels of trampling, high at moderate levels, and lower at high and extreme levels of trampling. Two years after the introduction of dead trees to selected urban woodlands, few forest carabid beetles have responded positively to this addition. Since wood in boreal forests decompose slowly and vegetation recovers slowly from intense human trampling, it may be too early to observe an effect even if one exists. To maintain carabid communities in urban areas, we recommend the creation of more 'natural-like' urban parks with dead and decaying wood on the forest floor. Placing of these natural obstacles may also restrict trampling on the forest floor and allow vegetation recovery, both of which may have a positive effect on carabid forest specialists.

P09-09 **MACDONALD, KRISTI** Ecology and Evolution Program, Rutgers University, 1 College Farm Road, New Brunswick, NJ 08901, (kristim@eden.rutgers.edu)

THE ROLE OF FOREST PROXIMITY AND LAND USE IN MAINTAINING DIVERSITY OF BREEDING SONGBIRDS IN AN URBAN WATERSHED: OPPORTUNITIES FOR URBAN CONSERVATION PLANNING

In order to determine the value of forests and human built habitats in maintaining bird diversity in urban regions, avian surveys were conducted along 250 transects during the breeding season in 2002 and 2003. Transects were located in and adjacent to 21 forests and at various distances from forest edges in areas reflecting different types of land use in the heavily urbanized Arthur Kill watershed of New Jersey and New York. Richness and abundance of species that regularly crossed the forest boundary best reflected differences among urban land use types and this was largely dependent on vegetation composition and structure and the amount of built cover. Proximity of transects to forest greatly increased richness and abundance of this "transboundary" group up to at least 200 meters from forest patches in all land use types. These findings suggest that even small urban forests are valuable as conservation targets for maintaining avian diversity in urban regions. Furthermore, forest proximity and specific habitat characteristics of human-built environments (e.g., tree and shrub cover) interact in maintaining diversity of the transboundary group. This has important applications for conservation planning, habitat management, and restoration aimed at enhancing avian diversity in urban regions.

P09-10 **MORRISON, JOAN L. and Erin J. Riley** Department of Biology, Trinity College, 300 Summit St., Hartford, CT 06106 (joan.morrison@trincoll.edu)

URBAN PARKS AS HABITAT ISLANDS WITH IMPORTANCE FOR CONSERVATION OF REGIONAL BIODIVERSITY

Expanding urbanization poses a major challenge for the conservation of biodiversity. Extensive habitat modification resulting from urbanization leads to reduced avifaunal richness and diversity, fewer native species, and increased abundance of some (mostly exotic) species in urban environments. In regions where landscapes have been fragmented and altered by centuries of human impact, urban parks may have an important role in the conservation of regional biodiversity. Using distance sampling methods and multiple regression, we compared patterns of species' occurrence and factors potentially influencing the presence and abundance of breeding birds in urban parks and their surrounding neighborhoods in Hartford, CT. In the parks, total area accounted for species richness and the pattern was highly nested, while the amount of wooded area and wooded patch size influenced the presence of species in forest and shrub-nesting guilds. Non-native ground foragers dominated in neighborhoods surrounding the parks, yet were only minor components of bird communities in the parks. Tree and housing density influenced species richness in neighborhoods suggesting that wooded streets can increase urban landscape connectivity for native species. Recognizing the importance of urban parks as biodiversity hotspots in cities is important in a regional framework for management and conservation of native birds.

P09-11 **MURATET AUDREY, Nathalie Machon, Gérard Arnal, Jacques Moret, and Yoann Faivre** UMS 2699 Inventaire et Suivi de la Biodiversité, Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France (muratet@mnhn.fr) UMR 5173 CNRS MNHN Conservation des Espèces, Restauration et Suivi des Populations. Muséum National d'Histoire Naturelle. 61, rue Buffon, F-75005 Paris. France .

DISTRIBUTION OF SPECIES RICHNESS IN A VERY URBANIZED ZONE

The aim of our study was to understand the functioning of plant biodiversity in urbanized environments. For that purpose, we inventoried all the locations where plants were growing, in a very urbanized region, immediately bordering on Paris (France). The locations were classified in 24 types of environments. In each type of environment, we randomly chose several locations where we performed quasi-exhaustive floristic inventories. In that manner we know precisely the distribution of the species richness and particularly where the rare species are located. The majority habitats are urban lawns and waste grounds. Statistical analysis showed that the species were more abundant when the lawns were larger and more distant from Paris and when they contained representative species. Structural characteristics (soil, exposure…) seemed to have no effect on the species distribution. We suppose that anthropogenic factors mask their effects. The rarest species were mainly found in waste grounds. In regions where green zones are constantly threatened by urbanization, these results allow to classify them according to their respective contribution to the dynamics of the biodiversity and give decision elements to town managers.

P09-12 **OLALLA TÁRRAGA, MIGUEL ÁNGEL** Department of Ecology. Faculty of Sciences. Universidad Autónoma de Madrid. Campus de Cantoblanco. Ctra. de Colmenar, km.15. 28049 Madrid (Spain) (miguel.olalla@uam.es)

AN AGGREGATED INDEX TO ASSESS AN INTEGRATED APPROACH TO SUSTAINABILITY IN URBAN ECOLOGICAL SYSTEMS: AN APPLICATION TO A UNIVERSITY CAMPUS

Few aspects of the structure and functioning of ecosystems are devoid of human influence. This connection is evident in the heterotrophia of cities. Building a sustainable urban environment involves managing factors that extend beyond metropolitan boundaries, and has clear implications in conservation. Contemporary approaches in urban ecology should take into account interactions and feedbacks between socio-ecological dimensions. Sustainability indicators are key tools to assess such integration, but initiatives are diverse and there is no agreed framework for the assessment of such interactions and feedbacks. We analysed five frameworks and eight models, combining them into a single Hierarchical Model of sustainability (divided into dimensions, areas, objectives, attributes and indicators). Using aggregation algorithms to elaborate a sustainability index, we represented the results of this model graphically through the Dashboard of Sustainability, a visual model presented in the Johannesburg Summit of 2002. This presentation format shows complex relationships in a format easily comprehensible to citizens and decision makers. These designs have been used separately and nearly always at a national or regional level, but never locally. Using this methodology to model the campus of the Universidad Autónoma de Madrid, a university campus with 35000 users 15km from Madrid (Spain), as a medium city, the trend and present situation of 43 indicators were evaluated as an example of an integrated assessment for sustainability appraisal at an urban level.

P09-13 **ROBINSON, TARA R., W. Douglas Robinson, George R. Angehr, Lisa J. Petit, Daniel R. Petit, and Jeffrey D. Brawn** Oregon State University, Dept of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331 (tara.robinson@oregonstate.edu) (TR, WDR); Smithsonian Tropical Research Institute, Unit 0948, APO AA 34002 (GRA); Smithsonian Institution Migratory Bird Center, National Zoological Park, Washington, D.C. 20008 and National; Park Service, Cuyahoga Valley National Park, 15610 Vaughn Road, Breckville, OH 44141 (LJP); Cleveland Metroparks, 4401 Fulton Parkway, Cleveland, OH 44144 (DRP); University of Illinois, Urbana-Champaign Department of Animal Biology, 113 Shelford Vivarium, 606 E. Healey Street, Champaign, IL 61820 (JDB)

DISTRIBUTION OF BIRD DIVERSITY IN AN URBANIZING TROPICAL LANDSCAPE

The struggle between urbanization and the preservation of biodiversity is at the forefront of international issues. The withdrawal of the U.S. military from the Republic of Panama exposed 64,000 ha of lowland forest to urbanization and development. We present an overview of the distribution of bird diversity in the forests of the canal area based on ten years of inventories. Four hundred ninety-eight species have been recorded, of which 177 species occur only in lowland forests. Species typical of forests are probably most at risk because rapidly increasing human population growth and opportunities for land development usually lead to destruction of forests. Extensive fragmentation, disconnection of forested corridors between foothills and lowlands, and anthropogenic degradation of forests near cities and towns have altered regional bird community dynamics. Some dynamics occur on large spatial scales, such as the movements of elevational and transisthmian migrants. Long-term maintenance of bird species diversity in the canal area will require preservation of the large forest tracts and re-establishment of a forested connection from the canal corridor lowlands to foothills in the east. Such conservation activities will be challenging to execute given the region's growing human population and desires for a stronger national economy.

P09-14 **ROBINSON, W. DOUGLAS, B. Graeme Lockaby, Daowei Zhang, Jack W. Feminella, Josh McDaniel, and Jeffrey A. Stratford** Dept. of Fisheries and Wildlife, 104 Nash Hall, Oregon State Univ., Corvallis, OR 97330 (douglas.robinson@oregonstate.edu) (WDR); School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849, USA (BGL, DZ, JWF, JM, JAS).

A MULTIDISCIPLINARY INVESTIGATION OF URBANIZATION IN THE SOUTHEASTERN UNITED STATES: THE WEST GEORGIA PROJECT

An interdisciplinary investigation of urban development was initiated in 2001 in a forested landscape north of Columbus, Georgia, USA. The study area includes a gradient of human population density, rate of growth, and landscape compositions. Major land uses include urban, residential/suburban, forested, and rural (mostly pasture). Our sampling focuses on 22 watersheds, ranging in size from 1000 to 5000 ha, to bridge the gap in spatial scales at which ecological and sociological processes operate. We have quantified relationships between land usage and local economics, human cultural perspectives, water quality, terrestrial biodiversity (birds, plants), aquatic biodiversity (fish, invertebrates, and periphyton), and aesthetics. All facets show strong responses to urbanization of the landscape. Water quality declines precipitously as urbanization increases. Biodiversity responses are complex, but species richness tends to peak in suburbanized landscapes; increasing urbanization leads to numerical domination of communities by generalists. Human knowledge of nature is lower in urban areas. Econometric models are being developed to predict changes in each component of our study as a function of changing land use scenarios. Effective conservation of natural resources in urbanizing landscapes will require educational programs as well as detailed landscape planning to protect water quality and biodiversity.

P09-15 **ROUSSEAU, JOSÉE, Jean-Pierre Savard, and Rodger Titman** Macdonald Campus, McGill University, 21111 Lakeshore, Ste-Anne-de-Bellevue, Quebec, H9X 3V9, Canada, (josee.rousseau@mail.mcgill.ca) (JR, RT). Canadian Wildlife Service, Environment Canada, 1141 route de l'Église, Box 10100, 8e étage, Sainte-Foy, Quebec, G1V 4H5, Canada.

AVIAN DIVERSITY, ASSEMBLAGES AND USE OF VEGETATION IN AN URBAN ECOSYSTEM

Urbanization is known to have a negative impact on biodiversity. However, some shrub-nesting species establish their breeding territories on the island of Montreal. My first objective was to compare bird diversity among four urban habitat types: low and medium density residential sectors, and residential and natural parks. A second objective was to determine the presence of bird species assemblages within each urban habitat. A third objective was to explore associative relationships among six bird species and vegetation. Point counts were conducted in each of 103 locations. Environmental variables measured consisted of type (coniferous versus deciduous), density and height of vegetation within each 1ha sector. The results demonstrate an increase in bird diversity from medium-density residential habitats to natural parks. Low-density residential habitats and residential parks had similar diversity indexes. Most bird species appeared to be associated with at least one type of urban habitat. Correlation between bird species and vegetation demonstrated different levels of association between each species and the different habitat variables. Clumps, edges of vegetation, shrubs and conifers seem particularly important for the selected urban birds.

P09-16 **SAUTER, ANNETTE, Reed Bowman, and Karin Schiegg** Universität Zürich, Zoologisches Institut, Winterthurerstrasse 190, 8057 Zürich, Switzerland, (asauter@zool.unizh.ch) (AS, KS). Archbold Biological Station, P.O. Box 2057, Lake Placid, FL 33862 (AS, RB)

GOOD START, BAD CONDITIONS? GROWTH AND SURVIVAL IN SUBURBAN FLORIDA SCRUB-JAY NESTLINGS

Urbanization is increasing but its impact on animals apart from habitat loss is not well studied. Natural foods generally decrease in urban areas, while the amount of anthropogenic foods increases. We studied variation in nestling growth and survival by supplementing suburban (n=28) and wildland (n =55) Florida Scrub–Jay (Aphelocoma coerulescens) families with natural foods during the first 10 days after hatching of the young. Suburban nestlings at the age of 3 days post-hatching were heavier than wildland nestlings of the same age, but by age 11 days this relationship was reversed. Food supplementation led to increased nestling mass and decreased brood reduction and these effects were stronger in the suburban habitat. Post-fledging survival was lower in the suburban habitat, but was not influenced by food supplementation in either habitat. Access to anthropogenic food seems to enable suburban parents to either invest more in egg quality or to better provision the young at an early age. As the nestlings grow older however, their nutritional needs may not be fulfilled adequately, which results in reduced growth when compared to wildland nestlings. Nevertheless, reduced nestling survival in the suburban habitat can not be explained only by impaired nestling growth.

P09-17 **STRINDBERG, SAMANTHA** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (sstrindberg@wcs.org).

A COMPARISON OF SURVEYS DESIGNS USED IN LINE TRANSECT SAMPLING

Line transect surveys are used to estimate abundance, monitor trends, and quantify changes in the distribution of wildlife populations. Accuracy and precision of abundance estimates for the purpose of wildlife population assessment, as well as the efficiency achieved, are determined to a large extent by the survey design. Designs are contrasted with regard to properties such as the spatial distribution of sampling locations within the survey region, the distances covered by observers to obtain the sample data, and the probability of a particular location being included in the sample (coverage probability). Systematic designs provide a more even spatial spread over the survey region than their non-systematic counterparts, which tends to improve estimator precision. Survey designs based on continuous lines waste no effort on movement between line segments and this improves efficiency. If coverage probability is assumed to be even when it is not, standard estimation methods can be biased. If more complex methods are used to allow for uneven coverage probability, estimator precision is typically lower than for an even coverage probability design. Various survey designs have been automated and their properties are illustrated with terrestrial and marine survey examples. Efficiency and survey cost are considered for differing logistical constraints.

P09-18 **STROH, ESTHER D.** U.S. Geological Survey Northern Prairie Wildlife Research Center, Missouri Field Station, 373 McReynolds Hall, University of Missouri, Columbia, MO 65211.(esther_stroh@usgs.gov).

FINDING DIVERSITY WHERE THERE WAS NONE: INTERSIMPLE SEQUENCE REPEAT MARKERS REVEAL RELATIONSHIPS AMONG RELICT PLANT POPULATIONS WHERE ISOZYMES FAIL

Relict populations that have been long isolated from the core of a species are particularly susceptible to loss of heterozygosity through inbreeding and drift. If the same alleles for a suite of genes are fixed or nearly fixed in a set of populations, it is difficult to determine relatedness, similarity, or gene flow among the populations. Intersimple sequence repeat (ISSR) markers have been used successfully to distinguish between genetically similar cultivars of many agricultural crops, and they are now being used to determine genetic relationships among populations and species of native plants. ISSR motifs are common in many plant genomes and can be used with no previous sequencing knowledge for a species. I used isozymes and ISSR markers to determine genetic relationships among relict and non-relict populations of ;Zigadenus elegans; in several US states. Isozymes demonstrated almost no diversity among or within relict populations compared to non-relict populations, but ISSR markers revealed enough diversity within and among all populations to determine genetic distances, construct relationship trees and make estimates about gene flow between geographically close relict populations in Missouri. With a few caveats, ISSR markers are a simple technique to distinguish among otherwise homogeneous populations.

P09-19 **VAN DER REE, RODNEY and Michael McCarthy** Australian Research Centre for Urban Ecology, Care of School of Botany, The University of Melbourne, Victoria 3010, Australia, (rvdr@unimelb.edu.au)

MITIGATING THE BARRIER EFFECT OF ROADS ON FAUNA. ARE WE ASKING THE RIGHT QUESTIONS?

The barrier effect of roads and traffic on fauna (due to increased rates of mortality via collision and avoidance of the road and traffic) is considered a major threat to population viability. Measures to mitigate this impact include the construction of tunnels and overpasses to assist safe passage. In this paper, we review the scientific literature to assess the effectiveness of wildlife-crossing structures, with a particular focus at the population level. All studies, which were conducted primarily in Europe, North America and Australia, documented a range of species using the structures. Most studies identified factors influencing the rate of crossing (e.g. tunnel dimensions, vegetative cover) but few identified what the structure was used for (e.g. daily use, dispersal). A lack of detail in specifying road width, traffic volume, and the type and dimensions of the structures limited comparisons between studies. However, the major shortcoming was the lack of assessment at the population level. Consequently, conclusions about the extent to which mitigation measures have improved the viability of local populations cannot be made. To ensure the barrier effect of roads is minimised and mitigation funds spent most effectively, we conclude with a model that examines the population-level effect of mitigation measures.

P09-20 **VAZQUEZ, LUIS-BERNARDO and Kevin J. Gaston** BIOME. Department of Animal & Plant Sciences. University of Sheffield. Alfred Denny Building, Western Bank. Sheffield S10 2TN. U.K. (l.b.vazquez@shefiield.ac.uk).

PEOPLE AND MAMMALS IN MEXICO: CONSERVATION CONFLICTS AT A NATIONAL SCALE

The on-going regional and global decline in native biodiversity is, ultimately, associated with growth in the human population and the enterprise that sustains it. Whilst the large 'ecological footprint' of components of this population important, generation pressures in areas often far removed from where the people responsible reside, the extent of the conflicts between people and other species also depends in large part on the degree to which spatially they co-occur. We examined relationships between the spatial variation in the distributions of mammal species richness, human population density, landscape transformation, and conservation areas in Mexico. Our results revels that spatial variation in the mammal richness is positively correlated with spatial variation in the numbers of people. That is, on average, areas in which there are more mammal species also tend to have more people. The existence of broadly similar relationships of both mammal species richness and human population density with environmental variables supports the argument that the covariation between the mammal species richness and human density is a consequence of them responding in similar ways to spatial variation in environmental conditions. The positive spatial relationship between mammals and human population density suggests that the conservation of mammals in Mexico may face greater conflicts than might otherwise be the case.

P09-21 **YASUDA, MIKA and FUMITO KOIKE** Graduate School of Environment Science and Technology, Yokohama National University, 79-7 Tokiwadai, Hodogaya-ku, Yokohama 240-8501, Japan (mic.yasuda@kub.biglobe.ne.jp)

BIODIVERSITY ASSESSMENT IN GOLF COURSE:PRELIMINARY EXPERIMENT FOR DETECTING THE IMPACTS OF COURSE MANAGEMENTS BY THE FIELD INVESTIGATION AND HEARING

In order to assess the impacts of golf courses on environment and human health, there is number of ways of testing such as indicator species. Most of these tests involve laboratory works. However, the ecosystem is a complex system, it is difficult to detect at laboratory. Therefore, it is important to develop the methods to predict the impacts of course managements and to find how to maximise the wildlife in golf courses, and are focus of this study. The investigation of biota on turf grasses was carried out in the summer of 2002 at seven golf courses in Japan. Collected samples (18 samples in each course) were identified and the numbers of individuals were counted. Information of management applied in each course was obtained by the interviews with green keepers. In total 110 invertebrate families were collected. The number of 42 invertebrates families were associated with course management features such as mowing grasses and applying chemicals. Although further study needed, this preliminary experiment tells that it is possible to detect the impacts on biota with the field investigation and the experiment needs the co-operation of course owners and green keepers to maximise the wildlife in the golf courses.

P09-22 **YLI-PELKONEN, VESA and Jari Niemelä** Department of Biological and Environmental Sciences, P.O. Box 65, FIN-00014 University of Helsinki, Helsinki, Finland, (vesa.yli-pelkonen@helsinki.fi).

INTEGRATING ECOLOGICAL AND SOCIAL SYSTEMS IN URBAN PLANNING AND GREEN SPACE CONSERVATION: FINLAND AS A CASE

To preserve urban nature and its biodiversity in the course of urbanization, it is essential to work within a framework where ecological and human-social systems are linked for sustainable urban land-use planning. We adapted a theoretical and conceptual scheme for studying the land-use change as a result of urban development in Finland, where a lot of nature has so far been retained in urban areas, and addressed how ecological information is incorporated into the urban planning process and the kind of social drivers influencing the information utilization. The interviewed key professionals, from planning processes in three focus districts in the Helsinki metropolitan area, regarded ecological information very important for identifying and preserving valuable urban nature and its biodiversity, and for enabling nature-related experiences and services for urban dwellers. Utilizing ecological information was regarded challenging due to its insufficiency, fragmentedness, inadequate interpretation and poor presentation. Major societal drivers, such as the city's planning policy and economic growth, and the importance of the district to local residents and to the city, affect a planner using ecological information. Improving communication between planning and ecology, and matching contradictory values and perceptions, would be in the best interest of nature and people of urban areas.

P10-01 **ARTHUR, VICTORIA** Southern Oregon University, 1250 Siskiyou Blvd., Ashland, OR 97520 and Bureau of Land Management, 3040 Biddle Rd., Medford, OR 97504, Victoria_Arthur@blm.gov.

CONSERVATION BIOLOGY CURRICULUM KIT FOR SECONDARY TEACHERS: WHAT EVERY EARTH CITIZEN SHOULD KNOW

The big question of the 21st century, is whether people can live on Earth without wrecking it! We have a responsibility to make sure that no one leaves school without having an understanding of the state of the environment and how the choices they make effect it. The goal of the Conservation Biology Curriculum Kit is to educate students about environmental issues and to stimulate critical thinking, discussion, and informed decision making on behalf of the environment. The curriculum covers the topics of species extinction, habitat loss, human population growth, “What Can I Do to Help?” and critical thinking. Environmental issues are complex and there are many perspectives and much uncertainty. This should not stop us from tackling these issues in school. With careful guidance, these different points of view can contribute to a dynamic learning environment in which students clarify their own thinking, learn how to listen to others, and gain new insights about these issues. The kit is intended to open student's minds to the world around them and engage them in dialogue and activities related to their place on the planet - and about the future of the world we all share.

P10-02 **FORD, MARY E. and Alan R. Berkowitz** Institute of Ecosystem Studies, Education Program, Box R, Millbrook, NY 12545 (FordM@ecostudies.org) (MEF and AB)

LINKING ECOLOGICAL LITERACY AND CONSERVATION BIOLOGY USING URBAN SCHOOLYARDS AND COMMUNITY GARDENS AS ECOSYSTEMS OF STUDY

In an urban context, teaching conservation biology and the ecological principles that underlie it requires sensitivity to the particular constraints and opportunities presented by the setting. The Education Program at the Institute of Ecosystem Studies has used multiple methodologies for improving ecological literacy in urban areas and involving students in real scientific study of the ecosystems that they have easy access to: schoolyards and gardens. These methodologies include multi-session teacher trainings that integrate scientific investigations with pedagogical models, the introduction of outdoor inquiry-driven science at urban school sites, work with students in community gardens in the City of Poughkeepsie and other programs. Specific techniques range from analysis of aerial photos to quantifying biodiversity through field work to studying patterns of human use in ecosystems of interest. Analysis of these programs indicates that students' interest in and understanding of urban conservation concerns increase through participation in the study of local ecosystems, and that teachers gain confidence in this field through working with scientists and other educators in professional development experiences. This presentation will include details of a variety of programs, results of assessments of these programs, and recommendations of techniques for use by conservation biology educators working in urban areas.

P10-03 **GRAWE, LARISA R. and Derek T. DeSantis** Yale Outdoor Education Center, P.O. Box 208216, New Haven, CT 06520 (larisa@aya.yale.edu)

ACHIEVING EDUCATIONAL OBJECTIVES AT THE YALE OUTDOOR EDUCATION CENTER: THE CONSTRUCTION OF AN INNOVATIVE NATURE TRAIL AND SUPPLEMENTAL EDUCATIONAL MATERIALS

The Yale Outdoor Education Center (YOEC) serves as an environmental haven for the Yale community of outdoor enthusiasts, consisting of 2,000 forested acres located on the south shore of a mile-long lake. Prior to the development of informal educational opportunities, the educational materials available at the YOEC consisted of a limited number of bulletin boards describing the resident fish. The construction of an innovative nature trail has significantly increased the educational opportunities from which visitors can gain an understanding of diverse ecosystems, wildlife inhabitants, ecological processes, and site history. The nature trail uniquely integrates limited signage, lookout spots, historical landmarks, diverse ecosystems, and brochures; interactively enhancing observational skills and enabling Connecticut residents and other visitors to the YOEC to appreciate what is in their “backyard.” The inquiry-based brochure conceptually links topics including, but not limited to, species identification, land-use history, ecological systems, Lyme disease information, and environmental conservation. Through the combination of an interactive nature trail and the extended length of a hiking trail, the YOEC achieves an ideal composite trail (2.5-miles in length) from which the greatest cognitive and affective gains of visitors are achieved.

P10-04 **JACOBSON, SUSAN, Julie Morris, J. Scott Sanders, Eugene N. Wiley, Franklin Percival, and Robert Bennetts** Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL (jacobsons@wec.ufl.edu) Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL (JM) Florida Fish and Wildlife Conservation Commission, Tallahassee, FL (SS). Florida Fish and Wildlife Conservation Commission, Tallahassee, FL(EW), Franklin Percival, USGS Florida Cooperative Fish and Wildlife Research Unit, Gainesville, FL (FP), USGS Center for Aquatic Resources Studies, Gainesville, FL (RB)

UNDERSTANDING, MEASURING, AND BREAKING DOWN BARRIERS TO IMPLEMENTATION OF AN ADAPTIVE MANAGEMENT PROGRAM IN FLORIDA

The Florida Fish and Wildlife Conservation Commission (FWC) manages almost 2 million ha of land, including 26 wildlife management/environmental areas. The FWC has designed a new adaptive management approach that incorporates objectives based on the desired condition of the land. This study identifies the potential barriers to successful implementation of this Objective-based Vegetation Management approach and makes recommendations for breaking down barriers. A review of the adaptive management and organizational culture literature combined with the responses from interviews and surveys of FWC personnel and external scientists suggest that the barriers can be divided into 6 broad categories: logistical, educational, attitudinal, conceptual, organizational, and communication barriers. An analysis of 4 case studies and results of a FWC organization-wide survey further identified specific barriers to implementation. Ameliorating these barriers should ultimately result in improved management of native ecosystems on FWC-managed lands in Florida.

P10-05 **LI, EVE and Endi Zhang** Wildlife Conservation Society-China Program, C/o East China Normal University, Shanghai 200062, China (evebingli@163.net)

WORKING TO REDUCE WILDLIFE CONSUMPTION IN CHINA- AN OVERVIEW OF ASIA CONSERVATION COMMUNICATION PROGRAM

Asia Conservation Communication Program (ACCP) was founded in September, 1996 by New York based Wildlife Conservation Society (WCS) as the first wildlife consumer oriented project based in Mainland China. The program aims to raise public awareness of conservation, especially that of the tiger, and to influence and change public consumption concepts in hopes of helping reduce poaching. We have identified several groups i.e. the practitioners of Traditional Chinese Medicine (TCM), school children, university students, government officials, and the general public as our target audiences in the start phase. We then conducted a series of activities including hold 16 TCM workshops, sponsored 55 'model schools for wildlife conservation', and run public debates and other campus based activities among university students. Our working strategies include: employing diversified educational methods; assessing previous efforts and making timely adjustments in strategies taken; and strengthening communication and cooperation. In order to assess the program, we have conducted an evaluation towards our target groups, and the results showed as following:

1. The education has been very effective among TCM practitioners. Those who have participated in our activities not only manifested stronger awareness of conservation and readiness to act than those who have not, but also have played an active part in disseminating conservation information through following workshops and publications. T-test indicates significant difference between the two groups.
2. ACCP has made substantial achievements in raising conservation awareness among TCM students, those who had participated in the activities had better knowledge and behavior than those non-participants. T-test indicates significant difference between the two groups between the two groups, and
3. Our educational efforts over the years have been effective in bring up conservation awareness among school students in "model schools" for wildlife conservation. Students from "Model schools" tend doing better in both conservation awareness and attitude towards wildlife products, involved more in conservation activities, and they were also more active in participating in educational activities and more susceptible to educational efforts than that of non-Model schools, respectively. T-test indicates significant difference between the two groups.

P10-06 **MATSUO, PATRICIA MIE and VANESSA BOUCINHA** Both authors: Golden Lion Tamarin Association, Caixa Postal 109.968, Casimiro de Abreu-RJ, Cep 28.860-970, Brazil, (miematsuo@yahoo.com)

TEACHER TRAINING AS A TOOL FOR CONSERVATION OF THE ATLANTIC FOREST AND GOLDEN LION TAMARIN IN BRAZIL

The Golden Lion Tamarin Association (AMLD), a Brazilian non-governmental organization, coordinates a multidisciplinary program to conserve a viable population of golden lion tamarin ;Leonthopithecus rosalia; in their natural habitat - Atlantic Forest of Rio de Janeiro State, Brazil. One conservation strategy of the AMLD is the use of environmental education as an approach to stimulate the local population to become more aware and active in forest conservation. Community support is crucial for the success of efforts to conserve endangered ecosystems. AMLD has developed a capacity building program for educators with the participation of 25 teachers from 14 schools of the municipality of Silva Jardim, State of Rio de Janeiro. The teachers have participated in workshops to develop projects in their schools seeking Atlantic Forest conservation. The teachers developed many field activities on flora, fauna, treats and conservation action. The students learned more about the Atlantic Forest in an interdisciplinary way, inside the disciplines of Science, Portuguese and Arts. Teacher training is an important step to get more partners and collaborators to guarantee the long-term conservation of threatened species. This project has been supported by WWF-Brasil, Disney Wildlife Conservation Fund, American Society of Primatologist and Education Department of Silva Jardim.

P10-07 **MERKEL, JANE F., Eric Miller, Luis Padilla, Mary Duncan, Nicole Gottdenker, Tim Walsh, Gustavo Jimenez, and Patricia Parker** Saint Louis Zoo, One Government Drive, Saint Louis Mo 63110 (merkel@stlzoo.org). (JFM, EM, LP, MD, NG, TW, PP) University of Missouri – St. Louis, Department of Biology, 8001 Natural Bridge Road, St. Louis MO 63121 (PP). Charles Darwin Research Station, Galapagos (NG, TW, GJ)

CREATING AN EARLY WARNING SYSTEM FOR AVIAN DISEASE ON GALAPAGOS: TRAINING WORKSHOPS FOR DISEASE MONITORING

Integrating people from many disciplines can facilitate collection of samples for biomedical studies. In 2001 and 2002, the Galapagos National Park Service, Charles Darwin Research Center (CDRS), Saint Louis Zoo and University of Missouri St. Louis collaborated on an avian disease workshop. Conducted in the Galapagos Islands, the workshop involved people at all educational levels and backgrounds, and offered both lecture and practical sections. All workshop participants practiced both phlebotomy and necropsy techniques. Education of park rangers, veterinarians, quarantine officers, and biologists from the Charles Darwin Research Station and Galapagos National Park resulted in collection of fresh blood and tissue samples. Domestic chickens (Gallus gallus) were purchased to demonstrate clinical pathology and necropsy techniques, and rock doves (Columba livia) were obtained through an eradication program. Samples were collected as part of a disease monitoring program, which includes placement of a full time veterinary pathologist stationed at the CDRS. Since the inception of the program, hundreds of samples have been analyzed for the presence of avian diseases. A major goal of the project is to prevent catastrophic losses due to introduced diseases. The ongoing project monitors both endemic and introduced species for the presence of avian diseases.

P10-08 **OMLAND, KRISTIAN S., Stephen C. Trombulak, Julie A. Robinson, Jeffrey J. Lusk, Thomas L. Fleischner, Glenn Brown, and Meg Domroese** Vermont Cooperative Fish & Wildlife Research Unit, Rubenstein School of Environment & Natural Resources, University of Vermont, Burlington VT 05405, (Kristian.Omland@uvm.edu) (KSO). Department of Biology and Program in Environmental Studies, Middlebury College, Middlebury VT 05753 (SCT). Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center, 2400 NASA Road 1, C23, Houston TX 77058 (JAR). Department of Forestry, 008C Agriculture Hall, Oklahoma State University, Stillwater OK 74078 (JJL). Environmental Studies Program, Prescott College (TLF). Environmental Science and Management Program, Capilano College (GB). Center for Biodiversity and Conservation, American Museum of Natural History(MD).

RECOMMENDED GUIDELINES FOR CONSERVATION LITERACY: AN OUTREACH PROJECT OF THE SCB EDUCATION COMMITTEE

The Society for Conservation Biology includes education in the principles of our discipline as one of its six core activities, yet currently there is no central, concise description of what those principles are. A working group of the Society's Education Committee took on the charge of generating a statement of the essential principles of conservation biology; in short, we set out to articulate guidelines for conservation literacy. Our intent was to provide guidance to individuals and institutions developing courses and curricula under the name "conservation biology." We were motivated by our belief that greater literacy in the principles and practices of conservation biology is an essential step toward improving the health of our planet's ecosystems. Our efforts yielded a document that is now ready for public distribution and discussion. We invite members of the Society to aid us in disseminating the guidelines. The fruit of our collective effort will be a more consistent education in conservation biology among students, conservation professionals, and regulatory officials around the world, a worldwide conversation on what constitutes literacy in conservation biology, and ultimately more healthy ecosystems.

P10-09 **WATTERS, CHRISTINA F. and Roger C. Wood** Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247 (CFW, RCW), (research@wetlandsinstitute.org). Richard Stockton College of New Jersey, Pomona, NJ 08240 (RCW).

TEACHING ABOUT TERRAPINS: LOCAL, REGIONAL, AND INTERNATIONAL COMMUNITY BASED CONSERVATION

The Wetlands Institute initiated the Terrapin Conservation Project in 1989 to promote conservation of diamondback terrapins (*Malaclemys terrapin*), a species of turtle under severe stress rangewide owing to human activities (habitat destruction, bycatch, road mortality). Terrapins are the only turtle species exclusively inhabiting brackish water. The Institute includes the world's only exhibit dedicated solely to terrapins, seen by approximately 25,000 visitors annually, including 10,000 school children. The Institute hosts classes, distance learning, and public education programs focused on terrapin life history, research, and conservation activities. The plight of terrapins is publicized by brochures, magazine and newspaper articles, radio and television features, and television documentaries. The Project's cornerstone program is a summer internship for undergraduate students. During the past 15 years, students from over 75 academic institutions have worked alongside professional researchers and presented their results at regional, national and international scientific meetings. In 2000, the Institute became the host research institution for the Asian Scholar Program. Young Asian herpetologists (10 to date) learn conservation and research skills transferable to wildlife issues in their own countries. Our partners include: local teachers, Stockton College, the Philadelphia Zoo, and the New York Turtle and Tortoise Society. Partial funding provided by NSF Grant DBI-REU-0097635.

P10-10 **MERTENS, ANNETTE** Institute of Applied Ecology, Via L. Spallanzani 32, 00161 Roma, Italy. (a.mertens@libero.it)

PUBLIC ATTITUDES TOWARDS A ROMANIAN POPULATION OF HABITUATED BEARS AND THEIR MANAGEMENT

Romania is home to the largest bear (Ursus arctos) population in Europe, numbering 5,500 individuals. In the city of Brasov is the Racadau neighborhood, with 25,000 inhabitants. Here the bears feed from garbage containers that stand by the side of the road and, in doing so, come into close contact with humans. An opinion poll was taken among the general public. It aimed at: 1. determining the level and distribution of knowledge about bears in order to identify the target group for public awareness programs; 2. determining the type of information needed for the program, 3. assessing attitudes towards possible management methods. A 43-question survey was administered to 300 people. The findings suggest that factual data about ecology of bears should be provided throughout Racadau, to people of all ages and education levels, with additional emphasis on women. The data should include information about the danger habituated bears pose and recommendations for appropriate human behaviors towards the bears. Activities to increase people's interest in bears should be encouraged, and will serve as an effective tool for improving their knowledge about these animals. The shortcomings of translocation as a management tool and effectiveness of aversive conditioning should be clearly explained.

P10-11 **VOGLER, DONNA W., Ted Wohnsiedler, and Peter Paluch** State University of New York, College at Oneonta, Oneonta, NY 13820 (DWV) (voglerd@oneonta.edu). Catskills Institute for the Environment, Margaretville, NY (DWV, TW, PP).

SUSTAINABILITY SCIENCE ACROSS THE CATSKILLS: A CASE STUDY CURRICULUM USING VIDEOCONFERNCING

In the fall of 2002, the Catskills Institute for the Environment (CIE) developed a distance-learning curriculum to foster research among its constituent colleges and promote sustainability of Catskills resources. The Sustainability Science course was novel in that three independent colleges participated. Each offered their own version of the course focusing on a separate issue of local sustainability: Hartwick College developed a green design for a building rehab, SUNY-Oneonta conducted an ecological footprint for the town and SUNY-Ulster examined the ecology of the Esopus watershed. Student participants reported to the other campuses via periodic videoconferencing, with students from each site posing questions and responding to the others. Our videoconferencing approach yielded several benefits over traditionally taught classroom courses. The technological aspects facilitated the development of presentation and discussion skills among all of the students. Moreover, each student group was exposed to three very different approaches to sustainability in our region. The greatest benefit, however, was in linking the relatively small research communities of the three small colleges.

P11-01 **BATÁRY, PÉTER, András Báldi, and Sarolta** Erdős. Hungarian Natural History Museum, Ludovika sq. 2, H-1083 Budapest, Hungary, (batary@nhmus.hu) (PB, SE). Animal Ecology Research Group, Hungarian Academy of Sciences and Hungarian Natural History Museum, Ludovika sq. 2, H-1083 Budapest, Hungary (AB).

THE EFFECT OF LANDSCAPE COMPOSITION AND STRUCTURE ON BIRD ASSEMBLAGES OF INTENSIVELY AND EXTENSIVELY USED GRASSLANDS IN HUNGARY

Hungary's grasslands are the habitats of many threatened bird species. The quality of these grasslands is depending on the grazing intensity and management. In an EU funded project (EASY) on the effects of agri-environmental schemes, we compared bird communities of paired extensively and intensively grazed cattle pastures in three different regions (7 pairs of sites in each region). One area is situated in a structurally simple landscape with large landscape units (Saline region in the Kiskunság National Park), one in structurally complex landscape with marshy patches and trees in the grasslands (Meadow region in the Kiskunság NP) and one in a landscape with intermediate structural complexity (Heves landscape protection area). We pointed out 12.5 ha sample sites, on which we made a territory mapping during the breeding season of 2003. All observations by sight or sound were charted on maps of the fields. Territories were then drawn around complementary observations made during the visits. Our first results show that on the extensively grazed pastures there are more bird territories (e.g. skylark, yellow wagtail) than in the more intensively used pastures, however on the latter there are more species because of higher spatial heterogeneity.

P11-02 **DIDIER, KARL A. and William F. Porter** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (KAD), (kdidier@wcs.org)

TEMPORAL DYNAMICS OF FORESTS ON TIMBERLAND IN NORTHERN NEW YORK STATE, 1968-1993

Data for describing broad-scale forest dynamics are rare. The U.S. Forest Service's Forest Inventory assessment database can be used to assess long-term dynamics (decades) over broad regions (e.g., 10,000 km^2). We used the database to assess changes in structure and composition (relative volume) of forests in northern New York (25,600 km^2) from 1968-1993. The volume of all trees ($r^2$0.99, slope=3.44 m^3/year, p=0.02, df=2) and individual species, except spruces (*Picea spp.*) and yellow birch (*Betula allegheniensis*), increased linearly since 1968. The forest as a whole maintained a negative exponential structure, although mid-diameter classes increased more rapidly in volume. In terms of composition, spruces, yellow birch, eastern hemlock (*Tsuga canadensis*), and American beech (*Fagus grandifolia*) decreased in relative volume. Spruces declined nearly 5%. Black cherry (*Prunus serotina*), maples (*Acer rubrum*, *A. saccharum.*) increased 2% in relative volume. Beech increased in relative volume for trees 27.9 cm DBH, but decreased for trees 33.0-73.7 cm. Many changes (e.g., the favoring of maples) can be attributed to successional trajectories set into motion by agricultural clearance and harvesting of the late 1800s and early 1900s. However, recent anthropogenic influences including harvesting, pollution, and exotic pathogens (e.g., beech bark disease), have also played an important role.

P11-03 **MARTINEZ, MARINA and Karen V. Root** Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403 (martim@bgnet.bgsu.edu)

PREDICTING HABITAT SUITABILITY AND OCCURRENCE FOR THE CRICKET FROG, (Acris crepitans blanchardi), IN NORTHWEST OHIO

The cricket frog, a declining species in Northwest Ohio, has been identified as the amphibian species of greatest concern in the Midwest. A challenging task is to develop effective conservation strategies to address this issue. One successful approach uses predictive habitat models that can be readily verified and refined. The main objectives of this research were: (1) determine where the cricket frogs are found, and (2) develop and test a model to predict occurrence of cricket frogs based on habitat suitability. We identified 13 ponds in Wood County using aerial photographs and surveyed them in 2003. Local variables were measured for each pond. Landscape variables were extracted from GIS data. Our model applies stepwise regression to these variables and presence/absence data to predict occurrence. Preliminary results indicate that the presence of some local variables is important for the occurrence of cricket frogs, but they are not definitive. For example, pH appears not to have strong influence on their presence. The analysis of landscape variables will be included in the model and therefore increase the accuracy of the predictions. Findings from this study will help identify suitable areas for cricket frogs and increase our understanding of the ecology of the species.

P11-04 **PADOA-SCHIOPPA, EMILIO, Marco Baietto, Renato Massa, and Luciana Bottoni** Universita' degli Studi di Milano-Bicocca, Dipartimento di Scienze dell'Ambiente e del Territorio; Piazza della Scienza 1 - 20126 Milano, ITALY, (emilio.padoaschioppa@unimib.it)

THE USE OF POISSON REGRESSION MODEL (PRM) TO ASSESS LANDSCAPE SUITABILITY FOR BIRDS IN A SUBURBAN PARK

In ecology, models built by mean of stepwise multiple regression are nowadays widespread in land planning and biodiversity conservation to obtain suitability maps. This models require a normal data distribution, so, often data must be transformed, and result interpretation may be complicate. An other possibility came from Generalized Linear Models theory, in particular the model based on Poisson distribution (PRM). It doesn't require a data transformation because PRM is a nonlinear regression technique but the models are specified as if it were a linear model, so errors in specifying the correct form of the model are avoided. Furthermore this model has been developed to use count data. We applied both methods to a suburban-agricultural area in South of Milan (ITALY) assessing land suitability for five groups of bird focal species (every group linked to a different habitat: woodlots, large and small hedgerows, open and wet areas). We obtained two models for every group. Every model has been validated using leave-more-out technique. PRM model fitted better than stepwise regression both in $R^2$and Q2 in 4 out of 5 groups of bird focal species. This result confirms PRM method like a good descriptor of ecology.

P11-05 **RUDALEVIGE, ALLISON and John Rotenberry** Biology Department, University of California, Riverside, California 92507 (Flur@MSN.com)

RAPTOR HABITAT RELATIONSHIPS IN AN URBANIZING LANDSCAPE

Many rural and exurban areas will experience substantial human population growth in the coming years, with the subsequent conversion of natural lands to developed areas. Given this change in the landscape and our desire to maintain species diversity, it is important to study the relationship between species and the habitats they utilize. Raptors are potential candidates for monitoring the effect of these overall landscape changes due to their high mobility and ability to range over large distances. These characteristics stress the need for studies at the large spatial scales that might be perceived by raptors and influencing their distributions. We performed an initial analysis in western Riverside County, California, with a human population expected to double within the next 20 years. We identified the proportion of land cover types within 1 km of raptor point count survey locations and used logistic regression to analyze species-landscape relationships. Probability of detecting Red-tailed Hawks increased with increasing agriculture, coastal sage shrub, and grasslands, whereas American Kestrels were more likely to occur in association with increased housing. This is the first step to assess which raptors may benefit from marginal levels of development and that may tolerate human populations.

P11-06 **TRAVERS, MICHAEL J., Stephen J. Newman, and Ian C. Potter** Centre for Fish and Fisheries Research, Murdoch University, South Street, Perth, WA, 6150, Australia, (mtravers@murdoch.edu.au) (MJT,ICP). Tropical Finfish Research Section, Department of Fisheries, P.O. Box 20, North Beach, WA, 6920, Australia (SJN).

FISH COMMUNITIES OF INSHORE WATERS OF NORTH-WESTERN AUSTRALIA: BIOGEOGRAPHICAL INFORMATION FOR MARINE PROTECTED AREA PLANNING

Baseline ecological information is important during the process of marine protected area (MPA) allocation and subsequent adaptive management. Prior to this study there was no information on the species composition of the inshore fish fauna over reefs and soft substrates along ;ca; 3,000 km of coastline in north-western Australia, where there are currently no marine reserves. Fish were sampled at seven locations between 2000 and 2002 using traps (reefs) and trawl nets (soft substrates). The number of fish species and families recorded over soft substrates (279 species and 74 families) were more than twice those recorded over reefs (132 species and 36 families) and catches were greater in deep than shallow waters. A faunal break separated the two most northern locations, where turbidity is high, from southern locations, where water is clear. Ichthyofaunal composition of inshore waters in north-western Australia, is influenced most by habitat type, followed by latitude, water depth, time of day and then season. This study provides a baseline account of the characteristics of the fish faunas along approximately half of the Western Australian coastline and provides invaluable information necessary for effective MPA allocation, currently lagging on this section of coastline in Australia.

P12-01 **ANDREW, WAYNE and Michael Guilbeaux** Hatohobei Natural Resource Management Program, PO Box 1017, Koror, Palau 96940 (helenreef@palaunet.com)(WA); Community Conservation Network, 212 Merchant Street, Ste. 200, Honolulu, HI 96812 (MG)

CONSERVING HELEN REEF, PALAU: A COMMUNITY-BASED SUCCESS STORY IN PALAU

Hatohobei (Tobi) State in the Southwest Islands of the Republic of Palau contains the nation's largest coral reef atoll. The 162 sq km Helen Reef, located over 300 miles and 40 hours by ship from main islands of Palau and often cited as one of the most biologically diverse Pacific coral atolls, has for decades been the target of foreign poaching and overexploitation of marine resources. In recent years, the people of Hatohobei and partner organizations have established a conservation program to enhance conservation and sustainable management of the Atoll's outstanding resources. A series of actions on the part of the State have resulted in virtual elimination of overuse threats. These include: biological surveys involving both local people and a team of marine biologists, a thorough community-based strategic planning process to identify priorities and actions, the training of eight community members in enforcement, the creation of a Helen Reef Management Board, and cooperation with outside support agencies and donors. This presentation outlines the lessons learned at Helen in remote coral reef management and discusses several of the ongoing challenges facing the Tobi community, foremost of which is developing mechanisms to ensure the sustainability of their management success and effectiveness.

P12-03 **BISHOP, MARY ANNE and Sean P. Powers** Prince William Sound Science Center, P.O. Box 705, Cordova, AK 99574 USA, (MAB) (mbishop@pwssc.gen.ak.us). University of South Alabama & Dauphin Island Sea Lab, 101 Bienville Blvd., Dauphin Island, AL 36528 (SPP)

CONSERVATION OF SUB-ARCTIC TIDAL FLATS: COPPER RIVER DELTA ALASKA

The unique interface of land, sea and air characteristic of intertidal habitats serves to promote high biological productivity. Many of the factors that contribute to the high biological productivity also result in a heightened sensitivity of intertidal systems to natural and anthropogenic change. The Copper River Delta in southcentral Alaska includes extensive (500 km^2) tidal flats that are critical to many taxa including migratory shorebirds and salmonids. These tidal flats are vulnerable to petroleum spills, both from offshore tankers and the Trans-Alaska pipeline. To more effectively protect the Delta, we investigated the intertidal soft-bottom community and its predators. We determined that the benthic invertebrate community is characterized by low species diversity, dominated both in biomass and numerical abundance by *Macoma balthica*, a slow-growing and long-lived bivalve. The predator community is dominated by shorebirds in spring and a large, demersal-fish community dominated by flatfish, *Crangon* shrimp, sculpin, snake prickleback and crab. Many of the fish species are of significant fisheries value (Pacific halibut, Dungeness crab, lingcod). Natural or human-induced changes to *Macoma balthica* populations could impact the food web of the delta, which could cascade to larger geographic impacts because of the importance of the delta to migratory species.

P12-04 **HOULIHAN, PAUL, Tracy A. Farrell, Francisco Ollervides, and Christopher L. Dyer** School for Field Studies, 10 Federal Street, Salem, MA 01970 (phoulihan@fieldstudies.org)

USING AN ECOSYSTEM APPROACH TO CONSERVE MARINE RESOURCES IN MAGDALENA BAY, BAJA MEXICO

Marine resource conservation requires an ecosystem approach to understand how anthropogenic, physical, and ecological factors impact marine ecosystems. In recognition of this need, The School for Field Studies-Center for Coastal Studies (SFS-CCS) has developed its five year research plan and worked with its clients and stakeholders to implement strategies that improve the health of the Magdalena Bay, in Baja California Sur, Mexico. In research collaboration with the University of San Diego funded by the David and Lucile Packard Foundation, SFS-CCS found localized but severe water quality problems in the bay-information which helped to justify installation of water purification equipment in a local cannery. This research also examined the black sea turtle Chelonia mydas agassizi poaching and habitat loss- information which resulted in the development of a marine protected area proposal. SFS-CCS research also identified the impacts of whale watching on gray whale Echrichtius Robustus behavior, suggesting new regulations for tour operators. Strategies for ecotourism and aquaculture development have also been recommended. An ecosystem approach has enabled us to examine potential cause and effect linkages between bay resource uses and impacts, and suggest viable solutions for improving the health of the bay while sustaining the surrounding community of Puerto San Carlos.

P12-05 **KRITZER, JACOB P., Margaret F. Docker, Daniel D. Heath, and Peter F. Sale** Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada N9B 3P4 (kritzer@uwindsor.ca) (JPK, PFS); Great Lakes Institute for Environmental Research, University of Windsor, Windsor, Ontario, Canada N9B 3P4 (MFD, DDH)

CONSERVATION GENETICS OF MESOAMERICAN CORAL REEF FISHES: UNTANGLING EVOLUTIONARY PROCESSES TO UNDERSTAND ECOLOGICAL DYNAMICS

Connectivity among marine populations via larval dispersal is topical in marine conservation biology given its implications for designing marine reserve networks and developing international co-management arrangements. We investigated genetic similarity among populations of dusky damselfish, ;Stegastes adustus;, distributed throughout coral reef systems in Mexico, Belize and Honduras as a proxy for inter-population connectivity. We amplified the mitochondrial D-loop, and discovered that genes of two different sizes (1000 and 1100 base pairs) were present within the sample. Such a large difference suggests that we might have inadvertently targeted two similar species. To examine this possibility, we sequenced approximately 400 base pairs of the highly conserved cytochrome-B region, which should more clearly distinguish common and different species. Cytochrome-B sequences differed among specimens with different sized D-loops by approximately 5%. This is fairly high for intra-specific variation, but is much less than the difference between our specimens and a sympatric congener, ;Stegastes planifrons; (15%), and eight Indo-Pacific ;Pomacentrus; species (up to 25%). Evolutionary factors potentially explaining these somewhat ambiguous patterns include existence of cryptic species, ongoing speciation, or historically divergent populations only recently interacting ecologically. Furthermore, the results highlight the importance and difficulty of defining distinct taxonomic units for conservation management.

P12-06 **PARSONS, E.C.M. and C. Howard** School of Life Sciences, Heriot-Watt University, Edinburgh, Scotland (CH). Department of Environmental Science and Policy, David King Building, George Mason University, 4400 University Drive, Fairfax, Virginia 22030-4444 (ecm-parsons@earthlink.net) (ECMP).

PUBLIC ATTITUDES TO CETACEAN CONSERVATION IN SCOTLAND

In 2003, a survey was conducted in two major Scottish cities in order to investigate current perceptions of the public toward cetaceans and their conservation. Public concern about cetacean conservation was high. The issues considered to be the greatest threats to cetacean populations were generally pollution-related: oil spills, and chemical and sewage pollution (serious threat: 68%, 65% and 63%, respectively). Concern was also high about depletion of cetacean prey by over-fishing (serious threat: 54%; moderate threat: 26%). Concern about commercial whaling was divided: almost as many respondents considered it to be a serious threat (37%) as not a threat at all (31%). Other issues considered serious threats included entanglement in fishing gear, marine litter and global warming (51%, 44%, and 43%, respectively). Conservation issues that are of particular concern in Scottish waters were also noted, but to a lesser extent: military activities, fish-farming and oil exploration. Least concern was expressed about whale-watching (serious threat: 3%; moderate threat: 8%; not a threat: 48%). Most participants (60%) were unsure as to whether there was currently sufficient legal protection for cetaceans in Scotland, but eight out of ten respondents thought that there should be legislation specifically for the conservation of Scottish cetaceans.

P12-07 **SMITH, KATHERINE F. and William J. McClintock** University of California Santa Barbara, Ecology, Evolution and Marine Biology, Santa Barbara, CA 93106-9610(k_smith@lifesci.ucsb.edu)

ENVIRONMENTAL CHANGE AND THE DYNAMICS OF BARENTS SEA HARP SEAL MIGRATIONS: IMPLICATIONS OF SEA-ICE, REGIONAL FISH ABUNDANCE, AND POTENTIAL LINKS TO HARBOR SEAL EPIDEMICS

Dynamic changes in species geographic distributions are complex and dependent upon variation in physical conditions and biotic interactions. Determining these interactions is key to understanding the factors that contribute to the interspecific transmission and emergence of infectious diseases. Here we examine the effects of sea-ice concentration and fish abundance on the migratory patterns of Barents Sea harp seals and the coincident emergence of phocine distemper virus in neighboring harbor seal populations. Preliminary results suggest that high sea-ice concentration is coincident with atypical migrations of Barents Sea harp seals to northwest Norway, whereas drastic declines in prey abundance correspond with mass migrations of harp seals to southern Scandinavia. It appears that the 1988 harp seal migration to southern Scandinavia introduced phocine distemper virus to naive harbor seal populations, causing mass mortality and potentially contributing to a more recent epidemic in 2002.

P13-01 **FAUST, LISA J., and Patricia Valcarcel** Department of Conservation and Science, Lincoln Park Zoo, 2001 N. Clark St., Chicago, IL 60614 (lfaust@lpzoo.org) (LF, PV); and Ecology and Evolution Group, University of Illinois at Chicago, 845 W. Taylor, Chicago, IL 60607 (LF)

MEASURING ENVIRONMENTAL AND DEMOGRAPHIC STOCHASTICITY IN DEMOGRAPHIC RATES OF SMALL POPULATIONS

Small populations face increased extinction risk, partially due to the increased impact of stochasticity. Small size magnifies the impacts of random events on individuals (demographic stochasticity, DS). Small populations are also less resilient to large variation in environmental conditions (environmental stochasticity, ES). Managers can start to understand the magnitude of such threats by partitioning observed variation in mortality and fecundity (vital) rates between DS and ES, but this is often difficult in wild populations because datasets may be short-term or incomplete. Small zoo populations offer a unique opportunity to study variability because 1) detailed historical population data exist, 2) sampling variance is negligible because the entire population is known, and 3) ES should be reduced without changing DS. We conducted a comparative analysis of levels of ES and DS in vital rates in 30 captive vertebrate populations. We measured total levels of variation, estimated variation due to DS, and calculated variation due to ES. We found that a large portion of the observed variation in mortality and fecundity rates is due to DS rather than ES. Infant mortality had the largest levels of total variation. We discuss our results in the context of the impact of stochasticity in captive demography.

P13-02 **FLORES, ALEJANDRO, Gladys I. Manzanero, Jordan Golubov, and Maria C. Mandujano** Centro Interdisciplinario de Investigacion para el Desarrollo Integral Regional. Unidad Oaxaca. Instituto Politecnico Nacional. (CIIDIR IPN Oaxaca). Hornos 1003. Santa Cruz Xoxocotlan, Oaxaca. C.P. 71230. (FLA, GIM).(alexfmtz62@hotmail.com.) Universidad Autonoma Metropolitana Xochimilco (UAM Xochimilco) Calzada del Hueso 1100. Col. Villa Quietud. Mexico 04960 D.F. (JG). Instituto de Ecología. Universidad Nacional Autonoma de México (UNAM). Apdo. Postal 70-275. Mexico 04510 D.F. (MCM).

POPULATION DYNAMICS OF AN ENDANGERED CACTI SPECIES

The characterization of population dynamics is a main issue in the protection of endangered species such as the narrow endemic *Mammillaria huitzilopochtli*. We followed over a five year period two populations of this species located in disturbed and undisturbed sites. Four size-based population projection matrices were constructed for each site and elasticity analyses performed. Fecundity and the probabilities of seedling survival and seed germination were estimated through controlled experiments due to the lack of natural establishment. The distribution of *M.huitzilopochtli*; is spatially contagious, probably due to the nursing effect of the rocky substrate. The percentage of seed germination and seedling survival was 95% and 12.5%, respectively. The matrices of the population in the disturbed population projected a declining population (lambda ranged between 0.72 and 0.95) while the undisturbed population projected a growing population (lambda ranged between 1.1 and 1.2). The elasticity values were highest for matrix entries corresponding to stasis for both populations (Fecundity= 0.09 to 1.16, Stasis= 0.47 to 0.81, Growth= 0.15 to 0.33). The conservation of the few extant populations of *M. huitzilopochtli* is highly dependent on the maintenance of suitable habitat as well as the protection of adult reproductive individuals.

P13-03 **HARVESON, LOUIS A. and R. William Adams** Department of Naural Resource Management, P.O. Box C-16, Sul Ross State University, Alpine, TX 79832 (harveson@sulross.edu)

EVALUATING THE IMPACTS OF MOUNTAIN LION ON PREY IN A MULTI-PREY SYSTEM

In southwestern ecosystems, mountain lions (*Puma concolor*) are thought to limit prey populations, however empirical data are lacking. To better understand the impacts mountain lion have on prey populations, we initiated a study to: (1) model mountain lion distribution relative to habitats, (2) estimate density of mountain lions, and (3) determine the composition and rate at which prey are killed by mountain lion. Twenty-five mountain lions were captured and monitored from the 3,000-km^{22}*Odocoileus virginianus*), feral hog (*Sus scrofa*), or javelina (*Tayassu tajacu*) every 5-7 days. At the current densities, prey loss to mountain lion predation is negligible.

P13-04 **LEE, DEREK E., Nadav Nur, William J. Sydeman, Peter Pyle, Kyra L. Mills, and Pete Warzybok** PRBO Conservation Science, Marine Ecology Division, 4990 Shoreline Highway, Stinson Beach, CA 94970, (dlee@prbo.org)

AGE-SPECIFIC DEMOGRAPHY OF CASSIN'S AUKLETS (PTYCHORAMPHUS ALEUTICUS) AT SOUTHEAST FARALLON ISLAND, CALIFORNIA

We examined age-specific rates of survival, breeding propensity, and reproductive success for Cassin's Auklets (Ptychoramphus aleuticus) on Southeast Farallon Island, California using capture-recapture data collected from 1986-2002. The a priori model set for each sex included parameters: 1) as constants, 2) as linear trends with age, 3) as quadratic trends with age, 4) as cubic age trends, 5) as natural log trends, and 6) as inverse age trends. We used QAICc Weights to calculate model average (weighted average) parameter estimates. Female breeding propensity increased to 6, then remained constant to age 11. Female survival followed an erratic cubic trend. Male breeding propensity increased steadily from age 3 to 10, then declined. Male survival increased throughout life. Reproductive success followed a quadratic trend, peaking in middle age. Age distribution was unstable, related to initial colonization of nest boxes by only young age birds, exacerbated by variable cohort production and recruitment. We used estimated parameters to construct a deterministic, age-structured matrix population model. The finite rate of population growth (l) from the model was 0.857, l calculated from the observed population decline = 0.946. An elasticity analysis showed that l was most sensitive to survival of age 0, 1, and 2 birds.

P13-05 **MANDUJANO, MARIA C. and Alejandra Garcia Naranjo O-H** Depto. Ecología de la Biodiversidad. Instituto de Ecología. Universidad Nacional Autónoma de México (UNAM). Apdo. Postal 70-275. Mexico 04510 D.F. (AGN, MCM). (mcmandu@miranda.ecologia.unam.mx)

POPULATION ECOLOGY AND ESTABLISHMENT SITES OF ;Lophophora williamsii; (PEYOTE), AN ENDANGERED SPECIES OF CACTACEAE

We studied the population ecology and pattern of spatial distribution of ;Lophophora williamsii; in Cuatrocienegas, Mexico. In addition, the nurse plant association, germination of different aged seeds and seedling growth rates were determined. Static life tables were constructed using field and controlled experiments that allow us to convert size plant into age. This species showed an aggregated pattern of spatial distribution, as a consequence of clonal growth and nurse plant preferences. Plant density is low 0.35 ind/m2 and single individuals can be composed of 1-34 heads. Like other species of cacti, 91% of individuals were associated to nurse plants predominating the association with ;Larrea tridentata; (65%). Distribution frequencies of the population indicate that 37% of individuals belong to small size classes (3 to 4 heads), but only 7.5% to the first one, suggesting infrequent seedling establishment. Mean percentage of seed germination was 65% and decreased with age. Plant growth rate was 2 cm /yr indicating that individual plant age ranked from 3 to 120 years. Life table analyses suggest the population is in numeric equilibrium and clonal growth is necessary to maintain population stability. In order to protect and maintain ;L. williamsii; it is important to preserve the Cuatrocienegas region.

P13-06 **MCGHEE, JAY D. and Jim M. Berkson** Virginia Polytechnic Institute & State University, Dept. of Fisheries & Wildlife Sciences, Blacksburg, VA 24061-0321 (jamcghe1@vt.edu)

CORRELATION OF WILD TURKEY POULT:HEN RATIOS WITH POPULATION SIZE USING MULTIPLE TIME-SERIES

Knowledge of how density affects population growth is important for the conservation and management of phasianids. Unfortunately, available time-series are often too short for statistical detection of density-dependence. We attempted to circumvent the problem of short time-series by using multiple datasets. We assessed the correlation between wild turkey recruitment and population size using data from seven state wildlife agencies. We calculated correlation coefficients between surveyed poult:hen ratios and harvest-based population indices for 31 geographic or harvest management regions. Estimated correlation coefficients were tested for homogeneity to determine if an average correlation could be calculated. Correlation coefficients for the 31 regions ranged from -0.82-0.70. A Q-test for homogeneity indicated that correlation coefficients were similar enough to warrant averaging [Q=22.578, df 30, p=0.8322]. We calculated a weighted average correlation coefficient [r = -0.19 ± 0.07 se]. Graphical analysis indicated that a negative correlation between poult:hen and population size tended to occur when the range of population sizes was large. We conclude that density-dependent reproduction is a viable hypothesis for wild turkey, and that time-series covering a wide range of population sizes are preferred for detection of density dependence in other phasianids. We recommend using multiple datasets when estimating density dependence effects.

P13-07 **OLIVIER, THOMAS** Green Creek Paradigms, LLC, 4632 Green Creek Road, Schuyler, VA 22969, (tolivier@cstone.net)

INTERACTIONS BETWEEN SOCIAL, GENETIC AND DEMOGRAPHIC PROCESSES IN SIMULATED MONKEY POPULATIONS

This study illustrates use of a computer simulation system built to permit modeling by conservationists of a range of processes in spatially and socially subdivided populations. The study examines relationships between social, demographic and genetic processes in simulated populations with subpopulations similar to multi-male groups found in many cercopithecine monkey species. Groups in model populations contain immigrant adult males and natal animal segments composed of matrilines. Groups may fission, partly along matrililines, and they may fuse. The models simulate individual life histories and maintain age, sex, genotype and pedigree information on simulated individuals. Parameters allow control of various aspects of group fission and fusion processes. Analyses in this study compare group compositions, dynamics and gene distributions in simulation series where age-specific birth and survival rates are set to set to produce expectations of population size stability, growth and decline. The modeling system employed here is written in Python using a strongly object-oriented architecture. Application of the software to modeling other mammalian species is discussed. The system includes a run-time link to a geographic information system. Applications of the system to modeling infectious disease spread and site-specific conservation planning are considered.

P13-08 **SUPUMA, MIRIAM and Debra Wright** Wildlife Conservation Society Papua New Guinea Program, P.O. Box 277, Goroka, EHP, Papua New Guinea. (msupuma@global.net.pg)

PLANT DYNAMICS OF A PAPUA NEW GUINEAN HILL FOREST

Little is known about the demography of rainforests in Papua New Guinea yet they are heavily exploited for industrial and subsistence use. I recensused 42 0.1-ha plots in a hill forest 8 years after initial enumeration. In 1994 basal area was 35.08 m2 ha-1 with 637.86 stems ha-1 while in 2002, basal area was 33.96 m2ha-1 with a density of 622.6 stems ha-1. The mean growth rate was 0.29 cm yr-1, with larger trees having a higher absolute growth rate, but smaller trees a faster growth rate for their size. Mortality of trees was not size dependent but was negatively correlated to density. The numbers of trees dying and being recruited per plot were not correlated although an average of 17.95 trees; 10 cm died and 16.04 were recruited ha-1yr-1 so that on a larger scale the number of trees remained relatively constant. There was no significant difference in the distribution of size classes of trees between censuses. The absence of net change in parameters suggests that this is a climax forest in equilibrium. Studies of forest dynamics and tree demography in undisturbed sites act as a baseline for conservation and management when compared to data from disturbed sites.

P13-09 **TOLLEFSON, JENNIFER, Gretchen Stevens, and John Sullivan** Hudsonia Ltd., P.O. Box 5000, Annandale, NY 12504 (tollefson@bard.edu).

BIODIVERSITY ASSESSMENTS AND HABITAT MAPPING: NEW TOOLS FOR PROACTIVE LAND-USE AND CONSERVATION PLANNING

Most local land use decisions are made on a site-by-site basis without the benefit of good ecological information for the site in question, or for surrounding lands. Cumulative impacts of this decision-making approach include habitat fragmentation and degradation, and the depletion of regional biodiversity. Habitat mapping over large areas facilitates a landscape-based approach to land use and conservation planning by illustrating the location and configuration of ecologically significant habitats. Hudsonia uses a variety of data sources (e.g., geology maps, soil maps, topographic maps, aerial photographs) to predict the occurrence of ecologically significant habitats and prepare a preliminary habitat map. We then conduct fieldwork to check, correct, and refine the map. Through our habitat mapping work in New York's Hudson Valley, we have identified high quality examples of common habitats, as well as habitats that are rare or declining in the region or that may support rare species and other species of conservation concern. We have also documented the largest, contiguous areas of unfragmented habitat and the corridors that connect them. Completed habitat maps and supporting ecological information help local decision-makers establish conservation priorities and locate and design new development to avoid or minimize harm to habitats and species.

P14-01 **EARNHARDT, JOANNE, M., Michael Wilson, Anne Pusey, Steven D. Thompson, and Elizabeth V.Lonsdorf** Department of Conservation and Science, Lincoln Park Zoo, 2001 N. Clark St., Chicago, IL 60614 (Joanne@lpzoo.org) (JME, SDT, EVL); and Jane Goodall Institute and University of Minnesota, St. Paul, MN (MW, AP)

POPULATION HABITAT VIABILITY ANALYSIS (PHVA) FOR THE GOMBE STREAM NATIONAL PARK (GSNP) CHIMPANZEE POPULATION

The GSNP chimpanzee population has declined in size over the last 40 years; this decline implies an increased risk of extinction. Our PHVA simulation results indicate that if current conditions do not change, the population is not at high risk of extinction. However, the population is at high risk for a slow but continual decline in size, which would adversely impact ongoing research and ecotourism. Our analyses suggest that changes in carrying capacity, mortality rates, and catastrophes could cause the population to decline more rapidly, stabilize, or increase from present size. Carrying capacity in GSNP is the key factor impacting long-term population viability. Even if managers successfully reduce mortality rates, the population is unlikely to maintain its current size unless carrying capacity, which can act as a buffer for unfavorable environmental conditions, is substantially increased (e.g., from 100 to 250 individuals). Catastrophes that reduce survivorship pose a greater risk than those that reduce reproduction. Even when catastrophes occur with low frequency (i.e., three times in 100 years) the population can't recover and extinction risk increases. To ensure survival of this population, it is essential to minimize the impact of catastrophes by reducing juvenile and adult mortality and/or increasing carrying capacity.

P14-02 **QUINTANA-ASCENCIO, P F. and E. S. Menges** Department of Biology, University of Central Florida 4000 Central Florida Boulevard, Orlando, FL 32816(pquintan@mail.ucf.edu, PFQA); Archbold Biological Station, 123 Main DRive, Venus FL 33960 (ESM)

A SPATIALLY-EXPLICIT INDIVIDUAL-BASED MODEL OF POST-FIRE FLORIDA ROSEMARY AND SCRUB HYPERICUM POPULATION DYNAMICS

We developed an individual-based model which summarized the spatial patterns of two Florida scrub plants: scrub hypericum (Hypericum cumulicola), an herbaceous species virtually restricted to inter-shrub gaps within Florida rosemary scrub, and Florida rosemary (Ceratiola ericoides), the dominant shrub species in this community. Our model predicts post-fire population dynamics using: (1) survival, growth, and recruitment estimates of scrub hypericum based on plant location, plant size, distance to nearest Florida rosemary, and conspecific density. (2) Florida rosemary growth modeled considering plant size and distance to conspecific neighbors; (3) a beta dispersal function of scrub hypericum obtained from transplant experiments; (4) and an experimental evaluation of scrub hypericum seed and seedling dynamics. Model predictions were verified by contrasts with observed data. We did not generally find significant differences between predicted and observed demographic parameters, although predicted data underestimated observed variation. Our simulations mimicked the patchy distribution of scrub hypericum within the landscape, with higher densities in larger gaps. Our model indicated higher probabilities of decline with time-since-fire in landscapes with fewer scrub hypericum and higher densities of Florida rosemary. This prediction agrees with observed differences in scrub hypericum disappearance among gaps with contrasting rosemary density but similar time-since-fire.

P20-01 **BROWN, LESLEY, Liza Agudelo, and Bill Varettoni** Sustainable Development and Conservation Biology, 1204 Biology-Psychology Building, University of Maryland, College Park, MD, 20742. (lakenutrients@yahoo.com)

PRACTICAL ATTENUATION OF EUTROPHICATION IN DEVELOPING NATIONS: DECENTRALIZED WASTEWATER TREATMENT, DETERGENT COMPOSITION AND AGRICULTURAL BEST MANAGEMENT

Eutrophication of lakes and coastal waters is negatively impacting peoples' livelihoods and health as well as aquatic and marine biodiversity. Many of the projects aimed at reducing nutrient pollution in developing countries focus on large-scale infrastructure projects that require many years and millions of dollars to complete. We evaluated less expensive, smaller-scale strategies that can be applied to individual watersheds: decentralized wastewater treatment, laundry detergent composition and agricultural best management. Information was gathered from primary literature, textbooks, local watershed publications, and personal communications with experts in the field. These strategies were applied to two case studies of watersheds with eutrophication concerns (Lake Naivasha in Kenya and the Bhopal lakes in India) and specific recommendations were formed. As most developing countries have a low percentage of the population connected to sewage treatment plants, reduction of phosphates in detergents (in the form of STPP) can have immediate results. In agriculture several nutrient management practices can be implemented at the farm- and community-levels. In place of the centralized model of sanitation that is often transferred to developing nations, providing decentralized treatment systems (such as constructed wetlands and waste stabilization ponds) for towns and rural areas is more cost-effective and practical.

P20-02 **DALZEN, ROBYN, Marianne Dunn, Kim Bonine, and John Reid** BP Conservation Programme, 1919 M Street NW Ste 600, Washington, DC 20036 USA (RD); BP Conservation Programme, BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA UK (MD); Conservation Strategy Fund, 303 Potrero St. 42-301, Santa Cruz, CA 95060, (KB, JR).

THE ROLE OF STUDENT-LED RESEARCH IN BUILDING THE CAPACITY OF THE NEXT GENERATION OF CONSERVATION PRACTITIONERS

Student-led conservation research projects are playing an important role in the global conservation effort by building the capacity of the next generation of conservation leaders and establishing best practices, while contributing to key conservation outcomes. Currently there is a shortage of trained conservation professionals, especially in tropical countries where there tends to be greater biodiversity. While there currently exists a myriad of formal training opportunities for conservationists in the US and UK at the university and NGO level, many students from tropical developing countries are unable to attend these programs due to a lack of financial resources and/or poor academic preparation. Young conservationists need interdisciplinary training with opportunities for practical application, where they can create links with local institutions; they need assistance in accessing graduate programs in the US/UK; and finally, they need in-stream training in areas such as biological monitoring, policy analysis, negotiation, economics and business skills. The BP Conservation Programme has been working for the past 15 years to fill some of these skills gaps and serves as a useful case study to highlight the effectiveness of this kind of approach.

P20-03 **GUILBEAUX, MICHAEL** Locally Managed Marine Area Network (mike@conservationpractice.org)

A NETWORK OF LOCALLY MANAGED MARINE AREAS (LMMAS) AS A STRATEGY TO ADDRESS COASTAL CONSERVATION THROUGH SOCIO-POLITICAL CONNECTIVITY

Designed networks of marine protected areas (MPA) are considered essential for coral reef conservation in many places, yet is often challenging for practitioners and scientists to establish networks of MPAs that adequately fulfill biodiversity conservation needs, as well as social needs at particular sites. The Locally Managed Marine Area (LMMA) Network is comprised of networks of LMMAs in seven countries in the Pacific, and is based on requirements of project commitment and participation. This is an example of a unique and practical approach that has emerged to address social and political obstacles to successful MPA network initiatives. This participatory approach facilitates the establishment of community based MPA networks that are monitoring and adaptively managing their respective projects. In contrast to many conventional networks of MPAs, some LMMAs are driven more by local community criteria and needs, rather than scientific and biodiversity criteria per se. The challenge in many areas is to integrate the two approaches; several case studies will outline how some LMMA projects are trying to achieve this convergence when progressing from sites to systems. As biologically driven approaches seek greater local stakeholder support for their networks, participatory LMMA approaches seek greater biological functionality through adaptive management and learning.

P20-04 **KÜHL, ALINE, Natalia Balinova, Anna A. Lushchekina, and E.J. Milner-Gulland** Renewable Resources Assessment Group, Department of Environmental Science and Technology, Imperial College, Prince Consort Road, London, SW7 2BP, UK, (aline.kuhl@imperial.ac.uk) (AK, EJM). Kalmyk Institute for Humanities, Russian Academy of Sciences, ul. Ilihkina 8, Elista, 358000, Kalmykia, Russian Federation (NB). Laboratory of Landscape Ecology of Mammals, Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy Prospect, 117071, Moscow, Russian Federation (AAL).

INTERACTIONS BETWEEN THE RAPID DECLINE IN SAIGA ANTELOPE POPULATIONS AND THE COLLAPSE OF RURAL ECONOMIES IN FORMER SOVIET UNION STATES

Poaching is considered the primary factor responsible for the dramatic decline in populations of the saiga antelope (;Saiga tatarica tatarica;), a nomadic bovid of the steppes of Central Asia. Since the break-up of the former Soviet Union in 1991, rural economies have collapsed leading to a lack of livelihood options and severe poverty. A sample of 116 households were surveyed using both questionnaires and participatory methods to investigate the role of saiga poaching in rural livelihoods near the Chernye Zemli State Biosphere Reserve in the Republic of Kalmykia, Russian Federation. The prevalence of poaching coupled with the decline of the Kalmykian saiga antelopes illustrate that current poaching activity is highly unsustainable. Our results further demonstrate that saiga poaching is a major livelihood activity; approximately every sixth household within the study area is involved. We show that the underlying causes of saiga exploitation are poverty, as well as the type of livelihood activity pursued and the level of education. Ineffective law enforcement has further facilitated the decline. Current saiga conservation action solely targets the protection of saiga antelopes from poachers; here we emphasize the importance of addressing the socio-economic factors driving the poaching to find a viable solution for saiga.

P20-05 **MARGOLUIS, CHERYL** Yale School of Forestry, 210 Prospect St., New Haven, CT 06511. (Cheryl.Margoluis@yale.edu)

TRAGIC CHOICES & CREATIVE COMPROMISES: MANAGING PROTECTED AREAS WITH HUMAN SETTLEMENTS

Limited access to new technology, skewed resource distribution, and few economic opportunities mean that many subsistence agriculturalists must migrate to find suitable farming land in order to support their families. Yet as populations grow worldwide, the land available for them is quickly shrinking. As many protected areas appear to be the only vacant land, many farmers find themselves – either knowingly or unknowingly – settling illegally within their boundaries. One way that protected area managers are trying to incorporate the needs of these communities while minimizing the impact they have on the surrounding area is to increase their land security. The assumption is that with greater security communities will use resources more sustainably – by planning for the future rather than maximizing short term gain. This research empirically explored these assumptions by examining the activities of communities in the Maya Biosphere Reserve, in northern Guatemala. Results indicate that an increase in security does not necessarily lead to a change in resource use or in economic strategy and that key conditions can greatly affect the impact of any resource security programs.

P20-06 **O'CONNOR, CATHERINE M. and Lisa M. Curran** University of Michigan School for Natural Resources and Environment, Dana Building, 430 East University, Ann Arbor, MI 48109 (oconnorc@umich.edu)(CMO). Yale School of Forestry and Environmental Studies and Yale Tropical Resources Institute, Sage Hall, 205 Prospect Street, New Haven, CT 06511 (LMC).

SUBSISTENCE HUNTING, SWIDDEN AGRICULTURE, AND COMMERCIAL LOGGING: IMPLICATIONS FOR LOCAL COMMUNITY LIVELIHOODS AND EQUITABLE RESOURCE MANAGEMENT

Despite growing recognition that industrial plantations and logging operations are major agents of land cover change, subsistence hunters and agriculturalists are often blamed for defaunation and deforestation. Household surveys were conducted in 1992, 2000, 2001, and 2002 in five Dayak villages located within a logging concession in Central Kalimantan, Indonesia, to quantify livelihood changes over time. Rapid shifts from subsistence to cash economy were observed. Although Dayak households that hunt have decreased significantly, hunters reported a major decrease in prey. Defaunation in these logged areas cannot be attributed solely to local subsistence or small-scale market hunting. Concession employees double the numbers of hunters in the region and exhaust vertebrate populations. Company-implemented programs to encourage wet rice have altered agricultural practices. Rice self-sufficiency has declined significantly; families are increasingly relying on wages to purchase food. Local villages subsumed within concessions have limited rights to forested areas and dramatically increased market access. 'Forest-dependent communities' have become 'company-dependent communities,' relying on outside employment for basic needs. As logging leases expire, this cycle of dependency will leave local communities without the safety net of forest or market. The political, socio-economic and ecological impacts of industrial logging on rural upland communities' livelihoods will be discussed.

P20-08 **PINTO DA SILVA, PATRICIA** NOAA Fisheries, 166 Water Street, Woods Hole, MA 02543, (Patricia.pinto.da.silva@noaa.gov)

HUMAN DIMENSIONS OF FISHERIES MANAGEMENT: NORTHEAST INITIATIVES

Although there have been individual sociologists and anthropologists working for the National Marine Fisheries Service for years, for the first time in the Northeast, a Human Dimensions of Fisheries Management Program is being developed. This program includes a strategic action and research plan. This presentation will detail the history of the social sciences in fisheries management with the Northeast Fisheries Science Center. It will also describe activities underway and future plans for improving the social sustainability of fisheries management in the NE.

P21-01 **ACMA, BULENT** Anadolu University, Department of Economics, Head of Southeastern Anatolia Project(GAP), Yunusemre Campus, 26470 Eskisehir/TURKEY(bacma@anadolu.edu.tr)

PROMOTING SUSTAINABLE HUMAN SETTLEMENTS AND ECO-CITY PLANNING APPROACH: SOUTHEASTERN ANATOLIA REGION AND SOUTHEASTERN ANATOLIA PROJECT(GAP), IN TURKEY AS A CASE STUDY

In the recent years, there have been many opportunities flourishing through the development of Turkey. One of these is unvalued rich agricultural and hydro-sources in the Southeastern Anatolia Region. The Southeastern Anatolia Project (GAP), one of the most important projects to develop the remarkable natural resources of the world, is considered as a chance to make use of rich water and agricultural resources of the Southeastern Anatolia Region. In the recent years, the concept of promoting sustainable human settlements and eco-city planning approach have been included into the GAP Project. And by applying these concepts in real projects caused remarkable results through development of the region. The aim of this study is analyze the concepts of promoting sustainable human settlements and eco-city planning approach in the GAP Project that has been still processed. In the first section, the region of Southeastern Anatolia and the GAP Project will be introduced briefly. In the second section, the stages of GAP Project and the project existing will be analyzed. In the third section, the projects and sub-projects used for promoting sustainable human settlements will be introduced. In the last and fourth section, a series of policies and strategies for providing the process of settlements which is optimal and harmonizes with eco-system will be given.

P21-02 **BANI, LUCIANO, Dario Massimino, Luciana Bottoni, and Renato Massa** Department of Landscape and Environmental Sciences, University of Milano-Bicocca, Piazza della Scienza 1, I-20126 Milano, Italy (luciano.bani@unimib.it)

ECOLOGICAL NETWORK DESIGN IN ANTHROPOGENIC FOREST LANDSCAPES

Natural resources exploitation often produces a reduction and a general degradation of original habitats. The aim of our research is to evaluate the effects produced by forest management practices on bird focal species breeding in broadleaved forests (Lombardy, Northern Italy). Bird data result from a regional survey (1995 to 2003) consisting of more than 5500 point counts. Environmental data come from European CORINE Land Cover Project. Forest structure data were gathered by means of a field survey, carried out in 15 sample areas. Focal species were previously identified among hole-breeding birds. We evaluated the effects on focal species distribution of (a) multiple-scale environmental mosaic, (b) landscape patterns (forest patch size and isolation), and (c) forest structure (trunk dimensions and basal area). The results quantify the relative importance of each land-use variable pertaining to the environmental mosaic, and allow us to draw a focal species environmental suitability map for the study area. The outcomes of forest structure and landscape pattern analysis are particularly meaningful. Actually, inside suitable areas, focal species abundance is mostly affected by forest organization, shaped by management practices, as well as by landscape patterns, where connectivity seems to prevail over forest patch size.

P21-03 **GILMAN, ROBERT TUCKER, Robin A. Abell, and Christopher E. Williams** Conservation Science Program, World Wildlife Fund - US, 1250 24th Street NW, Washington, DC 20037 (RTG and RAA) (tucker.gilman@wwfus.org), World Wildlife Fund - US, 1250 24th Street NW, Washington, DC 20037, (CEW)

ARE BIODIVERSITY CONSERVATION OBJECTIVES UNDERREPRESENTED IN INTEGRATED RIVER BASIN MANAGEMENT?

The resource management literature strongly promotes Integrated River Basin Management as an approach for achieving the sustainable provision of freshwater ecosystem services. There is evidence that maintaining these services depends on the conservation of native biodiversity. We analyzed 35 case studies from around the world to explore the extent to which Integrated River Basin Management programs incorporate biodiversity conservation goals. We categorized the objectives of the case study programs and compared those from developed and developing countries. Less than one third of case study programs included comprehensive long-term planning for biodiversity conservation. We found that Integrated River Basin Management programs in developing countries were significantly ($p<0.05$) less likely to include biodiversity conservation goals than those in developed countries. We conclude that biodiversity conservation is underrepresented in Integrated River Basin Management, and that this is more pronounced in programs based in developing countries. This is alarming given that a disproportionate amount of Earth's biodiversity may be concentrated in the large tropical lakes and moist forest ecosystems of developing countries.

P21-04 **MIRANDA-CASTRO, LEOPOLDO** U.S. Fish & Wildlife Service, Branch of Habitat Restoration, Partners for Fish & Wildlife Program, 4401 N. Fairfax Dr. Rm. 400, Arlington, VA 22203, (Leopoldo_Miranda@fws.gov)

RESTORING SHADE COFFEE PLANTATIONS IN TROPICAL UNITED STATES

Traditionally, coffee is cultivated under a shading canopy of native trees in tropical areas of the world. Within the U.S., coffee is cultivated only in Hawaii and Puerto Rico. Shade coffee plantations provide most of the ecological functions of natural environments such as nutrient recycling, habitat for plant, fish and wildlife species. In many areas, these plantations are vital in protecting biodiversity during periods when the landscape is severely deforested. With the ever-increasing human population and associated development these plantations are a critical component of any conservation initiative. The Partners for Fish & Wildlife Program in the Caribbean focuses on the restoration of the native shading canopy in coffee plantations. This is the only shade coffee restoration effort currently occurring within the U.S. Of the ~90,000 acres of coffee in Puerto Rico, less than 40% are shaded. We developed simple habitat restoration procedures in order to protect Federal trust resources in tropical U.S. We use native vegetation in spatial arrangement that provide important habitat for wildlife while maintaining the agricultural value and the acceptance of landowners. These efforts with shade coffee restoration projects provide a model to be used as a management tool for private lands around tropical forest reserves.

P21-05 **Lu, Jacqueline W.T.** Dept. of Ecology, Evolution and Environmental Biology, 1200 Amsterdam Avenue, Columbia University, New York, NY 10027 (jl2071@columbia.edu)

NEW YORK CITY'S STREET TREES AND THEIR RELATIONSHIP TO PATTERNS OF SOCIAL STRATIFICATION

Understanding the role of the human social system in ecology becomes increasingly important as urban populations grow and result in increasing land cover conversion. GIS analysis of the relationship between the street tree population and indicators of social stratification in New York City shows a significant correlation between human social hierarchies and the distribution of a critical ecosystem resource. Without including possible constraints due to other physical and social factors, analysis of the demand for new trees shows that the future abundance of street trees in New York City likely will not reflect these existing patterns and processes of social stratification. Placing this analysis in the human ecosystem model allows it to be related to other studies of biological and social patterns and processes, such as demonstrated relationships between vegetation and the urban heat island and energy use, to issues of air quality and public health. It can also be potentially used as a tool to identify areas where processes of social stratification have a diminished role in the distribution of ecological resources, and are mitigated by other social resources such as community groups and institutions. These areas can then be further examined for effective strategies in urban environmental management.

P22-01 **FRANKEL, MICHELLE A., William S. Seegar, M. Blake Henke, and Jack Cibor** Earthspan, 1450 S. Rolling Rd., Baltimore, MD (michellefrankel@earthlink.net) (MAF, MBH, JC). U.S. Army, Research Development and Engineering Command, Aberdeen Proving Ground, MD 21010 (WSS).

EDUCATING URBAN YOUTH ABOUT CONSERVATION RESEARCH AND TECHNOLOGY

We present a case study regarding the impacts of a supplementary curriculum in environmental science on urban and other underserved youth. The “Eye of the Falcon” (EOF) is an interdisciplinary environmental science curriculum for middle and high school that utilizes GIS, remote sensing data, and satellite tracking of wildlife to teach core concepts in the life sciences and involve students in cutting-edge wildlife conservation research and technology. The program engages urban youth by focusing on local natural resources, developing local pride, and empowering students to be involved in local conservation programs. Environmental science comes to life as students engage in authentic, ongoing research and are challenged to use their results to solve real conservation issues. The program also brings diverse cultures together, as sister schools in different countries exchange information about their cultures, environments, and the migrating animals that know no boundaries. Results of evaluations of classrooms in four states show that after using the EOF curriculum, students exhibit an increased awareness of local and global conservation issues, increased ability to conduct scientific inquiry, increased proficiency in technology use, and a greater appreciation of biodiversity. EOF was developed by Earthspan, a non-profit organization dedicated to wildlife conservation, research, and education.

P22-02 **LUCE, DONALD T.** Bell Museum of Natural History, University of Minnesota, 10 Church Street SE, Minneapolis, MN 55455 (lucex001@umn.edu); Carol Strecker, Bell Museum of Natural History; Jane Greenberg, Bell Museum of Natural History; Sonja Welhelm, Forest Resources Department, University of Minnesota

NATURE IN THE CITY: PLANNING A NATIONALLY TRAVELING EXHIBITION TO EXPLORE URBAN BIODIVERSITY

The Bell Museum recently completed a NSF-funded planning project for an exhibition to encourage urban audiences to explore the diversity of life and ecological interactions within urban environments. Objectives included: 1) assess the nature-related interests, knowledge and attitudes of diverse urban youth, 2) gather relevant content information, 3) develop preliminary exhibition and program plans.

Activities included audience research and focus groups, developing community and content advisory teams, surveying the field of current urban ecology research and expertise, assessing existing urban environmental education efforts, conducting a survey of museum interest in the traveling exhibition, and the development of a preliminary exhibition plan. Results of the audience study indicate that urban youth have an interest in city flora and fauna, understand nature as a system and enjoy the sensory aspect of nature. They would be attracted to an exhibition that presented their familiar environment in a new and unusual perspective. The exhibit concept plan was developed utilizing the latest research in visitor behavior and will engage visitors in the processes of current ecological research related to urban wildlife, ecosystems and land stewardship. The museum survey indicated a strong interest in the subject of urban ecology and in hosting the proposed exhibition.

P23-01 **BROWN, MICHELLE L. and Timothy H. Tear** The Nature Conservancy, 200 Broadway, Suite 301, Troy, New York, 12180 (michelle_brown@tnc.org)

EVALUATING THE ROLE OF INVENTORY AND RESTORATION AS CONSERVATION STRATEGIES: SETTING LOCAL PRIORITIES FROM REGIONAL-SCALE CONSERVATION ASSESSMENTS

Increasingly the conservation community is recognizing the need to identify and address issues at multiple spatial and temporal scales. However, effective synthesis of information compiled at multiple scales has been challenging, often thwarting the emergence of clear guidance for managers. In order to improve the links between on-the-ground conservation efforts and regional-scale conservation planning, we propose that project teams should evaluate their contribution to meeting quantitative goals set forth in broader-scale planning efforts. We present a case study of a single conservation area within The Nature Conservancy, the Southern Lake Champlain Valley program, and demonstrate that through following a simple decision tree and linking regional and site goals, priorities for inventory and restoration efforts clearly emerge. In particular, the valley clayplain forest stands out as a priority for restoration. Scientific justification at multiple scales is important given the long-term and financial commitment necessary to pursue extensive restoration projects. In addition to guiding on-the-ground conservation efforts, our process linking regional quantitative goals with local actions creates a foundation for: assessing how to address gaps between current status and future desired conditions; increasing coordination between strategy development at multiple planning scales; and improving our ability to adaptively manage conservation efforts.

P23-02 **COLES, CHRISTOPHER F., Gavin Stewart, and Andrew S. Pullin** Centre for Evidence–Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK, (c.f.coles@bham.ac.uk)

DOES ROTATIONAL BURNING OF UK SUB–MONTANE, DRY DWARF–SHRUB HEATH MAINTAIN VEGETATION DIVERSITY? USING AN EVIDENCE–BASED FRAMEWORK FOR DECISION SUPPORT

To test the application of an evidence–based framework to support decision–making in conservation management, we critically appraised the available evidence for the effectiveness of rotational burning in maintaining vegetation diversity of UK sub–montane, dry dwarf–shrub heaths; a management issue raised by staff at English Nature. We conducted a systematic review by searching sources of published and unpublished primary data, and contacting experts in the field of UK upland ecology. The review identified 28 data sub–sets from eight articles reporting on rotational burning of the subject vegetation community. Only one investigation studied more than one burning rotation and concluded that there is some evidence for positive short–term and negative long–term effects, conflicting with the results of the other studies that dealt only with short–term post–burn succession. These suggested that effects may be mostly negative in the short–term, tending to be more positive for more mature stands. We conclude that the evidence–based framework is a powerful objective tool for supporting decision–making and, particularly in this case, for identifying priority areas where critical evidence is lacking. Further research needs to consider the effects of burning over more than one rotation, with appropriate controls and/or comparators.

P23-03 **KIRSHENBAUM, SHERIL R., Yong Chen, and James A. Wilson** 216 Libby Hall, School of Marine Science, University of Maine, Orono, ME 04469 (sheril_kirshenbaum@umit.maine.edu)

ASSESSMENT AND MANAGEMENT OF THE MAINE SEA CUCUMBER (CUCUMARIA FRONDOSA - A MULTIDISCIPLINARY APPROACH

The sea cucumber (Cucumaria frondosa) fishery in the state of Maine is relatively new and still developing. Population dynamics for this species are not well understood and information on the fishery and resource is limited. Therefore, the current status of the Maine sea cucumber and impacts of exploitation to the resource are undefined. Slow growth and aggregate distribution are likely to make this a boom-bust fishery like other similar fisheries in the area (e.g., Maine sea urchin fishery) if not managed appropriately. In cooperation with the fishing industry, we are conducting research to estimate key life history parameters and quantify spatial and temporal distributions of the sea cucumber in Maine. An egg-per-recruit model is being developed aimed for the protection of reproductive potential. This information will be used to explore possible conservation strategies, including temporal and spatial closures of different scales, establishment of marine protected areas, and input and output control management systems. A risk analysis will be conducted to evaluate the effectiveness of various management strategies and identify an optimal management plan for the Maine sea cucumber.

P23-04 **LYNAM, ANTONY J. and Pimolsri Chalermchai** Border Patrol Police Bureau, Royal Thai Police Office, Phaholyothin Road, Phyathai, Bangkok, THAILAND 10400 (CP). Wildlife Conservation Society – International Programs, 2300 Southern Boulevard, NY 10460-1099. (AJL). (tlynam@wcs.org)

COMBINING SCIENCE AND SECURITY TO PROTECT THAILAND'S TRANSBOUNDARY WILDLIFE

In Thailand, most wildlife persists in protected areas that cover 17% of the country. Most significant populations of tigers, Asian elephants and wild cattle now reside in large forest tracts along >5,000 km of land frontiers with neighbor countries. Despite their importance, poaching and illegal cross-border trade in wildlife threatens the integrity of these transborder forests. The task of enforcing wildlife laws is enormous given a myriad of potential smuggling routes and organized trade networks. Thailand's Border Patrol Police (BPP) Bureau, primarily responsible for national security, has a role to play in protecting wildlife and forests. With a field staff of 12,000, BPP are in a good position to support enforcement efforts but staff lack knowledge of wildlife and understanding of the regional scale and impacts of hunting and trade on wildlife populations. Since 2000, the Wildlife Conservation Society has provided basic training for 180 BPP staff in wildlife identification, conservation principles, wildlife law and navigation. Strengthening capacity has led to increased motivation to protect wildlife and identification of illegal border markets. Wildlife conservation is now formalized in a BPP five-year workplan. Collaboration between conservation agencies and enforcement agencies is increasingly a successful model in Southeast Asia.

P23-05 **REED, J. MICHAEL, Eric G. Strauss, David A. Krauss, Colleen B. Hitchcock, Eve Spangler, Aaron M. Toffler, Catherine M. O'Connor, and Charles P. Lord** Boston College Biology Department, 355 Higgins Hall, 140 Commonwealth Avenue. Chestnut Hill, MA 02467 (strausse@bc.edu) (EGS, DAK). Tufts University Department of Biology, Dana 218, Medford, MA 02155 (JMR). Boston College Sociology Department, McGuinn Hall 426, 140 Commonwealth Avenue, Chestnut Hill, MA 02467 (ES). The Urban Ecology Institute, 355 Higgins Hall, 140 Commonwealth Avenue, Chestnut Hill, MA 02467 (EGS, CBH, AMT, CMO, CPL).

NATURAL CITIES: LINKING ECOLOGICAL, SOCIAL, AND LEGAL RAPID ASSESSMENTS TO DETERMINE CONSERVATION PRIORITIES IN URBAN AREAS

Long-term research is critical to understanding urban ecosystems; however, current programs do not address the immediacy of development pressures or link ecological research to advocacy or social change. We developed a unique rapid assessment program using ecological, social and legal tools that local stakeholders can implement to determine conservation priorities in their communities. In 2002, 114 ecologically-valuable sites within a Boston area watershed were selected for analysis. In a related study of eight watershed communities, 27 socially-valuable sites were identified through open-ended surveys about social concerns and environmental priorities. Twenty-three sites (85% of socially-valuable sites; 20% of ecologically-valuable sites) were present in both data sets, indicating both social and ecological importance. Ecological Rapid Assessments using 17 parameters were conducted at the 23 sites, resulting in a numerical rank of comparative ecological condition. Two classes of sites important to a sustainable urban ecosystem emerged: those in good ecological condition and those in low ecological condition but of high social value. Next, legal advocacy strategies and transformation projects based on ecological and social needs were designed. Incorporating social, legal, and ecological information is integral to executing lasting conservation projects, as ecological health can be ensured in part by meeting community needs.

P23-06 **SCHMIDT, GERALD** Institut fuer Ethnologie, Kultur- und, Sozialanthropologie, Universitaetsstr. 7,1010 Vienna, Austria (and/or) Institut für Ökologie und Naturschutz, Althanstr. 14, A-1090 Vienna, Austria, (gerald.schmidt@univie.ac.at)

"POSITIVE ECOLOGY:" FROM CONSERVATION BIOLOGY TO A SCIENCE OF ECOLOGICALLY AND HUMANLY "GOOD LIVES"

The need for integrative/consilient science and an understanding of the positive potential of a transformation to sustainability, without which the aims of conservation biology will not be fulfilled, is finally being considered. The continuing perception of conservation as a crisis response and a luxury, concerning scientists only and quite opposite to human development and daily life, is a major barrier. A scientific approach therefore has to be integrative in an even wider sense, spanning ecological-evolutionary aspects of human dependence on a functioning ecosphere and foundations of sustainability, in their relation with anthropological and psychological aspects of the fulfillment of human needs and potential for achieving a "good life." There is considerable empirical evidence that sustainable ways of life integrating both 'natural' and 'human' concerns will not only be necessary in the long term, but can be shown to be understandable, engaging and attractive to society at large and the individual. The concept of positive ecology provides a framework for the integration of these different aspects; it also points out that the challenge for ecological sciences like conservation biology will be scientific, educative, as well as practical, in engaging with both perceptions (e.g. ethics) and ways of making a living.

P23-07 **STEWART, GAVIN, Christopher F. Coles, and Andrew S. Pullin** Centre for Evidence–Based Conservation, School of Biosciences, The University of Birmingham, Birmingham B15 2TT, UK (GBS, CFC, ASP) (g.b.stewart@bham.ac.uk).

DOES BURNING DEGRADE BLANKET BOG? A SYSTEMATIC REVIEW AND TEST OF THE EVIDENCE–BASED APPROACH

Scientific information on management of species and habitats is of variable quality, often contradictory and inaccessible to practitioners in a usable form. Here we test the applicability of an evidence–based framework for systematic review, synthesis and dissemination of evidence to support decision–making in conservation management. As a case study we critically appraised the available evidence for the effect of burning management on blanket bog vegetation in upland UK; a management issue raised by staff at English Nature. A systematic review was conducted by searching a range of electronic databases using a repeatable methodology and consulting experts in the field of UK blanket bog ecology. Over 20,000 articles were initially screened. Of these, 13 were of sufficient quality and relevance to meet the inclusion criteria. Five of these studies reported on the same datasets and were excluded. The available evidence suggests that burning either degrades blanket bog or is neutral in effect. The extent of evidence available for review indicates that more high quality research and monitoring of burning on blanket bogs is required. Application of the evidence–based framework to a conservation problem provided an effective means of objectively evaluating, synthesising and disseminating information to support decision–making by conservation practitioners.

P23-08 **WRIGHT, KATHERINE M., Lori A. Williams, Carola A. Haas, Marcella J. Kelly, and Patrick D. Keyser** Department of Fisheries & Wildlife Sciences (MC 0321), Virginia Polytechnic Institute and State University, Blacksburg, VA 24061 (kwright1@vt.edu) (KW, CH, MK). North Carolina Wildlife Resources Commission, 36 Pearl Street, Black Mountain, NC 28711 (LW). MeadWestvaco Corporation, P.O. Box 577, Rupert, WV 25984 (PK).

MODEL VALIDATION AND IMPROVEMENT USING NEW DATA ON HABITAT CHARACTERISTICS IMPORTANT TO SALAMANDERS

We determined how well habitat models predicting salamander abundance performed with new data, and suggest reasons for, and possible solutions to, generally poor model performance. These suggestions could be used to improve future studies with similar goals. Regression models of habitat characteristics important for salamanders in the southern Appalachians were previously created to provide recommendations for forest management. In order to determine the utility of these models, we counted salamanders by turning natural cover objects in 240 10 x 10 m quadrats located in the MeadWestvaco Wildlife and Ecosystem Research Forest in north-central West Virginia. We collected habitat data in these quadrats, and used these data to predict salamander abundance with the previously created models. These analyses suggest that the relationship between predicted and observed values is not strong (r^2 from 0.005 to 0.321). The general lack of consensus between predicted and observed values suggests that there are some un-measured variables that greatly affect salamander abundance. We suggest that this variation falls into two classes: detectability (such as weather or observer variation) and true variation (caused by factors such as landscape variables). To improve model performance, these variables must be measured, and detectability must be held as constant as possible.

P24-01 **AUIL, NICOLE and Jane M. Packard** Coastal Zone Management Authority and Institute, PO Box 1884, Belize City, Belize, (nauil@neo.tamu.com) (NEA). Texas A&M University, 2258 TAMUS, College Station, Texas, 77843-2258 (NEA, JMP).

IMPLICATIONS OF SEASONAL SHIFTS IN MANATEE DISTRIBUTION: INTEGRATED COASTAL ZONE MANAGEMENT FOR BELIZE

Antillean manatees (;Trichechus manatus manatus;) potentially serve as an umbrella focal species for protection of biodiversity in coastal systems of the greater Caribbean. We examined the seasonal change in manatee distribution among habitats in the coastal zone of Belize. Aerial surveys were conducted in the dry and wet seasons (1997, 1999-2002). Manatee locations were classified by habitat: cay, coast, estuary, lagoon, and river. The survey route was buffered 1 km on both sides, with a 1-km grid classified by habitat type. Likelihood-ratio tests were used to determine interactive effects (season by habitat) on presence of at least one manatee in each cell. Manatee locations were significantly more likely in river habitat in the dry season and offshore cay habitat in the wet season. However, the use of specific sites was not consistent from year to year. Although manatee density was higher in near-shore (estuary, lagoon, river) compared to offshore habitat (cay, coast), the total number of manatee locations was higher offshore. We recommend coordinated site-specific surveys to determine how environmental factors influence seasonal shifts in coastal habitats for focal marine species, thereby providing a sound scientific basis for integrated coastal zone management in developing countries of Central America.

P24-02 **AYCRIGG, JOCELYN L., Edward O. Garton, and Jason F. Hicks** P.O. Box 441136, Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID 83844-1136 (aycr8488@uidaho.edu)

IDENTIFYING ELK POPULATION STRUCTURE IN THE NORTHERN ROCKIES USING GENETIC CHARACTERISTICS

Conserving wildlife populations over large spatial areas challenge wildlife and conservation biologists to take new approaches. Large mammals, such as Rocky Mountain elk (;Cervus elaphus nelsoni;), exemplify this challenge because they have seasonal and annual ranges that cover areas the size of watersheds or sub-basins, respectively. To meet this challenge and to conserve elk, we performed spatial analysis of populations at the landscape level using the metapopulation concept and a genetic analysis approach. We collected tissue samples of individual elk from across the northern Rocky Mountains and genotyped each individual using microsatellites at multiple loci. We examined genetic population structure with 5 approaches. Individuals were assigned to local populations based on their relative similarity or dissimilarity to each local population using genotypes and geographical location. Our results indicated a moderate level of genetic differentiation between specific regions of the areas. Ongoing efforts to expand sample size and number of loci examined may improve our ability to identify genetic differentiation between elk populations. Understanding population dynamics of elk from a metapopulation perspective using genetic analysis will provide both theoretical and practical benefits for conserving and sustaining this species.

P24-03 **BOITANI, LUIGI and Valeria Salvatori** Institute of Applied Ecology, Via L. Spallanzani 32, IT – 00161 Rome(v.salvatori@ieaitaly.org) (VS). Dept. of Animal and Human Biology, University of Rome “La Sapienza”, Viale dell’Università 32, IT – 00185 Rome (LB).

CONSERVATION OF LARGE CARNIVORES IN THE CARPATHIAN MOUNTAINS:A GEOGRAPHICAL ANALYSIS OF ENVIRONMENTAL SUITABILITY, DAMAGE AND PROTECTED AREAS

The population of large carnivores in the Carpathian Ecoregion is the largest in Europe, accounting for 1/3 of the whole European population. The fast economic growth of the Carpathian countries (Poland, Slovakia, Ukraine and Romania) might bring major landscape transformations within future development programs, leading to dramatic changes of current conditions. The evaluation of environmental suitability for large carnivores was performed calculating the Mahalanobis distance from a set of optimal conditions estimated from recent locations of bears, lynx and wolves across the mountain range. The results showed that 23% of the mountain system (200,000 km2 ca.) provides excellent environmental conditions for the three species at once. Nevertheless, only 19% of suitable areas are included in any kind of protected territory. Opportunistic sampling throughout the Ecoregion indicated that 59% of damage caused by carnivores was reported to occur in highly suitable areas, and only 14% of damage events were reported to be inside a protected area. The results obtained represent a baseline picture for the conservation of carnivores in the Carpathians, and suggest that higher portions of the area should be under any kind of protection for avoiding the increase of conflict between carnivores and human activities.

P24-04 **HERNANDEZ, PILAR, Marie-Josee Fortin, Ferenc Csillag, and Lawrence Master** Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, ON, Canada (PH, MJF) (phernandez@zoo.utoronto.ca); Department of Geography, University of Toronto, 3359 Mississauga Road, Mississauga, ON, Canada (FC); NatureServe, 11 Avenue de Lafayette, Boston, MA (LM)

INCLUDING SPATIAL ARRANGEMENT OF HABITATS TO DERIVE SPECIES DISTRIBUTION MODELS FOR CONSERVATION

Habitat distribution models are being utilized by conservation planners to provide insight into the drivers and patterns of the spatial distribution of rare and endangered species. Usually the species that need to be conserved have sparse and/or restricted distribution patterns resulting in species occurrence data that is unevenly distributed in space with small sample sizes. Generating accurate habitat distribution models with occurrence data having these characteristics poses many challenges. While the statistical implications of small sample sizes are difficult to control, the problems caused by patchy distributions can be addressed by methods that include some measure of 'space'. We are investigating how spatially explicit consideration of space attributes can result in more accurate habitat distribution maps. This was tested using virtual species that have hypothetical ecological niche requirements. Realized distribution maps were generated to simulate various spatial distribution patterns imposed by biological processes such as species dispersal ability and home range requirements and different levels of landscape occupancy. We compared existing and our proposed spatially explicit methods with local landscape connectivity and logistic analysis for their ability to accurately predict the simulated species distribution patterns. Environmental data from Napa county California were used for evaluation purposes.

P24-05 **McCLUSKEY, SHANNON M., Glenn R. VanBlaricom, and Miles G. Logsdon** Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, WA 98195-5020 (ShanMcC@u.washington.edu)(SMM, GRVB). School of Oceanography, University of Washington, Box 355351, Seattle, WA 98195-5020 (MGL). Northwest Fisheries Science Center, NMFS, NOAA, Seattle, WA 98112 (SMM).

SOUTHERN RESIDENT KILLER WHALES AND PACIFIC SALMON: CORRELATIONS THROUGH SPACE AND TIME IN THE INLAND WATERS OF WASHINGTON STATE AND BRITISH COLUMBIA

The southern resident community of killer whales (Orcinus orca) (SRs), have been closely monitored for >25 years. Anomalously declining numbers of SRs since the middle 1990s have raised conservation concerns, with primary risk factors thought to be altered patterns of prey abundance and distribution, anthropogenic chemical contamination, and disturbance by increasing vessel activity. Only limited data are available on the foraging ecology of the population, but SRs apparently depend primarily on salmonid fishes for food, specifically selecting for chinook salmon (Oncorhynchus tshawytscha). We report investigations focused on possible associations of fluctuating salmonid prey populations with changing SR numbers. A spatial data model was developed using scientific, commercial, and tribal fisheries salmon data from selected years of whale population increase and decrease between 1975 and 2002 and overlayed with SRs sighting data for the same years. GIS-based procedures were used to discern correlations of SRs spatial data to specific stocks, species, and areas, and temporal variability therein. Results indicate complex relationships of salmon and SRs, including species and pod-specific association patterns. Any information relating to the influence of salmon distribution and abundance on SRs behavior and population trends is crucial to the management of both the SRs and regional salmon stocks.

P24-06 **MCSHEA, WILLIAM J., Wang Dajun, Li Seng, Li Ming Fu, and Daniel Guertin** National Zoo's Conservation and Research Center, 1500 Remount Rd., Front Royal, VA 22630, (wmcshea@crc.si.edu) (WJM, DG). North America Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (WJM). Panda Conservation Center, Peking University, Beijing, 100871 PDR China (WD, LS). Wildlife Protection Division, Tangjiahe Panda Reserve, Sichuan. PDR China (LMF).

MEASURING HUMAN-IMPACTS ON MAMMALS IN TANGJIAHE PANDA RESERVE, SICHUAN PROVINCE, CHINA

We used infrared-sensing trip cameras to monitor mammal populations at 329 locations within Tangjiahe Panda Reserve, and assess the relative importance of human settlement and reserve staff presence on their distributions. The reserve was stratified into 56 2x2 km squares and 5 cameras were placed within each square along animal trails, baited with scent lure, and left for 10 days. We obtained 509 pictures of 18 species during two 9-month sample periods (2002-2003). For 7 species (takin, reeve's muntjac, tufted deer, sand badger, Chinese porcupine, serow, and wild boar), there were sufficient detections and we were able to use CART regression to construct a model of suitable habitat within the sanctuary. We then took all sample locations within the model's suitable habitat and used logistic regression to examine the impact of distance to roads, villages, and park headquarters as determining factors for whether a species was detected. For 6 of the 7 species, their spatial distribution was significantly predicted by human presence. Animals were more abundant closer to park headquarters (n = 4), or farther from human settlement (n = 2). Only the distribution of the largest species, takin, was unpredictable based on human presence. In reserves with the potential for heavy pressure from poaching, this quantifiable technique that can be used as one measure of the effectiveness of patrolling staff.

P24-07 **PACHECO, VICTOR, Lynne Villalobos, Heidi Quintana, Alicia Vásquez, Irayda Salinas, Daniel Rodríguez, Hamilton Beltrán, Dyana La Rosa, Edith Salas, Juana Suárez, Claudia Torres, Paul Velazco, and Lily Arias** Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Apartado 140434, Lima 14, Perú (vpachecot@unmsm.edu.pe)

CONSERVATION OF FRAGMENTED MONTANE FORESTS IN CENTRAL PERU: BOSQUE DE CARPISH

Andean montane forests are one of the world hotspots of biodiversity; however, are also one of the least known ecosystems and poorly represented in Conservation units. In Central Peru, fragmentation of montane forests is increasing because of agriculture and unplanned immigration. These forests usually receive little attention by conservation agencies based on the argument that species diversity and population size are low. We evaluated the Bosque de Carpish, a fragmented montane forest of about 20000 ha, at 2500-3000 m, in Central Perú, which is threatened by potato agriculture, orchid traffic, and immigration. We carried out four expeditions, in dry and wet seasons, 20 days each, to evaluate diversity of plants, frogs, reptiles, and mammals. We recorded a large diversity, high percentage of endemism and even new species to science: 452 plant species (ten endemics), 32 species of mammals (one endemic, two new species), 21 frog species (two new species) and three reptiles. Diversity of Carpish was compared with nearby National Parks, concluding that in spite of fragmentation, diversity is rather similar to protected montane forests. These results and surveys on similar forests suggest that the conservation of fragmented forests is essential to maintain the unique diversity of Andean montane forests.

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IMPACT OF URBANIZATION ON THE THREATENED EUROPEAN TREE FROG (;HYLA ARBOREA;) IN AN AGRICULTURAL LANDSCAPE: A CENTRIFUGAL ANALYSIS

Pond-breeding amphibians are affected by site-specific factors as well as regional and landscape-scale land-use patterns. Recent anthropogenic landscape modifications (drainage, agriculture intensification, road network and traffic increase) affect species by reducing the suitable habitat area and fragmenting remaining populations. Here we analyzed the frequency of one traffic and 14 land-use indices at 20 circular ranges (from 100 m up to 2 km radii) around 76 ponds identified in western Switzerland, in order to evaluate the impact of recent landscape changes on the presence of the endangered European tree frog in wetlands. Results show that urban areas and road surfaces have a strong adverse effect on tree frog presence even at relatively great distances (from 100 m up to 1 km). When road surfaces are balanced with traffic measurements, the effect increases, thus suggesting negative impact due to a vehicle-induced effect. Altogether, this study indicates that urbanization and traffic must be taken into account when pond creation is an option in conservation management plans, as is the case with tree frog remnants in western Switzerland. This method facilitates the identification of potential sites for pond creation, maximizing the probability of tree frog presence. Together with pond-scale determinants, the viability of the populations should be increased when multiscale factors are taken into account in the creation of new breeding sites.

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LANDSCAPE ATTRIBUTES OF FISHLESS LAKES IN MAINE

Permanent ponds lacking fish support a potentially unique natural community-type. The aquatic fauna of many such systems in North America have evolved in the absence of fish since the end of the Pleistocene, and the issue of how these organisms are affected by the artificial introduction of fish is attracting increasing attention from ecologists and conservationists. Maine may host the greatest number of unaltered fishless pond ecosystems in the northeastern United States. With over 6000 lakes and less than one quarter surveyed for fish presence, there are no accurate estimates of the number or distribution of fishless lakes in the state. The aim of this research is to estimate the number of naturally fishless lakes in Maine using remote sensing and geographic information systems. ArcGIS software was used to identify landscape-scale environmental factors that relate to the fishless condition (e.g., lake isolation, slope of out-flowing stream, soil type). Based on these factors statistical models were created that estimate the likelihood that a particular lake is fishless. Ponds predicted to be fishless were visited to confirm fish absence with trapping and paleolimnological techniques. This research will be used to devise management guidelines that protect naturally fishless lakes and their associated biological communities.

P24-10 **SCHWEIZER, DANIELLA and Paula Henry** CONS Program, Department of Biology, University of Maryland, College Park, MD 20742-4415 (danimar_1999@yahoo.com) (SD). USGS - Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, Maryland 20708-4017 (PH).

GIS ASSESSMENT OF MAIN TERRAPIN TURTLES NESTING AREAS IN NEED OF PROTECTION IN THE CHESAPEAKE BAY, MARYLAND

The Chesapeakebay -the largest marine estuarie in the United States-, is a highly complex ecosystem that represents a very important nesting and nursing site for many different, terrestrial, marine and freshwater species. One of this is the Diamondback Terrapin Turtle, a specie that resides in the bay throughoutits life cycle. However, certain areas of the Chesapeakebay have been submitted to intense development pressures, thus reducing the turtle nesting habitat available.

Currently, the USGS, through the Patuxent Wildlife Research Center, has engaged in an extensive research initiative aimed at assessing the status of the Diamondback Terrapin in the Chesapeakebay. As part of that initiative, the present project evaluated, with the aid of GIS, current terrapin use of land in the western shore area of the bay, as well as possible risks turtles might face if further urban development continues. GIS layers on development pressure and protected areas, land-use overage maps, and USGS, 2002 and 2003, terrapin nesting data, were employed in the analysis. The results show that the shoreline area of Dorchester County has significant nesting activity ocurring in unprotected areas that are under an intense pressure from urban and agricultural development. Further field research is suggested to better understand the dynamics of the nesting activiy in that area, and the establishment of new protected sites, based on the maps generated in the present study, is highly recommended.

P24-11 **VAN COEVERDEN DE GROOT, PETER, Candace Scott, Tom Foose, Muhammad Agil, Aidi Mohamad, Juan Carlos Morales, Don J. Melnick, and Peter T. Boag** Dept. of Biology, Queen's University, Kingston, ON, K7L 3N6, Canada (PJVCDG, CAS & PTB); (peterj@biology.queensu.ca); IRF Program Office White Oak Conservation Center, 3823 Owens Road, Yulee, Florida 32097 (TF); Department of Reproduction and Obstetrics,Faculty of Veterinary Medicine, Bogor Agricultural University, Jalan Agatis, IPB Campus of Darmaga, Bogor 16680, Indonesia (MA); Suite B-61-12, Megan Philed Ave 12, Jalan Yapkwan, Kuala Lumpur, Malaysia (AM); and Center for Environmental Research and Conservation, Columbia University, 10027-5557, New York, NY (JCM, DJM)

MICROSATELLITE VARIATION IN THE SUMATRAN RHINO DICERORHINUS SUMATRENSIS

The Sumatran rhinoceros (Dicerorhinus sumatrensis) is critically endangered with less than 300 remaining. Here were report on microsatellite variation in the species and use this data to determine 1) if there is evidence of genetic differentiation between Malaysian and Indonesian populations of Sumatran rhinos at fast evolving microsatellite loci and 2) whether the first captive born calf in over 100 years was from highly related parents. Thirteen polymorphic di-nucleotide loci were cloned and optimized and variation was assayed at these loci in 17 captive animals - ten from Indonesia and seven from Malaysia. Across all animals the expected (Hardy Weinberg) heterozygosity at these loci was He number of alleles per locus evidence of microsatellite differentiation between Sumatran rhinos from the two countries with 5 of the 13 loci having at least one country specific allele. Of the 45 shared allele distance comparisons within Indonesian Sumatran Rhinos, the distance between the parents of the new born calf was lowest. This suggests these individuals were highly related and may partially explain why their five preceding pregnancies were lost within the first three months of conception.

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ECOLOGY IN A MULTIDISCIPLINARY ASSESSMENT OF URBAN GREEN SPACE SYSTEMS ACROSS EUROPE

The provision of urban green space (UGS) in European cities varies considerably both qualitatively and quantitatively. The aim of this study is to assess UGS systems in European cities and to develope recommendations for improving their planning and management, thus enhancing the quality of life of urban residents. An extensive evaluation of UGS systems and policy has been conducted using ecological, sociological, economic and planning criteria, with data collected in a number of cities. The objective is to investigate what aspects of UGS affect quality of life for urban residents and to provide recommendations for improvements to the planning and management of UGS. The ecological criteria also assess the sustainability of UGS systems, as well as direct effects of green space on the urban environment. This multidisciplinary study has been conducted at two levels: the level of the whole city's green system and the level of two case study sites. The result has been the developement of tools and a strategy for monitoring and enhancing the quality of UGS. The partner cities of the URGE project are committed to applying these tools.

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LONG TERM CHANGES IN THE BREEDING BIRD SPECIES OF CENTRAL PARK, NEW YORK CITY FROM 1868 TO 2004

Breeding bird data from seven avifaunal surveys of Central Park published between 1868 and 1988 were analyzed and compared to bird species found breeding from 1994-2004. During the last 136 years, a total of 68 bird species (60 native) bred in Central Park. Numbers of breeding species varied from 43 (38 native) in the 19th century, to 21 (18 native) from 1904-1922, to 35 (29 native) from 1994-2004. Seven species (Rock Pigeon, Downy Woodpecker, House Wren, American Robin, Song Sparrow, Common Grackle, House Sparrow) have bred more or less continuously from 1868 to the present. By comparison, of 13 species of flycatchers, vireos and wood warblers that nested since the 19th century, 10 (76.9%) have become extirpated. No obligate ground nesting species, except waterfowl, still breed in Central Park. Certain birds that are considered fairly common breeding species today (Mourning Dove, Red-bellied Woodpecker, Blue Jay, Northern Cardinal, House Finch) have become established, or re-established, only since the 1950s. Of the 29 native bird species that nested from 1994 to 2004, 12 (44.8%) are considered rare breeders in Central Park. Recommendations are made to improve nesting habitats, increase educational outreach, and enforce existing park rules and regulations.

P25-02 **AMANZO, JESSICA, Raúl Acosta, Cesar Aguilar, Karen Eckhardt, Severo Baldeón, and Tatiana Pequeño** Museo de Historia Natural,Universidad Nacional Mayor de San Marcos, Av. Arenales 1256, Jesús Maria, Ap. 14-0434, Lima, Perú (JA, CA, KE, SV, TP);(jessica_amanzo@yahoo.com). Departamento de Ecología, Universidad de Barcelona, Av. Diagonal 654, Barcelona, España (RA).

RAPID BIOLOGICAL ASSESSMENT OF THE NATIONAL SANCTUARY TABACONAS-NAMBALLE, PERU

Tabaconas – Namballe National Sanctuary is the only Peruvian protected area that preserves the Paramo ecosystem. It is placed in the transitional area between the northern and southern Andean regions. Several studies made in the surroundings had showed high diversity and endemism of species. We developed a rapid assessment for plant, insect, reptile, amphibian, bird and mammal species using standard inventory methods. We evaluated three sites: Arrebiatadas lagoons (3000-3300 m), Samaniego River (2150-2450 m) and El Sauce (1500-2000 m). We registered: 238 fanerogams including one new species of ;Gynoxys; (Asteraceae) for the science and 48 cryptogams; 372 terrestrial insects and 118 aquatic insects including 4 new species for the science: 3 Elmidae and 1 Anomalopsychidae (Trichoptera); 13 amphibians, including 2 new frogs for the science (;Phrynopus; sp. nov and ;Osteocephalus; sp.); 5 reptiles including one new register of a lizard (;Enyalioides heterolepis;) for Peru; 186 birds including the register of the Andean duck (;Anas andium;) for Peru; and 59 mammals including one bat (;Sturnira; sp.) and one rodent (;Oryzomys; sp.) new for the science. The Sanctuary assessment shows high diversity and endemism. The diversity appears to be more similar to the north region of the Andes than to the south.

P25-03 **GRANT, EVAN H.C., Robin E. Jung, and Priya Nanjappa** USGS-PWRC, 12100 Beech Forest Rd., Laurel, MD 20708 (ehgrant@usgs.gov)

"HOW ARE THE FROGS DOING?": THE ARMI APPROACH

The decline of amphibians has received substantial attention over the last several decades. Until recently, most research efforts to determine the extent of amphibian declines have focused on small-scale projects on specific species. The Amphibian Research and Monitoring Initiative (ARMI) is a national program mandated by congressional directive and implemented by the Department of Interior (DOI, specifically USGS) to monitor changes in populations of amphibians across DOI lands in the United States and to address research questions related to amphibian declines using a hierarchical framework of base-, mid- and apex-level monitoring sites. ARMI uses a hierarchical framework such that mid- and apex- level sites can be monitored in collaboration with partners which provide data for surrounding areas, ensuring good spatial distribution of monitoring sites in each The program uses the proportion of area occupied (PAO) as the region. primary state variable to analyze mid-level monitoring data on amphibian species of interest. ARMI is currently monitoring 83 amphibian species (29% of species in the U.S.) at mid- and apex-level sites. We provide a brief description of ARMI, chart the progress of this 4-year-old program, and provide an example of the monitoring approach from the Northeastern ARMI region.

P25-04 **HOKE, PETER** Conservation International, Rapid Assessment Program, 1919 M ST. NW STE. 600, Washington, DC 20036 (p.hoke@conservation.org)

EASY ACCESS: FACILITATING THE USE OF RAPID ASSESSMENT PROGRAM SURVEY DATA ONLINE

Conservation International's Rapid Assessment Program (RAP) collects data on the flora and fauna of some of Earth's most biologically diverse and imperiled areas. Datasets collected during RAP surveys are now available online for use by scientists, park managers, government officials and other interested parties to support and enhance conservation work. The interactive site enables users to easily mine almost 15 years of biodiversity survey data and download results for further analysis. The website also includes species and location photos and links the user to the original Working Papers/RAP Bulletin of Biological Assessment report in searchable pdf. Since 1990 RAP has conducted 28 terrestrial and 9 freshwater surveys. Detailed descriptions of 28 datasets and how to use the database will be presented.

P25-05 **HOOD, CRAIG S. and Lauren E. Nolfo** Department of Biological Sciences, Loyola University, New Orleans, LA 70118 (chood@loyno.edu) (CSH). Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 (LEN)

CHALLENGES OF INVENTORY AND MONITORING MAMMALS OF JEAN LAFITTE NATIONAL PARK – HISTORIC & ONGOING URBAN IMPACTS

Established in 1978, units of Jean Lafitte N.P. have been modified by people of the region for over 200 years and are currently undergoing several major urbanizing impacts. The state of knowledge of mammal biodiversity is incomplete and largely unconfirmed. The forests and swamps are small linear fragments bordered by urban development. The marsh habitats that comprise nearly 70% of Barataria have experienced significant physical and biotic change. During the past 50 years, the combined effect of disrupting freshwater flow together with saltwater intrusion, has caused significant degradation of the western boundary of the unit. A Mammal Inventory and Monitoring Program was initiated in Summer 2003 and is reported here. At the date of abstract submission, live-trapping (marshes, 2,000 trapnights; spoil banks, 1,000 trapnights; forests, 2,000 trapnights) , motion-triggered cameras (4 months of monitoring), and field observations have confirmed occurrence and habitat use of more than a dozen species within major habitats. Documentation a large population of coyotes (;Canis latrans;) was surprising. Several innovative strategies to overcome challenges of conserving a highly fragmented natural area with multiple users (including hunters and trappers) adjacent to a major metropolitan area were developed and are proving successful.

P25-06 **HOOKER, YURI** Departamento de Ecología, Museo de Historia Natural, Universidad Mayor de San Marcos, Av. Arenales 1256, Jesús Maria, Ap. 14-0434, Lima, Perú.(hookery@yahoo.com)

DISTRIBUTION OF THE LABRIDAE FAMILY IN THE PERUVIAN COAST AND ITS VARIATION DURING "EL NIÑO"

In Peru, there are very few ichthyic studies of non-commercial species, being unknown the distribution of many of them. Nine species of Labridae family were known for Peru; however, four of them are synonymies (*Semicossyphus maculatus*, *Semicossyphus* sp. aff. *maculatus* and *Semicossyphus* sp. = *Semicossyphus darwini*) therefore only six are valid species. During faunistic inventories and evaluations by submarine visual census method carried out between 1996 and 2001 we registered ten species of Labrids, four of them (*), are new registrations for Peru: *Bodianus diplotaenia*, *Bodianus eclancheri*, *Decodon melasma*, *Halichoeres chierchiae**, *Halichoeres dispilus*, *Halichoeres nicholsi**, *Halichoeres notospilus*, *Semicossyphus darwini*, *Thalassoma grammaticum** and *Thalassoma lucasanum**. *Halichoeres dispilus* is the most abundant and broadly distributed species (79.8% of the registered specimens), followed by *Bodianus diplotaenia* (13.9%) and *Thalassoma lucasanum* (4.8%). *Halichoeres chierchiae* was registered only during "El Nino", while *Thalassoma grammaticum* was registered only in Lobos de Afuera islands. Among 1997 and 1998, during "El Nino", it was observed significant changes in the distribution of the Labrids along the coast, as well as changes in the community composition and species abundance. *Semicossyphus darwini* had been considered a vulnerable species to extinction and has been proposed for the Peruvian threatened species list.

P25-07 **JOSEPH, LIANA N, Chris Wilcox, Stephen Garnett, Stephen Williams, and Hugh Possingham** School of Life Science, University of Queensland, St Lucia, AUSTRALIA 4072 (LN, CW, HP); Conservation Services, Queensland Parks and Wildlife Service, Northern Region, P.O.Box 2066, Cairns, AUSTRALIA 4870 (SG); Rainforest CRC, School of Tropical Biology, James Cook University, Townsville, AUSTRALIA 4811 (SW) (l.joseph@zen.uq.edu.au)

OPTIMAL MONITORING STRATEGIES FOR LISTING THREATENED SPECIES

Threatened species lists (TSL), such as the IUCN Red List, are essential for providing legislative protection for extinction prone species. Species monitoring is essential to compiling and maintaining these lists, however, there has been little research into the most appropriate method to monitor populations to adequately detect population changes that meet criteria for listing. The aim of this study is to optimise monitoring strategies to maximise the probability of detecting a change in listing category given a fixed budget for monitoring. To achieve this, we use a spatially-explicit simulation of the population dynamics of threatened bird species from the Wet Tropics region of northern Australia. Realistic patterns of decline such as those expected from threatening processes, like global climate change or disease, are simulated. The power of different sampling strategies (monitoring of occupancy, abundance or demographic variables) to detect population changes required to trigger listing on a TSL is determined (e.g. 30% decline over 10 years). We give guidelines for optimal threatened species monitoring, by simultaneously considering the power to detect declines and the cost of different sampling techniques.

P25-08 **STEVENS, WENDY J. and Luis A. Ruedas** Portland State University, Biology Department, P.O. Box 751, Portland, OR 97207 (wendys@pdx.edu) (WJS, LAR).

RESEARCH AND MONITORING OF URBAN BIODIVERSITY WITH NON-SPECIALISTS: OUTCOMES FOR CONSERVATION AND SCIENCE EDUCATION, A CASE STUDY

The global trend in urbanization and its impact on biodiversity predicates a growing need to study and manage urban ecosystems. Ecosystem management and conservation of biodiversity receive limited government and private funding, resulting in a small number of funded specialists to conduct research, inventories and monitoring of urban biodiversity. Therefore, more attention needs to be given to developing valid and reliable methods of surveying and managing urban biodiversity using nonspecialists groups such as science students. Some research suggests that terrestrial arthropods may be important indicators of biological integrity especially where larger animals are no longer present. Arthropods may also be accurately used by nonspecialists. A pilot study found that research partnerships between scientists and land managers, and high school and undergraduate science students resulted in student learning, civic engagement, and positive attitudes towards science. While providing valuable scientific information for conservation of urban biodiversity, the partnership was time intensive, requiring development of long term working relationships between community partners. Successful partnerships should provide training of science teachers. Initial findings suggest that identification of terrestrial arthropod indicators of ecosystem health and the development of valid and reliable monitoring methods may prove useful for long-term management of Portland urban biodiversity.

P25-09 **LEE, YU MAN, Bruce A. Kingsbury, Jennifer A. Olson, Michael Monfils, Lori G. Sargent, and Peter B. Pearman** Michigan Natural Features Inventory, Michigan State University Extension, Mason Building, P.O. Box 30444, Lansing, MI 48909 (YL, JAO, MM, PBP). Center for Reptile and Amphibian Conservation and Management, Indiana-Purdue University, Fort Wayne, 2101 E. Coliseum Blvd., Fort Wayne, IN 46805 (BAK). Michigan Department of Natural Resources, Wildlife Division, Natural Heritage Program, Mason Building, 4th Floor, P.O. Box 30444, Lansing, MI 48909 (LGS). (leeyu@michigan.gov)

EASTERN MASSASAUGA SURVEYS IN MICHIGAN

The eastern massasauga rattlesnake (Sistrurus catenatus catenatus) has declined throughout its range in the U.S. and Canada, primarily due to habitat loss and human persecution. As a result, the species has been afforded some level of protection across its range and was listed as a federal candidate species by the U.S. Fish and Wildlife Service in 1999. Michigan appears to be the last U.S. stronghold for this species relative to other states within its range. Thus, conservation of the eastern massasauga in Michigan is critical for ensuring the species' long-term viability. The Michigan Department of Natural Resources is currently developing an Eastern Massasauga Candidate Conservation Agreement with Assurances to implement a conservation strategy for the massasauga in Michigan. In support of this effort, field surveys were conducted from 2001-2003 to identify extant massasauga populations on public or other protected lands and adjacent private lands. Massasauga observations from resource managers and the general public also were compiled and evaluated. At least 65 extant populations have been identified in Michigan, including a new county record. These results indicate that while massasaugas have declined in Michigan, they appear still to be fairly abundant and widespread in the state.

P25-10 **McCULLOUGH, JENNIFER** Conservation International, Rapid Assessment Program, 1919 M ST. NW STE. 600, Washington, DC 20036 (j.mccullough@conservation.org)

USING RAPID BIODIVERSITY SURVEYS TO QUICKLY BUILD CONSERVATION KNOWLEDGE AND CAPACITY IN GUINEA, WEST AFRICA

Southeastern Guinea holds some of the last remaining forest in West Africa, and a number of forest reserves within this area have been suggested as priorities for conservation. While political instability surrounding Guinea has impeded research and conservation efforts in these forest patches, pressures including bushmeat hunting and development make rapid assessment essential in setting conservation priorities and taking action in this region. In the past 18 months, the Rapid Assessment Program (RAP) of Conservation International has facilitated brief inventories within this area to quickly improve the knowledge base of several reserves (Pic de Fon, Diécké, Déré, and Mt. Béro), documenting at least 37 new records for Guinea, and at least 12 species new to science. Data were likewise collected on Red-listed species, including the Endangered ;Pan troglodytes verus, Cercopithecus diana diana, Malimbus ballmanni, Microptamogale lamottei; and ;Neolemonniera clitandrifolia;, as well as 24 Vulnerable, 19 Near Threatened, 2 Conservation Dependent and 5 Data Deficient species. These data are being used locally and internationally to design conservation strategies. Concurrently, RAP surveys are used to build local capacity for biological inventories within West Africa, as well as building relationships between conservation biologists and local and regional stakeholders.

P25-11 **O'BRIEN, CARRIE J. and William J. McShea** Ecology Center, Utah State, University, UMC 5205, Logan, UT, 84322 (cobrien@cc.usu.edu) (CJO); Smithsonian National Zoological Park, Conservation & Research Center, 1500, Remount Rd, Front Royal, VA 22630 (CJO,WJM). North American Program, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460, USA (WJM)

SMALL MAMMAL RICHNESS AND URBANIZATION IN THE GREATER POTOMAC RIVER REGION

The Asiatic cheetah's (*Acinonyx jubatus*) distribution has been reduced to small subpopulations centered on the Kavir Desert of Iran. Local extinctions have occurred over the past 100 years due to persecution of cheetah and elimination of prey, and today cheetahs persist in approximately 10 locations. We used standardized line transects, point counts and camera trap surveys to examine the distribution and abundance of cheetah, their principal prey (gazelle, Urial sheep and wild goat), and other carnivores in five protected areas. Populations of gazelle are very low in the reserves; goitered gazelle were found only in one reserve and jebeer gazelle populations were under 250 in all but one reserve. Lack of gazelle has forced cheetahs to shift to Urial sheep and wild goats as primary prey. Sheep populations were distributed unevenly throughout the mountains of reserves; density ranged from 0.21 – 10.8/km^2. Wild goat distributions also were clumped and density ranged from 0.06 – 5.5/km^2. Cheetahs were rare everywhere we looked, with estimated minimum densities of one cheetah/2000 km^2. Wolf, leopard, and caracal were as uncommon as cheetah, and we suspect persecution of carnivores is widespread. Recovery of Asiatic cheetah will depend on stopping direct killing of cheetahs and recovery of gazelle populations.

P25-12 **ROCHA, CARLOS F.D., Helena G. Bergallo, Monique Van Sluys, Maria A. S. Alves, and Carlos E. Jamel** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 200559-900, Rio de Janeiro, RJ, Brazil, and Instituto Biomas, Rua Sonia Angel Jones 5, Recreio dos Bandeirantes, Rio de Janeiro, Rj, 22785-470, RJ, Brazil. (cfdrocha@uerj.br)

THE REMNANT AREAS OF RESTINGA HABITATS IN THE BRAZILIAN ATLANTIC FOREST OF RIO DE JANEIRO STATE, BRAZIL: HABITAT LOSS AND RISK OF DISAPEARING

“Restingas” (herbaceous/shrubby coastal sand-dune habitats) covered most of Rio de Janeiro State coast, suffering extensive degradation over the last five centuries. Using satellite images and field work, we identified the remnants restingas in the State, recording factors resulting in their degradation. We used two scenes (fuse 24, fuse 23, spatial resolution 15m, 30m). Each area was checked in the field, degraded areas were mapped, and the degraded habitat area was subtracted from the area of the remnant. We identified 21 restinga remnants totaling 105,285ha. The largest and smallest restinga remnants were Jurubatiba (25,141ha) and Itaipu (23ha). We identified 14 causes of degradation. The most important were vegetation removal for housing developments, establishment of exotic plant species, change of original substrate, and selective removal of species of economic importance to the horticultural industry. All restingas had disturbed parts under strong pressure for human activities. Due to intense habitat loss, and occurrence of endemic/threatened vertebrates in restinga habitats, we strongly indicate the implementation of new conservation units to protect these fragile remnants. This habitat is steadily decreasing and most remnants lack legal protection, so most of this unique habitat is likely to be lost from the State within the next few years. "Supported by: Conservation International Brasil"

P25-13 **RODRÍGUEZ-CLARK, KATHRYN M., Pedro D. Vernet, and Ángel J. Gómez** Grupo de Trabajo en Tortugas Marinas del Estado Nueva Esparta, Provita, Apartado 47552, Caracas 1041-A, Venezuela, (tortuga@gttmne.org) (PDV, AJG). Instituto Venezolano de Investigaciones Científicas, Centro de Ecología, Apartado 21827, Caracas 1020-A Venezuela (KMRC).

TWO TURTLES WITH ONE STONE: THE IMPORTANCE OF A VOLUNTEER NETWORK FOR SEA TURTLE CONSERVATION AND RESEARCH ON MARGARITA ISLAND, VENEZUELA

Sea turtle reproductive biology presents significant challenges to conservation and research efforts on the island of Margarita -- nesting attempts are nocturnal, unpredictable, and widely-spaced -- while Venezuela's ongoing economic crisis encourages continued poaching. In the face of limited resources, is it possible to overcome these obstacles? Here we present the results of a three-year effort to do so by building an innovative volunteer network, the Red de Aviso Oportuno (RAO), drawing on the local community, businesses, and universities. Volunteers are assessed carefully and pass through six defined levels, ranging from turtle spotters (who notify the network of nesting attempts), through advanced coordinators. Of the 252 volunteers recruited between 2000 and 2002, 8 reached the highest level. During this time, nest poaching fell from 83% to just 10% (total nests = 391), while the number of beaches with registered nesting increased from 7 to 34. Furthermore, volunteers collected data on 509 of 560 known nesting attempts, and reared and released 11,983 live hatchlings from translocated nests. We believe our successes are replicable elsewhere with three key ingredients: 1) energetic central leadership; 2) rigorous volunteer standards, and 3) motivation via the possibility of a unique wildlife experience for volunteers.

P25-15 **Morgan, David B., Crickette M. Sanz, Jean R. Onononga, and SAMANTHA STRINDBERG** Cambridge University, Department of Biological Anthropology, Downing Street,Cambridge CB2 3DZ, United Kingdom (DBM), Washington University, Department of Anthropology, 1 Brookings Drive, Saint Louis, MO 63130 (CMS), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Blvd., Bronx, NY 10468 (JRO, SS) (sstrindberg@wcs.org).

APE ABUNDANCE AND HABITAT USE IN THE GOUALOUGO TRIANGLE, REPUBLIC OF CONGO: A COMPARISON OF LINE TRANSECT NEST SURVEYS AND DIRECT OBSERVATIONS

As human influence continues to expand throughout equatorial Africa, determining the abundance and ecological requirements of remaining ape populations is of increasing importance. The main objective of this study was to estimate the absolute abundance and habitat utilization of chimpanzees (Pan troglodytes troglodytes) and gorillas (Gorilla gorilla gorilla) in the Goualougo Triangle, Republic of Congo. A second objective was to compare estimates of abundance and patterns of habitat utilization generated by distance sampling of ape nests using line transects and direct observations of apes during reconnaissance surveys. A total of 222 km of transect surveys were conducted, with resulting nest site densities converted to chimpanzee and gorilla densities. Chimpanzee density estimates were also generated by applying the home range method to direct observations of a semi-habituated community. Aside from the standard analyses of ape abundance, we present the results of a spatial model applied to the line transect data. This model allowed us to incorporate variables (biotic or human disturbance) into the analysis and investigate their potential influence on ape densities. With these results we can assess the merits of different survey methods and provide a preliminary description of how chimpanzees and gorillas coexist within a central African forest.

P25-16 **STRINGER, MICHAEL, Frank Steimle, and Debbie Dalton** NY/NJ Baykeeper, Bldg. 18, Sandy Hook, Highlands, NJ 07732, US (mstring@mail.umd.edu) (MS and DD); NOAA/NMFS, James J. Howard Marine Sciences Laboratory, 74 Magruder Road, Highlands, NJ 07732, US (FS)

COMMUNITY-BASED OYSTER RESTORATION IN THE NY-NJ HARBOR ESTUARY

Oysters were once an important fishery and ecological component of the New York-New Jersey Harbor Estuary. Overharvesting and pollution have contributed to the near extirpation of this keystone species. Since 1998, NY/NJ Baykeeper has led the effort to explore the feasibility of restoring oyster beds in the Estuary. In the last two years, the program has taken strides to develop partnerships, with the National Oceanic and Atmospheric Administration and a vocational high school to establish an oyster aquaculture system enabling the production of nearly 1,000,000 oysters per year. A volunteer 'Oyster Gardening' program of over 100 participants adds another 200,000 oysters to this total each year. Efforts have focused on re-building oyster beds in the Navesink River, to concentrate this effort on one tributary. In 2003, close to 100 volunteers planted 3 tons of oyster shell to rebuild oyster reef habitat at Oyster Point. Growing support for this effort has led to policy changes at the state level to encourage future projects. This presentation will focus on the achievements and obstacles to this community-based habitat restoration effort, focusing on the challenges of restoring shellfish beds in urban areas, such as public health and water quality issues.

P25-17 **VIANA, LEONARDO R., Jean C. Santos, Camila E. M. de Sá, Ellen C. Pereira, Felipe V. M. Almeida, Maria S. Ferreira, Mariana P. A. Hilarino, Paloma A. Côrtes, Geraldo W. Fernandes, Ricardo M. Pinto-Coelho , and Salvatore Siciliano** Laboratório de Ecologia Evolutiva de Herbívoros Tropicais, Pós-Graduação em Ecologia, Conservação e Manejo da Vida Silvestre.. Departamento de Biologia Geral. ICB/UFMG. CP: 486. CEP: 30161-970. Belo Horizonte, MG. Brazil (leov39@hotmail.com) (LRV, JCS, CEMS, ECP, FVMA, MSF, MPAH, PAC, GWF, RMPC), Escola Nacional de Saúde Pública/FIOCRUZ Departamento de Endemias Samuel Pessoa, Laboratório de Ecologia, Rua Leopoldo Bulhões, 1480-térreo, Manguinhos, Rio de Janeiro, RJ 21041-210 Brazil (SS)

ENVIRONMENTAL EDUCATION IN MINAS GERAIS, BRAZIL: “PAMPULHA LIMPA 2003” - A CASE STUDY

The use of educational programs in developing countries is seen as a necessity in conserving biological diversity. Brazil, containing two of the world’s 25 hotspots of biological diversity, is an excellent example of a country in which environmental educational programs could yield significant results in the conservation of its natural resources and biological diversity. Here we present results of an environmental educational program conducted in Pampulha Lake, Belo Horizonte, the third largest city in Brazil. Two hundred school children from low-income areas participated in an integrated environmental education program involving multiple supporting entities. Lectures and informative presentations were followed by a collection of refuse at four sites in the Pampulha lake waterway system. One-day results included the removal of nearly 400 Kg (880 lbs.), which were classified onsite, based on type. The items most collected were 1) Mixed items (30.82%), 2) Plastic (24.90%), 3) Rubber (17.80%), 4) Glass (8.26%), and 5) Metal (6.90%). Questionnaires, testing environmental knowledge were administered both prior and post program, comparative results proved non-significant. Non-significant results notwithstanding, the authors believe this program will have positive repercussions for the future conservation of biological diversity due to the raised environmental awareness of the general public.

P25-18 **OLSVIG-WHITTAKER, LINDA S., Talya Oron, and Didi Kaplan** Israel Nature and National Parks Protection Authority, 3 Am Ve Olamo Street, Givat Shaul, Jerusalem 95463, Israel. (Linda.Whittaker@nature-parks.org.il) (LOW, TO, DK)

TRENDS IN WETLAND VEGETATION OF HULA NATURE RESERVE IN GALILEE, ISRAEL

Hula Nature Reserve, an internationally recognized RAMSAR wetland in the Galilee of Israel, is under constant pressure from agricultural development in the surrounding Hula Basin. Monitoring of the status of key species and groups (notably vegetation and waterfowl) is critical under these circumstances. The vegetation of Hula Nature Reserve has been sampled for twenty years but only recently analyzed to assess changes that may occur due to management or environmental degradation. Use of Detrended Correspondence Analysis (DCA) sample traces has clearly illustrated that fluctuating water levels and plant species invasion have altered the vegetation in several parts of the nature reserve. Redundancy Analysis (RDA) indicates these changes are general and significant. We present a summary of the analysis and its implications for management.

P25-19 **WHITTAKER, DANIELLE J.** Department of Anthropology, City University of New York Graduate Center, 365 Fifth Avenue, New York, NY 10016; New York Consortium in Evolutionary Primatology; (djwhittaker@mindspring.com)

STATUS OF KLOSS'S GIBBON POPULATIONS AND HABITATS

The Kloss's gibbon (*Hylobates klossii*) is one of the most endangered small ape species, but no specific population estimates have been published since the early 1980s, when the remaining Siberut population was estimated at 36,000 individuals. This study uses the vocalization survey method of Brockelman and Ali (1987) to estimate gibbon population density at sites throughout the four Mentawai Islands (Siberut, Sipora, North Pagai, South Pagai). Within the only protected area, Siberut National Park, population density ranges from 1.27 to 2.25 groups/km^2, for a total of 9,400-16,700 gibbons (average observed group size: 5 individuals). In Sipora, density is 0.96 to 1.12 groups/km^2, though only a small area of forest remains. Efforts to establish a reserve in the Pagai Islands have not yet been successful. However, the logging company that has managed approximately 50% of the islands' total area has practiced selective logging and plot rotation since 1971, and 20-year regenerating plots were found to support gibbon densities of 1.27 to 1.5 groups/ km^2 . The company's self-established conservation and limited production areas thus support 1,200 to 1,418 gibbons. The total number of Kloss's gibbons in the Mentawai Islands, based on recent estimates of remaining forest cover, is between 12,000 and 20,000 individuals.

P26-01 **ANGELONE, SONIA, Karin Hilfiker, Rolf Holderegger, and Susan E. Hoebee** Section of Ecological Genetics, WSL Swiss Federal Research Institute, Zürcherstrasse 111, CH-8092 Birmensdorf, Switzerland (sonia.angelone@wsl.ch)

A HIERARCHICAL APPROACH INVESTIGATING HOW SCALE AFFECTS GENETIC CONNECTIVITY OF POPULATIONS IN THE SCATTERED TEMPERATE FOREST TREE ;SORBUS TORMINALIS;

So far, most studies related to measurements of inter-population gene flow in trees have concentrated on rare tropical species or widespread and wind pollinated temperate species. When insect pollinated temperate species have been investigated, rather large geographical scales were considered. Here, we contrast these former approaches by examining the degree of genetic isolation among populations of the widespread, but scattered, insect pollinated forest tree ;Sorbus torminalis; at different hierarchical levels and comparably small geographical scales. Genetic variation was assessed in a set of 30 Swiss populations using both biparentally (inter simple sequence repeats: ISSRs) and maternally (chloroplast DNA restriction fragment length polymorphisms: cpDNA-RFLPs) inherited markers. Additionally, the individual environment of trees within a population was recorded along with estimates of population size and fruit set. The screening of 572 individuals with five ISSR primers resulted in 54 polymorphic fragments, while RFLPs from 229 individuals on three cpDNA-regions amplified by polymerase chain reaction identified ten haplotypes. Comparison of these marker types will allow us to evaluate relative contributions of pollen and seed dispersal to population connectivity. The results obtained from fruit set estimates suggest that environment and not size significantly influenced population fecundity and, hence, fitness.

P26-02 **BENNETT, CHANDA E., William Hahn, Jennifer Pastorini, and Luke Dollar** Department of Ecology, Evolution and Environmental Biology, Columbia University, 1200 Amsterdam Avenue, MC 5557, New York, NY 10027 (ceb61@columbia.edu) (CEB, WH); Center for Environmental Research and Conservation (CERC), Columbia University, 1200 Amsterdam Avenue, New York, NY 10027 (JP); Nicholas School of the Environment and Earth Sciences, Duke University, Durham, NC 27708 (LD).

PHYLOGENY OF THE MALAGASY RING-TAILED MOGOOSE (GALIDIA ELEGANS) FROM MTDNA SEQUENCE ANALYSIS

Madagascar is host to a remarkably high level of biodiversity. Given the increasing rate of habitat deforestation that threatens the persistence of the island's unique flora and fauna, implementation of effective management strategies behooves us to understand the genetic structure of the remaining species in an effort to evaluate appropriate units for conservation. The ring-tailed mongoose, *G. elegans*, is Madagascar's most common and widely distributed endemic mongoose with three geographically recognized subspecies: the eastern *G. e. elegans*, northern *G. e. dambrensis*, and western *G. e. occidentalis*. Subspecific delimitation is currently based on phenotypic diversity of pelage color between the geographic locations. We conducted a molecular phylogenetic study to test the monophyly of the described subspecies and to determine their phylogenetic relationships. Phylogenetic assessment of approximately 550 base pairs of the mtDNA D-loop region from twenty *G. elegans*; specimens revealed a strongly supported distinct genetic signature in the western region of the island and management of this clade is recommended given its uniqueness. However, our analysis remains inconclusive with regard to the subspecies status of the northern and eastern populations, which exhibits gene flow between *G. elegans dambrensis* and *G. elegans elegans* populations.

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BRIDGING THE GAP FROM SCIENTIST TO SCIENTIST TO MANAGER: AN EXAMPLE FROM THE KIWI RECOVERY PROGRAMME

Communication barriers between scientists and conservation managers are often recognized, perhaps less apparent though are similar barriers between scientists within the same discipline. This provides another stage where information significant in conservation planning can be misunderstood or overlooked. Making the data accessible to scientists in other fields through 'translation' or workshops could circumvent this problem. We present an example from the Kiwi Recovery Programme (KRP), of effective data presentation across biological disciplines. Primarily, molecular phylogenetic and phylogeographic data are communicated from systematists/phylogeographers to field biologists. The field biologists combine the molecular data with their own to recommend priority management and research areas to managers. Since (1) management decisions for the KRP rely heavily on the maintenance of genetic diversity within kiwi, (2) the principal sources of this information are phylogenetics and phylogeography, and (3) data from these subdisciplines are not readily accessible to the uninitiated, it is imperative that these data are presented in a manner that non-systematists can comprehend. Therefore, new data is presented to collaborators with background information that will allow them to access and critically evaluate it.

P26-04 **POWELL, MADISON S., Christine C. Cegelski, Matthew R. Campbell, Rick Wilkinson, and Steve Brink** Addresses:University of Idaho, Center for Salmonid and Freshwater Species at Risk, Hagerman, ID 88332 USA, (mpowell@uidaho.edu) (MSP). Idaho Department of Fish and Game, Eagle ID 83616 USA (MRC, CCC). Idaho Power, P.O. Box 70, Boise, ID 83702 USA (RW, SB)

COMPARATIVE ASSESSMENT OF MICRO-SCALE GENETIC RISKS IN A NATIVE TROUT POPULATION: CONFLICT BETWEEN LONG-TERM CONSERVATION GOALS

Abstract:Both isolation and hybridization can be hazards to long-term fitness and genetic integrity of populations. Redband trout, Oncorhynchus mykiss gairdneri, in the Malad River, ID represent an interesting case study, in which maintaining isolation or allowing for hybridization will result in conflicting conservation actions for long-term sustainability. Microsatellite analysis of O. mykiss sampled from three reaches of the Malad River, a tributary (Cove Creek) and the adjacent Snake River were performed to examine genetic differentiation and look for evidence of intraspecific hybridization with introduced rainbow trout. Allelic variation between reaches was examined using a homogeneity test computed as an exact test along with F-statistics. Adjacent reaches were not statistically different from one another. However, non-adjacent reaches endured moderate differentiation; with decreasing levels of allelic diversity upstream indicating a typical genetic ichthyofaunal cline. Further, genetic assignment tests provided evidence of intraspecific hybridization and introgression with hatchery rainbow trout in the lower reach and Snake River sample sets but not among Cove Creek samples or those collected from the middle and upper reaches. Results suggest removal of barriers for upstream passage, and resultant homogenization of adjacent reaches is a preferable over population isolation in all cases except the indigenous, Cove Creek deme.

P26-05 **DANTAS, GISELE P.M, Patrícia. J. Faria, Fausto P. Campos, Joaquim B. Olinto, and Joao S. Morgante** Instituto de Biologia, Universidade de Sao Paulo, Rua do Matao, 277, Sao Paulo, Brazil 05508-090 (giselebio@yahoo.com.br) (GPMD, PJF, JSM); Fundaçao Florestal Rua do Horto, 931 Sao Paulo, Brazil 02377-000 (FCP). Centro de Estudos Tecnologicos do Mar e da Terra, Universidade do Vale do Itajai, Rua Uruguai, 458 C.P. 360, Itajai, Santa Catarina, Brazil (JBO)

GENETIC VARIABILITY OF *LARUS DOMINICANUS* AND YOUR IMPLICATIONS FOR CONSERVATION

;Larus dominicanus; is a generalist, widespread species on the brazilian coast. The increase of anthropic activities along the coast have increased the availability of food resources for this species, and has resulted in an expansion of populations. This population expansion is associated to the displacement of other seabirds due to the fact that ;L dominicanus; is a competively superior species, preying on eggs and chicks of several species. This work aims to evalute the genetic variability and structure of *L. dominicanus* populations along the brazilian coast and provide data that help effective mangenment approaches. In 83 individuals sampled between 24 14´S 46 41´W e 28 26´S 48 42´W (900 km coastline) we found only one haplotype for the mtDNA gene cytocrome b. This low genetic variability can be the result of a past population bottleneck, followed by great population expansion due to increased of availability of resources. The low variability increases the probability of extinction due to stochastic events, disease, and environmental changes. The lack of genetic structure observed for cytochrome b suggests that brazilian coast may be a single population. However, nuclear and mtDNA sequences must be analysed to confirm this low variability, and verify the effect of recent events on population structure.

P26-06 **HOLDEREGGER ROLF, Urs Arnold, Christoph Düggelin, Felix Gugerli, Sabine Brodbeck, Sonia Angelone, Peter Rotach, and Susan E. Hoebee** Section of Ecological Genetics, WSL Swiss Federal Research Institute, Zürcherstrasse 111, CH-8903 Birmensdorf, Switzerland (rolf.holderegger@wsl.ch) (RH, UA, CD, FG, SB, SA, SEH). Department of Forest Sciences, Swiss Institute of Technology ETH, Rämistrasse 101, CH-8092 Zurich, Switzerland (UA, CD, PR)

HOW DO ISOLATION AND POPULATION SIZE AFFECT MATING PATTERNS AND GENE FLOW IN A SCATTERED TEMPERATE FOREST TREE? THE CASE OF *SORBUS TORMINALIS*

Small population size and geographical isolation affect mating patterns within and gene flow among populations. In this study, we investigated contemporary gene flow through pollen in a small, isolated and a large, non-isolated population of the widespread but scattered, insect-pollinated, temperate forest tree *Sorbus torminalis*. Flowering phenology, fruit and seed set showed high interplant and interannual variances. However, trees in the small population set less fruit, fewer seed per fruit and fruited more irregularly. Paternity analysis, using five microsatellite loci, revealed that progenies had multiple paternity and that near-neighbour mating was predominant. Crossings nevertheless often occurred between trees separated by several hundred metres, but mating patterns were also subject to interannual variation. In the small population, fewer fathers contributed to progenies. The percentage of external gene flow was substantial, but more so in the large, non-isolated (39%) than in the small, isolated population (9%). In conclusion, this study suggests the occurrence of Allee effects in small populations of a temperate forest tree (i.e. mate limitation leading to reduced seed set sired by fewer fathers), although substantial spatial isolation (> 1.5 km) did not preclude external pollen flow

P26-08 **MCMILLAN, AMY M., Mark J. Bagley, and David C. Evers** State University of New York College at Buffalo, Biology Department, 1300 Elmwood Ave., Buffalo, NY 14222 (mcmillam@buffalostate.edu) (AMM). United States Environmental Protection Agency, Cincinnati, OH 45268 USA (MJB). BioDiversity Research Institute, 411 Rt. 1 Suite 1, Falmouth ME 04105 (DCE).

PRELIMINARY ANALYSIS OF COMMON LOON (;GAVIA IMMER;) GENETIC STRUCTURE IN NORTHEAST NORTH AMERICA BASED ON FIVE MICROSATELLITE LOCI

This study seeks to determine fine-scale genetic structure of Common Loon breeding populations in order to link wintering birds with their breeding regions. Common Loons are large piscivorous birds that breed in lakes of northern North America and Iceland. Loons are highly philopatric and territorial in breeding areas and are susceptible to mercury poisoning, lake acidification and other threats across much of this region. Wintering loon populations originate from a mix of breeding regions. In North America, wintering populations are found primarily in nearshore coastal environments and these birds are susceptible to oil spills. Loons also are threatened by the current botulism poisoning outbreak, which has killed thousands of loons in the Great Lakes. Despite significant demographic data, little is known about the population genetic structure of Common Loons. Preliminary analysis using five polymorphic microsatellite loci demonstrated strong differentiation between loons in eastern and western North America (R X C exact test ;X²; = 48.14, df = 10, ;P; = 0.000). Differentiation among five putative eastern loon breeding populations was also identified. Differences were found in four of ten pairwise comparisons. The information developed on loon population structure will be crucial for understanding year-round impacts on these birds.

P26-09 **MENDEZ, MARTIN, Tomas Waller, Patricio A. Micucci, and Juan Carlos Morales** Fundacion Biodiversidad Argentina, San Martin 945 3rd floor #23, Buenos Aires C1004AAS, Argentina (mm1772@comcast.net) (MM, TW, PM). CERC, Columbia University, New York, NY 10027 (JCM)

POPULATION STRUCTURE AND PHYLOGEOGRAPHY OF THE CURIYU BOA IN NORTHERN ARGENTINA: MANAGEMENT IMPLICATIONS

Conservation and management of species require identifying independent demographic units or populations in which the conservation efforts should be maximized. Cytochrome B and ND4 mitochondrial DNA sequences were analyzed to evaluate population structure and phylogeographic patterns of the Curiyú boa (;Eunectes notaeus;) considering historical and contemporaneous landscape features in northern Argentina. The level of differentiation and phylogeographic patterns observed among the populations surveyed strongly suggest that the southwestern portion of Formosa province holds an independent demographic group for the species. Main landscape features, such as the Pilcomayo, Bermejo and Paraguay rivers, have played a major role in shaping the demographic and phylogenetic relationships within this species. Regarding the current management strategy for the Curiyú, the demographic independence of the southwestern group suggest that at least two discrete management units should be considered in the region: the Pilcomayo River group in northern Formosa, and the southern group consisting of populations from the Bermejo and Paraguay rivers. Genetic diversity of this latter group ranks among the lowest in the province and should be monitored with special attention.

P26-10 **MORAES-BARROS, NADIA, Cristina Yumi Miyaki, Vera Lúcia de Oliveira, Maria Eugênia Laurito Summa, and João Stenghel Morgante** Laboratorio de Biologia Evolutiva e Conservaçao de Vertebrados, Departamento de Biologia, Instituto de Biociencias da Universidade de Sao Paulo, Rua do Matao 277, 05508-900, Sao Paulo/SP, Brazil (namoraes@ib.usp.br) (NMB, CYM, JSM). DEPAVE - Departamento de Parques e Areas Verdes do Estado de Sao Paulo, Divisao Tecnica de Medicina Veterinaria e Biologia da Fauna (MELS). CEPLAC -Comissão Executiva do Plano da lavoura Cacaueira (VLO).

A FIRST PHYLOGEOGRAPHY AND GENETIC DIVERSITY STUDY OF THE ATLANTIC FOREST ENDEMIC SLOTH, ;BRADYPUS TORQUATUS;, AND THE WIDESPREAD SPECIES ;BRADYPUS VARIEGATUS;

;Bradypus torquatus; is endemic to the Atlantic Forest and it is considered endangered due to deforestation. A more widespread sloth species, ;Bradypus variegatus;, occurs in both the Atlantic and Amazon Forest. It is not considered threatened. However, its range includes forested areas in Brazil that are being fragmented. Here we present the results obtained in a study of the phylogeography and genetic diversity of these two species. Analyses performed using nuclear and mitochondrial DNA indicated low levels of genetic variability and great divergence among populations for both species. In these two species analyses of mitochondrial DNA shows that the Atlantic forest is subdivided into a North and South genetic component. The 54 sampled ;B. variegatus; sloths are grouped in six distinct mitochondrial phylogroups distributed according to the different geographical regions. One of these phylogroups is in the northeastern region of Brazil and contains haplotypes characteristics of Amazon and Atlantic forests. The most divergent group, representative of the region between Tapajós and Amazonas River, shows values of nucleotide distance higher than those found when comparing the two sloth species, suggesting that additional ecological, morphological, and molecular studies are needed to evaluate how many and which phylogenetic lineages need biological conservation approach.

P26-11 **NARO-MACIEL, EUGENIA, Eduardo Moreira Lima, Jose Henrique Becker, Maria Angela Marcovaldi, and Robert DeSalle** Department of Ecology, Evolution and Environmental Biology, Columbia University/AMNH, 1200 Amsterdam Ave. MC 5557 NY, NY, 10024 USA (en58@columbia.edu), Projeto TAMAR-IBAMA, Almofala, Ceara, Brazil (EML), Projeto TAMAR-IBAMA, Ubatuba, SP, Brazil (JHB), Projeto TAMAR-IBAMA, Praia do Forte, BA, Brazil (MAM), AMNH, Central Park West at 79th St. NY, NY, 10024 USA (RD)

CONSERVATION GENETICS OF WESTERN SOUTH ATLANTIC GREEN SEA TURTLE (CHELONIA MYDAS) FORAGING POPULATIONS

Western South Atlantic green sea turtle (Chelonia mydas) foraging populations were analyzed using population genetic methods. In this approach objectives were to: 1) Determine relationships between the two study groups and other green turtle populations; and 2) Examine rarely addressed aspects of intra-population genetic structure. This research provides otherwise unobtainable insight into marine vertebrate migration, dispersal, temporal and spatial genetic variation, disease, and mortality. Importantly, establishing connectivity addresses the serious conservation concern that groups protected in one area will be caught during dispersal. The present research thus informs prioritization of management strategies, while additionally assessing distinctiveness of protected populations and establishing a baseline for forensic work. One of the greatest C. mydas feeding aggregations worldwide is located in the Western South Atlantic along the coast of Brazil. This area further encompasses a significant portion of the regional feeding habitat. Genetic analysis of the mtDNA control region and nuclear microsatellites reveals the southern foraging group shares alleles principally with eastern and southern Atlantic rookeries. The hypothesis of homogeneity between this group and other Atlantic foraging populations with the exception of Uruguay was rejected. Intra-population structure was detected as the hypotheses of homogeneity between years, seasons, and size classes were rejected.

P26-12 **NOEL FLORENCE, Florian Kirchner, Denis Couvet, Jacques Moret, and Nathalie Machon** Conservatoire Botanique National du Bassin Parisien, Muséum d'Histoire Naturelle de Paris, 61 rue Buffon, 75005, PARIS, FRANCE (FN, JM, NM) (fnoel@mnhn.fr.) Laboratoire Conservation des espèces, Restauration et Suivi des Populations, UMR5173, 61 rue Buffon, 75005, PARIS, FRANCE (FN, FK, DC, NM).

ROLE OF THE CORRIDORS IN THE DYNAMICS OF A METAPOPULATION

Corridors are spatial structures that allow movements of individuals among patches. Their disappearance is supposed to have a negative impact on population viability in decreasing migration rate and thus fitness components. For this reason, many programs in conservation biology promote the usefulness of corridors. ;Ranunculus nodiflorus; L. is a rare and endangered species living in a naturally fragmented landscape: temporary pools in a forest near Paris (France). After rains, some of the pools can be transitorily connected through natural corridors. The aim of the study was to enlighten the role of those corridors in the dynamics of the metapopulation. Analysis with neutral markers and adaptive traits showed that plants from connected pools were more similar than in average. However, fitness of plants situated in isolated pools seemed not to be lower than those in large networks.

These results suggest that isolated patches are not more threatened than connected ones. However, corridors allow migration of seeds among patches. After extinction events, recolonization of extinct patches is more likely when connected with other pools containing plants. From a conservation perspective, corridors seem to increase the persistence probability of the metapopulation.

P26-13 **RODRIGUES, FERNANDO P., Flávia S. Rocha, and Sergio R. Matioli** Departamento de Biologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão 277, CEP 05422-970, Cidade Universitária, São Paulo, Brasil, (pacheco_rodrigues@hotmail.com) (FPR, SRM). Instituto de Pesquisas Ecológicas – IPÊ, Teodoro Sampaio, SP, Brasil (FSR).

GENETIC DIFFERENTIATION OF THE WOOLLY MOUSE OPOSSUM (*MICOUREUS TRAVASSOSI*) IN ATLÂNTIC FOREST FRAGMENTS

The Brazilian Atlantic Forest is one of the most endangered ecosystems in the planet and its last great remnant at the inner part is the Morro do Diabo State Park, at West of São Paulo state. Around this protected area, with 35.000 hectares, we can find other small forest patches surrounded mainly by cattle pasture. This scenery, developed during the last sixty years, is a good area to the monitoring of genetic changes imposed by recent habitat fragmentation. Tissue samples from 95 woolly mouse opossums, representing seven populations, were screened for polymorphism at four microsatellite loci. Mean observed heterozygosity was 0,42. Significant but intermediate to low levels of differentiation (overall F_{ST}=0,060 and R_{ST}=0,053) were present between some populations, while hierarchical analyses of differentiation among them using F_{ST} e R_{ST} values show a weak genetic structure. Although little is known about the dispersal pattern of this species, it seems that the weak genetic structure found must be a consequence of the recent habitat fragmentation and ancestral polymorphism retention instead of migrant exchanges between populations. If so, the genetic changes may be pronounced in the next decades, contributing with other perils that threaten these populations.

P26-14 **SATKOSKI, JESSICA A., Carel Van Schaik, Noviar Andayani, Don J. Melnick, and Jatna Supriatna** Department of Anthropology, Columbia University (jas491@columbia.edu) (JAS); New York Consortium for Evolutionary Primatology (JS, DJM); Anthropologisches Institut, Universiat Zurich, Switzerland (CS); Pusat Studi Biodiversitas dan Konservasi, University of Indonesia, Indonesia (NA); Center for Environmental Research and Conservation, Columbia University (DJM); Department of Evolution, Ecology and Environmental Biology, Columbia University (DJM); Conservation International, Jl. Taman Margasatwa 61, Indonesia (JS)

AN UNSTABLE EVOLUTIONARY STRATEGY AMONG ORANGUTAN MALES IN SUMATRA?

Orangutans (*Pongo pygmaeus*),unique among primates, have two forms of fertile males. Some males develop secondary sexual features at puberty, and form consortships with adult females. Others delay development and employ a rape strategy. While physiological reasons for this delay have been postulated, evolutionary mechanisms are unknown. This study investigated the paternity of 13 offspring in the former Gunung Leuser National Park, Sumatra. Van Schaik and colleagues collected samples of hair or feces. All sampled individuals were genotyped at seven microsatellite loci. Three analyses were applied to the genotype data: relatedness, allelic paternity exclusion, and log-likelihood paternity exclusion. Subadult males had a slightly lower rate of paternity than adult males. Male competition is thought to be the primary selective force for sexual dimorphism in primates. The broad female distribution of orangutans incites intra-sexual competition because adult males can only advertise their presence through long calls within their territories, risking harassment from the other resident adult males. Subadult males are not attractive to females, and cannot long call. These males will be expected to adopt alternative strategies. The evolution of a fertile but undeveloped male would not have proliferated in orangutans without forced copulation, which allows subadult males to subvert female choice.

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AGE-SPECIFIC REPRODUCTIVE SUCCESS IN POLAR BEARS AND IMPLICATIONS FOR SUSTAINABLE HARVEST MANAGEMENT

In Canada, the polar bear harvest has recently changed from a sustenance-based hunt to a quota-based, sex-biased harvest to foster population recovery after historical overharvest. Today, sustainable harvest levels within each polar bear management unit (MU) are based on mark-recapture survey data that estimate population size and demographics. However these surveys cannot determine estimates of variance in reproductive success (VRS) and male based dispersal. These data are essential to understand the impact of trophy-oriented and sex-biased harvest on the mating system of polar bears and to model the recovery of MUs subject to historical overharvest. To estimate VRS over 600 tissue samples from mark-recapture surveys and harvest samples from two central Canadian polar bear MUs were genotyped at nine highly variable microsatellite loci. Male mating success was determined using categorical likelihood which assigned paternity of each cub to our set of candidate fathers. Our major findings were 1) multiple paternity within single litters, 2) age-specific VRS with males siring the most cubs between 8-14 years of age while living for 25-30 years and 3) different patterns of male RS in healthy versus overharvested populations. These findings have important implications for polar bear management in Canada, particularly for recovering populations.

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MICRO-EVOLUTIONARY CONSEQUENCES OF HUMAN DISTURBANCE IN A RAINFOREST BIRD SPECIES FROM CENTRAL AFRICA

With the loss of biodiversity has come the challenge of conserving not only the pattern of biodiversity but also the processes that produce and maintain it. However, little attention has been directed toward understanding the micro-evolutionary consequences of human disturbance on natural populations. Here we examine the influence of anthropogenic habitat changes on morphological traits important to fitness in the Little Greenbul (Andropadus virens), an African rainforest bird species. We find populations living in mature and human altered rainforest habitats differ significantly in wing and tarsus length and bill size. Using environmental variables from remote sensing data, we classified the habitats and correlated the extent of anthropogenic impacts with morphological changes. Using 10 microsatellite markers we found no evidence of genetic structuring indicating that levels of gene flow among all populations is high. This suggests natural selection likely caused by differences in environmental quality are driving morphological differences. Results illustrate how anthropogenic changes may have micro-evolutionary consequences, with implications for conservation and restoration.

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RELATIONSHIPS BETWEEN REMOTELY SENSED LAND COVER DATA AND STREAM HYDROLOGY IN AN URBAN METROPOLITIAN AREA

Remotely sensed land cover information is now available through the World Wide Web to most planning and management agencies and other interested parties. Use of land cover data in planning, monitoring and restoration efforts requires an understanding of relationships between land cover and ecosystem structure and function. To investigate relationships among watershed land cover and one measure of stream ecosystem function, hydrological variation, we used a land cover map developed from Landsat 7 imagery acquired during the spring and early summer of 2000, and US Geological Survey gauging data for 22 watersheds in the Baltimore Metropolitan region. We calculated eight indices of flashiness, severity and predictability of low and high discharge events for the 2000, 2001 and 2002 hydrological years. Modeling of indices based on area and configuration of watershed land cover indicated simple models based on impervious surface area often accounted for > 60% of the variation in hydrological indices. Our results suggest that simple measures derived from widely available land cover data can be used by local and regional planning and management agencies to assess and monitor stream ecosystem integrity and restoration projects in urban and urbanizing areas.

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COMPARING 1:24,000- AND 1:100,000-SCALE DIGITAL STREAM DATA FOR THREATENED SALMONID HABITAT ANALYSIS

Digital stream data are used to analyze, model, and plan surveys for threatened Oregon Coast coho salmon and candidate steelhead trout habitat, but substantial differences exist in spatial position and geographic extent of streams represented at the 1:24,000 and 1:100,000 scales. Use of the widely available coarser-scale data may impact analytical results and interpretation for management applications. We compared the 1:24k and 1:100k stream data for: 1) spatial position in 21 reaches using 100m riparian buffer conditions (vegetation, slope, road density) and stream gradients (calculated using a 10m DEM); and 2) spatial extent in 34 subwatersheds using fish habitat (from stream surveys) and 100m riparian buffer conditions. Significant differences were found between the two stream scales in several of the measures of vegetation, slope, and road density within riparian buffers around reach arcs, buffer conditions and fish habitat characteristics at the subwatershed level, and channel gradient. These differences have implications for resource characterization and modeled relationships in reach- and subwatershed-level applications. They also support the hypothesis that streams from the two scales represent different populations for fish habitat, with implications for inference of choosing to sample 1:100k rather than 1:24k streams.

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RAPTORS AND OTHER GROUPS OF BIRDS IN URBAN AND NATURAL HABITATS

Birds of prey come as a group being widely studied in different parts of the world. There re deep researches in their topical and trophical interactions and their distribution in various habitats. Though comparative characteristics of raptors interactions with other groups of birds, including Corvids and small Passeriformes, is less presented. We study spatial interactions of birds of prey and other birds in habitats variously urbanized. At present our main results concerning the topic are the following. There happens the change of dominants in birds communities in habitats variously urbanized. On the gradient starting with natural habitats up to Urbs raptors give up their niche to Corvids. One of the main Representatives - Hooded crow - proves to be a plastic species in urbanized landscapes. Goshawk, most adaptable raptor in Urbs, prefers to nest in forest park. The species adaptability is provided by the changes in its ethology and nesting phenology. There forms a window around the goshawk s nest free from Hooded crow s nests, that occupy tightly the very edge of the forest park. Besides, when choosing nest sites in town and city Hooded crow prefers residential area to nearby forest park. Amongst Hooded crow s nest site choice factors most important comes the distance between nests and objects of particular ecological value container with waste, ravine and forest park edge. Nest tree and tree parameters are of less importance. Most necessary is the nest location in the upper part of the tree. Hooded crows show high level tolerance preferring to nest in residential area, both in terms of each other, what is expressed in their territoriality reduction, and in terms of people and Urbs predators. Hooded crow s tolerance in terms of people is expressed in short put up distance, especially by potentially safe majority of people (and less by an observer). Co-existence of Corvids and goshawk on the same territory is possible, though still there is some inter-isolation of the species left. In case tolerant attitude of people to raptors is kept on, their population in town and city will probably rather increase, and the population of Hooded crow will reduce insignificantly.

P27-02 **BROOK, LAURO** St. John's University, Jamaica, N.Y. 11439. (laurob@stjohns.edu)

ANNUAL PATTERNS OF WATERFOWL DIVERSITY AND ABUNDANCE AT SUBURBAN PONDS AND LAKES ON LONG ISLAND, NEW YORK: IMPACT OF WINTER FREEZE

Results are presented for a study of waterfowl diversity and abundance at 16 suburban ponds and lakes on Long Island, New York. A characteristic bell shaped curve occurred for both seasons where overall peak diversity and abundance occurred during mid February in the 2000/2001 season and mid January in the 2001/2002 season. There was a positive correlation between pond/lake size and diversity, as well as abundance. Significantly fewer waterfowl were present during the winter of 2000/2001 compared to 2001/2002. This was related to significantly lower temperatures and significantly greater ice cover in 2000/2001 compared to 2001/2002. The discussion considers the importance of winter temperature and ice cover to waterfowl abundance in a suburban environment.

P27-03 **CRAMPTON, LISA H., William S. Longland, and M. Peacock** Ecology, Evolution and Conservation Biology, University of Nevada Reno, Reno NV 89557 (crampton@unr.nevada.edu)

FACTORS INFLUENCING THE DISTRIBUTION AND ABUNDANCE OF PHAINOPEPLAS (PHAINOPEPLA NITENS, AVES), IN SOUTHERN NEVADA: IS DESERT MISTLETOE NECESSARY BUT NOT SUFFICIENT?

In southern Nevada, phainopeplas and their principal winter food, desert mistletoe, reach the edge of their range. Cold and drought may produce greater fluctuations in bird and mistletoe abundance here than at the range core. Also, urbanization-induced habitat loss and degradation have been implicated in phainopepla population declines. To determine which habitat factors influence phainopepla distribution and abundance in this peripheral region, we recorded phainopepla density, mistletoe abundance and several other vegetation parameters along line transects in 55 potential habitat patches of different sizes in 2000-2003. Phainopeplas were common (within and across years) at 40% of the patches. In the rest, they occurred rarely or never. Mistletoe abundance was the best predictor of phainopepla distribution, especially in the winter. In 2000-2002, phainopeplas were significantly more likely to occur, and in 2001-2002, were more abundant, where mistletoe was abundant. Across all sites, patch size and tree height and density did not influence phainopepla distribution. However, among sites with abundant mistletoe, other factors appear to affect phainopepla abundance and length of residency, especially during the breeding season. This multi-causal variability in phainopepla abundance among sites and years suggests that conservation efforts for phainopeplas must focus on numerous sites.

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DOES “LIGHT POLLUTION” AFFECT BREEDING BY BEACH NESTING BIRDS?

Nocturnal lighting – street lamps, external house lights, etc. – has increased greatly as areas have become urbanized, and studies in disparate systems have found adverse effects of lighting on various species. In southern New England, concerns have been raised that such “light pollution” could add to the threats faced by beach-nesting birds such as least terns and piping plovers. We investigated the potential link between light levels and successful nesting by these birds using a combination of beach light level surveys, artificial nest experiments, and nocturnal predator observations. We found that light levels were significantly higher on beaches without plovers or terns than at sites where breeding has occurred in the past twenty years, but that there was no difference between sites currently used and those that have been abandoned recently. Among sites with nesting birds, light level was not related to the number of fledglings. In our artificial nest experiments we found no difference in nocturnal predation rates between light and dark sites. Predatory mammal activity was slightly higher on light beaches than dark beaches, but abundance of avian predators and humans did not differ with illumination levels. Overall we found little evidence that lighting affects breeding success.

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MODELING BIRD SPECIES RICHNESS IN URBAN PARKS. A CASE STUDY IN THE CITY OF PUEBLA (MEXICO)

During the 2003 breeding season we studied the richness of bird species inhabiting 12 urban parks in the City of Puebla, by means of 392 point counts. At each site, we also described habitat structure and estimated degree of human perturbation, as measured by cover of pavement surfaces and ambient noise levels. In addition to the observed number of species (Sobs), we calculated the following non-parametric richness estimators: ICE, Chao 2, Jack 1, Jack 2 and Bootstrap. Species richness (observed and estimated) was then modeled as a multiple linear regression function of the corresponding environmental variables, including urban park size (area) among the potential predictors. Regression analyses were statistically significant for all the estimators, and their corresponding goodness-of-fit was high (from 55 to 79%). Bird species richness was always a positive function of park size; mean cover of herbaceous vegetation was negatively selected in two models, whereas mean noise levels was also negatively included in the equation modeling Sobs; the remaining potential predictors were not selected by the analyses. Our results have direct applicability in the design and management of urban parks and other green areas, since they allow enhancing habitat quality for birds in order to increase their richness.

P27-06 **HERNANDEZ, DANIEL E.** Department of Ecology, Evolution and Natural Resources, Cook College, Rutgers University, 14 College Farm Rd., New Brunswick, NJ 08901 (captdan@rci.rutgers.edu)

FORAGING DYNAMICS OF MIGRATORY WADERS RELATIVE TO PREY DENSITY

Delaware Bay (USA) is a critical staging area for migratory waders due to the presence of historically abundant prey: horseshoe crab (Limulus polyphemus) eggs. Declines in the horseshoe crab population, however, have led to a significant reduction in eggs available to birds. Waders, particularly the red knot (Canutus calidris4), depend on eggs for acquiring fat reserves and have had concurrent sharp declines. My objective was to study how prey density affects the foraging dynamics of migratory shorebirds. I hypothesized that reduced egg density may result in reduced forging efficiency. Using video sampling of foraging birds, I determined a step/peck ratio and compared this to concurrent measures of egg density from the foraging area. Initial results suggest that, despite an overall positive trend, there is a local maxima of foraging efficiency within the range of egg densities measured. I conclude that waders are adversely affected by reduced horseshoe crab egg densities due to patchiness of egg resources and by competition for patches. Management recommendations are to increase the number of available horseshoe crab eggs, such that resource abundance is increased, thus alleviating the effects of patchiness and competition.

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COMPARING BIRD FORAGING BEHAVIOR IN AN URBAN-DESERT LANDSCAPE: CONSERVATION IMPLICATIONS

Urban bird communities show high population densities and low species diversity. To address these phenomena from a conservation stand point, we must understand the behavioral mechanisms responsible for these patterns. We conducted experiments with artificial food patches (seed trays) and compared the leftover seed (giving up density - GUD), between urban and desert habitats in central Arizona. By measuring foraging decisions, we determined how predation, missed-opportunity cost (MOC), competition and metabolic cost affected foraging behavior. Desert birds exhibited a higher predation risk. Desert birds also responded to an increase of MOC by quitting foraging earlier while urban birds showed no response. In exclusion experiments, urban doves foraged more efficiently than passerines. Water availability decreased digestive costs for desert birds but not urban birds. We suggest the reduction of predation risk combined with an increase in resource abundance, leads to high densities of highly efficient forager species, which ultimately exclude native species. However, their dependency on water and food restrict most of these species to a narrow niche (i.e. mesic yards). Conservation plans that increase habitat heterogeneity by incorporating high proportions of xeric yards might therefore lead to greater coexistence between urban specialists and native species and thus, increase urban biodiversity.

P27-08 **MARINI, Miguel Â.** Departamento de Zoologia, Universidade de Brasília, Brasília, DF, Brazil (marini@unb.br)

STUDIES IN 100-HA PLOTS: NATURAL HISTORY AND CONSERVATION OF CERRADO BIRDS

Most field studies of bird biology are conducted at small scales and during short periods of time. This is also true for most cerrado (savana) birds from Central Brazil, in spite of very high deforestation rates of this World hotspot. To evaluate the viability and guarantee the successful conservation of these birds we depend on knowledge of several demographic data, such as: territory size, population density, and reproductive success. I describe a 10-year study which started in 2002 in the Brazilian cerrado where several aspects of avian biology are being studied in a 100-ha plot established inside a 10,000 ha reserve, near Brasília, Brazil. Preliminary data indicate that the endemic flycatcher (Suiriri islerorum) has territory sizes of 20 ha, occupy mostly typical cerrado and has low (< 30%) nesting success. The endemic tanager (Neothraupis fasciata) also has low (<30%) nesting success, has smaller territories (< 10 ha), but uses both typical and more open cerrado. These are examples of the kind of data that we are in need and can be collected with intensive studies. In the next years other data such as longevity and population fluctuations will be collected and used to run population viability analyses for several species.

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CORRELATES OF ABUNDANCE AND BREEDING SUCCESS IN THE GLOBALLY THREATENED HINDE'S BABBLER ;TURDOIDES HINDEI ;AND ITS CONGENER, NORTHERN PIED BABBLER ;T. HYPOLEUCUS; IN KENYA

The relationship between group size, habitat quality and breeding outcome was examined in two cooperative breeders, to test whether any correlation between adult group size and breeding outcome might be explained by larger groups securing better quality territories. Despite previous concerns over low breeding success, the percentage of young birds present was higher in the case of Hinde's Babbler ;Turdoides hindei<i/> (16%; 424 birds aged) than in the Northern Pied Babbler ;T. hypoleucus<i/> (12%; 162 birds aged), and comparable with that of two African congeners. Breeding outcome in Hinde's Babbler was positively correlated with adult group size and habitat quality, but there was no evidence that larger groups monopolised more favourable habitat. The influence of habitat quality on abundance and breeding has a bearing on the effective conservation of Hinde's Babbler. At intensively cultivated sites, significantly more groups occurred in areas retaining at least 3% thicket cover, while breeding outcome improved where cover exceeded 9%. Group density showed a positive, non-linear relationship with adjacent thicket cover, levelling out where cover exceeded 15-20%. These findings suggest that even a modest increase in thicket cover might significantly raise the density and productivity of Hinde's Babblers at these sites.Key words; Hinde's Babbler, Northern Pied-Babbler, thicket cover

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ECOTOURISM: HABITAT DISTURBANCE AND BREEDING SUCCESS OF THE PITTA-LIKE GROUND ROLLER

Although ecotourism was planned as a tool to promote sustainable development and conservation within protected areas, it may have negative impacts on breeding success of the animal species it intends to save. The breeding behavior and success of the Madagascan endemic bird species, Pitta-like Ground Roller (Atelornis pittoides - Brachypteraciidae - Coraciiformes) were found to be jeopardized by natural and human-induced habitat disturbance. My objective was to investigate the impact of ecotourism on the breeding behavior and success of this eastern rainforest species. From 2000 to 2002, comparative studies of the habitat and distribution of Atelornis were conducted at three localities (Parcelle 1, Vohiparara, and Talatakely) at the Ranomafana National Park. These localities were chosen for their differing degrees of tourism activities and disturbance. The nesting- and breeding-behavior of focal-banded individuals was analyzed. Breeding success was lower in areas of heavy tourism and in years marked by heavy tourism. Predation rates increased with increasing tourism. Nests built closer to tourist trails were found most vulnerable to predation.

As an attractive, forest-dependent species with unusual burrowing behavior, Atelornis is vulnerable to habitat disturbance. Conservation management recommendations are suggested in an effort to foster a better integration of tourism and sustainable conservation planning.

P27-11 **SOH, MALCOLM C.K., Navjot S. Sodhi, Haw Chuan Lim, and Barry W. Brook** Conservation Ecology Laboratory, Department of Biological Sciences, 14 Science Drive 4, Singapore 117543, Singapore (littlegrebe@hotmail.com) (NSS, MCKS, HCL), Key Centre for Tropical Wildlife Management, Northern Territory University, Darwin, NT, 0909, Australia (BWB)

ECOLOGY AND MANAGEMENT OF THE INVASIVE HOUSE CROW, *CORVUS SPLENDENS*, IN SINGAPORE

In Singapore, the population of the infamous house crow, *Corvus splendens*, has surged from a mere 20–30 in 1948 to an estimated 125,693 in 2001. They are considered pests because their large urban communal roosts irate residents, breeding pairs have attacked pedestrians and they pose a potential threat to native birds. Previous attempts to control the population have gone in vain primarily due to a poor understanding of its biology. In 2000, we embarked on a project to study their behavioural ecology in Singapore so that effective, biologically sound management can be recommended. We collected data regarding population characteristics, roosting behaviour and nesting ecology over two years. Our study shows that the house crows have adapted well in Singapore since resources such as food, suitable nesting and roosting sites are ample. To achieve a long-term reduction in their population, a multi-pronged management approach is encouraged. Our culling model suggests 46,500 crows should be culled every year for the next ten years. In addition, access to human refuse and tree management to deny crows nesting and roosting opportunities is required. Implementation of these measures will probably result in 90% reduction in the current crow population over the next ten years.

P27-12 **STRALBERG, DIANA, Mark Reynolds, Thomas Gardali, Ryan Burnett, Emily Heaton, Adina Merenlender, Colin Brooks, Gretchen Lebuhn, Geoff Geupel, and Brian Williams**
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EFFECTS OF LANDSCAPE CHANGE ON CALIFORNIA OAK WOODLAND BIRD COMMUNITIES

California oak woodlands, encompassing 19 species of native oak trees and shrubs, 300+ species of vertebrates, and numerous plants, invertebrates, and fungi, are among the most biologically diverse temperate habitats. They also support a diverse and important avifauna including woodpeckers, quail, raptors, and passerines, with many species that consume and cache acorns and contribute to oak regeneration. Only 4% of this habitat is protected and over 75% remains privately held. Furthermore, management practices are highly variable, largely undocumented, and dependent on individual landowners and local government policies. Current threats to oak woodlands and their wildlife inhabitants include landscape-scale changes such as residential and agricultural development (e.g., vineyard expansion). Thus we integrated and compared results across multiple scales and large geographic extents. Bird surveys were conducted over large parts of the north coast and Sierra Nevada foothill regions, which vary in climate, geology and biota, as well as management status, existing development, and future threats. Separately, these studies provided important information about bird responses to local- and landscape-level habitat features. Together, they revealed common and divergent patterns in the predictors of bird species diversity and abundance, controlling for regional variation and species distributions, allowing us to formulate regionally relevant conservation priorities.

P27-13 **STROHM, KRISTEN M., Gary C. White, and Clait E. Braun** Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523 (kstrohm@cnr.colostate.edu) (KMS, GCW). Grouse Inc, Tucson, AZ 85750, (CEB).

MODELING SAGE GROUSE POPULATION CHANGE: AN ALTERNATIVE TO LEK COUNTS

Given the marked declines of greater sage grouse (Centrocercus urophasianus) populations, reliable information is needed regarding the slopes of these declines and population responses to conservation efforts. Most studies of sage grouse population change, however, are based on unreliable counts of grouse at leks, in which daily and hourly variation in grouse attendance at lek locations may mask any annual variation in population size. In this study, we present a rigorous, alternative approach to measuring population change in sage grouse: constructing a population model from band recovery estimates of survival and harvest age-ratio estimates of recruitment. To illustrate this approach, we analyzed sage grouse data from North Park, Colorado, between 1974 and 1993. Demographic data from this population led to a model in which estimates of population change were more biologically reasonable than the lek counts for the same time period. The modeling approach also allowed estimates of precision to be calculated, further adding reliability over the lek count approach. Other declining species of shrub-steppe and prairie grouse have harvest and band recovery datasets similar to those used in our model, and their conservation may also benefit from models using our approach.

P27-14 **YAP, CHARLOTTE A.M. and Navjot S. Sodhi** Department of Biological Sciences, Science Drive 4, National University of Singapore, Singapore 117543 (g0202200@nus.edu)

EFFECTS OF LOGGING ON AVIAN BREEDING AND MOULTING IN PENINSULAR MALAYSIA

Rainforests are being logged extensively in Southeast Asia primarily as a result of urbanization. In Malaysia, 75% of the remaining forests are earmarked for cyclical selective logging. Thus there is an urgent need to determine the effects of forest degradation on the biota. We determined how critical aspects of avian ecology, such as reproduction and moulting have been affected by logging. Using mist-netting, we compared the breeding and moulting of resident avian populations among two unlogged and two logged rainforests of peninsular Malaysia. The logged forests were harvested at least 30 years ago. Results showed no significant differences in breeding and moulting frequencies, and the proportion of juveniles between the logged and unlogged forests. Similar numbers of species and individuals were observed in the unlogged and logged forests. The results suggest that 30-year-old logged forests are probably similarly conducive to avian breeding and moulting as unlogged forests. Thus logged forests may have conservation potential for birds as long as they are not degraded further.

P27-15 **WITT, JILL and Shaily Menon** Department of Biology, Grand Valley State University, Allendale, MI 49401 (mihelicj@student.gvsu.edu)

CONSERVATION OF THE VULNERABLE BEAUTIFUL NUTHATCH, *SITTA FORMOSA*: A PRELIMINARY ANALYSIS OF SPECIES DISTRIBUTION AND HABITAT REQUIREMENTS

The Beautiful Nuthatch, *Sitta formosa*, occurs in high altitude evergreen and semi-evergreen forests throughout the eastern and southeastern extent of the Himalayan Mountains. Populations of *S. formosa* are small, declining, and severely fragmented as a result of habitat degradation and fragmentation. The Birdlife International Red Data Book designates *S. formosa* as a Vulnerable species and recommends its protection throughout its range. Little is known of *S. formosa*'s habitat requirements, other than an apparent link with the oldest and largest trees in montane forests and a hypothesized dependence on *Fokienia hodginsii*, a tree species on the IUCN Red List of Threatened Species. We present a distribution map for *S. formosa* based on observed locations reported in surveys and museum specimens and a preliminary habitat suitability model which relates known observations of *S. formosa* to habitats with specific biological and topographic characteristics. Preliminary analyses indicate that the survival of *S. formosa* is not dependent on *Fokienia hodginsii*. We discuss the usefulness of the species distribution map and habitat suitability model in identifying habitat requirements and delineating key areas for the conservation of this species.

P28-01 **SAGATA, KATAYO** Wildlife Conservation Society Papua New Guinea Program, P. O. Box 277, Goroka EHP, Papua New Guinea. (ksagata@global.net.pg)

EFFECT OF SMALL-SCALE DISTURBANCE ON SPECIES DIVERSITY AND DENSITY ON TWIG-NESTING ANTS IN TROPICAL FOREST LITTER

Disturbance is one of the major factors that affect community structure and biodiversity. Twig-nesting ants in tropical forest litter are subject to frequent disturbance mainly from litter fall and rainfall. I censused twig-nesting ants by opening natural twigs in 1 x 1 m control plots. Then I made small-scale disturbance in 1 x 1 m plots and censused ants with artificial nests in several densities. I found 18 species of ants in disturbed plots compared to 37 species in control plots. Density of adult ants in plots and nests in disturbed plots were significantly lower than in control plots. Disturbed plots had lower proportion of nests colonized (39/800) than the control plots (122/1089). Very small-scale disturbance (on the scale of one m2) therefore, significantly reduces litter ant species diversity and population density in the forest litter. In Papua New Guinea many forms of development such as oil exploration cause medium-scale disturbances (on the scale of 1-10 ha), which dramatically alter litter quantity and quality. I predict (and am currently testing) that disturbances on the medium scale will have significant impacts on litter dwelling ants. Most conservation efforts in PNG focus on large-scale disturbances (100-1000s of ha).

P28-02 **SAHARI, BANDUNG, Heri Tabadepu, Christian H. Schulze, and Damayanti Buchori** HERI TABADEPU and Bandung Sahari: Center for Conservation and Insect Studies (Wildlife Trust Alliance) , Perum. Alam Sinar Sari, Jl Kecipir II No 30 Bogor, Indonesia, Graduate student of Bogor Agricultural University (bandung_27@yahoo.com); CHRISTIAN H SCHULZE: Department of Animal Ecology I, University of Bayreuth, D-95440 Bayreuth, Germany; DAMAYANTI BUCHORI: Bogor Agricultural University, Jl Kamper, Kampus IPB Darmaga, Bogor, Indonesia

A PRELIMINARY STUDY OF THE EFFECTS OF LANDUSE AND FOREST DISTURBANCE ON BUTTERFLY DIVERSITY AT MOUNT SALAK, JAVA (INDONESIA)

Effects of forest destruction and land-use change on butterfly diversity in Mount Salak are studied between September 2003 and September 2004. Preliminary research was conducted at five different locations covering two different habitats, secondary forest and paddy fields. Butterflies were surveyed by conducting transect walks. So far, we found 33 butterfly species at Mount Salak. Two butterfly species, a Radena (Ideopsis) sp. and a Cethosia sp., were only found in forest but not in paddy fields. Our findings from different areas at Mount Salak showed that species composition of butterfly communities was significantly related to habitat type. Furthermore, species richness in areas where forest experienced only minor disturbance was higher than in areas with heavily modified habitats. Several species could be only found in one forest type. For example, the species Prioneris autothisbe, Cepora aspasia, Graphium evemon, and Jamides caeruleus were only found in production forest, while Taenaris sp., Papilio demolion, Cethosia sp and Delias belisama were only found in undisturbed forest. Radena (Idiopsis) sp. could be only found in very disturbed forest. Our preliminary data indicate that there is a site-specific species composition of butterfly communities and habitat isolation that may contribute significantly to the presence of single species.

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CAN POACHERS CAPITALIZE ON THE PREDICTABILITY OF MIDDEN USE BY AN ENDANGERED GAZELLE?

We report the impacts of human visits at a waterhole used by mountain gazelles, Gazella gazella, and Nubian ibex, Capra ibex nubiana, in the Ibex Reserve, Saudi Arabia. Our hypothesis was that mountain gazelles would be significantly more impacted by human visits because they use the waterhole primarily during the day, which is when all human visits occurred. Our results show that Nubian ibex did not significantly use of the waterhole less within twenty-four hours after human visits. Mountain gazelles on the other hand, used the waterhole significantly less within a 24-hour period after human visits. We then reanalyzed the data in more detail, by breaking the time after disturbance into shorter periods. We found that Nubian ibex and mountain gazelle used the waterhole significantly less within six hours after human visits. We found no significant difference of waterhole use by Nubian ibex and mountain gazelles within the period of six to twelve hours or twelve to twenty fours hours after human visits. However, the number of mountain gazelles was almost significantly lower within the period of six to twelve hours after human visits. This suggests that mountain gazelles may be exhibiting increased wariness towards humans.

P29-02 **BERGALLO, HELENA G. and Carlos E.L. Esbérard** Departamento de Ecologia, IBRAG, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 20559-900, Rio de Janeiro, RJ, Brazil, (bergallo@uerj.br) (HGB). Projeto Morcegos Urbanos, Fundação RioZoo, Quinta da Boa Vista s.no., 20940-040, Rio de Janeiro, RJ, Brazil (CELE).

BATS IN AN URBAN PARK IN RIO DE JANEIRO CITY, SOUTHEASTERN BRAZIL

Urbanization results in the reduction of specialized species. Bats are found in all Brazilian cities, but very little is known about the species in urban environments. The main goal of this study was to list the species living in an urban park and check the hypothesis that urban species are the most common, widely distributed or more able to maintain bigger activity ranges. To test the adaptability of the species captured in the park, we calculated a sensitivity index comparing the capture rate in the park with the capture rate carried out in the closest forest (distant 4.5 km). In 80 night sampling we analyzed 2900 bats from 19 species. All the eight species with negative sensitive index used roosts inside the park, showing great adaptability to urban areas, whereas, only 45% of the 11 species with positive index used roosts inside it. There are more open air insectivores species and clustered space insectivorous in urban areas than in forest environment. The opposite was true to gleaners. The species captured in the park are the most frequent in inventories from Brazilian southeastern and several have large geographical distribution, showing a higher plasticity to urban environment.

P29-03 **BOGAN, DANIEL and Roland Kays** New York State Museum, Research and Collections, 3140 CEC, Albany, NY 12230 (DBogan@mail.nysed.gov)

ECOLOGICAL TRAP DYNAMICS WITHIN A COYOTE POPULATION OF A FRAGMENTED FOREST PRESERVE

In northeastern USA, top predators (wolves, mountain lion) have been extirpated through persecution and habitat loss. Eastern coyotes have recently expanded in population size and geographic range filling this important niche. We are studying coyote ecology using radiotracking (n = 21) and diet analysis in a fragmented suburban-natural area, the Albany Pine Bush Preserve (APBP). Diet analyses (n = 482) revealed coyote diet consisted of 38% cottontails, 28% deer, 17% small mammals, and 13% plant. Garbage occurred in 1% of samples, and domestic cat only once. Spatial analyses indicate that resident coyote home-ranges (95% fixed kernel) are primarily within natural areas, rarely overlapping with neighborhoods or commercial areas. Resident coyotes have exhibited high mortality from anthropogenic sources: roadkill = 7, shot = 6, poison = 1, and natural/unknown = 1. I hypothesized that this reduced survival (S = 0.20) is in part due to preserve characteristics: high perimeter/edge ratio, fragmentation by roads (road density 11.8km/km2) and a high level of interspersion of residential and natural areas. We will discuss these results in relation to ecological trap dynamics and coyote populations in less fragmented forest preserves.

P29-04 **CHUNG, CLAUDIA and Jessica Amanzo** Departamento de Mastozoología, Museo de Historia Natural,Universidad Nacional Mayor de San Marcos, Av. Arenales 1256, Jesús Maria, Ap. 14-0434, Lima, Perú (claudia_luciac@yahoo.com)

THE ANDEAN BEAR IN THE NORTH OF PERU: ESTIMATE DISTRIBUTION AND THREATENS

The process of human colonization of the natural areas in the Peruvian North Andean region had been increasing in the last decades, producing significant habitat loss for the Andean Bear. Our goal was to identify the threaten status of this species in Piura and Cajamarca Departments in Peru. We estimate the potential habitat available for bear using SIG. This information was complemented with fieldwork. Likewise, we visited different cities, towns and villages interviewing local people. Additionally, we identified plant species consumed by the bear from fecal samples.The Andean bear populations are diminishing mainly due to habitat loss, by the establishment of grassland for cattle and crops, and due to hunting.

We developed a map of estimated habitat available for bear. This area belongs to paramo, montane forest and premontane forest habitats, and has connection only with similar habitats in Ecuador, allowing genetic interchange between northern and southern populations. This corridor includes only one Natural Protected Area, Tabaconas - Namballe National Santuary (25900 ha). There are two vulnerable zones that could fragment this corridor in three parts and isolate populations. It is necessary to establish a protected corridor in these natural areas in northern Peru to protect bear populations.

P29-05 **GELOK, PAUL, Jay Malcolm, Justina C. Ray, and Brian Naylor** Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, Ontario Canada, M5S 3B3 (paul.gelok@utoronto.ca) (PG, JM). Wildlife Conservation Society, Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, ON, Canada M5S 3B3 (JCR). Northeast and Southern Science and Information Sections, Ontario Ministry of Natural Resources, 3301 Trout Lake Road, North Bay, Ontario, P1A 4L7 (BN)

SUMMER HABITAT USE BY AMERICAN MARTENS (MARTES AMERICANA) IN GREAT LAKES-ST. LAWRENCE FORESTS OF ONTARIO

The American marten (;Martes americana;) is widely used as an indicator of sustainable forest management, yet impacts of silvicultural systems on marten populations in Great Lakes-St. Lawrence forests are unclear. During two summers in Algonquin Provincial Park, Ontario, Canada, 76 transects were sampled for the presence of marten using track plate boxes. Variables derived from local habitat measurements and Forest Resources Inventory maps were used to build scale-dependent regression models explaining marten presence/absence (PA). Overall, marten PA was associated with fine woody debris ground cover. In deciduous forests alone, marten PA showed significant fluctuations between years, but was also significantly related to height of the canopy; in coniferous stands, there was a significant negative association between tree basal area and marten PA. Interestingly, marten PA could not be explained by silvicultural history at the stand or landscape scale. These results indicate that some silvicultural systems may not limit marten habitat in Great Lakes-St. Lawrence forests, and show that marten habitat correlates vary across forest types, suggesting that a stratified management plan for marten habitat is required.

P29-06 **MISTRY, SHAHROUKH and Felicie Reid** Biology Department, Westminster College, New Wilmington PA 16172 (mistrys@westminster.edu)

IDENTIFYING AREAS FOR THE CONSERVATION OF INDIAN BATS

The conservation of threatened and endangered species is especially difficult in developing countries such as India. This problem is compounded when the species of concern are disliked or considered pests, as is the case with Indian Chiroptera. Yet these animals comprise over 10% of all bat species, are one-fourth of the mammal diversity of India, and provide significant ecological and economic services via pollination, seed dispersal and insect consumption. Here we present a GIS analysis of the overlap between the distribution of bat species, known protected areas, hotspots of plant and vertebrate diversity, and habitat type. The vast majority of threatened/endangered species are found within the confines of the Biodiversity hotspots in India, especially in the Northeast and the Western Ghats regions. However, only ten percent of the threatened/endangered species are known to exist in areas currently protected. In addition, these hotspot areas have among the highest human population densities in the world. It is highly likely that many of these species will no longer exist in India without protection of more habitat. The expansion of existing protected areas within the biodiversity hotspots, as well as the creation of new areas, will be the challenge for the years ahead.

P29-07 **MOORE, DON** Wildlife Conservation Society, Prospect Park Zoo, 450 Flatbush Ave, Brooklyn, NY 11225 (dmoore@wcs.org)

REPRODUCTIVE VARIABLES AND SEASONALITY IN PAMPAS DEER (OZOTOCEROS BEZOARTICUS), COMPARED OTHER UNGULATES, WITH COMMENTS ON HOW REPRODUCTIVE SYNCHRONY CAN INFORM CONSERVATION MANAGEMENT

Pampas deer are one of the world’s rarest deer. Individual Pampas deer were studied in Uruguay and in captivity to elucidate reproductive characteristics for this endangered species. One of eight (12.5%) surviving, ear-tagged wild female Pampas deer gave birth to a fawn at age two years; in contrast, 67% of captive female Pampas deer gave birth in their second year. Pampas deer exhibit a mild spring birth peak. The birth season is phase-shifted by 183 days in the northern hemisphere captive population, which indicates heritable, proximate light:dark cycle cuing for the mild synchrony in this species. The interquartile range (IQR) for Pampas deer births in captivity was 90 days, while the IQR for blacktail deer births was 18 days and for pronghorn births was 11 days. The average interbirth interval (IBI) for captive Pampas deer is 335 days, which is significantly and biologically different from 365 days, while the average IBIs for captive blacktail deer and pronghorn are 359 and 363 days, respectively. The reproductive cycle of Pampas deer has important conservation implications. Livestock management activities and human disturbances allowed by ranchers should take into account the long duration of the birthing period of Pampas deer.

P29-08 **MPUNGA, NOAH E. and Daniela DeLuca** Wildlife Conservation Society (WCS), P.O. Box 1475, Mbeya, TANZANIA (dwdl@atma.co.tz)

CARNIVORE COMMUNITIES IN TWO MONTANE FORESTS IN SOUTHERN TANZANIA: INVENTORY AND ETHNOMAMMALOGY IN SITES OF DIFFERING MANAGEMENT REGIMES

Crouching at the top of the food chain, mammalian carnivores play a critical role in the stability and diversity of an ecosystem. Their rarity however, hampers our understanding of how they adapt to various levels of ecosystem integrity. Habitat degradation, unsustainable hunting and human persecution are responsible for a widespread decline in carnivore numbers. We investigated two unstudied highland areas with different levels of formal protection; the Udzungwa Mountains National Park (a comparatively well-protected biodiversity hotspot), and Mt Rungwe Forest Reserve (a little-known and unmanaged site in the southwest). Combining ecological inventories and socio-economic investigations we recorded carnivore presence, habitat preference and factors limiting abundance in both sites. Whilst Udzungwa was richer (17 sp) than Mt Rungwe (13 sp), carnivores are persecuted in both areas, and the degree, reasons and methods employed vary according to the different socioeconomic and cultural influences at play. Camera trap technology provided unequivocal evidence of carnivore presence, including rare Lowe's servaline genet and montane forest hyaenas in Udzungwa. Insights into behavioural adaptation were revealed through trapping effort, such as servals thriving high on Mt Rungwe where other top predators have been persecuted. The data are being used to assist conservation managers at both sites.

P29-09 **LEITE PITMAN, RENATA, George Powell, Dario Cruz, Mario Escobedo, Karen Escobar, Vicente Vilca, and Armando Mendoza** Center for Tropical Conservation/Associacao Pro-carnivoros, Duke University Box 90387, Durham, NC, 27705 (renata.leite@duke.edu), (RLP), AREAS Project - World Wildlife Fund, 1250 24th Street, NW, Washington, DC 20037 USA (RLP, GP, DC, ME, KE, VV, AM)

HABITAT USE AND ACTIVITY OF THE GIANT ARMADILLO (*Priodontes maximus*): PRELIMINARY DATA FROM SOUTHEASTERN PERU

The giant armadillo is an elusive, poorly known, and globally threatened species. Our aim is to study its landscape use, in order to design science-based conservation strategies for Amazonian biodiversity. In November 2003 we captured a 30-kg male in its burrow in the Amazonian lowlands of Peru and fixed a transmitter to the side of its carapace. Since then we have monitored its movements using telemetry, signs, and remote cameras. Over a three-month period, the animal occupied an area of ~20 ha and used three different burrows for approximately 28 days each. During these periods the animal emerged from its burrows infrequently to forage in upland forest and an adjacent swamp. Despite the species' reputation as a nocturnal animal that spends long periods in semi-hibernation underground, we documented both nocturnal and diurnal activity, much of it while the animal was in its burrows. These are the first telemetry data recorded for this species and suggest a more complex subterranean life than previously suspected. Because burrows dug by giant armadillos are used by several other mammal species, including the rare short-eared dog (;Atelocynus microtis;), the local extinction of Priodontes may have cascading effects in the mammalian community by impoverishing fossorial habitat.

P29-10 **ROCHA, FLÁVIA SOUZA, Fernando P. Rodrigues, and Claudio B. Valladares Pádua** IPÊ, Instituto de Pesquisas Ecológicas, Passeio Pica-Pau, 4, Vila São Paulo, 19280-000, Teodoro Sampaio, SP, Brazil (FSR, CBVP) (flarocha@uol.com.br.), Depto. de Zootecnia, Melhoramento Genético Animal, FCAV, UNESP, Jaboticabal, SP, Brazil (FPR).

DIFFERENTIAL RESPONSES OF MARSUPIALS TO THE FRAGMENTED LANDSCAPE OF THE PONTAL DO PARANAPANEMA REGION, SP, BRAZIL

To evaluate the conservation status of the marsupials Didelphis albiventris and Micoureus travassosi, six forest fragments and the Morro do Diabo State Park are being surveyed since January 2002, in the Pontal do Paranapanema region (SP, Brazil), where 84% of Semideciduous Atlantic Forest remnants are located. These species respond differently to the landscape. Didelphis albiventris is generalist, adapted to secondary areas, with high dispersion ability, dominant in all communities studied. We found significant higher densities in more disturbed fragments. Also, where ocelots are not found, Didelphis populations are very large, and communities are deppauperate, suggesting a mesopredator release phenomenon. Microssatelite analysis showed some inbreeding in the smaller and more isolated fragment. Micoureus travassosi is a small, arboreous marsupial. This species is not found in fragments smaller than 85ha, and seem to have very small and isolated (according to genetic analyses) populations even in larger areas. These results, and previous ones, suggest that M. travassosi is declining in the Atlantic Forest, becoming isolated in small fragments due to its limited dispersion ability and inospite matrices between remnants (usually large pastures). Actions to increase landscape connectivity have to be taken to assure that small mammal populations will persist for a long time.

P29-11 **RUTH, TONI K., Douglas W. Smith, Mark A. Haroldson, Polly C. Buotte, Charles C. Schwartz, Howard B. Quigley, Steve Cherry, Kerry M. Murphy, Dan Tyers, and Kevin Frey** Hornocker Wildlife Institute/Wildlife Conservation Society, 2023 Stadium Drive, Suite 1A, Bozeman, MT 59715 (truth@wcs.org) (TKR, PCB, HBQ). Yellowstone Center for Resources, P.O. Box 168, Yellowstone National Park, Mammoth, WY 89210 (DWS, KMM). United States Geological Survey, Interagency Grizzly Bear Team, Forestry Sciences Lab, Montana State University, Bozeman, MT 59717 (MAH, CCS). Department of Mathematical Sciences, Montana State University, Bozeman, MT 59717 (SC). United States Forest Service, Gardiner, MT 59030 (DT). Montana Department of Fish, Wildlife and Parks, Montana State University, Bozeman, MT 59717 (KF).

LARGE CARNIVORE RESPONSE TO RECREATIONAL BIG GAME HUNTING ALONG YELLOWSTONE NATIONAL PARK'S NORTHERN BOUNDARY

The future existence of carnivores depends on how well we understand anthropogenic effects and manage carnivore–human interactions. Concurrent studies on grizzly bears, wolves, and cougars allowed us to investigate activities of humans and carnivores prior to and during the backcountry game hunting season along Yellowstone National Park's northern boundary. The observed shifts of bears toward hunting activity, cougars away from hunting activity, and wolves apparently unresponsive to activity has implications for direct mortality to carnivores often resulting from human–carnivore encounters. Considering the role carnivores may play in community organization, and the lack of information available, we consider five aspects of the work as important learning points for future research and conservation efforts with carnivores: 1) the need for combined efforts between agencies and organizations to enhance data collection, 2) the need for multi-species, multi-project approaches and the considerations required for coordination, 3) our lack of understanding of carnivore-carnivore and carnivore guild-ecosystem interactions, 4) the role of protected areas in conservation of carnivores and the potentially different behavior of carnivore species in reaction to that protection, and 5) the potential tool for landscape conservation approaches that can be gained when documenting multi-carnivore movements in a multi-jurisdictional land use environment.

P29-12 **SHAPIRA, IDAN, Hatem Tamimi, and Uri Shanas** Department of Evolutionary and Environmental Biology, Faculty of Sciences and Sciences Education, University of Haifa, 31905, Mount Carmel, Israel, (the_pwr@keh.co.il) (IS, US). Friends of the Earth Middle East, Oman, Jordan (HT). Department of biology, Faculty of Sciences and Sciences Education, University of Haifa, Oranim, Kiryat Tiv'on, 36006, Israel (US).

DIRECT AND INDIRECT EFFECTS OF AGRICULTURE: GIVING-UP DENSITIES AND ACTIVITY OF SOUTHERN ARAVA VALLEY GERBILS

The effects of anthropogenic disturbances on species behaviour, survival and biodiversity are studied as part of a joint Israeli-Jordanian biodiversity survey in the Arava valley desert. Agricultural expansion may augment, in addition to habitat loss, the spread of commensal species. We therefore study the combined effects of habitat loss and predatory pressure by foxes on the abundance, density, and behavioural ecology of gerbils. Seed-trays were used to study the giving-up densities (GUD's) of gerbils (*Gerbillus gerbillus* and *G. nanus*) and tracking to follow the activity of gerbils and foxes (*Vulpes vulpes* and possibly *V. rueppelli*) at locations close (0.05-0.3 km) and far (4-6 km) from agricultural farms on full moon and moonless nights. Foxes' activity was significantly higher at close loci. Gerbils, on the other hand, had significantly higher activity at far loci. GUD's was significantly higher at the far loci, but based on GUD's, gerbils increased their activity in moonless nights only at close loci. These results suggest that the commensal red fox benefits from desert habitats loss to agriculture, while the specialized gerbils are facing, in addition to habitat loss, higher predatory pressure. The consequences are changes in foraging activity and a decrease in gerbils abundance.

P29-13 **UTRERAS B.,VICTOR, Eddy Silva, Luis Sandoval C., and Jeffrey P. Jorgenson** Wildlife Conservation Society – Ecuador Program, San Francisco 441 y Mariano Echeverría, P.O. Box 17-21-168, Quito – Ecuador (vmub@wcsecuador.org)

RELATIVE ABUNDANCE OF UNGULATES ALONG A HUMAN ACTIVITY GRADIENT, YASUNÍ NATIONAL PARK, ECUADOR AMAZON

Wildlife species respond differently to human activities. An understanding of these differences is critical if we are to develop effective conservation actions to enhance the conservation status of these species and their habitat. This research characterizes the relative abundance of four species of ungulates across a gradient of human activities in eastern Ecuador. During October/02-March/03, ungulates were monitored at 10 sites at Yasuní. At each site, there were six terrestrial transects (2 km) along which sign were counted for lowland tapir (Tapirus terrestris), white-lipped peccary (Tayassu pecari), collared peccary (Pecari tajacu), and brocket deer (Mazama americana). The sampling sites were grouped into three categories according to human disturbance levels: little disturbance (PD), moderate disturbance (MD), and disturbed (D). The total number of signs recorded for these species was 3253. The encounter rate (TES) was highest for tapir (9.63 signs/km), followed by collared peccary (8.93 signs/km), brocket deer (6.78 signs/km), and white-lipped peccary (1.76 signs/km). Encounter rates for the tapir and white-lipped peccary were highest in the PD area. Information about the distribution and relative abundance of these species as it relates to human activities is essential if we are to ensure the long-term survival of ungulates in the Yasuní region.

P29-15 **VONGKHAMHENG, CHANTHAVY, Arlyne Johnson, and Michael Hedemark** Wildlife Conservation Society, Box 6712, Vientiane, Lao PDR; (cvongkhamheng@wcs.org)

CONSERVATION OF SMALL CARNIVORES IN LAO PDR: NEW RECORDS ON THE DISTRIBUTION AND ABUNDANCE OF CARNIVORES RELATIVE TO HABITAT AND HUMAN USE

Lao PDR has globally significant populations of small carnivores and is one of the most important core areas for threatened mustelids and viverrids in the world. Yet, little is known about the distribution, status, and habitat use of small carnivores in the country. We conducted the first systematic camera-trap survey of carnivores and their prey in the Nam Et -Phou Louey National Protected Area (NPA) in northern Lao PDR. Intensive sampling was conducted in several 100 km2 blocks in the NPA at elevations ranging from 800-2200 m. asl and data on vegetation and human use gathered at each camera trap location. We found three regularly recorded small carnivores and seven rarely recorded species, including Back-striped weasel, Spotted linsang, and Owston's palm civet. The latter is the first field record for Lao PDR. Hog badger and Yellow-throated marten were the most common small carnivores, recorded at up to 40% and 28% (n=25) of sites in higher elevation evergreen forests. Relative abundance of most small carnivores was less at lower elevations, which is attributed to factors of habitat for some species but hunting pressure for others. Survey results are applied to recommendations for conservation action to reduce threats.

P29-16 **WALLACE, RICHARD L., Katie Dougherty, Stephen Dunkle, Rebecca Hill, Glen Klim, and Alissa White** Ursinus College, P.O. Box 1000 Collegeville, PA 19426 (rwallace@ursinus.edu)

SOCIAL INFLUENCES ON CONSERVATION AND THE ADEQUACY OF U.S. RECOVERY PLANS FOR MARINE MAMMALS

Recovery efforts for marine mammals listed under the U.S. Endangered Species Act (ESA) face many pressures. These include the expected technical (i.e., natural scientific) variables encountered in conservation efforts. They also include social influences on recovery programs such as leadership quality, communication and team-building skills, the presence or absence of evaluation, program structure and design, and participants' values and ideologies, among others. ESA recovery plans provide guidance for practitioners to address technical variables through research and management actions. However, recent analyses of U.S. marine mammal recovery programs indicate that social variables have profound influences on recovery program implementation and outcomes. To assess the guidance that recovery plans provide to practitioners, we analyzed all existing ESA recovery plans for marine mammals, as well as two federal draft recovery plans currently in development. In each plan, we found the quality and extent of guidance for addressing social influences on recovery to be minimal, and in some cases absent, even in plans for programs where documented social influences have severely undermined recovery efforts. Because recovery efforts require practitioners to address variables of extraordinary social and technical complexity, this lack of guidance undermines the goals of the recovery plans and the ESA.

P29-17 **WOOD, ROGER C.** The Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247; Richard Stockton College of New Jersey, Pomona, NJ 08240 USA (roger.wood@stockton.edu).

TERRAPINS AND TRAPS: THE POLITICS OF CONSERVATION

Diamondback terrapins (*Malaclemys terrapin*) occur only in salt marshes along the Atlantic and Gulf coasts of the United States. Within this range, terrapin populations have been severely depleted by various human activities (overhunting, loss of critical nesting habitat, road kills during the nesting season, and drowning as bycatch in commercial crab traps). Currently, terrapins are accorded various degrees of protection (endangered, threatened, or species of special concern in nine of the 16 states rangewide). An estimated 2 million crab traps are annually deployed in the waters where terrapins occur. Large numbers of terrapins drown in these traps (one in six in our studies). Research and extensive testing at the Wetlands Institute led to the development of a simple, inexpensive, and highly effective Terrapin Excluder Device which greatly reduces the numbers of terrapins entering crab traps. In 1998, New Jersey adopted a much amended excluder regulation after two years of contentious public hearings. Testimony of opponents was often acrimonious. Politics generally prevailed over rational discourse. Scientific evidence was ignored or discounted. Subsequent research has repeatedly shown the effectiveness of terrapin excluders and two other states (Delaware and Maryland) have also adopted excluder regulations.

P29-18 **WONG, SARAH and Pascale Sicotte** Department of Anthropology, University of Calgary, 2500 University Drive N.W., Calgary, Alberta, T2N 1N4 Canada. (snpwong@ucalgary.ca).

THE POPULATION STATUS OF *COLOBUS VELLEROSUS* AT THE BOABENG-FIEMA MONKEY SANCTUARY AND SURROUNDING FOREST FRAGMENTS, GHANA

The Boabeng-Fiema Monkey Sanctuary (BFMS) is inhabited by a growing population of ;Colobus vellerosus;, a species whose numbers are declining throughout its range in West Africa. Smaller, degraded forest fragments connected to BFMS also contain *C. vellerosus* and may provide important habitat for the monkeys. Our objective was to determine the current population status of *C. vellerosus* at BFMS and the surrounding fragments, and compare results to previous censuses. The census was a 'complete count' of colobus and was conducted over one month in July 2003. The same route was walked for 13 days, in seven locations by trained research assistants and myself. The 2003 population estimate of *C. vellerosus* at BFMS was 217-241 (15 groups); a slight increase from 2000. Numbers in the fragments (58-62; 6 groups) have remained stable from 1997, although distribution among the fragments has changed. Mean group size did not differ significantly between the fragments and BFMS. Larger fragments tended to have larger numbers of colobus and monkeys can apparently travel between fragments. By comparing these population estimates with current habitat quality, we can evaluate whether these fragments can sustain current numbers and if corridor development would be useful in maintaining a viable population.

P29-19 **ZOLKEWITZ, MICHAEL, Walter F. Bien, and James R. Spotila** Department of Bioscience and Biotechnology, Drexel University, 32nd and Chestnut Streets, Philadelphia, PA 19104 (zolk@drexel.edu).

FACTORS CONTRIBUTING TO SUCCESSFUL ESTABLISHMENT OF SCHIZACHYRIUM SCOPARIUM ON AN ABANDONED GRAVEL PIT IN THE NEW JERSEY PINE BARRENS

Over the last few decades, ecological restoration has become a practical way for reestablishing the ecological integrity of severely disturbed landscapes. Physically, chemically, or biologically manipulating degraded habitats to a condition closely modeled after natural systems poses many challenges. This is especially true in the Pine Barrens of New Jersey (NJPB) where nutrient poor-sandy soils, acidic hydrology, and an unpredictable fire regime dominate the environment. Abandoned gravel pits are frequent in the globally rare pine plains region of the NJPB resulting in excessive erosion, unnatural firebreaks, and habitat fragmentation. Identifying techniques to restore these areas is of great ecological importance. We present here the results of a germination field trial using the native warm season grass *Schizachyrium scoparium*. A 2x2x4 factorial experiment incorporating a split-split plot randomized block design investigated the effects of fertilization, tillage, and mulch depth on germination and growth over a single growing season. Our results suggest that on severely degraded soils within the NJPB only mulch depth influenced seedling germination (density) and growth (cover). Developing a successful and economical revegetation strategy will play a key role in facilitating the restoration process and will be of utmost value for preserving and protecting these important habitats.

P29-20 **ZHU, XIAOJIAN, Xiaoli Shen, Dajun Wang, Hao Wang, and Wenshi Pan** College of Life Sciences, Peking University, Beijing 100871, People's Republic of China (xjzhu@pku.edu.cn); 8610-62752271 ext 2092

EARLY DEVELOPMENT OF WILD GIANT PANDA (AILUROPODA MELANOLEUCA) CUBS, AND PRELIMINARY COMPARISON WITH CAPTIVE ONES

The development of 4 wild-born panda cubs from birth to 7 months was studied and compared with captive ones. The average daily weight gain was 64.7g, 62.9g and 50.8g for 3 cubs. The first dentition was seen at day 75~88, and about 20 teeth could grow at around day 130. Eyes first opened at day 40~49, fully opened at around day 72, and eye sight gained at around day 88~90. Newborn cubs were pink with sparse white lanugo. The skin's black pigmentation was seen at day 8 to 9, and the cub was fully furred at around day 25. There was no significant difference between wild and captive panda cubs in either body weight (n=6) or average daily weight gain (n=14). The development of hair, eyes, dentition and movement activity of wild panda cubs also assorted with those of captive cubs. However, the body weight of six 7-month-old captive cubs were 4%~40% (22.6%;12.4%) heavier than one wild cub of the same age, and the body weight of other 10 captive cubs at 6 months old was comparable of the 7-month-old wild cub. We hope the field data could help improve captive cub rearing, therefore contribute to panda conservation.

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SETTING PRIORITIES AND OBTAINING OPTIMAL GRID SETS FOR THE CONSERVATION OF MEXICAN CARNIVORES

We addressed the conservation of Mexican carnivores through a double prioritization exercise, obtaining a table of national priority scores (VPN; based on 5 combined parameters), generating distribution maps of species richness, endemism and vulnerability and by defining optimal sets of grid cells (0.5 x 0.5 each) that could guarantee the conservation of all Mexican carnivores by representing them 1 to 50 times each. Among the top ten species with highest VPN are the 4 endemic species *Nasua nelsoni, Procyon pygmaeus, P. insularis and Spilogale pygmaea, also Panthera onca, Leopardus pardalis, Ursus americanus and Eira barbara*. The highest concentration of species and endangered carnivores occurs in northeast México. Endemic carnivore species are restricted to Cozumel Island, the Islas Marías and south-central portion of the Pacific slope. Optimal sets obtained varied from 4 cells (all species represented at least one time) to 190 (at least 50 times). We generate 100 optimal sets for each criterion (e.g. represent them all at least 1 to at least 50 times), this gives a great flexibility to explore each set when selecting one for conservation purposes. This selection could be supported using the VPN values of each species, summed for each cell, to rank them.

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AQUATIC ECOLOGY: BANGLADESH PERSPECTIVE

Bangladesh had always been predominantly an agricultural based country. Over 3000 species of plants and 400 species of fish and other aquatic fauna depend on wetlands for whole or part of their life cycle. The seasonal floodwaters inundating the plains of Bangladesh have renewed this aquatic life support system for millennia, enriching the soils and washing away pollutants. This has enabled the rural population to enjoy open access rights to common property fishery resources- without having to worry about their future availability. Diversity of seasons and habitats (rivers, wetlands, water bodies, and flood plain and dry land areas) provides for a seasonal diversity of available fish species. This in turn provides the basis for diverse livelihood and food production options. As this diversity is depleted, so becomes the food and livelihood security of the rural population increasingly vulnerable. It is feared that these natural resources are in decline (in both diversity and number), thus jeopardizing the prospects for sustainable development. The transformation of the aquatic habitats and loss of wild species is increasing this vulnerability of Bangladesh's food production systems. Surface water pollution in Bangladesh occurs mainly by human sewage coupled with municipal garbage and industrial effluents. Industrial discharges along with municipal and urban wastes are creating special problems that completely destroy the microbial-based systems of decomposition. About 6,000 large and medium industries and 24,000 small industries are operating in Bangladesh, which discharge effluents directly to the rivers or nearby canal or waterbed without any regard to environment.

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EFFECTS OF HABITAT DISTURBANCE ON MIXED–SPECIES BIRD FLOCKS IN A TROPICAL SUB–MONTANE RAINFOREST IN PENINSULAR MALAYSIA

We determined the responses of mixed–species flocks and mixed–flock species to local–scale habitat disturbance, along an escalating gradient of anthropogenic modification (i.e., forest interior, forest edge, and urban), in a sub–montane rainforest in Peninsular Malaysia. The effect of habitat type (e.g, forest interior) on mixed–species flock richness was assessed. We also examined the significance of habitat variables (e.g., canopy cover) and ecological traits (e.g., body length), in determining the mean mixed–species flock richness and the sensitivity of mixed-flock members to habitat perturbation, respectively. The habitat types could be distinguished based on two main habitat variables (i.e., the number of trees with DBH less than 2 cm and canopy cover). More species participated in mixed–species flocks in forested habitats (i.e., forest interior and forest edge) than urban habitat. Canopy cover was the most important predictor of mean flock species richness. Mixed–flocking species sensitive to habitat disturbance were generally dependent on understory microhabitat. We conclude that sub–montane mixed–species flocks are affected by anthropogenic disturbance, and mixed flocks, as an entity, can be used as an indicator in formulating conservation strategies for anticipated future development of the sub–montane areas in the Peninsular Malaysia.

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HABITAT DISTURBANCE AND AVIAN FRUGIVORY: IMPLICATIONS FOR TROPICAL RAINFOREST ECOLOGY

A central question in conservation biology concerns the effects of anthropogenic versus natural disturbance. While habitat degradation poses a serious threat to global biodiversity, especially for tropical forests, the ecological consequences of this disturbance are poorly understood. One potential impact is disruption of key plant-animal interactions that structure ecosystems. We are investigating the influence of tropical rainforest disturbance on avian frugivory in Tobago, West Indies, because many Neotropical woody plants depend on birds for seed dispersal. Using a comparison of primary rainforest with neighbouring, abandoned cacao plantations, we address the question: how does disturbance affect plant and bird community composition, and what are the implications for bird-mediated seed dispersal? We are quantifying fruit abundance with monthly surveys, and the community of avian dispersers with point counts and mist netting. Preliminary results indicate that disturbed plots tend to have higher fruit and bird abundance than intact plots, and different plant and bird assemblages. Such changes could pose a conservation concern by altering tropical forest composition, structure, biodiversity, and regeneration.

P31-03 **OLVERA, DIANA, VÍCTOR M. RODRÍGUEZ, Mahinda Martínez, and Luis Hernández** Universidad Autónoma de Querétaro, Cerro de las Campanas s/n, Centro Universitario, Querétaro, Qro. C. P. 76010. Méx. (DOV) (olvera_valerio@hotmail.com) (VMRG)

IMPACT OF ANTHROPOGENIC ACTIVITIES ON THE VEGETATION ASOCIATED TO THE SAN JUAN RIVER, QUERETARO, MEXICO

Industrial development and the population growth in San Juan del Río, have affected the most important river of the region, altering the vegetal communities associated to the river. To analyze the urban impact on this vegetal communities, we determined the structure and diversity of the riparian forest and aquatic vegetation present in the area. We sampled four points along the river in 15 km inside the urban zone, that present different grades of perturbation. We obtained the importance value and diversity index (Simpson). We also made vegetation profiles of all the sites. The highest diversity index was found in La Cruz, with a Simpson's index equal to 0.27 to riparian trees and 0.97 to hydrophytes. This happens because this zone is before the city and the human impact is not important. San Pedro Ahuacatlán, has a Simpson's index zero, because the industries presents in this zone have severely affected the river. In addition, the waste water flow in this point. We concluded that this area is where the anthropogenic activities are intense, the diversity of the vegetal species decrease or disappear. We proposed a management plan and a recuperation program.

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THE EFFECT OF CHARCOAL PRODUCTION ON TREE AND SHRUB SPECIES DIVERSITY IN MIOMBO WOODLANDS, EASTERN TANZANIA

Miombo woodland covers about 48% of land surface in Tanzania. For many years, the woodland's ecological diversity is being destroyed through woodfuel production. This study was carried out in Mbwewe Public Forest and Uzigua Forest Reserve, Tanzania, to determine the effect of charcoal production on tree and shrub species diversity. 30 plots were laid down in each forest for data collection. Each plot was subdivided in three classes and measurements of tree/shrub height and diameter at breast height taken. *Shannon–winner index of diversity* were 2.5 and 2.86 for the public and reserved forest while the &*indices of dominance* were 0.11 and 0.08 respectively indicating high species diversity in the forest reserve. The number of stems/ha, basal area/ha, and wood volume were 219, $4m^2$, $8m^3$ for the public forest respectively for the forest reserve they were 392, $8m^2$ and $60.8m^3$ making higher stocking due to low disturbances. The free accessibility to the public forests and their proximity to the Dares Salaam city and Morogoro town make it vulnerable to high commercial productions due to increasing costs and unreliability of electrical energy. Some policy interventions are recommended in order to safeguard these woodlands especially those proximity to urban centres and highways.

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IMPACT OF URBANISATION ON ANT DIVERSITY ALONG AN URBAN GRADIENT

We investigated the distribution and abundance of ant species across varied disturbed gradients in Bangalore city, and examined patterns of ant species occurrences to identify areas of diversity and rarity. Five sites were sampled and the distribution and abundance of ants were compared. These sites represent a gradient of urban land use that ranges from highly disturbed to undisturbed areas. This study also determines whether ants could be used as indicators of disturbance. Quadrat sampling method was used in each of the sites, and within each quadrat, bait traps, pitfall traps, visual and litter collection methods were carried out. Quadrats were placed in areas with varied canopy cover such as completely closed canopy, medium canopy, partial canopy and open areas. A total of 51 species belonging to 7 families were recorded. Ant species richness and abundance peaked in the disturbed site. Significant differences were seen with respect to species richness across the urban gradient. Richness and abundance were positively correlated with litter cover. Common species increased with disturbance. A high number of rare species were found in the disturbed site, which stresses that disturbed sites, as well as the undisturbed patches should be protected and maintained.

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BENEFIT-COST ANALYSIS OF THE DELONG MOUNTAIN TERMINAL PROJECT: A CRITIQUE AND INDEPENDENT ASSESSMENT OF KEY PARAMETERS

Along the far northwest arctic coast of Alaska, the Army Corps of Engineers and the Alaska Industrial Development and Export Authority have proposed a $200 million port development scheme known as the Delong Mountain Terminal Project (DMTP). The DMTP is designed to enhance lead/ zinc concentrate shipments from the Red Dog mine and to facilitate deliveries of fuel oil to local villages. Last year, the Corps released a preliminary benefit-cost analysis of the project. Our paper presents a critique of the Corp's BCA and an independent assessment of parameters missing from that analysis. Coastal development in Alaska's arctic region raises a host of unique environmental, economic and cultural issues including adverse impacts to non-market values such as subsistence use and marine mammal habitat. However, non-market values were entirely excluded from the Corp's analysis of the DMTP. In our paper, we critique the Corp's assessment of national economic development benefits of the project, and develop independent estimates of non-market damages likely to occur if the project moves forward as planned. Both contingent valuation and benefits transfer methods are used to develop estimates of non-market costs associated with the loss of over 7,000 acres of intact marine ecosystems critical for the subsistence use of nearby Alaska Native villagers and the potential damage resulting from increased marine pollution. We also develop estimates of other national economic development costs excluded from the Corp's benefit cost analysis including transfers of economic activity from the U.S. to overseas as the port project makes substitution of Singapore-based fuel oil for U.S. fuel oil possible, opportunity costs associated with forgone wind energy savings, and regional economic development costs caused by labor-saving technologies at the port.
The DMTP exemplifies the challenges of socioeconomic analysis in the arctic region. Our paper is designed to identify how regional economic modeling and non-market economic analysis can enhance decision making and improve the body of information available to coastal development planners in the arctic region.
Suggested key words: arctic ecosystem values, benefit-cost analysis, subsistence

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CULTURAL EROSION AND ENVIRONMENTAL, SOCIAL, AND PERSONAL HEALTH: CANOE MAKING KNOWLEDGE IN POHNPEI, MICRONESIA

Erosion of traditional knowledge is a serious and accelerating problem in the world today, but quantitatively based work on traditional knowledge loss and its importance to conservation has been lacking. We investigated traditional knowledge of the biodiversity-intensive skill of canoe making on the island of Pohnpei, Micronesia, through an extensive survey. We found statistical linkages between traditional knowledge and environmental, personal, and social health, as well as perceived quality of life. We quantitatively documented the intergenerational erosion of canoe-making skills, generated statistical predictions of the disappearance of canoe knowledge, and found that the current generation of Pohnpeians may be the last to retain any knowledge of this traditional and important craft. We also identified correlates of knowledge loss, which highlight potential avenues for skill conservation. Finally, we discuss some of the important qualitative linkages between traditional knowledge and biological conservation on Pohnpei. This work forms a quantitative foundation for the preservation of traditional knowledge and its importance to environmental, social, and personal health. It also suggests a baseline protocol for conservation biologists and practitioners who wish to work with local people to conserve biodiversity via traditional knowledge.

P32-02 **MACHAGA, SOPHY J., Alfred A. Massawe, and Tim R.B. Davenport** Wildlife Conservation Society, P.O. Box. 1475, Mbeya, TANZANIA, (trbd@atma.co.tz)

MEDICINE, MEAT AND MAHOGANY: UNDERSTANDING NATURAL RESOURCE USE ON MT RUNGWE, SOUTHWESTERN TANZANIA

Rising to 10,000ft above sea level and encompassing unique forest and grassland habitats, Mt Rungwe is of considerable conservation significance. However, fertile volcanic soils and growing human populations have left the mountain surrounded on three sides by agriculture. Ineffective management and rural poverty combine to put considerable pressure on a finite resource base. In order to assist government and local communities better manage the forest reserve, we have investigated all aspects of natural resource use on the mountain. Over 1,100 individuals (6% of the surrounding population) from five ethnic groups were interviewed, and hunters, fishermen, pitsawyers and herbalists were enrolled in data collection. We estimate that over 20,000 trees are felled annually for charcoal, 10% of people pitsaw for timber and 30% collect fuelwood within the reserve. Non-timber forest products include 90 plant species used for medicine, wild fruits, honey and thatching. Six forest antelope are extensively hunted, including the threatened and endemic Abbott's Duiker, and seven fish species are harvested from forest rivers. Conversely, primates, bush pig and rodents inflict damage to crops. We provide a comprehensive account of resource extraction, socioeconomics, culture and community needs that have permitted the design of improved management and more sustainable resource use.

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OUT WITH THE OLD AND IN WITH THE NEW: EVALUATING THE POTENTIAL OF TRADITION FOR CONSERVATION IN TODAY'S WORLD

Indigenous participation in conservation is supposed to promote the conservation of both biological and cultural diversity. Yet, after thirty years of increasing participation, this collaboration is proving to be a disaster for biodiversity. Drawing on fieldwork in New Guinea, this paper proposes that a new blend of tradition and science will be needed to insure the future of the earth's biological and cultural heritage. Rather than expecting indigenous societies to balance societal needs with biodiversity conservation, it may be more profitable to view conservation as an effect of small-scale disturbance. Without concern for either biodiversity or conservation, traditional gardening can actually increase the area's biodiversity by creating a mosaic of habitats. In order for traditions such as taboos, sacred places or land tenure to promote biodiversity, each must be designed to limit human disturbance. As this study demonstrates, few traditions found among remote a society in New Guinea will limit human habitat disturbance or meet the current standards of conservation. If indigenous participation is to be effective, conservationists and indigenous peoples must become aware of the limitations of tradition and forge new traditions when necessary to limit human predation and habitat disturbance.

P32-05 **TILTON, MARY K., Jim Berkson, and Michael Vaughan** Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24060 (matilton@vt.edu)

EFFECTIVENESS OF POPULATION RECONSTRUCTION IN ESTIMATING WHITE-TAILED DEER AND BLACK BEAR POPULATIONS

White tailed deer (Odocoileus virginianus) and black bear (Ursus americanus) are subjected to heavy hunting pressure in the eastern United States. Accurate population estimation of these species is essential to prevent over harvest and subsequent population declines. Harvest data are a practical source of population information that are readily available to wildlife managers. Population reconstruction is a population estimation technique that calculates a minimum population size based on age-specific harvest data. We used simulated populations based on three different growth characteristics: low recruitment and low natural mortality, high recruitment and low natural mortality, and high recruitment and high natural mortality. We then simulated three harvest scenarios: equal harvest rates for all age classes, higher harvest rates for older age classes, and higher harvest rates for younger age classes. Lastly, we simulated sampling error by evaluating a range of coefficients of variation (0.05 – 0.75) associated with harvest estimates. This is the first critical evaluation of population reconstruction accuracy. Results from these simulations provide important information for biologists and managers as to the utility of this well used technique.

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FACTORS LIMITING PIPING PLOVER NESTING PAIR DENSITY IN NEW YORK

We studied the role of sandflat foraging habitat in limiting home range size and nesting pair density of piping plovers (Charadrius melodus), a federally threatened shorebird. We captured and individually marked plovers on Long Island, New York. Marked plovers were resighted each day during the breeding season, and locations were recorded with a GPS unit. Nest locations of marked birds were also recorded. Foraging rate data were collected during 5 minute continuous observations at the time of resighting. Using 1:800 scale aerial photos, we classified breeding sites into “nesting habitat” and “sandflats.” Home ranges and distances from nests of marked birds to sandflats were computed in a GIS. We found a positive relationship between home range size and distance between the nest and the nearest sandflat, and a negative relationship between home range size and mean foraging rate. Sandflats and similar shorebird foraging habitats are becoming increasingly rare because of beach management practices aimed at preventing breaches and overwashes. Our research indicates that availability of such habitats may improve carrying capacity by permitting reduced home range sizes. Management for these habitats may thus aid recovery of the piping plover.

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RECOVERY OF THE COLUMBIA BASIN PYGMY RABBIT (;BRACHYLAGUS IDAHOENSIS;) IN WASHINGTON STATE, USA

The isolated and genetically distinct Columbia Basin pygmy rabbit (;Brachylagus idahoensis;) was listed as Federally endangered in 2003. Less than 30 individuals survive in the wild. A captive breeding program was started in 2001 with 16 founding individuals. Husbandry techniques were developed using surrogate rabbits from Idaho. Eight-foot soil-filled round tanks planted with sagebrush simulate natural habitat. Pygmy rabbits are seasonal breeders (February-July) and adults are mutually antagonistic except during courtship. Females dig natal burrows near the end of a 25-day gestation period and have up to 3 litters per year. Young emerge two weeks after birth and littermates must be separated 1 to 2 months later. Fifteen offspring were born in 2002 and 14 in 2003. Significant differences in breeding success were seen between Washington (1.84 young/female/year) and Idaho (4.75 young/female/year) rabbits. All Idaho rabbits but only half of Washington rabbits successfully bred. Washington rabbits also had fewer litters and were more susceptible to infection. Recovery actions under consideration include the introduction of genetic material from other populations. An experimental reintroduction of 20 captive-reared Idaho pygmy rabbits was conducted in 2002 in Idaho. Four of the 20 rabbits survived the winter and successfully bred in 2003.

P33-03 **LANGTIMM, CATHERINE A., Cathy A. Beck, William L. Kendall, and Michael C. Runge** U.S. Geological Survey, Florida Integrated Science Center, Sirenia Project, 412 NE 16th Ave., Gainesville, FL 32601 (CAL, CAB),(Cathy_Langtimm@usgs.gov). U.S. Geological Survey, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, MD 20708 (WLK, MCR)

DIFFERENCES IN MANATEE POPULATION DYNAMICS: FLORIDA ATLANTIC COAST VS. NORTH GULF COAST

The endangered Florida manatee lives in an increasingly urbanized habitat in the waterways of coastal Florida. Management actions center on reducing injury and death from watercraft, addressing the pending loss of winter refuges at warm-water discharges at aging industrial plants, and assessing status and progress toward recovery under state and federal criteria. Capture-recapture statistical models and data from long-term study of individually known manatees, identified primarily by scars from watercraft injuries and monitored by photo-documentation, are being used to inform management. In two subpopulations with different habitat and management characteristics, results of analyses to estimate adult survival probabilities, temporal variance, breeding probabilities, and frequencies of different types of scars identified differences in demographic parameters and natural and anthropogenic effects impacting recovery. Notably, on the more urban Atlantic coast, adult survival probabilities were lower, with higher known deaths due to watercraft injuries, and higher frequencies of scars from fishing gear entanglements; but in the less-developed northwest on the Gulf of Mexico, adult survival was impacted by severe coastal storms. Results from these analyses, in conjunction with new photo-identification studies and new population and adaptive management models, are being used to assess status, identify management problems and strategies, and evaluate management results.

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AT-SEA MOVEMENTS, FORAGING AREAS, AND HABITAT USE OF HAWAIIAN MONK SEALS IN THE MAIN HAWAIIAN ISLANDS

The colonization, likely continued increase and greater length and girth of weaned pups of the endangered Hawaiian monk seals in the main Hawaiian Islands (MHI) run counter to the decline of the primary population in the Northwestern Hawaiian Islands (NWHI). This suggests the nutritional stress contributing to the monk seal decline in the NWHI is less of a factor in the MHI, despite a higher level of commercial and recreational fishing in the MHI, and raises the question: Why do monk seals in the MHI appear more successful at obtaining resources than those in the NWHI? Satellite-linked dive recorders deployed on MHI monk seals and a geographic information system (GIS) were used to investigate relationships between monk seal foraging and hydrographic features in the MHI. Due to the narrow neritic zone and steep bathymetric slope around the Hawaiian Archipelago, foraging in benthic habitats was limited to near-shore areas and neighboring banks. Most diving behavior occurred at depths < 150 m (mean 77.8 ± 36.1) and lasting an average of 4.5 ± 1.6 min, findings similar to previous NWHI monk seal foraging studies. Potential factors contributing to the apparent 'greater' foraging success of MHI monk seals include decreased inter- and intraspecific competition, different prey abundance and availability (absolute or per capita), and different quality of habitat.

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TOWARD A SYNTHETIC VIEW OF EXTINCTION: EXAMINING THE HISTORY OF A NORTH AMERICAN RODENT

Although it has long been recognized that multiple factors can interact to cause extinctions, it is difficult to consider many factors when investigating species declines. To follow up on an investigation of the proximate cause for the extirpation of the Allegheny woodrat (;Neotoma magister;), I conducted a post-hoc exploration of the historical literature to determine the major ecological events that accompanied and preceded the woodrat's decline, and considered the possibility that these events may have impacted the species. What emerges is a complicated picture involving multiple stressors, all attributable to human activities. Among the factors that are likely to have impacted this species are two exotic tree pathogens (the Chestnut blight and the gypsy moth), a native parasite (raccoon roundworm), habitat fragmentation, and the proliferation of a human-adapted species (the raccoon). The temporal pattern of the species' decline may have been affected by changing competitive regimes as the populations of major competitors, such as white-tailed deer and wild turkeys, recovered from over-exploitation. Although the historic record cannot give definitive answers, a better understanding the ecological events that surrounded the decline of a species may help us to pinpoint important causative factors and develop management priorities.

P33-06 **MCCLEERY, ROBERT, Nova J. Silvy, and Roel R. Lopez** Texas A&M University, Department of Wildlife and Fisheries Sciences. Nagle Hall,2258 TAMU, College Station, TX. (iamnotfunny@yahoo.com.)

URBAN DEVELOPMENT AND THE DECLINE OF THE ENDANGERED KEY LARGO WOODRAT

Urban development in habitat of the endangered Key Largo woodrat (KLWR, Neotoma floridana smalli) has caused precipitous population declines in recent years (2002, < 50 animals). Captive propagation is currently proposed for the KLWR. Our study objective were to evaluate (1) KLWR habitat and nest-site use needed for release site selection, and (2) determine usefulness of supplemental stocking the wild population with captive-reared KLWR's. We trapped 60 (1-ha) grids from March-September 2002 and 10 (1-ha) grids in October 2002-July 2003. Supplemental stockings were evaluated prior to implementation using a population model for the KLWR. We found KLWR selected young hammock (disturbed after 1971) over medium (disturbed 1940-1971) and old hammock (disturbed before 1940). Less than 10% of remaining area is ideal KLWR habitat. Model simulations predict the KLWR had >70% of terminal extinction over the next 10 years even with the use of supplemental stockings. Supplemental stockings delayed species decline but negative population trajectories accelerated after stockings ceased. Human impacts to the KLWR habitat (roads, fire ants, and feral cats) are believed to be limiting the population. Study results suggest suitable habitat and other limiting factors should be identified and corrected before supplemental stockings are used as a management option.

P33-07 **MYINT, THAN, Khin Maung Zaw, Antony J. Lynam, Alan Rabinowitz, and Saw Tun Khaing** Division of Wildlife and Nature Conservation, Forest Department, Ministry of Forestry, West Gyogone, Insein, Yangon, Myanmar (KMZ). Wildlife Conservation Society – International Programs, 2300 Southern Blvd, Bronx, NY 10460-1099 (wcsmm@mptmail.net.mm) (AJL, AR,TM, STK)

DEVELOPING A TIGER ACTION PLAN FOR THE UNION OF MYANMAR

One hundred years ago tigers were so common in Myanmar they were considered pests. Bounty hunters claimed thousands, yet populations persisted. In the last 20 years, because of decline in habitat and prey, coupled with demand for traditional medicines, tiger populations have been decimated. To provide long-term planning for tigers, and guide efforts to increase protected area coverage, in 1998 the Government of Myanmar initiated a project to develop a revised National Tiger Action Plan. Extensive surveys (camera trap, sign surveys) confirmed tigers in only three of 17 survey areas. Tigers (perhaps <150) persist in two core populations; in the far north and far south of the country, where large, intact forests areas have the potential for tiger recovery. Tiger populations can be recovered in the short-term (2-5 years) through expanding protected areas and corridors, mobilizing enforcement staff to reduce poaching of tigers and prey, and amending existing wildlife legislation to accord with international laws. In the long-term (6-20 years), increased support for tigers from local people, zoning of tiger areas to reduce habitat loss and disturbance, and maintaining connectivity of transboundary forests will be needed to save Myanmar's tigers.

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FOREST CORRIDORS - NEW PATHS FOR THE ATLANTIC FOREST HOTSPOT AND THE GOLDEN LION TAMARIN *LEONTOPITHECUS ROSALIA*, BRAZIL

Fragmentation is considered the biggest threat to the Atlantic Forest hotspot. In the golden lion tamarin *Leontopithecus rosalia* occurrence area - lowland forests restrict to Rio de Janeiro State, loss of habitat over the last 10 years has occurred at a rate of 1,2% per year. As a result, tamarins in the wild are split in isolated subpopulations. To avoid extinction due to loss of habitat and inbreending, forest corridors have been planted to reconnect these fragments. The first corridor was planted in 1997, and tamarins, sloths and birds were documented in it. The corridor currently being implemented will link Poço das Antas Reserve - the biggest protected area for tamarins, to the Rio Vermelho Ranch, a private area within the Rio de Janeiro metropolitan region that shelters reintroduced tamarins. This corridor will link 13 small patches of forest in several private ranches, covering a distance of 30 Km, and creating close to 1.000 ha of new forest available for tamarins. In two years, 40% of the corridor has been planted using native species (N=56). The corridor has been effective in linking fragments of forest, restoring genetic flow and involving the landowners in the biodiversity restoration of this precious ecosystem.

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ECOLOGICAL GENETICS OF A THREATENED PLANT: VARIATION IN PLASTICITY AND IMPLICATIONS FOR RESTORATION

Detection of ecotypic differentiation can promote an understanding of a species' distribution and be an important consideration in restoration efforts. We performed a reciprocal transplant study using four natural populations of Hydrastis canadensis to test for localized adaptation. A second study examined the importance of including multiple sources when introducing populations for restoration purposes. We established H. canadensis populations that were mixtures of three natural sources and also populations that were monocultures of each source. The reciprocal transplant study showed that H. canadensis exhibited plasticity in response to a superior site, but there was no evidence of local genetic adaptation. Additionally, the four H. canadensis sources responded differentially to microsites within the transplant site. In the population introduction study, we found that populations established from single sources performed better than those established with multiple sources, suggesting opportunistic infection of H. canadensis pathogens onto new host genotypes occurred in the mixtures. Collectively, our findings indicate that restoration efforts should involve multiple sources as a bet-hedging strategy to increase the likelihood of suitable source-microsite compatibility. However, within a given restoration site, these sources should be spatially separated, such that numerous populations are introduced each comprised of only a single source.

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A MODEL FOR RECLAIMING SEVERELY DISTURBED UPLAND AREAS IN THE NEW JERSEY PINELANDS

The New Jersey Pinelands contain some of the largest semi-wilderness areas along the mid-Atlantic coast. The region supports large tracts of a globally rare dwarf pine plains community. This fire-dependent community is characterized by a diminutive, closed-cone variety of pitch pine (Pinus rigida). Gravel extraction practices in pine plains and other pine-oak upland communities resulted in disturbed landscapes typically devoid of native vegetation. Consequently, these fragmented landscapes are severely eroded and serve as unnatural firebreaks that encourage undesirable recreational vehicle use. Developing successful revegetation strategies for areas such as these is beneficial and ecologically important. We present here the results of the reclamation of a severely degraded 25-year-old abandoned gravel pit. We developed a revegetation model using soil amendments and native warm season grasses that resulted in an increase in vegetation density, cover, and diversity over three growing seasons. Density of little bluestem (;Schizachyrium scoparium;) varied with mulch application and was greatest in areas with intermediate mulch thicknesses. Areas of maximum density in the study site (32.0 indiv/m^2) exceeded the mean density for a reference site (23.2 indiv/m^2) undergoing natural succession. By developing a successful revegetation strategy, we can apply this model to similarly disturbed sites in upland Pinelands habitats.

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THE IMPACTS OF THE RYAN FIRE ON GRAZED VS UNGRAZED LAND IN SOUTHEASTERN ARIZONA

In late April, 2002, the Ryan fire of anthropogenic origin burned 38,000 acres of grassland and savannah in southeastern Arizona. Within the burned area was an 8000 acre Audubon Sanctuary that has been ungrazed by domestic livestock since 1968. Pre- and post-burn comparisons of small mammals, birds, and woody vegetation showed significant responses to the fire on the sanctuary and adjacent working cattle ranches. Small mammals with affinities for heavy grass cover declined on the sanctuary following the burn, resembling more closely the distribution patterns of small mammals on grazed land. Birds that prefer heavy cover declined dramatically on the sanctuary for the first post-fire growing season, but started reappearing during the second post-fire season. Woody vegetation (oak and mesquite trees) was damaged or killed more often on the ungrazed area than on adjacent working cattle ranches. Fire responses to this burn may have been exacerbated because of the length of time between the fire and the onset of the summer monsoon rains, in contrast to post-fire biotic responses seen with lightning-caused fires that occur closer to the summer growing season.

P34-03 **DALL'AGLIO-HOLVORCEM, CHRISTIANE, Suzane M.F. Souza, Everton G. Costa, and F. Benedetti** Departamento Técnico-Científico, Fundação José Pedro de Oliveira, Campinas, SP, 13084-830, Brazil, (fjpodtc@hotmail.com)

ECOLOGICAL RESTORATION OF AN EDGE STRIP AT THE SANTA GENEBRA FOREST RESERVE (CAMPINAS, BRAZIL): MONITORING OF ARBOREAL SPECIES OVER A TWO-YEAR PERIOD

The Santa Genebra Forest Reserve is a fragment of semideciduous Atlantic rainforest with an area of 2.5 x 10^6 m^2, located at 22º49'S, 47º07'W, Campinas, Brazil. Its northeast edge has been invaded by *Panicum maximum* grass and several vine species, which severely reduced its tree density. To assess the feasibility of restoration of the northeast edge, a 15,000-m^2 strip was treated in 2001 by removing the invading grasses and vines, and planting 3456 individuals belonging to 22 native arboreal species, mostly from early successional stages. Mortality and tree growth were assessed one and two years after the treatment. The overall mortality rate between 2001 and 2002 was 12.8%, which rose to 20.0% between 2002 and 2003, possibly due to stronger shadowing effects caused by *Trema micrantha*, *Solanum erianthum* and *Ricinus comunis*. Our data suggest that *Enterolobium contortsliquum*, *Cytarexyllum myrianthum*, *Guazuma ulmifolia*, *Inga uruguensis*, and *Senna macrantera* are quite suitable for restoration in this kind of forest, due to their low mortality and fast growth on the initial two years after being planted. *Senna multifuga* and *Acacia polyphylla* had the highest mortalities (ranging from 29% to 91%), and do not appear to be suitable for restoration.

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MECHANISMS OF HEAVY METAL TOLERANCE OF *SESBANIA ROSTRATA*, A N-FIXING ANNUAL PLANT, TO CADMIUM AND COPPER

Sesbania rostrata, an annual tropical legume, was found to be tolerant to heavy metals with mechanism unknown. It is a promising candidate species for revegetation at mine tailings. In this study, sequential extraction with five solvents were used to extract various chemical forms of cadmium and copper in ; S. rostrata ; exposed and unexposed to Cd and Cu, so that mechanisms of detoxication can be inferred. The proportion of protein-binding form of Cd increased dramatically with Cd treatment from being undetectable in control. This suggested that Cd induced biochemical processes of producing protein-binding organic molecules which served as a major mechanism of the high Cd tolerance of *S. rostrata* . The case for Cu is quite different. The proportion of unsoluble Cu (e.g. oxalates and phosphate) in roots increased significantly under Cu treatment, which partially explains the tolerance of *S. rostrata* to Cu. However, how ; S. rostrata ; copes with the high biotic activity of inorganic salts of Cu, which increased in all parts of the plants under Cu stress, is a question for future studies. *S. rostrata* is among the very few N-fixing plants found to tolerate heavy metals. This study provided evidence for the mechanism for the first time.

P34-05 **GELDERLOOS, ORIN G.** University of Michigan-Dearborn, Department of Natural Sciences, Dearborn, MI 48128-1491 (ogg@umd.umich.edu)

THE RESTORATION ECOLOGY OF JENS JENSEN AT HENRY AND CLARA FORD'S HOME: AFTER 88 YEARS HAS IT ACHIEVED JENSEN'S VISION?

In 1915, Henry and Clara Ford hired Jens Jensen to design and plant the landscape around their new home on the bank of the Rouge River in Dearborn, Michigan. Jensen's signature landscape consists of long meadows bordered by forests of native species of trees, shrubs, and wildflowers. The topography is suitable for a mesic forest. An inventory of all trees > 10 cm were compared with the 17 species Jensen specified on his landscape plan. The inventory found 1,671 trees of 46 species with 13 of the 17 species specified by Jensen on the site. The most abundant species (more that 300 trees) was Sugar Maple (Acer saccharum) with White Ash (Fraxinus americana), Red Oak (Quercus rubra), Hop-hornbeam (Ostrya virginiana), and Silver Maple (Acer saccharinium) exceeding 100 trees each. The other species are representative of a mesic forest in southeast Michigan. This restored landscape, preserved by the University of Michigan - Dearborn, achieved Jensen's vision and serves as a model landscape for residential neighborhoods, industrial campuses, and municipal buildings in southeast Michigan. Jens Jensen was a visionary and promoter of native landscaping well ahead of his time.

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BROWNFIELD REDEVELOPMENT IS KEY TO LAND CONSERVATION IN NEW JERSEY

New Jersey is among three states noted for efforts to implement smart growth on a statewide basis. Maryland operates with a strong county system, Oregon focuses development within municipal areas. New Jersey, with 567 municipalities in 21 counties and regional cross-county cooperation, operates with a series of incentives and disincentives to encourage development in older areas and areas already developed, and encourage preservation of open space and farmland in less developed areas. New Jersey operates on the theory that conservation efforts need to be coupled with incentives for redevelopment of brownfields, rendering older communities more attractive for residential, retail, and industrial development. Likewise, incentives for redevelopment in older, settled areas are successful only if they are accompanied by a strong policy for open space and farmland preservation. Developers are key players in this scenario. Brownfield redevelopment incentives such as grants, loans, tax incentives, reimbursement, planning and design support, expedited review, permit coordination, and infrastructure enhancement help level the playing field as developers face off with conservationists over an ever-shrinking inventory of available land. In this project, we survey a diverse population of developers, representing home builders, industrial and office developers, and mixed use specialists, asking them to rank the importance of the various incentives and disincentives to their decisions about where to develop.

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REPRODUCTIVE SUCCESS OF BIRDS IN TWO GRASSLAND HABITATS

Grasslands and organisms associated with them are a natural component of the eastern United States, and these ecosystems contain bird species that are declining dramatically. Grassland habitat to support birds and other native species is being restored at the Montezuma National Wildlife Refuge in central New York State, USA. Areas have been restored to native warm-season grasses, which are typically bunch grasses suggested to provide better habitat for many species than cool-season grasses. To assess the value of the restoration program, the reproductive success of birds at four warm-season grass sites and four cool-season grass sites was measured by determining the predation rate on artificial nests stocked with unfertilized quail eggs. Results from the two-year study indicate that the restored warm-season grasses are typically slower to develop and thus provide less cover early in the breeding season. Predation rates during the first-year were independent of grassland type.

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ASSESSING STRESSORS FOR RESTORATION PLANNING, PRIORITIZING, AND IMPLEMENTATION FOR AN EASTERN DECIDUOUS FOREST NATURAL COMMUNITY

Conservation and restoration strategies are being implemented to protect highly fragmented valley clayplain forest in Vermont and New York. A rapid methodology using releve and plot-based sampling helped determine stressors that impede re-establishment of natural vegetation composition and structure. Previous work concluded that the natural disturbance regime, a landscape-scale factor often of concern, remained functional in the landscape. Factors identified as stressors were: isolation from seed sources (heavy-seeded species, such as oaks and shagbark hickory, and maple and basswood); competition from haymeadow grasses, which appeared to substantially impede establishment of tree and shrub seedlings; seedling herbivory by white-tailed deer; structural and compositional changes from invasive exotic shrubs; and alteration of microtopography and hydrology. Time-series or space-for-time-substitution studies are needed to evaluate the time-scale at which these stressors operate, the actual degree to which they impede ecosystem recovery, and efficient strategies for ameliorating them. Empirical experiments and long-term monitoring recommended in the restoration plan will help to provide such data. The analysis concluded that not all sites were seriously affected by these stressors. Differences were observed in stressor severity on lands previously used as hayfield and those that were pasture. Active restoration strategies were recommended for alleviating stressors on high-priority sites.

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CONFRONTING DYNAMIC ECOSYSTEM CHANGE IN JAMAICA BAY

Jamaica Bay, a 26,000 acre unit of Gateway National Recreation Area in New York City's eastern boroughs, is changing fast. Jamaica Bay is a precious natural resource with a rich cultural history preserved in an urban national park. It is home to many species of migratory and nesting birds (including several endangered species), a breeding ground for the diamondback terrapin, a nursery for fishes, and a haven for urban dwellers who need to get away from the stresses of city life. Its salt marsh wetlands are an increasingly rare and precious resource, important as habitat but also to filter and store the quantities of pollutants entering the bay's ecosystem. Jamaica Bay's salt marsh habitat is disappearing at an alarming rate (approximately 50 acres per year are being lost). Natural and manmade processes operating in and around the Bay create an ecosystem under constant and massive stress. Natural factors and manmade activities combine in ways we don't yet understand to affect the Bay's natural systems. There are presently many research projects in the Bay by academic and public agency groups, in efforts to determine the major factors in changes in the Bay ecosystem, particularly the loss of salt marsh wetlands, and how environmental factors combine with each other to drive ecosystem changes. In addition, restoration projects are underway in some of the marsh areas to determine successful techniques of stabilizing the existing marshes. The display is intended to visually summarize recent changes in Jamaica Bay and its surroundings, as well as to document some of the work the National Park Service and its partners in the Bay are doing to understand cause and effect to the Bay ecosystem, and to restore it.

P34-10 **PEARSALL, DOUGLAS R, Donald Tilton, Christopher A. Clampitt, Jack McGowan-Stinski, and Sherri Laier** The Nature Conservancy, Michigan Chapter, 101 E. Grand River, Lansing, MI 48906 (dpearsall@tnc.org) (DRP, SL). Tilton & Associates, 501 Avis Drive, Suite 5C, Ann Arbor, MI 48108 (DT). Michigan Department of Environmental Quality, Geological and Land Management Division, 301 East Louis Glick Highway, Jackson, MI, 49201-1535 (CAC). The Nature Conservancy, West Michigan Program Office, 456 Plymouth Ave. NE, Suite A, Grand Rapids, MI 49505 (JM-S)

ECOSYSTEM RESTORATION OF A MIDWEST CALCAREOUS FEN: WATER LEVEL AND VEGETATION RESPONSES TO MULTIPLE RESTORATION STRATEGIES

Throughout their range, calcareous fens harbor biodiversity that is disproportionately significant relative to their size and total area. In the glaciated midwest, fens are relatively common and are a component of many landscape conservation projects. Agriculture and residential development have directly and indirectly altered wetland hydrology and, in many cases, led to invasion by non-native plants and further degradation. Ives Road Fen, in southeastern Lower Michigan, is a highly diverse wetland that has suffered installation of ditches and tile lines, and has been heavily invaded by non-native plants. Over a period of several years, we have taken an adaptive approach to restoration at Ives Road by filling ditches, redirecting channelized surface flows, removing tile lines, cutting and poisoning invasive plants, and using prescribed fire. Water level monitoring indicates that each of the hydrologic tactics has resulted in raising water levels that had been lowered. Vegetation monitoring has enabled us to develop a refined, multi-step process to restoring vegetation. In addition, negative effects that can result from hydrologic restoration have not manifested themselves. Further restoration will be guided by what we have learned over the years, and we have communicated these lessons to partners across southern Lower Michigan and elsewhere.

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SPATIAL SIMULATION OF AN ANTHROPIC LANDSCAPE EVOLUTION; INTEGRATING CELLULAR AUTOMATA, MARKOV CHAIN AND MULTICRITERION METHODS: CASE STUDY IN A SWISS CONTEXT

In industrialized country, landscape changes observed during the lasts decades (i.e. urbanization and agriculture intensification) are principal cause of habitat degradation, landscape fragmentation and then loss of biodiversity. Understanding the forces driving the landscape dynamics and their effects of future land use are essential to define an efficient biodiversity conservation strategy. The aim of our study is to propose a methodology for spatially simulate future land use evolution, integrating land use change tendency (i.e. transition matrix) and spatial “driving forces” (i.e. distance of natural reserves, type of land use, ground slope, …). A case study was realized in a 20 km2 area, in the Rhône Valley (Switzerland). We extract data of land use (forest, urban, agricultural and natural area) from aerial photo (years 1946 and 2000). With a multicriterion approach were calculated maps of land change affinity for every land use class considered. Aggregation of observed evolution and landscape change affinity was realized using Markov chain and cellular automata theory. The approach was realized in raster format with IDRISI32 GIS software. Six scenarios of future land use were calculated for year 2030. Our approach constitutes a decisions tool to evaluate spatially consequences of managers and conservation planners’ decisions.

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BINATIONAL SCIENCE AND CONSERVATION IN BAJA AND THE SEA OF CORTEZ

The Gulf of California is an immense natural basin joining Mexico and the United States. It harbors a uniquely rich sea, surrounded by one of the most singular deserts on earth. The thousand-kilometer long peninsula, isolated from the Mexican mainland, encloses a similarly long sea, isolated from the Pacific. The sea and the desert embrace each other, and mutually create the conditions for the other to evolve in unique ways. Insularity, endemism, rarity, fragility, richness, and diversity make this region one of the most extraordinary places in the world. The atmospheric and oceanographic cycles impact this sea and this land like in few other places on earth, and conservation here demands the preservation of all the regional ecosystems as a single, unique complex. There are no boundaries for studying and conserving the Gulf and the surrounding deserts. Recent years have seen a tremendous flowering of science and conservation in the Sea of Cortés and Baja California, through many binational—and in many cases international—efforts. Taken as a whole the region is one where conservation biology is being put to the full test, and where the lessons are worth learning.

S01-2 **BAXTER, CHARLES and Raphael Sagarin** Hopkins Marine Station of Stanford University, Pacific Grove, CA 93950 (charles.baxter@comcast.net) (CB); Department of Environmental Health Sciences, University of California, Los Angeles 90095-1772 (RS).

FROM ED RICKETTS TO PISCO: LOOKING “FROM THE TIDE POOL TO THE STARS AND THEN BACK TO THE TIDE POOL AGAIN”

Once upon a time we believed in the balance of nature. Now we are concerned about what changes in nature are natural and what changes are anthropogenic. This presents us with the problem of how to extrapolate recent trajectories into an uncertain future. The intertidal of the Pacific coast provides a tractable arena to examine the biological consequences of change and to study the ongoing response. From a diversity of sources we can reconstruct a history of life in the coastal zone from the Miocene to the present. We examine the pioneering research in intertidal ecology that began around the time that Ed Ricketts and John Steinbeck explored the Sea of Cortez and the role it played in generating current environmental consciousness. Modern science has returned to examine patterns of the distribution of life on the coast with new ideas, tools and motivations in large-scale multidisciplinary approaches to its past, present and future status. We present preliminary results from intertidal field studies conducted during a recent retracing and extension of the Ricketts-Steinbeck surveys. Current studies validate Ricketts’s holistic view of the intertidal and how it can serve as a model to understand deeper and broader issues in ecology.

S01-3 **SÁENZ-ARROYO, ANDREA, Callum M. Roberts, Jorge Torre, Micheline Cariño-Olvera, and Roberto R. Enríquez-Andrade** Environment Department, University of York, York, YO10 5DD, UK (asaenz@cobi.org.mx) (ASA, CMR); Comunidad y Biodiversidad A.C., Bahía de Bacochibampo, S/N Colonia Lomas de Cortés, Guaymas, 85450, Sonora, México (ASA, JT); Universidad Autónoma de Baja California Sur, Área Interdisciplinaria de Ciencias Sociales, Apartado Posta 19 -B, La Paz, 23080 Baja California Sur, México (MCO); Universidad Autónoma de Baja California, Facultad de Ciencias Marinas, Apartado Postal 453, Ensenada, 22870, Baja California, México (RREA).

RAPIDLY SHIFTING BASELINES AMONG FISHERS OF THE SEA OF CORTEZ

The shifting baselines syndrome describes how as one generation replaces another, people's perspectives change and they no longer believe historical anecdotes of past abundance or size of species. Here we investigate how far and fast environmental baselines of fishers are shifting in the Sea of Cortez where fish populations appear to have declined steeply over the last 60 years. We interviewed more than 100 fishers from the Sea of Cortez. We found consistent decline from old to young fishers in the percentage that named species from a suite of large and vulnerable animals as depleted and a consistent change in the mention of nearshore and offshore sites as productive. Despite times of plentiful large fish within living memories, few young fishers appreciate that large species had ever been common or that nearshore sites had been productive. Such rapid shifts in perception reveal that the Sea of Cortez appears to have had abundant large vulnerable marine vertebrates such as turtles and groupers and easily extirpated conchs and oysters in the 1940s. And all these species have become threatened by local population explosion, tourism development, road construction, and expansion of fish markets in the area during the second half of the 20th century.

S01-4 **MARKAIDA, UNAI, Cesar A. Salinas Zavala, Joshua J.C. Rosenthal, and WILLIAM F. GILLY**
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JUMBO SQUID: WHAT IS THE FATE OF THIS MYSTERIOUS PREDATOR AND MAJOR FISHERY IN THE GULF OF CALIFORNIA?

Commercial fishing of Dosidicus gigas in the Gulf of California commenced in 1974 and landings have increased dramatically during the last decade. Although this fishery is essentially artisanal, it now ranks third or fourth in Mexico in terms of both value and tonnage. However, our knowledge of the biology of this species is fragmentary. We carried out conventional tag and recapture studies in the central Gulf. Overall return rate in two experiments (1000 squid each) was 8%, suggestive of substantial fishing pressure. Estimates of the population in one fishing zone (~100 km2) near Santa Rosalia yielded about 4 million individuals. Based on this population size and conservative estimates for body mass (10 kg) and daily prey consumption (10% body weight), the jumbo squid in this area alone would consume about 4,000 metric tons of prey per day, primarily myctophid fishes, for half the year. Dosidicus gigas clearly constitutes a major predatory presence in this region of the Gulf, and must play a powerful role in shaping the regional ecosystem, both by its great abundance and by its absence following seasonal mass migrations. We suggest additional research on Dosidicus that will be essential for developing ecosystem-based regional management programs.

S01-5 **MICHELI, FIORENZA, Christopher Costello, Laura Gonzalez, Sergio Guzman del Proo, Sergio Hernandez Vazquez, Salvador Lluch Cota, Bonnie McCay, Enrique Morales Bojorquez, German Ponce Diaz, Mario Ramade Villanueva, and James Wilson** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; D. Bren School of Environmental Science and Management, University of California, Santa Barbara, CA 93106; Integrative Biology, University of Texas, Austin, TX 78712; Escuela Nacional de Ciencias Biológicas, Instituto Politecnico Nacional, México D.F. 09400; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Department of Human Ecology,Rutgers University, New Brunswick, New Jersey 08901; Instituto Nacional de la Pesca, La Paz, BCS 23020, Mexico; Centro de Investigaciones Biológicas del Noroeste, La Paz, BCS 23090, México; Federacion de Cooperativas Pesqueras “Baja California”, Ensenada, BC 22860, México; School of Marine Sciences, University of Maine, Orono, ME 04469

HUMAN AND BIOPHYSICAL PROCESSES UNDERLYING THE PERFORMANCE OF SMALL-SCALE FISHERIES IN BAJA CALIFORNIA

Small-scale fisheries engage over 90% of the world’s fishers and produce over half the worlds annual marine fish catch, and are one of the dominant influences on coastal ecosystems. Our interdisciplinary research project seeks to explain the variation in performance of small-scale fisheries and associated coastal marine ecosystems along the Pacific coast of Baja California. Performance is evaluated in terms of resource productivity, economic yield, sustainability of human activities and communities, and persistence of marine populations and ecosystems. Ongoing work includes the development of integrated biophysical, agent-based, and bioeconomic models, and statistical analysis and retrospective analyses of historical trends in catches, effort, and oceanographic conditions. Planned field surveys of target fisheries species, lobster and abalone, and of their habitats, will be conducted in conjunction with ethnographic studies and collection of socioeconomic descriptors at six locations along the Baja California coast, including the first Baja fisheries to be certified as sustainable by the Marine Stewardship Council. The study will provide a framework for examining the possible outcomes of environmental change, changes in fisheries regulations and incentives, and the new and future uses of coastal resources in Baja California with anticipated population increases and coastal development.

S01-6 **NICHOLS, WALLACE J. and Stephen Delgado** WiLDCOAST International Conservation Team, POB 324, Davenport, CA 95017, and Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118 (wjnichols@wildcoast.net) (WJN); Department of Life Sciences Communication, College of Agriculture & Life Sciences, University of Wisconsin - Madison, 440 Henry Mall, Madison, WI 53706 (SD).

TRANFORMING TURTLES FROM A MYSTICAL MEAL TO AN ICON OF COMMUNITY CONSERVATION

For millennia sea turtles have provided a source of food for people in the Gulf of California. Sea turtle feasts have spiritual and cultural significance for indigenous and Mexican people alike. Five species of sea turtles use the Gulf as a foraging, developmental, and/or nesting area. Sea turtles from as far away as Japan migrate to the Gulf's rich waters. However, hunting and incidental catch have killed thousands of sea turtles each year, resulting in a decline in population sizes and a conservation crisis. Rather than a source, the Gulf has become a sink for sea turtle populations. All five Gulf species are now endangered. Over the past decade, a binational research and conservation program has investigated the biology and threats to sea turtle. The Grupo Tortuguero de las Californias (Sea Turtle Conservation Network of the Californias) is an alliance of communities, fishing cooperatives, NGOs, scientists, government agencies, and individuals formed to restore the ecological, economic and cultural role of sea turtles. Through community-based monitoring of sea turtle populations, network meetings, and social marketing the group has developed a model for marine conservation and international collaboration. And sea turtles are now emerging as a powerful conservation icon for the region.

S01-7 **AGUIRRE-MUÑOZ, ALFONSO and Bernie Tershy** Grupo de Ecología y Conservación de Islas, A.C., Avenida López Mateos 1590-3, Fracc. Playa Ensenada, Ensenada, B.C. 22880, Mexico (aaguirre@islandconservation.org) (AA); Island Conservation, UCSC, 100 Shaffer Road, Santa Cruz, CA 95960 (BT)

ISLAND BY ISLAND: RECONQUERING THE SEA OF CORTEZ FROM INTRODUCED SPECIES

Covering only 2.7% of the earth's surface, islands are critical to biodiversity, holding 15-20% of plants, reptiles, and bird species. But 67% of animal extinctions have been on islands. The biggest threat is the introduction of plants and animals. More than 230 islands and islets off the coast of Northwest Mexico have experienced limited impacts, thanks to their dry climate and secluded location, particularly in the Gulf of California. They are among the most intact non-polar islands and are sanctuaries of endemic biodiversity: 185 vertebrates and  115 plants, plus pinnipeds, turtles, and 38 breeding seabirds. Nevertheless from 19 extinctions, 18 can be attributed to introduced mammals. These islands have benefited from a collaborative effort between Mexican government agencies (INE and CONANP), academic institutions, and NGOs, following an integrated conservation approach. A sine qua non condition has been the removal of introduced species. We have eradicated 31 introduced populations from 24 islands, protecting 69% of the endemic seabirds, 21% of the vertebrates, and 25% of the plants. Since removal, seabirds have recolonized and expanded breeding colonies on the islands. We have created a database to monitor and define priorities, as we conduct research, improve techniques, and promote new protected areas.

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DEVELOPING A COMPREHENSIVE STRATEGY AND LIST OF TARGETS FOR CONSERVATION IN THE GULF OF CALIFORNIA

Many organizations share a vision to conserve biologically important and diverse areas within the Gulf of California. As a means to a comprehensive conservation strategy, Comunidad y Biodiversidad has partnered with the Nature Conservancy to develop a network of conservation areas for the Gulf using the conservancy's ecoregional assessment methodology. Participatory ecoregional assessment requires collaboration between NGOs, government agencies, local communities, and scientific experts to arrive at a realistic conservation target list that represents the ecoregion's biological diversity and feasible conservation strategies. Conservation targets include species, natural communities, and ecological systems and processes. Conservation goals are derived for each target and represent a hypothesis for the number and distribution of the target necessary to maintain long-term viability. Conservation areas are identified which are sufficient in size and distribution to capture ecological gradients and meet conservation goals. The use of a sites selection algorithm facilitates the selection of conservation areas based on tradeoff analyses between biological values and other economic or social data. This establishes a baseline of data and an analysis that is replicable and transparent and can be refined and enhanced as new data becomes available and as changes occur in marine and land use in the Gulf.

S02-1 **OLDEN, JULIAN D. and N. LeRoy Poff** Colorado State University (olden@lamar.colostate.edu)

FORCASTING CURRENT AND FUTURE PATTERNS OF BIOTIC HOMOGENIZATION IN RESPONSE TO URBANIZATION

Global urbanization is unprecedented in its rate of growth, the absolute numbers of people involved, its geographic scope, and its environmental consequences. The ecological implications of urbanization are diverse and include widespread changes in the global distribution of biota, which collectively are causing the homogenization of historically unique biotas. Recent theoretical advances have involved the development and validation of a mechanistic model that predicts levels of biotic homogenization/differentiation based on dominant ecological processes operating on the landscape, and spatial patterns and rates of species introductions and extirpations. Here, we explicitly link historical and contemporary models of urbanization (relating habitat disturbance and connectivity to species introductions and extirpations) and the above mechanistic model (relating species introductions and extirpations to changes in community similarity) to predict the magnitude of biotic homogenization/differentiation as a function of human urbanization. Using indices of urbanization we apply these models to provide global predictions of current and future patterns of biotic homogenization/differentiation for a diverse set of major taxonomic groups. Next, we provide detailed predictions for the United States, validate the model using empirical estimates of fish fauna homogenization, and utilize urbanization prospects to forecast those geographic locations most susceptibility to future biotic impoverishment.

S02-2 **BLAIR, ROBERT B.** Department of Fisheries, Wildlife, and Conservation Biology (blairrb@umn.edu)

URBAN SPRAWL AND ITS EFFECTS ON BIRDS: INVASION, EXTINCTION AND HOMOGENIZATION

Urbanization affects native biodiversity in myriad ways and at multiple levels of biological organization. Many researchers have suggested that urbanization may lead to the replacement of native species with invasive ones and consequent global homogenization. Here, I explore this idea by comparing the occurrence of birds along gradients of urban land-use in SW Ohio and northern California and examining the effects of urbanization at the species, community, landscape, and global levels. At the species level, urbanization leads to local patterns of extinction and invasion. These patterns, in turn, affect community richness and diversity, which are mirrored in landscape heterogeneity. At the global level, local extinction of endemic species, followed by invasion by weedy, ubiquitous species leads to faunal homogenization between ecoregions. To determine what makes these weedy species successful in urban areas, I assessed the life history attributes of the birds in Ohio. I found that the number of species that use a multiple-brood breeding strategy increased with urbanization. I also found that birds identified as high-nesting species reached peak levels at the most natural sites while low-nesting species exhibited the reverse trend. These findings suggest that nesting success may drive the distribution of avian species in urban areas.

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EFFECTS OF URBANIZATION ON FISH INVATIONS AND EXTINCTIONS IN CALIFORNIA

Urbanization is a growing source of disturbance for aquatic systems and often acts in concert with other types of disturbance, often anthropogenic in origin. Together theses forces can create 'invasion windows' that facilitate species invasion and may drive sensitive species to extinction. Using state-wide data for both native and exotic fishes as well as landscape-level GIS data for all the watersheds in California, we explore the effect of urbanization on fish invasions. Using multiple regression models, we show that urbanization has a significant negative effect on native species diversity and a significant positive effect on fish invasion. These two forces acting together contribute to an ongoing process of biotic homogenization across the state.

S02-4 **PAUCHARD, ANÍBAL, Lohengrin Cavieres, Alicia Marticorena, Alejandra Jiménez, and Ramiro Bustamante** Facultad de Ciencias Forestales, Universidad de Concepción, Casilla 160-C, Concepción, Chile, (pauchard@udec.cl)(AP). Departamento de Botánica. Universidad de Concepción, Casilla 160-C, Concepción, Chile (LC, AM, AJ). Departamento de Ecología, Facultad de Ciencias, Universidad de Chile, Santiago, Chile (RB).

HOMOGENIZATION BY ALIEN PLANTS IN REGIONS WITH CLIMATIC PARALLELS: A COMPARISON BETWEEN CALIFORNIA AND CENTRAL CHILE

Alien plants are increasingly dispersing and invading ecosystems due to human activity. This trend is expected to increase local diversity but to decrease intercontinental diversity thus homogenizing the global flora. Alien floras are hypothesized to be similar, especially in regions with climatic parallels. We compared the alien floras of California and Central Chile to test for differences and similarities in species richness and composition. For California, we used records by county (58) and for Chile by administrative regions (8). We found that California has 1191 alien species, while central Chile 600. Both regions share 386 species. In California and Chile, species assemblages respond to climatic gradients associated with latitude and local geomorphology. For some families, species diversity is associated to these climatic gradients. However, we found important differences in the floras of the two regions. California has a higher diversity of alien plants, which may be related to higher propagule pressure caused by higher exposure to international trade or to more intense human disturbances. Nonetheless, ca. 40% species of the alien flora of Chile still have not been reported for California. Comparative studies of alien floras may contribute to establish priorities for early detection and control.

S02_7 **MILLER, JAMES** Iowa State University, Ames, IA 50011 (jrmiller@iastate.edu)

BIOTIC HOMOGENIZATION AND THE SCALE OF HUMAN EXPERIENCE

Environmental degradation is as old as human history, but broad-scale biotic homogenization is a relatively recent phenomenon that is primarily a function of technological innovations over the last century. One result of such innovations is that people are increasingly able to ignore the natural limits of place. We have responded by creating a monotonous sameness in suburban and urban areas that accommodates few species other than our own. There is a growing awareness, however, that such environments are not sustainable over the long-term and therein lays the hope of enhancing conditions for biodiversity by reducing the ecological footprint of our cities, towns, and suburbs. Recent advances in the fields of sustainable design and ecological restoration hold much promise in terms of reconciling our own lifestyles with the needs of native species. Although ecoregions provide the context for such practices, their implementation necessarily occurs over finer spatial scales, affording the opportunities for involvement of a larger segment of society in conservation activities and for fostering greater ecological awareness at the grassroots level. Ultimately, such a foundation is necessary for the broader transformations in our economic and political institutions needed to maintain biodiversity.

S02-8 **SCHWARTZ, MARK W.** Department of Environmental Science & Policy University of California mwschwartz@ucdavis.edu

CAN RARE PLANTS PERSIST IN THE URBAN ENVIRONMENT?

Biotic homogenization is driven by two complementary phenomena. The addition of a uniform suite of weedy species increases homogeneity, as do losses of unique, often rare, species. With regard to homogenization, the most damaging species to lose are those that are infrequent. A recent study documented that 24% of county level occurrences of federally listed threatened and endangered plants are found within the 8% of land where half of all Americans live. This study also showed that most species of conservation concern within the San Francisco Bay Metropolitan Region (Bay Area) are found on land within the public domain, but that resources for management are few. Similarly, we also recognize that urban centers are vulnerable to the two attributes that threaten species diversity the greatest: habitat loss and invasive species. I summarize data monitoring data from a variety of sources to test two hypotheses of conservation interest for plants in the Bay Area. First, small plant populations within the urban environment are as likely to persist through time as those in remote areas; and (2) losses of rare plants within the urban environment are more likely in highly invaded habitats.

S03-2 **POWELL, GEORGE** World Wildlife Fund-US, 1250 24th Street, NW, Washington, DC 20037 (george.powell@wwfus.org)

IDENTIFYING ECOLOGICALLY VIABLE AREAS IN THE CONSERVATION OF TROPICAL FRUGIVORES

We looked at seasonal movements of a suite of large frugivorous birds in the tropical moist forest biome of Central America to assess the ecological viability of biodiversity in that region's integrated system of protected areas. Three species representing 3 families, ;Ara ambigua; (Psittacidae), ;Pharomachrus mocinno; (Trogonidae), and ;Procnias tricarunculata; (Cotingidae), were radio-tagged and monitored over a minimum of 4 years. Each of these species exhibited large-scale, predictable movements among the range of major habitats within the moist forest, including movements among middle elevation sites, among lowland sites along a moisture gradient, and between lowland and middle-elevation sites. The implications of these movements, which are consistent with those being described for other large Central American frugivores, are that most protected areas in the region are not adequately designed to protect this suite of species. Most countries recognize and accept this fact and have taken some steps to redress the inadequacies. However, there is currently no systematic approach to identifying and incorporating these large-scale movements into the design of protected area systems.

S03-4 **PEERY, CHRISTOPHER A. and Kathleen L. Kavanagh** Idaho Cooperative Fish and Wildlife Research Unit Department of Fish and Wildlife (cpeery@uidaho.edu) Department of Forest Resources University of Idaho (KLK)

CAN WE SET ECOLOGICALLY DEFENSIBLE GOALS FOR PACIFIC SALMON?

Achieving recovery of ESA listed Pacific salmon (Oncorhynchus spp.) populations poses significant biological, political and economic challenges unique to fisheries and aquatic systems. Pacific salmon exhibit a complex life cycle requiring a diversity of habitats and environmental conditions. Impacts to freshwater and marine habitats as well as the connecting migratory corridors must be addressed when considering recovery efforts and illustrate the differences between population-based and ecosystem-based approaches to conservation biology. Early discussions to establish recovery goals for ESA listed Snake River Chinook salmon centered on minimum populations sizes required to produce sustainable populations and preserve genetic diversity, but this type of 'minimum viable population' approach may be insufficient for salmon systems. Recent studies suggest that salmon and their ecosystems have evolved to be mutually dependent upon one another. Salmon-derived nutrients, in particular, appear to be crucial to primary productivity of salmon-forests ecosystems, especially in the low nutrient systems of the interior Pacific Northwest. Pacific salmon provide an opportunity to establish ecologically defensible recovery goals that will assure species persistence and preserve their ecological roles, but significant biological and political obstacles will need to be overcome in the near future.

S03-6 **BERGER, JOEL** Teton Field Office, Wildlife Conservation Society, PO Box 340, Moose, WY 83012 (jberger@wcs.org)

ANIMAL BEHAVIOR MAY REVEAL ECOLOGICAL RECOVERY -- DO POLICY MAKERS REALLY CARE?

Some species play disproportionate ecological roles; when they disappear, systems may experience radical changes. While ecosystem recovery is an oft stated goal of species restoration, animal behavior has been a neglected tool upon which to gauge progress. To indicate how, when, and where behavior might prove fruitful, I report two case studies. The first concerns the impending federal de-listing of grizzly bears and wolves from T & E status in the Yellowstone region and the extent to which prey (elk, bison, moose) behavior within and beyond park boundaries has become 're-normalized' as these carnivores re-colonize previously vacant habitats. Conclusions about ecological recovery in this ecosystem will depend upon which prey species are included in analyses. The second case involves the unraveling of a food web in California's Channel Islands where feral pigs facilitated golden eagles. Island foxes apparently failed to display appropriate anti-predator behavior, and collapsed due to eagle predation. Based on these empirically-derived insights, decision-makers chose to either ignore or modify policies aimed at ecological recovery. These varied policy responses underscore resultant attitudinal differences between state versus federal perspectives as well as cultural inertia in state government.

S04-1 **CZECH, BRIAN** Virginia Polytechnic Institute and State University, Northern Virginia Center, 1021 Prince Street, Alexandria, Virginia 22314 (brianczech@juno.com)

URBANIZATION AS A THREAT TO BIODIVERSITY: NICHE BREADTH, TROPHIC THEORY, AND ECONOMIC GEOGRAPHY

"Habitat loss" is often cited as the primary cause of species endangerment in the United States, followed by invasive species, pollution, and direct take. However, various types of habitat loss are readily identified. Urbanization is one type of habitat loss that entails a relatively thorough transformation from the "economy of nature" to the human economy. It is also a common transformation on the economic landscape because it represents the proliferation of light manufacturing and service sectors, which are "economic trophic levels" supported by the agricultural and extractive sectors operating in rural areas. Largely for the sake of economic efficiency, urban areas also tend to comprise residential areas for the labor force. When the types of habitat loss are broken down into numerous categories, urbanization remains the leading cause of species endangerment in the contiguous United States. Urbanization is strongly associated with other prominent causes of endangerment such as roads and industrial development. This association helps to identify urbanization as both a proximate cause of species endangerment and a co-symptom of a more distal or ultimate cause, i.e., economic growth, which results in a higher extent and intensity of urbanization in addition to the various other habitat-transforming economic sectors more common to exurban areas.

S04_2 **SQUIRES, ROD** Department of Geography, University of Minnesota, Minneapolis, MN 55455 (squires@umn.edu)

PRESERVING OPEN SPACE IN AND AROUND A METROPOLITAN AREA

There are a plethora of efforts to preserve open space from urban development in and around the Twin Cities metropolitan area. Some involve public acquisition of a landowner's use rights, either acquiring fee title or encumbering the land with an easement, while others involve public restriction on how a landowner may exercise the use rights. This paper asks, "How should we think of these efforts - in terms of our democratic institutions and in terms of past and future urban growth?"

S04-3 **SNYDER, STEPHANIE and Robert Haight** USDA Forest Service, North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108. (stephaniesnyder@fs.fed.us)

OPTIMIZATION DECISION TOOLS TO SUPPORT METROPOLITAN OPEN SPACE DECISIONS

Urban land planners face difficult decisions when selecting lands for conservation and open space protection. First, planners and stakeholders have a variety of goals and priorities for land acquisition, some of which may be in conflict, including habitat protection for rare or native species, public accessibility to open spaces for recreation, and economic efficiency. Second, planners face intense competition for open space from land developers. As a result, open space is expensive and resources are usually insufficient to acquire a large number of parcels at once. Third, land availability is dynamic: open space sites currently on the market may be developed if protection is delayed, and sites not immediately available may be on the market later. In response, optimization decision models have emerged as useful tools that can assist managers and planners in making difficult land use protection decisions. Application of these tools is illustrated through a discussion of open space protection in the Fox River watershed in Chicago.

S04-4 **WESTPHAL, LYNNE M., Alaka Wali, Douglas F. Stotz, David Soucek, and Jeffrey M. Levengood** USDA Forest Service North Central Research Station, 1033 University Place, suite 360, Evanston IL 60201-3172 (lwestphal@fs.fed.us) (LMW); Field Museum of Natural History, 1400 S. Lake Shore Drive, Chicago IL 60605-2496 (AW, DFS); Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, IL 61820 (DS, JML).

BROWNFIELDS REDEVELOPMENT: A HIDDEN OPPORTUNITY FOR CONSERVATION BIOLOGY

Brownfields—land that is unused or underused due to concerns about contamination—are often prominent features of urban areas. Conservation in an urbanizing world must take brownfields into consideration because areas of heavy industry can harbor substantial areas with ecological significance. The Calumet region of NW Indiana and NE Illinois is one such place, where the Calumet Initiative, a partnership of government, industry, academia, nonprofit groups and local residents, is working towards economic and ecological sustainability. In the Calumet, partners have developed a research and action program that integrates social, biological, and physical issues in order to move towards a sustainable future. Current activities include planning that considers biodiversity as well as redevelopment goals, research that investigates invasive species, phytoremediation, environmental toxicology, collaborative planning and state threatened and endangered species viability. Using a marsh site in Calumet that serves as a rookery for a state threatened species and borders a potential superfund site, we will outline this approach and its wider application for conservation biology.

S04-5 **BENGSTON, DAVID N. and Yeo-Chang Youn** USDA Forest Service, North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108 (dbengston@fs.fed.us); Lab of Ecological Economics and Forest Policy, Department of Forest Resources, Seoul National University, San 56-1 Shillim-dong, Gwanak-gu, Seoul 151-742, Republic of Korea.

URBAN CONTAINMENT POLICIES AND THE PROTECTION OF NATURAL AREAS: THE CASE OF SEOUL'S GREENBELT

Many countries around the world have responded to growing concern about the environmental and social costs of sprawling development patterns by creating a wide range of policy instruments designed to manage urban growth and protect natural areas. But the effectiveness of these policies is often questioned. Out of the array of growth management techniques, various types of urban containment policies are considered by some to be a promising approach. This paper reviews three types of urban containment policies (greenbelts, urban growth boundaries, and urban service areas) and then examines the case of Seoul's greenbelt-based policy. We show that Seoul's long-standing greenbelt has generated significant social and environmental benefits (e.g., amenity and recreational value for urban residents, and protection of agricultural land, natural areas, and life-supporting ecological functions and services) as well as significant costs (e.g., increased land and housing prices in Seoul, constraint of greenbelt landowners' ability to develop their land, and increased urban congestion). We conclude that a less rigid greenbelt, combined with a system of integrated land use policies and regional planning, would have generated greater net benefits and reduced the ecological footprint of Seoul.

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URBAN GROWTH MANAGEMENT AND ECOLOGICAL SUSTAINABILITY: CONFRONTING THE "SMART GROWTH" FALLACY

Growth management practices in the United States represent an ongoing process of growth accommodation. The current "smart growth" focus of those management practices serves to reinforce that growth accommodation bias. As a result of this pro-growth orientation, growth management in general, and "smart growth" in particular, have largely ignored the matter of sustainability. With a continued endorsement of growth under both growth management and "smart growth," sustainability considerations tend to translate into references to prospects for "sustainable growth," when, by definition, growth represents unsustainable behavior, i.e., behavior incapable of being continued or maintained indefinitely. Current growth management and associated "smart growth" initiatives must therefore be recognized as practices that are incongruous with advancing the goal of ecological sustainability. This paper portrays the growth-accommodation practices that comprise growth management and "smart growth" initiatives today, considers the magnitudes of ongoing demographic, economic, and urban growth that are destined to nullify those initiatives, and suggests alternative growth management endeavors intended to further ecological sustainability.

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THE BIG TENT OF GROWTH MANAGEMENT: SMART GROWTH AS A MOVEMENT

Growth management efforts in the U.S. have failed to gain significant political support in many regions. This lack of support has in turn limited efforts to manage development patterns and protect natural resources. Growth management has been characterized by its opponents as unwarranted interference in land markets and unwarranted usurpation of local autonomy in land use policy. The appeal of growth management has also been limited because of its narrow identification with environmentalist issues. This paper examines the Smart Growth movement as a means of addressing the critics of growth management and expanding the range of interest groups supportive of growth management. The Smart Growth movement has been able to bring new actors into the debate over development controls, and has provided a big tent under which transportation groups, environmentalists, affordable housing advocates, and neighborhood activists have combined efforts to affect land policy. While this has expanded the breadth of political support for growth management, the Smart Growth movement still founders on the resistance of local officials and private development groups in the same ways the growth management movement did in previous decades.

S05-2 **PRINCIPE, MICHAEL A. and Robert Mayer** New York City Department of Environmental Protection, Bureau of Water Supply, 465 Columbus Avenue, Valhalla, NY (mprincipe@dep.nyc.gov).

MEETING THE NEEDS OF MILLIONS: NEW YORK CITY'S APPROACH TO WATER STEWARDSHIP

The New York City (the City) water supply, which is operated and maintained by the New York City Department of Environmental Protection, consists of 19 reservoirs and 3 controlled lakes which receive drainage from a 2000 square mile watershed. The supply serves 9 million people (1/2 the population of New York State) delivering approx. 1.3 billion gallons per day to the metropolitan area. The system is divided into the components: the Catskill System, the Delaware System, and the Croton System. In each of these systems reservoir releases or diversions are made to support fish populations. The City is currently working with the Parties to the Delaware River Supreme Court Decree to develop a long-term fisheries program for the City's Delaware Reservoir tailwaters. In addition, the City is evaluating, with the goal of piloting, a new release strategy for the Esopus Creek in the Catskill Supply, as well as improving release regimes within the Croton Supply. Extensive water quality/hydrological monitoring and modeling is being performed in order to evaluate the efficacy of each of these release strategies.

S05-3 **APSE, COLIN D. and George E. Schuler** The Nature Conservancy, Neversink River Program, 108 Main Street, New Paltz, NY 12561. (capse@tnc.org)

DEFINING ECOLOGICAL FLOWS IN THE UPPER DELAWARE: PROGRESS TOWARD BALANCING HUMAN AND ECOLOGICAL NEEDS IN THE DELAWARE BASIN

Flow management in the Delaware Basin has been an issue of contention since the 1920s, decades before the U.S. Supreme Court defined the basic water management rules for the basin in 1954. Over a half-century later, a collaborative effort between New York City, state and federal government agencies, and the non-profit and academic sectors is seeking to facilitate sustainable management of Delaware Basin waters into the future. The primary step in this science and policy effort is to define ecological flow needs in the Delaware Basin. Studies are initially focused on the heavily regulated Upper Delaware using a blend of techniques in an attempt to address the needs of target species and the ecosystem as whole. A 2-dimension hydrodynamic model is being developed for representative reaches in the Upper Delaware and will be coupled with habitat preference data for a range of species and species guilds. To enhance this approach, we will integrate IHA analysis and targeted research as well as undertake a set of expert workshops to translate available information into flow recommendations that incorporate inter- and intra-annual variability. Critical issues to be highlighted include effectively using water management models and integrating habitat preference models with recently developed holistic approaches.

S05-4 **FLANNERY, MICHAEL S.** Senior Environmental Scientist, Southwest Florida Water Management District, 2379 Broad St., Brooksville, FL. 34604-6899 (sid.flannery@swfwmd.state.fl.us)

A PERCENT-OF-FLOW APPROACH FOR REGULATING WITHDRAWALS AND MAINTAINING FLOW REGIMES IN UNIMPOUNDED RIVERS IN SOUTHWEST FLORIDA

The Southwest Florida Management District has implemented a management approach for unimpounded rivers that limits withdrawals to a percentage of streamflow at the time of the withdrawal. This method forces withdrawals to mimic natural streamflow characteristics and rise and fall with the stream hydrograph. No new instream reservoirs have been built in west-central Florida since 1965. Water storage options used in conjunction with the percent-of-flow approach include offstream reservoirs and aquifer-storage-recovery systems. The initial justification for the approach came from studies of the freshwater inflow relationships of estuaries in the region. A number of key estuarine characteristics respond to freshwater inflow in a non-linear manner, and ecological changes that can result from a given quantity of withdrawal are often much greater if the withdrawal occurs during the dry season. The percent-of-flow approach guards against such marked changes by scaling withdrawals to the concurrent rate of streamflow and allowing withdrawals to gradually increase as flows rise. The percent of flow approach is now being applied to freshwater streams by evaluating changes in PHABSIM metrics in time series simulations of flows that are reduced by various percentages. A key step in applying the approach to any new withdrawal is trend analysis of historic flow records to detect any previous changes in a river's flow regime.

S05-5 **HALL, GREENEVILLE B. and Clifford P. Neubauer** Department of Resource Management, St. Johns River Water Management District, 4049 Reid Street, Palatka, Florida 32177 (shall@sjrwmd.com)

MINIMUM FLOWS AND LEVELS: A BASIN-WIDE APPROACH TO PROTECTING NATURAL FLOW VARIABILITY

The St. Johns River Water Management District's minimum flows and levels (MFLs) method, developed in Florida, USA, has been applied to rivers, lakes, wetlands, and springs. The method is used in a regulatory water management framework to protect aquatic and wetland systems from ecological harm resulting from anthropogenic surface or ground water withdrawals. MFLs are primarily ecologically based. Multiple MFLs, which define a minimum hydrologic regime, are determined for a system to ensure that high, average, and low hydrologic conditions are protected. MFLs are represented by hydrologic statistics composed of magnitude (flow and/or level), duration (days), and return interval (years) components. MFLs are implemented with output from hydrologic water budget models that simulate long-term system hydrology (>30 years). The method enables water management decisions to be made in an a priori and cumulative manner, evaluating how proposed water management decisions might affect system hydrologic conditions and existing legal water users. Additionally, the method can be used to evaluate management options for systems that may be over-allocated or for ecohydrologic restoration projects. Case studies emphasizing protection criteria will be presented. The method's conceptual approach and terminology can be used outside of Florida.

S05-6 **TEAR, LUCINDA M., Jan Cassin, Robert Fuerstenberg, Kelly Whiting, and David St. John** Parametrix, Inc., 5808 Lake Washington Blvd. NE, Suite 200, Kirkland, WA 98033 (LT, JC) (ltear@parametrix.com). King County Department of Natural Resources and Parks, 201 S. Jackson St, Suite 600, Seattle, WA 98104-3855 (RF, KW, DSJ).

MANAGING URBAN STREAMS IN THE FACE OF UNCERTAINTY - CAN WE USE BIOLOGICAL INDICATORS TO ESTABLISH STREAM FLOW TARGETS IN THE PACIFIC NORTHWEST?

Sustainable management and restoration of aquatic ecosystems requires restoring critical components of ecological processes, such as the natural flow regime. Most flow assessments and restoration projects in lotic systems have occurred on fourth order and larger rivers where identifiable sources of flow alteration and resulting ecological effects could be identified. In third order or smaller streams in urbanizing areas in the Pacific Northwest, multiple land cover and water use changes can occur within a stream basin. Limited understanding of specific ecological responses to flow alteration results in uncertainty about the ecological and societal benefits, and feasibility, of restoring normative flow regimes. King County has undertaken a project to develop analytical tools for evaluating the ecological effects of altered flows in Puget Sound lowland streams and to use this understanding to inform their management practices. We first identified candidate indicators of hydrologic alteration and ecosystem response and then empirically tested these relationships in a set of small urban streams. We discuss the limitations of this empirical approach, steps we think can provide near-term guidance for urban stream management while ecological research is on-going, and research that could improve certainty about how to manage flows to restore ecological processes in urban streams.

S05_7 **DEPHILIP, MICHELE** The Nature Conservancy, Great Lakes Program, 8 S. Michigan Avenue, Suite 2301, Chicago, IL (mdephilip@tnc.org)

FLOW PROTECTION FOR NORTH AMERICAN GREAT LAKES ECOSYSTEMS

Requests to export water from the North American Great Lakes region have led state and provincial leaders to commit to develop a new decision-making standard for evaluating proposals to use Great Lakes water. This new standard will apply to both withdrawals for in-basin use and out-of-basin diversions. It will be based on two protective principles. First, a project will not be allowed unless it will have no significant adverse ecological impact. Second, a project must include an ecological improvement. In order for this new standard to effectively protect Great Lakes' ecosystems, The Nature Conservancy and others believe that it must protect and restore natural water levels and flows in rivers, in lakes, and underground. We recommend that a proposed water project should be judged explicitly on its effects on hydrologic conditions, not just biological or chemical consequences of these changes. To further the implementation of this standard, we are developing tools to describe current and natural hydrologic conditions and predict impacts of proposed water projects on patterns of water levels and flows. We will present a framework for evaluating hydrologic impacts of a withdrawal proposal and discuss pilot analyses to define current, natural and post-withdrawal hydrologic conditions.

S06-1 **KOONTZ, FRED, Susan Elbin, and Scott Newman** Wildlife Trust, 61 Route 9W, Palisades, NY 10964 (koontz@wildlifetrust.org)

LIFE IN THE BIG APPLE: BIODIVERSITY CONSERVATION IN THE NEW YORK BIOSCAPE

The New York Bioscape, a social-ecological region defined by a 100-mile radius from New York City, is home to nearly 24 million persons (8% of the U.S.). Despite considerable urbanization in recent decades, the region supports significant biodiversity. Even species normally associated with wilderness can be found (e.g. black bears, bobcats, peregrine falcons, timber rattlesnakes, and sea turtles). This rich fauna and flora reflects both a complex physical dimension and the fact that the region is located at the intersection of Mid-Atlantic, New England, and Midwestern U.S. biomes. Physiographic divisions include Coastal Plains, Piedmont, Highlands, and Ridge and Valley, where important natural areas are found (e.g. Hudson River Estuary, Long Island Sound, New Jersey Meadowlands, New Jersey Pine Barrens, and New York/New Jersey/Connecticut Highlands). Local environmental groups, now numbering more than 200, have played key historical roles in shaping environmental protection policy in the region and throughout the United States. Government protected areas encompass about 8% of the land area. Threats to biodiversity include: habitat fragmentation and degradation from sprawl, invasive species, chemical pollution, and insufficient environmental protection policies. We suggest that more regional, landscape-level, collaborative research linking biodiversity conservation to health and local sustainability is needed.

S06-2 **GROFFMAN, PETER M., Patrick J. Bohlen, Timothy J. Fahey, Melany C. Fisk, Esteban Suarez, and Holly A. Ewing** Institute of Ecosystem Studies, Box AB, Millbrook, NY 12545 (groffmanp@ecostudies.org) (PMG, HAE), MacArthur Agro-ecology Research Center, Archbold Biological Station, 300 Buck Island Ranch Rd., Lake Placid, FL 33852 USA (PJB), Cornell University, Department of Natural Resources, Ithaca, NY 14853 USA (TJF, ES), Appalachian State University, Department of Biology, Boone, NC 28608 (MCF).

INVASION OF FOREST SOILS BY EXOTIC EARTHWORMS

The invasion of north temperate forests by exotic species of earthworms is an important factor that has been overlooked in study and management of these forests. We have investigated the effects of earthworm invasion on soil carbon and nitrogen dynamics in these ecosystems at two sites in New York State. The most dramatic effect of earthworm invasion was the loss of the forest floor and redistribution of carbon and nitrogen pools and fluxes in the soil profile. Invasion changed soil total C and P pools, C:N ratios, the loss and distribution of different soil P fractions and the distribution and function of roots and microbes. Loss of carbon from the soil profile was marked, while nitrogen loss was minimal, likely due to earthworm stimulation of microbial biomass and activity in the mineral soil. Response to invasion varied with site characteristics and earthworm species. Our results suggest that exotic earthworm invasion is a significant factor that will influence the structure and function of northern temperate forest ecosystems over the next few decades. Regional evaluations of these forests will need to consider the presence or absence of earthworms along with other important ecosystem drivers such as pollution, climate, or underlying soil characteristics.

S06-3 **BURGER, JOANNA, Michael Gochfeld, and Sheila Shukla** Division of Life Sciences, 604 Allison Road, Piscataway, NJ 08854 (burger@biology.rutgers.edu). Michael Gochfeld, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ Sheila Shukla,Division of Life Sciences, 604 Allison Road, Piscataway, NJ 08854

USING COMMON TERNS (STERNA HIRUNDO) AS BIOINDICATORS OF LEVELS OF METALS

Managers and policy makers require information on trends in contaminant levels in organisms to assess ecosystem health. Seabirds are excellent bioindicators because they are long-lived, feed at different trophic levels, and are at the top of the food chain. They can reveal spatial and temporal trends in contaminant levels. We examined temporal and spatial trends in the levels of cadmium, chromium, lead, manganese, mercury and selenium in eggs from common terns (Sterna hirundo) nesting on salt marsh islands in Barnegat Bay, New Jersey. We test the null hypothesis that there are no temporal or spatial differences in levels of cadmium, lead, mercury from 1971 to 2002, and in chromium, manganese, selenium and arsenic from 1992 to 2002. Levels were highest for manganese, followed by selenium, mercury, arsenic, lead, chromium and cadmium. Common tern eggs showed a decline in levels of cadmium, chromium, and lead. Mercury declined from 1971 to 1982, increased in 1999, and declined thereafter. Manganese showed a decline (except for 2001), and selenium declined initially, but then remained stable. The data indicate that common terns can serve as useful bioindicators of temporal trends in exposure, and that some of the metals of concern in estuarine environments (lead, cadmium) have declined over the last thirty years, although mercury levels are higher than in the early 1980s. Funded by Wildlife Trust, NIEHS (ESO 5022), DOE (DE-FG 26-00NT 40938), NJ Endangered and NonGame Species Program, and Hatch grant (Cook College).

S06-4 **SCHUSTER, WILLIAM** Black Rock Forest Consortium, 129 Continental Road, Cornwall, NY 12518 USA (blackrock@ldeo.columbia.edu)

LONG-TERM TRENDS IN FOREST REGENERATION AT BLACK ROCK FOREST, CORNWALL, NEW YORK

The Highlands Province encompasses nearly 2 million acres adjacent to the New York-Philadelphia urban corridor and provides water for 10 million people. I sought to answer whether these forests are sustainable or deteriorating through analysis of forest regeneration. Black Rock Forest (BRF) is a 1500-hectare forest representative of the Highlands. I analyzed inventory data, long-term plots, and deer exclosure data from BRF. Northern relicts have been lost while introduced and northward-expanding species have been added. The understory has changed from 53% oak and 27% maple to 50% maple and 20% birch. Regeneration has been low for all species except red maple and black birch, and patterns are generally consistent around the region. Large disturbances show abundant seedlings of tree-of-heaven. Red maple and black birch will be most likely to occupy gaps after small disturbances. A transition from oak- to maple-dominated forests will impact ecosystem processes and the loss of acorns will impact many native birds, rodents and mammals. Large disturbances will result in more expanding species and exotics. Animal habitats, energy flow, chemical cycling, and the provision of clean water and forest products may all be impacted. Further research is needed to understand these changes and to devise possible management strategies.

S06-5 **KIVIAT, ERIK and Tanessa Hartwig** Hudsonia Ltd., P.O. Box 5000, Annandale NY 12504-5000 (kiviat@bard.edu)

INVASIVE MARSH PLANTS AND MANAGEMENT IN THE NEW YORK CITY REGION

Invasive plants are usually considered of little value to native biota. The New York City region supports large populations of common reed (;Phragmites australis;), purple loosestrife (;Lythrum salicaria;), Japanese knotweed (;Fallopia japonica;), and water-chestnut (;Trapa natans;). In North America many organisms use these invasive plants as individuals or stands: at least 400 species of animals, fungi, and vines in loosestrife; 200 species of mammals, reptiles, amphibians, and birds in reed; and 160 species of animals, plants, and fungi in Japanese knotweed stands. Most are native species and some are rare, declining, or specialist species. Examples are rusty blackbird and purple martin roosting in reed; Cecropia moth selecting loosestrife over native foodplants; and loosestrife providing nectar to many native pollinators. Stand character, including extent, density, height, dominance, interspersion, edge, flowering, and hydrology, all of which vary spatiotemporally, influence habitat functions. Management, thus, must be goal-directed, habitat-framed, and site-specific. Various approaches to management are appropriate in different situations, including eradication (e.g., for small or newly-established stands) and modification of stand character to alter habitat function. Research is needed that compares density, productivity, and fitness of native organisms in invasive plant stands and alternate communities under different management regimes.

S06-6 **AGUIRRE, ALONSO, Michele Sims, Kim Durham, Rob DiGiovanni, Steve Morreale, and Kathryn McGonigle** Wildlife Trust, 61 Route 9W, Palisades, NY 10964 (AA, MS, KM) (aguirre@wildlifetrust.org), Riverhead Foundation for Marine Preservation and Research, 467 East Main St., Riverhead, NY 11901, , Cornell University, Dept. of Natural Resources, Fernow Hall, Ithaca, NY, 14853 (SM)

ASSESSMENT OF SEA TURTLE HEALTH IN PECONIC BAY OF EASTERN LONG ISLAND

This study is assessing sea turtle health in Peconic Bay, Long Island, NY. Prior assessment of migrant juvenile turtles in Peconic Bay in the 1980's indicated that the turtles appeared in excellent health. In the face of rapid development, it is important to reexamine health, status, and trends of sea turtle populations. With the cooperation of local fisherman, accidental captures have facilitated collection of biological samples including blood, tissue biopsies, and scute samples, and provided an opportunity to perform physical exams to assess condition. Nine turtles were captured in 2002 and twenty were captured in 2003. Of these, 16 were green (Chelonia mydas), 11 were Kemp's Ridley (Lepidochelys kempii), and two were Loggerheads (Caretta caretta). This initial health assessment includes physical exam findings along with CBC, blood chemistries, histology, and evidence of exposure to turtle herpesvirus, which has been implicated as a possible etiology for marine turtle fibropapillomatosis. Archived samples can also later be analyzed to determine exposure to polychlorinated biphenyls (PCBs), Methyl Tertiary-Butyl Ether (MTBE), a gasoline additive, organophosphates, and heavy metals. The results will both benefit sea turtle recovery management and provide a sentinel species view of contaminants, pathogens, and other stressors present in the Peconic Bay.

S06-7 **MICKELSON, JOHN, Fred Koontz, and William Schuster** CIESIN, 61 Rt. 9W, Palisades NY 10964 (jmickels@ciesin.columbia.edu)

DELINEATING DETAILED ECOLOGICAL LAND UNITS IN THE NEW YORK BIOSCAPE USING MULTI-TEMPORAL LANDSAT IMAGERY

This project seeks to advance our ability to resolve, map and analyze more accurate and precise digital geospatial data and information systems representing land cover and ecological communities patterns and processes within the NY Bioscape. Specifically, we seek to establish the mechanisms and protocols for establishing adequately detailed spatial and thematic information and data baselines to be used for effectively mapping (locations and distributions), monitoring (conditions and changes), and modeling (historic paleo-ecological patterns, underlying drivers and system influences and projected future conditions and trends) integrated, multivariate environmental patterns and processes, across spatial and temporal scales. Multi-date Landsat TM and ETM+ imagery as well as a wide array of ancillary digital geospatial data and GPS referenced ground plots are being used to evaluate the phenologically based spectral and spatial signals that ecological communities (as defined by the National Vegetation Classification System and the NYS Heritage Program) exhibit across the growing season. Results have shown that we can improve our ability to resolve ecologically based landcover classes dramatically using this approach; we are now extending it to attempt to include patterns of invasive species such as (Purple Loosestrife - Lythrum salicaria and Common Reed - Fragmites australis).

S06-8 **DANOFF-BURG, JAMES A., Elizabeth Nichols, and Fred Koontz** Department of Ecology, Evolution, and Environmental Biology, Columbia University, 1200 Amsterdam Ave, MC 5557, New York, NY, 10027, (jd363@columbia.edu); Department of Ecology, Evolution, and Environmental Biology, Columbia University, 1200 Amsterdam Ave, MC 5557, New York, NY, 10027. Wildlife Trust, 61 Route 9W, Palisades, NY 10964

FROM DUNG BEETLES TO PARASITIC WASPS: KEEPING INSECTS IN THE METROPOLITAN MIX

The current global expansion of urban areas is unprecented, and the majority of our understanding of biodiversity dynamics in urban environments is generalized from natural systems. Two studies recently conducted within the greater New York area focus on trophic interactions between plants, pests, and their parasitoids in community garden habitats and the impacts of urbanization on dung beetles and flies along an urban-rural gradient. In community gardens, parasitic wasps were significantly more diverse than plant pests with increasing garden structural complexity, though not with increasing garden size, or plant richness. Plant pest diversity was positively correlated with garden size, a finding opposite of those derived from fragmentation studies in natural systems. Dung beetles in urban forest fragments had less than two-thirds the abundance and half of the species level diversity of forest fragmented surrounded with suburban, agricultural or forested matrices, while abundance and diversity of their main competitor (Muscoid flies) nearly doubled. Both studies indicate that the dynamics of interspecific competition may shift in highly urban environments, that interpatch movements may be a key factor in the maintenance of viable populations, and that managed urban habitat remnants may comprise unique systems that are inadequately described by generalized ecological principles.

S06-9 **HARRIS, REBECCA, Florina Tseng, Mark Pokras, and Scott Newman** Center for Conservation Medicine, Wildlife Medicine Building, Tufts University School of Veterinary Medicine, North Grafton, MA 01536 (becky.harris@tufts.edu) (RH, FT, MP) Wildlife Trust, 61 Route 9W, Palisades, New York 10964 (SN)

SEANET: A CITIZEN-SCIENTIST COLLABORATIVE TO MONITOR THE ECOLOGICAL HEALTH OF SEABIRDS

Numerous threats contribute to the mortality of seabirds and waterbirds, such as diseases, fisheries operations, persistent organic pollutants and metals, and oil pollution. Unlike the ongoing beach monitoring projects in Atlantic Canada, where significant chronic oiling problems have been detected, the northeastern coast of the United States has not recently been monitored regularly for seabird mortality. The Seabird Ecological Assessment Network (SEANET http://www.tufts.edu/vet/seanet/) is a large-scale, collaborative program focusing on seabirds as indicators of marine and coastal ecological health. We are developing a network of seabird and ecological health organizations from Canada to New Jersey, launching 'citizen-scientist' beached bird surveys, and collecting data on seabird mortality, population distribution, ocean contamination, and coastal land use. Preliminary results indicate fewer beached birds with a much lower incidence of chronic oiling occur on northeastern coast of the U.S., but long-term data is needed to assess trends. Seasonal differences in deposition of various species have been detected, as well as numerous causes of death and periodic episodes of larger scale mortalities.

S06-10 **BRASH, ALEXANDER** Natural Resources Group City of New York, Parks & Recreation, 1234 Fifth Avenue New York, N.Y. 10029 (Alex.Brash@parks.nyc.gov)

URBAN PARKS AS BIOTIC FONTS

Neither the wolves in Alaska, nor the bison in Yellowstone are beyond the reach of human interference. In a view reflected in the works of Escher, we recognize that the nation's great wildernesses now ecologically blend with the urban environment. Around New York City, colonial era fields have returned to forests, and 20th Century environmental efforts have resulted in cleaner air and waters. Thus there has been a recent and dramatic increase in the return of wildlife to the area. Bear, coyotes, deer, turkeys, wading birds, salmon, and a host of other species have now returned to large areas of their historic ranges. In this presentation we will discuss how urban parks may in fact not only sustain certain species, but in some cases they may in fact become biotic fonts. For some species, urban parks may offer decreased pressure from predation or herbivory. For others, parks and the surrounding cityscape may provide a greater abundance of prey, plentiful nesting sites, or a surfeit of some other critical resource. We will consider some of the current lessons from the region. It is our contention, that with proper management, urban parks can constructively contribute to a region's biological diversity. For while it is clear that the Northeast hardly needs any more white-tailed deer, urban parks can help sustain a great number of smaller, rarer species that will benefit from a park's protection.

S06-11 **WHITEFORD, RICHARD** Highlands Coalition (Savebios@earthlink.net)

HIGHLANDS PRESERVATION AND ITS BENEFITS TO NEW YORK CITY

The Highlands region is the vital water source for Manhattan and other eastern seaboard communities. It is also an important ecosystem for sustaining biodiversity. More than 80 percent of the Highlands area is unprotected and sprawl and industrial development is eating away at the Highlands at a rate of 5,000 acres per year. The objectives of the Highlands Coalition are to identify the critical habitat areas and procure the funding to preserve them. We have an appropriations bill in Congress called the Highlands Conservation Act that will provide $100 million a year for ten years for the purchase of theses areas. We also work to get matching funds from state and municipal grants for these efforts. The Highlands Coalition is acutely aware of the loss of water, recreational, and natural resources for Manhattan and neighboring residents that will result if the Highlands are not protected.

S06-12 **KLEMENS, MICHAEL W., Nicholas Miller, and Jennifer Schmitz** Wildlife Conservation Society, Metropolitan Conservation Alliance, 68 Purchase Street, 3rd Floor, Rye, NY 10580; (mca@wcs.org)

WILL BETTER LAND USE DECISIONS PROTECT OUR REGION'S BIODIVERSITY?

The tri-State New York metropolitan region is an area where local jurisdictions have home rule authority over most land use decisions. Hundreds of autonomous bodies thus decide how and where development occurs across the landscape. This balkanization of land use decision-making has had profound consequences for the survival of the region's diversity of wildlife and the ecosystems upon which all life depends. State and federal mandates have had limited impact in our Region. Our greatest strength (and weakness) is the strong home rule basis for land-use decisions. Rather than attempt to increase top-down mandates, which have limited on-the-ground effectiveness, the Wildlife Conservation Society has focused conservation at the local level, working with groups of towns to plan for natural resource protection. The lessons learned from our experiences demonstrate that with thoughtful engagement of land use decision makers, conservation biologists are able to capitalize on the strengths of home rule to achieve significant levels of ecosystem protection.

S06_13 **PIRANI, ROBERT** Regional Plan Association (ROB@rpa.org)

BUILDING A METROPOLITAN GREENSWARD IN THE NEW YORK CITY REGION

The Metropolitan Greensward is RPA's vision of a system of protected open spaces and waterways that distinguish the cities and suburbs of the New York/New Jersey/Connecticut metropolitan region. This regional open space system will conserve the Region's critical natural resource systems and recreational opportunities while shaping future patterns of growth in the Tri-State Region – much in the way that Olmsted and Vaux's Greensward Plan for Central Park shaped the development of Manhattan 150 years ago. RPA has focused its efforts on conservation initiatives three critical region-shaping landscapes: New York – New Jersey Harbor, Long Island Sound, and the Appalachian Highlands in New Jersey, New York, and Connecticut. Our assessment, planning and advocacy efforts in these areas suggest ways that concerns about biodiversity and ecosystem health can be incorporated into a land use and regional planning framework.

S06-14 **LYNN, WILLIAM S.** Center for Humans and Nature, 109 West 77th Street, Suite 2, New York, NY 10024, (williamlynn@practicalethics.net)

HUMANS AND NATURE TOGETHER: SOUND SCIENCE, SOUND ETHICS

Questions of ethics, of 'how we ought to live', are at the heart of our concern for biodiversity. Whether biodiversity has value in itself, or is indispensable to ecosystem services, our moral sensibilities urge us to conserve and restore the community of life on Earth. Even so, there is a mismatch between the scientific and ethical discourse of biodiversity. On the one hand, scientific discussions tend to emphasize 'sound science' -- the evidence-based, theory-rich baseline for managing biodiversity in wild and humanized landscapes. Yet empirical data, quantitative models or management techniques have little to do with the origin of the biodiversity crisis. Instead, the origin lays in a deeply rooted cultural conflict over our coexistence with other forms and ways of life. On the other hand, many environmental ethics tend to be abstract 'thought experiments' that reinforce a dichotomy between science and ethics. Using the coyotes of the Hudson Highlands as a point of departure, I argue that sound science requires a 'sound ethics'. A sound ethics should, at a minimum, recognize the moral standing of non-human life, highlight the moral significance of conservation science, and emphasize the practical value of conservation values in securing ecological health and sustainability.

S07-1 **COLWELL, RITA** Distinguished University Professor, University of Maryland at College Park and Johns Hopkins, Bloomberg School of Public Health

GLOBAL INFECTIOUS DISEASES, WATER AND HUMAN HEALTH

Recently the interactions of sea surface temperature, seasonal events, climate, and cholera epidemics have been discovered and their correlations described. Cholera epidemics in developing countries, such as Bangladesh, have become a paradigm for elucidating the complexity of waterborne diseases, including Campylobacteriosis, tularemia, and many bacterial and viral agents of diarhoeal diseases. The distinct seasonality of Campylobacter cases in England, Scotland, and Wales has been reported and Helicobacter pylori, the causative agent of stomach ulcers and its sequel, stomach cancer, appears to be yet another water borne disease. From each of these examples, and collectively, an holistic model can be drawn that provides a global perspective for infectious disease, including ecology, climatology, microbiology, meteorology, mathematics, and geography. Clearly, epidemiology has moved from a very narrow clinical definition to an encompassing interdisciplinary science, with much greater predictive capacity for human health.

S07-2 KILPATRICK, A. MARM**, Laura D. Kramer, Peter Daszak, Peter P. Marra, Andrew P. Dobson, Scott R. Campbell, E. Oscar Alleyne.** Consortium for Conservation Medicine at Wildlife Trust, New York. (kilpatrick@conservationmedicine.org)

THE ECOLOBY OF WEST NILE VIRUS ACROSS AN URBANIZING LANDSCAPE

Since its first appearance in North America in 1999, West Nile virus (WNV) has spread across the continent and into Central America, infecting more than 14,000 people and causing over 500 deaths. We present the results of a study on the vectors and hosts of WNV along an urban to rural gradient in the greater DC region. We show that spatial variation in transmission of WNV to avian hosts can be explained by a combination of vector densities and other factors of the host community. A second line of our research involves assessing the risk of human infections. We present a novel risk assessment framework for WNV and use it to determine which mosquito vectors are responsible for transmitting WNV to humans. Our results run counter to all conventional wisdom and challenge the way WNV is managed and controlled.

S07-3 **NEWMAN, SCOTT, Anton Wolfaardt** Wildlife Trust, 61 Route 9W, Palisades, NY 10471 (SN) (newman@wildlifetrust.org)

HOW EFFECTIVE IS THE REHABILITATION OF OILED SEABIRDS? IS THEREA ROLE FOR THESE ACTIVITIES IN CONSERVATION?

Oil spill events and wildlife impacts have increased worldwide during the latter half of the 20th century as international transport of fuel has increased and globalization continues to occur. Since 1999, five major oil spill incidents in France, Germany, South Africa, United States, and Spain have resulted in the need for biomedical care of more than 50,000 seabirds and at least a half million seabirds have perished. As impacts of large oil spills gain notoriety worldwide, the efficacy of oiled wildlife care is being challenged, especially from the biological perspective. Past studies have shown that oiled wildlife do not survive long after release, do not behave normally if they survive, and rarely reproduce. This raises the question of whether millions of US dollars should be spent to rehabilitate oiled wildlife if these efforts do not contribute to sustaining or restoring seabird populations. Recent research suggests that advances made in the field of oil spill medicine and improved post-release monitoring techniques are changing the outcome of some oiled and rehabilitated wildlife. Research results from the United States and South Africa demonstrate that in the future, from strictly a biological perspective, there may be a role for oiled wildlife care in seabird restoration and conservation efforts.

S07-4 **COLLINGE, SHARON K.** Associate Professor Dept. of Ecology and Evolutionary Biology and Environmental Studies Program 334 UCB, University of Colorado Boulder, CO 80309-0334 (Sharon.Collinge@colorado.edu)

PLAGUE AND PRAIRIE DOGS: CONFLICTS BETWEEN CONSERVATION AND PUBLIC HEALTH

Urbanization of native landscapes results in loss and fragmentation of native habitats, which may dramatically alter the rate of transmission and spread of infectious diseases. Disease is a major mortality factor for black-tailed prairie dogs, a species of conservation concern in western North America. Prairie dogs are highly susceptible to plague, yet little is known about factors that influence spatial and temporal occurrence of plague epizootics in prairie dogs. Prairie dogs occur in grasslands surrounded by varied landscape contexts, from urbanized landscapes to relatively continuous grasslands. We used plague occurrence data from the past 10-20 years to investigate the importance of landscape structure for predicting plague outbreaks in prairie dogs in two landscapes, one fragmented by urbanization and one relatively unfragmented. Plague occurrence in prairie dog colonies was significantly related to landscape context, but in somewhat unexpected ways. In the urbanized study area, urban cover in the surrounding landscape was not significantly correlated with plague occurrence, but road cover was negatively associated with plague occurrence. In the rural study area, plague occurrence was also negatively associated with percent cover of roads in the surrounding landscape. Plague occurrence was negatively associated with the cover of streams and lakes in both landscapes. We conclude that landscape context was significantly correlated with plague occurrence in two study areas that occur in quite different landscape settings. The similarity in plague correlates between urban and rural study areas suggests that the correlates of plague are not altered by uniquely urban stressors.

S07-5 **DOBSON, ANDY and Juliet Pulliam** Princeton University

DISEASE EMERGENCE IN EARLY HUMAN CITIES: IMPLICATIONS FOR THE NEW EMERGING DISEASES

Many of the infectious diseases that we consider a standard part of modern life originally emerged in the last 2000 years. Measles, chickenpox, tuberculosis and smallpox have evolved from related pathogens of domestic animals (cattle or dogs) these moved into human hosts following the domestication around 10,000 years ago. Classic work on endemicity of measles virus on islands shows that this pathogen requires between 350,000 and 500,000 humans (its threshold population density) to produce enough susceptibles to allow the virus to persist continuously in humans. Yet historical records show that they established in humans significantly earlier than cities of this size had developed. So the key to persistence of these pathogens as a major scourge of humans is the development of networks of human populations divided into villages, towns and early cities. Whooping cough, dysentery, plague, diphtheria, mumps, tuberculosis and perhaps influenza all appear to have emerged in these early conglomerations. In this talk, we will demonstrate how we can use our understanding of these first emerging infectious diseases (EIDs) to throw light on a new threat the emergence of zoonotic pathogens from wildlife. For example, Nipah virus is a newly discovered measles-like virus carried by fruit bats that emerged in Malaysia in 1999, moving first into dense populations of domestic pigs, then humans. Modeling of wildlife diseases also gives us insight into how certain pathogens have become a significant threat to the conservation of wildlife. In some cases, even where threatened species occur in populations below the threshold density, the presence of domestic animal reservoirs allows lethal pathogens to persist and threaten local extinction of the endangered host.

S07-6 **PATZ, JONATHAN** Johns Hopkins Bloomberg School of Public Health (jpatz@jhsph.edu)

A TALE OF TWO MICROBES: URBANIZATION, DEFORESTATONI AND THE RISE OF DENGUE AND MALARIA.

An estimated 2.5 billion people are at risk from dengue infection. Between 250,000 and 500,000 cases of dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS), the more severe form of dengue occur yearly throughout the world. Outbreaks in urban areas infested with dengue's primary mosquito vector, Aedes aegypti, can involve up to 70% to 80% of the populations. As urban sprawl continues and as peri-urban slums proliferate, dengue risk will continue or expand. Climate variability has potential to act synergistically with urban sprawl and case studies demonstrating these relationships will be presented from several regions of the world. Malaria is deemed the most important vectorborne disease, killing between 1-2 million people annual, primarily children. New evidence implicates landscape and ecological change. In our study site in the Northern region of the Peruvian Amazon much deforestation has accompanied development, caused in large part by road construction, which opens up previously inaccessible areas to farming, logging, and cattle ranching. Simultaneously, the area has seen a sharp rise in malaria incidence, increasing fifty-fold from 1987 to 1997, and an invasion by South America's major malaria vector, Anopheles darlingi. We compared four different land use categories to determine the relationship between the extent of deforestation and entomological risk factors for malaria, after controlling for human population density. Our findings show a strong relationship between the extent of deforestation and abundance of Anopheles darlingi, and its breeding sites. These finding have potentially large implications for development planning and conservation policies beneficial both to human and ecological health.

S07-7 **POKRAS, MARK A.** Tufts University (mark.pokras@tufts.edu)

GETTING THE VETS OUT OF THE BARN: CREATING THE COLLABORATION BETWEEN VETS, MEDICS AND CONSERVATION BIOLOGISTS.

Because of emerging threats to human and animal health around the globe, it is important to develop of cross-cutting collaborations and educate new types of broadly trained professionals. We will discuss ongoing efforts to bridge disciplinary boundaries among veterinarians, physicians, public health specialists, and conservation biologists to avoid potential threats at the earliest possible stages. Over 75% of emerging diseases are infectious agents that can be transmitted between people and animals. Other major threats include the security of our food supply, and the introduction of destructive exotic species that can upset ecosystems and food chains and cause huge ecological and economic effects. Some threats are not biological agents, but can easily kill people and other animals, impair their health, or destroy food supplies. These include radiation, chemical agents that pollute water or air and insidious threats like immune suppressors and endocrine disruptors.

S07-8 **OSTFELD, RICHARD S. and Felicia Keesing** Institute of Ecosystem Studies, Millbrook, NY 12545 USA (RSO and FK), (Rostfeld@ecostudies.org); Biology Department, Bard College, Annandale-on-Hudson, NY 12511 (FK)

URBANIZATION, FOREST FRAGMENTATION, AND MISSING WEAPONS OF MOUSE DESTRUCTION: EFFECTS OF BIODIVERSITY LOSS ON DYNAMICS OF VECTOR-BORNE ZOONOTIC DISEASES

Urbanization and suburbanization cause fragmentation of natural habitats, including forests. Some vertebrate species decline or disappear within small remnant patches, whereas other species increase. An example of species that adapt well to fragmentation are mice in the genus Peromyscus, which also act as reservoirs for many zoonotic pathogens, including the agent of Lyme disease (Borrelia burgdorferi). We evaluate evidence that the loss of vertebrate biodiversity in fragmented landscapes increases risk of human exposure to Lyme disease via two pathways. First, the loss of mouse predators and competitors (or, the lack of weapons of mouse destruction) enables mouse populations to achieve high average densities, which increases the absolute availability to the tick population of this most competent reservoir. Alternatively, the loss of non-mouse hosts, all of which are poorer reservoirs for B. burgdorferi, removes hosts that feed ticks but are unlikely to infect them, but does not directly alter the absolute abundance of mice. Under this latter scenario, low diversity increases the availability of mice relative to other less competent hosts, but not absolute mouse abundance. Original data from fragmented landscapes of the northeastern United States, as well as published data from the midwestern U.S., suggest that both these mechanisms operate.

S07-9 **WILCOX, BRUCE** Department of Ecology and Health, John A. Burns School of Medicine, University of Hawai'i at Manoa (daszak@conservationmedicine.org)

ECOHEALTH AND CONSERVATION MEDICINE: EXTENDING OUR UNDERSTANDING OF ECOLOGY, HEALTH AND CONSERVATION.

Our understanding of the links between ecology, health and conservation has increased dramatically in the last two decades. Advances in disease ecology, epidemiology and modeling have been followed by an explosion of interest in the impact of diseases on wildlife populations. New techniques have been developed that significantly increase our ability to discover and identify pathogens rapidly. At the same time, the field of conservation biology has produced new theoretical and practical understanding of how anthropogenic changes affect wildlife populations and lead to biodiversity loss. Connecting these diverse disciplines is our next great challenge. In this talk I review the new fields of Ecohealth and Conservation Medicine, and discuss the practical and theoretical connections between ecologists, microbiologists, conservation biologists and sociologists that have resulted in this new approach to conservation.

S08-1 **POSSINGHAM, HUGH P.** The Ecology Centre, The University of Queensland, Brisbane, QLD 4072, Australia, (hpossingham@zen.uq.edu.au)

SYSTEMATIC CONSERVATION PLANNING: HOW TO INCLUDE TIME AND SPACE

Most tools and algorithms for conservation planning do not take into account spatial relationships between sites nor changes in the system through time. Some algorithms deal with spatial issues like connectivity, boundary length, replication and surrogates of population viability. No algorithm deals with spatially explicit processes or direct measures of population viability. Conservation planning has traditionally assumed that the world is static; species distributions do not change, local extinctions do not occur, and landscapes will not change after the system is designed. Indeed the literature generally assumes that all aspects of the system are time invariant. In this paper we show how the conservation planning problem can be reformulated to deal with some spatially explicit processes and the dynamics of species and habitats. We find that highly efficient reserve systems may be fragile under change, and that spatial processes are readily included in the conservation planning problem, but their solution incurs some computational expense. There are many opportunities for further research on these issues.

S08-2 **HASTINGS, ALAN** Dept. of Environemntal Science and Policy, Univ. of California, Davis, CA 95616 (amhastings@ucdavis.edu)

SIMPLE MODELS FOR MULTIPLE GOALS OF MARINE RESERVES

The placement of marine reserves is argued for on at least two grounds: preservation of biodiversity and as a way to mage fisheries. Using simple models, I will focus on the extent to which these two goals can be met at the same time, and the extent to which they conflict. In a single species context, the persistence requriement for biodiversity preservation also must be met for the fisheries case, thus reducing the conflict. In the multispecies setting, marine reserves can be shown to be more effective in protecting non-target species than traditional fisheries management tools.

S08-3 **STEWART, ROMOLA and Hugh Possingham** The Ecology Centre, Department of Zoology and Entomology The University of Queensland (rstewart@zen.uq.edu.au)

PLANNING MARINE RESERVE SYSTEMS THAT INTEGRATE CONSERVATION AND SOCIO-ECONOMIC GOALS

With marine biodiversity conservation the primary goal for reserve planning initiatives, a site's conservation potential is typically evaluated on the basis of the biological and physical features it contains. By comparison, socio-economic information is seldom a formal consideration of the reserve system design problem and generally limited to an assessment of threats, vulnerability or compatibility with surrounding uses. This is perhaps surprising given broad recognition that the success of reserve establishment is highly dependent on widespread stakeholder and community support. Using information on the spatial distribution and intensity of commercial rock lobster catch in South Australia, we demonstrate the capacity of mathematical reserve selection procedures to integrate socio-economic and biophysical information for marine reserve system design. Our findings show that the objective of minimising the areal extent of the reserve system was barely compromised by incorporating economic design constraints. With a small increase in area (<3%) and boundary length (<10%), the economic impact of marine reserves on the commercial rock lobster fishery was reduced by more than a third. Analyses of trade-offs highlight the opportunities to design representative, efficient and practical marine reserve systems that minimise potential loss to commercial users.

S08-4 **HEPPELL, SELINA and Leah Gerber** Oregon State University, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331 (Selina.Heppell@oregonstate.edu) Arizona State University, School of Life Sciences, College & University Dr., Tempe, AZ 85287

ONTOGENETIC SHIFTS AND MARINE RESERVE PLANNING: LIFE HISTORY MATTERS!

Ontogenetic habitat shifts necessitate reserve networks for species conservation. Most marine organisms undergo dramatic changes in size and habitat needs as they progress through their life history. Individuals may traverse tens or even hundreds of miles in their lifetimes, simply through habitat requirements that are life stage specific. While considerable attention has been paid to the importance of larval transport, spillover and migration behavior in marine reserve planning, less research has focused on deterministic dispersal. In most cases, a site specific reserve will only protect one or two life stages of a marine organism. We use matrix sensitivity analysis to explore the relative impacts of ontogenetic dispersal and reserve-induced mortality reductions of individual life stages. Over a range of life histories, reserve design that includes consideration of life history and age-specific habitat requirements can improve a) species recovery rates (l) and b) spillover, potentially contributing to fisheries.

S08-5 **MICHELI, FIORENZA, Daniel Brumbaugh, Craig P. Dahlgren, Alastair R. Harborne, Kate E. Holmes, Carrie V. Kappel, and Peter J. Mumby** Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY 10024,; Perry Institute for Marine Science, Caribbean Marine Research Center, Lee Stocking Island, PO Box 29001 George Town, Exuma, Bahamas; School of Biological Sciences, University of Exeter, Exeter, EX4 4PS, UK; Center for Biodiversity and Conservation, American Museum of Natural History, New York, NY 10024; Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950; School of Biological Sciences, University of Exeter, Exeter, EX4 4PS, UK. (micheli@stanford.edu)

VARIATION IN THE STRUCTURE AND FUNCTIONAL DIVERSITY OF CORAL REEF COMMUNITIES ACROSS CARIBBEAN SEASCAPES: IMPLICATIONS FOR MARINE RESERVE NETWORK DESIGN

Comprehensive marine reserve networks aimed at conserving and restoring coral reef ecosystems at regional scales should maximize representation of different community types and of the ecological functions they perform. However, information of how the structure and functional diversity of communities associated with different marine habitats vary across regional scales is generally lacking. As part of the Bahamas Biocomplexity Project, a multisciplinary research program studying the design and function of marine reserve networks in the Bahamas, we surveyed benthic and fish communities in 12 to 15, shallow (0 – 15 m deep), coastal habitats at nested spatial scales (from 10s m to 100s km) across the Bahamian Archipelago. Maps of shallow water habitats were created from high resolution remotely sensed images. This extensive dataset allowed us to examine variation in species diversity, community structure, and functional diversity, quantified based on the known ecological functions and services performed by species and species groups, across seascapes. Our analysis is a first step towards incorporating the functional roles of different components of these diverse communities in the design and evaluation of marine reserve networks.

S08-6 **AIRAMÉ, SATIE** Channel Islands National Marine Sanctuary (satie.airame@noaa.gov)

ECOLOGY AND ECONOMICS OF MARINE PROTECTED AREAS AROUND CALIFORNIA'S CHANNEL ISLANDS

A network of marine protected areas (MPAs) was established in the Channel Islands National Marine Sanctuary in April 2003. The network includes ten fully protected marine reserves (308.3 km2) and two conservation areas (22.3 km2) that allow certain sustainable fisheries. The MPA network was designed to achieve goals for conservation at a minimum cost to existing commercial and recreational activities. Explicit ecological criteria were used to guide the design process. At least one, and up to three, marine reserves are located at each of the five northern Channel Islands. The network protects a variety of habitats, including kelp forests, seagrass beds, rocky reefs, and sandy bottoms. Generally, habitats are represented in more than one reserve, increasing the probability of long-term persistence. The size of the protected areas was constrained by potential economic impacts. To estimate potential economic impacts, economists gathered data on the distributions and values local commercial and recreational fisheries and other activities, including wildlife watching, sailing, kayaking, and non-consumptive diving. Boundaries of MPAs were adjusted to reduce impacts to consumptive activities while protecting important ecological features. The MPA network was a compromise between two designs developed by an advisory committee, representing divergent views of stakeholders.

S08-7 **DORFMAN, DANIEL, Michael Beck, and Zach Ferdaña** The Nature Conservancy Marine Initiative, Center for Ocean Health, Long Marine Lab, 100 Shafer Road, Santa Cruz, CA, 95060, (ddorfman@tnc.org) (DSD, MB); The Nature Conservancy Northwest Division, 217 Pine St, Suite 1100, Seattle, WA 98101(ZF) .

INTEGRATED REGIONAL PLANNING ACROSS MARINE, TERRESTRIAL, AND FRESHWATER ENVIRONMENTS

The Nature Conservancy's Marine Initiative has been coordinating research and development for regional planning methodologies for a broad range of geographies and operating units. Recent work has focused on environmentally integrated planning efforts, where marine, terrestrial, and freshwater biota are considered in a combined framework. Many of these integration experiments employ the use of the Marxan decision support system. Case studies from the Pacific Northwest, Southeast United States, the Caribbean, and Hawaii will be discussed, focusing on recent experiments in representing biodiversity at multiple scales and across environments. Spatially explicit tracking of threats across environments will also be reviewed with an emphasis on constructing a single cost surface representing ecological integrity for marine, terrestrial, and freshwater systems.

S08-8 **LESLIE, HEATHER** Dept. of Zoology,Oregon State University, Corvallis,OR 97331 (leslieh@science.oregonstate.edu)

A TEMPLATE FOR LEARNING AND EVALUATION? A REPORT ON A MARINE CONSERVATION PLANNING DATABASE

In this talk, I report on a database of marine conservation planning approaches from around the world. While there are significant biogeophysical, social and institutional differences between terrestrial and marine systems, this database could be a useful template for other types of conservation planning and resource management efforts. Data were collected on >20 characteristics of each case; today I focus on the scientific criteria and tools used to make conservation and management decisions. The majority of the 27 documented cases occurred in North and Central America, were regional in nature, and were based on biogeographic boundaries. Biodiversity conservation was the primary objective. Outcomes included priority-setting plans and implementation of reserve networks and other marine protected areas. Eleven cases considered biogeophysical criteria first, whereas 16 relied on integrated criteria (i.e. biogeophysical plus socioeconomic data and pragmatic considerations). Key tools included expert workshops, maps, and siting algorithms. Analysis of these cases suggests planners consider knowledge of marine population and ecosystem dynamics important when identifying priority areas, but do not necessarily have clear guidelines for how to operationalize these principles. One of the most striking findings was how few well-documented cases I was able to find.

S09-1 **CATTERALL, CARLA** Environmental Sciences, Griffith University, Nathan, Qld. 4111, AUSTRALIA. (c.catterall@griffith.edu.au)

RESPONSE GUILDS OF FAUNAL ASSEMBLAGES AND URBAN HABITAT MOSAICS: A PERSPECTIVE FROM EASTERN AUSTRALIA

Urbanising regions can be complex spatial mosaics of different forms of land cover (e.g. residential suburbs, concrete-dominated zones, grassy parklands with scattered trees, patches of agriculture or pasture, and native vegetation remnants). Conversion of one patch type to another creates "winners" and "losers" among faunal taxa (increasers or decreasers in abundance), as well as those showing no clear response. Understanding these differences in response pattern will aid the planning and management of urban land cover, to achieve conservation goals. Species' responses to landscape change can readily be quantified through an "observational experiment" approach that uses standardised surveys at replicated sites within different forms of urban land cover. Responses may be evident among either taxonomic units (e.g. species) or functional groups. These points are illustrated using results from the Brisbane region (eastern Australia), where remnant eucalypt forests in lowland urbanising areas are important habitat for migrant birds. Urbanisation causes shifts in avian guild structure, away from small-bodied insectivores towards large-bodied species with mixed diets. Garden plantings are associated with shifts in species composition, but not towards a "forest-like" species or guild assemblage. Typical forest assemblages generally occur in habitat remnants above 10-20 ha. Opportunities/constraints for comparative studies are discussed.

S09-2 **ALBERTI, MARINA and John Marzluff** Department of Urban Design and Planning, University of Washington, Box 355740, Seattle, Washington 98195 (MA). College of Forest Resources, University of Washington, Box 352100, Seattle, Washington 98195 (JM) (malberti@u.washington.edu)

EFFECTS OF URBAN PATTERNS ON ECOLOGICAL FUNCTION AND THE PERSISTENCE OF BIODIVERSITY IN CITIES

Urbanization has become one of the key ecological drivers on Earth. Because alternative urban development patterns affect the amount and interspersion of built and natural land cover we argue that alternative urban patterns (i.e., urban form, land use distribution, and connectivity) generate varied effects on ecosystem function. In cities and urbanizing areas fragmentation of natural habitats, simplification and homogenization of species composition, disruption of hydrological systems, and alteration of energy flow and nutrient cycling reduce cross-scale resilience, leaving systems increasingly vulnerable to shifts in system control and structure. This paper reports the findings of an empirical study that examined the impacts of urban development patterns on ecological conditions in the Puget Sound (WA, USA). Using measures of benthic macroinvertebrates and avian communities as indicators of biotic integrity, we developed an integrated framework to test formal hypotheses regarding the relationships between urban patterns and ecological conditions. Significant statistical relationships were found between landscape patterns—both amount and configuration of impervious area and forest land—and biotic integrity of streams suggesting that patterns of urban development matter to watershed function. However, the amount of forest is more important to birds in our region than interspersion of forest and urban land.

S09-3 **ELMQVIST, THOMAS** Dept of Systems Ecology, Stockholm University,Sweden (thomase@ecology.su.se)

BIODIVERSITY AND ECOSYSTEM SERVICES ALONG RURAL-URBAN GRADIENTS

Urban green areas produce a number of ecosystem services providing recreational and educational values, as well ecological processes such as pollination and seed dispersal. With increased urbanization and loss of green areas, how do we maintain biodiversity necessary for generation of urban ecosystem services? It has been hypothesized that species diversity along an urban-rural gradient is humped-shaped, with the highest diversity in areas in between rural areas and the urban core. I will discuss the generality of this hypothesis across taxa and the mechanism contributing to a humped-shaped diversity pattern. For example, low permeability of matrix in urban areas and high seed and nest predation, may lead to that several species in urban environments show source-sink dynamics and their persistence in the urban end of the gradient is limited by the rate of immigration. Results from field experiments along rural-urban gradients in the Stockholm metropolitan area support this notion. Urban management plans often focus on specific, small areas without paying attention to the surrounding landscape and there is a need for a deeper understanding of the importance of source-sink dynamics and matrix permeability for maintenance of urban biodiversity and important ecosystem services.

S09-4 **PARKER, TOMMY S. and CHARLES H. NILON** Department of Fisheries and Wildlife Sciences, 302 Anheuser-Busch Natural Resources Building, University of Missouri-Columbia, Columbia, MO 65211-7240, (tsp62e@mizzou.edu)

COMPARATIVE STUDY OF NATIVE AND EXOTIC URBAN GRAY SQUIRREL POPULATIONS

Comparative studies of terrestrial vertebrates are one aspect of understanding the ecology of cities. Comparative studies can be useful because they apply standard methods to studying questions about animal ecology and conservation. We study how urban mammals use habitat patches in cities, and if patterns of use are similar or different between cities. Our research uses a patch dynamics approach to study gray squirrel (Sciurus carolinensis) use of small urban parks. We compare gray squirrel density and behavior between native (Baltimore, Maryland, USA) and exotic (London, United Kingdom) populations. We predict that differences in density and behavior are due to differences in resources within the patch and in the matrix surrounding the patch rather than to differences in native vs. exotic species. Six study sites have been established in each city. Study sites are patches similar in size (2 – 6ha), percent canopy cover (40 - 65%) and located within in a matrix that extends 2km from the perimeter of the patch. Each matrix is categorized by the percent paved and unpaved area present. Our results indicate that differences in matrix type and resource availability have similar correlations with density and behavior among the two cities.

S09-5 **FERNANDEZ-JURICIC, ESTEBAN** Department of Biological Sciences, California State University Long Beach, Peterson Hall 1-109, 1250 Bellflower Blvd., Long Beach, CA 90840 (efernand@csulb.edu)

AVIAN CONSERVATION IN FRAGMENTED URBAN LANDSCAPES: THE EFFECTS OF SECONDARY FRAGMENTATION THROUGH HUMAN DISTURBANCE

Several studies have shown that urban sprawl negatively affects avian diversity through primary fragmentation. However, once fragments in urbanized landscapes become popular for recreational activities (hiking, bike-riding, dog-walking, etc.), birds could be affected by secondary fragmentation: an increase in habitat spatial and temporal heterogeneity within fragments. Several studies on the effects of human disturbance on wildlife have been conducted in the city of Madrid (Spain). The main results are (a) secondary fragmentation interacts with primary fragmentation reducing the suitability of forest fragments and the probabilities of fragment occupation, (b) responses to human disturbance could be linear or non-linear depending on the tolerance of different species, (c) the main mechanism implicated in such responses is the relationship between the frequency of human visitation and the frequency of resource use by wildlife (resource-use disturbance trade-off hypothesis). From a management perspective, this human-wildlife interaction mechanism predicts that to increase the representation of avian species in urbanized landscapes, humans do not necessarily need to be excluded from forest fragments, but pedestrian rates (number of visitors per unit time per unit area) need to be managed to ensure that low-tolerant species have enough spatial and temporal availability of resources for breeding and overwintering.

S09-6 **MCDONNELL, MARK J. and Kirsten M. Parris** Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne, c/o School of Botany, University of Melbourne, Victoria, 3010, Australia (markmc@unimelb.edu.au)

ATTRACTION OF NATIVE WILDLIFE TO URBAN AREAS, CONFLICT WITH HUMANS, AND IMPLICATIONS FOR CONSERVATION

The growth of urban and suburban environments around the world has led to the local extinction of many native plants and animals. Typically these environments support a large diversity and biomass of non-native species that thrive in cities and towns. Such organisms have been labeled urban exploiters or 'kulturfolgers'. Although many indigenous animals are urban avoiders, a small proportion successfully utilize urban and suburban habitats. In Australia, the magpie, brush-tail possum and grey-headed flying-fox are native species that have adapted to living in cities and towns. We will discuss the major conflicts resulting from the presence and activities of these three species in densely populated human environments. In addition, we will highlight strategies that have been used to maintain and manage their populations in cities and towns. Special attention will be given to the grey-headed flying-fox, a colonial-roosting species listed as vulnerable to extinction at both the State and Commonwealth levels, which poses a unique set of conservation challenges.

S09_7 **NIEMELÄ, JARI, D. Johan Kotze, and Vesa Yli-Pelkonen** Department of Biological and Environmental Sciences, P.O. Box 65, FIN-00014 University of Helsinki, Finland (jari.niemela@helsinki.fi)

APPROACHES IN COMPARATIVE URBAN ECOLOGY AND CONSERVATION BIOLOGY

Urban development threatens many species and habitats, but also creates novel habitats which support unique communities. This diversity of human impact poses a challenge for conservation. Comparative studies between cities will enhance our understanding of the ways in which components of the urban environment influence biodiversity. An approach combining urban-rural gradients with predictions about community responses to urbanisation has been used as a framework for comparative studies. Results from cities across the globe showed that carabid beetle communities were distinctly separated along such gradients in some cities but not in all. Furthermore, specific predictions made about species responses to urbanisation gained some support. However, individual cities displayed city-specific community characteristics, the causes of which should be explored with reference to the 'ecological' history and setting of the cities. For the application of ecological research in urban planning we link ecological and social systems by using the 'human ecosystem model', focusing on land-use changes as a result of urban planning and development. This approach may provide a way to address the important variables and feedback mechanisms between ecological information and social drivers, and thus result in increased understanding on how human society interacts with changes in urban ecological patterns and processes.

S09-8 **SADLER, JON P., Emma C. Small and Mark Telfer** School of Geography, Earth and Environmental Sciences, The University of Birmingham (j.p.sadler@bham.ac.uk) (JPS) + (ECS) UK Headquarters, The RSPB United Kingdom (MT)

THE CONSERVATION OF CARABID SPECIES ASSEMBLAGES IN URBAN ENVIRONMENTS: IS HABITAT QUALITY IMPORTANT?

Carabid assemblages in Birmingham (UK) were examined over the course of one full season to determine the relative importance of habitat quality, when contrasted against other potentially important variables related to the structure of the urban landscape (e.g. Site size, location). A total of 65 sites located across the rural-urban gradient and at varying distances from potential habitat corridors were examined. The results indicate that urban derelict and wetland habitats are particularly important for carabid conservation at the local scale, containing rich assemblages and some nationally scarce species, whereas grasslands, which are the most widespread form of urban habitat in most UK cities, are relatively depauperate. However, the main factors that appeared to affect carabid assemblages were related to habitat quality. Derelict and wetland assemblages were strongly influenced by vegetation (as a surrogate of age since the last disturbance) and woodland assemblages to the degree of site disturbance. Most of the carabid species studied appeared to not be affected by the degree of habitat fragmentation in the city and assemblages did not differ significantly between sites on and off urban habitat corridors.

S10-1 **KARESH, WILLIAM B. and Patricia Reed** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460 (wkaresh@wcs.org)

EBOLA AT THE HUMAN / WILDLIFE INTERFACE: GREAT APES, SURVEILLANCE AND 'WIN-WIN' OPPORTUNITIES FOR PUBLIC AND WILDLIFE HEALTH

In areas of the Central African Republic, Republic of the Congo, and Gabon, programs geared towards the development of gorilla eco-tourism as well as long-term ecological and behavioral research are currently underway by several organizations, including WWF, ECOFAC, EDG, WCS, and CIRMF. Increased concern about disease stems from recent reports of thousands of square kilometers of good gorilla habitat now almost devoid of gorillas and chimpanzees following the Ebola virus outbreaks in north-eastern Gabon in the mid 1990's. Additional outbreaks in more recent years have reduced chimpanzee and gorilla populations in neighboring areas. The Field Veterinary Program of the Wildlife Conservation Society is developing an integrated approach to protecting the health of lowland gorillas by partnering with ongoing projects and providing health care advice, services, training and community education and outreach programs. The overall objectives are to ensure the long-term health of great ape populations as eco-tourism and other human activities expand in the region, to ensure the health of humans that have direct or indirect contact with gorillas, and to use the linkages between great ape and human health to increase effectiveness of conservation efforts.

S10-2 **ROCKE, TONIE E., F. Joshua Dein, and Milton Friend** USGS National Wildlife Health Center, 6006 Schroeder Rd., Madison, WI 53711 (tonie_rocke@usgs.gov)

THE INTERNATIONAL TRADE IN WILDLIFE: DISEASE AND CONSERVATION ISSUES

Wildlife trade is a major global business estimated to be worth billions of dollars. U.S. wildlife trade has increased substantially in the last decade, increasing concerns about species conservation, the introduction of injurious animals, and the potential risks to human and animal health. In 2002 alone, over 38,000 mammals, 365,000 birds, 2 million reptiles, 49 million amphibians, and 216 million fish were imported into the U.S. Furthermore, the number of different species in trade increased from 200,000 in 1992 to 352,000 in 2002. The conditions for animal movement via the exotic pet and other wildlife trade facilitate opportunities for disease transmission between species that normally do not overlap in nature. The transmission of monkey pox through Gambian rats to prairie dogs and onto humans is a recent example, but it is not an isolated event. Rabies has been documented numerous times in pet wildlife brought into North America, and salmonellosis is commonly associated with pet reptiles. The movement of pathogens like Koi virus via the international trade of ornamental fish is a key pathway for spread of emerging fish diseases. Despite popular perception, safeguards to prevent the introduction and spread of disease through human movement of wildlife are lacking.

S10-3 **GINSBERG, JOSHUA R., Linda Krueger, and Endi Zhang** Wildlife Conservation Society, 2300 Southern Boulevard, Bronx NY 10406-1099 (jginsberg@wcs.org)

WILDLIFE TRADE AND EMERGING DISEASES-SHORT AND POTENTIAL LONG TERM IMPACTS ON CHINESE DEMAND FOR WILDLIFE PRODUCTS: AN OPPORTUNITY FOR CONSERVATION?

The use of wildlife for both medicine and food is deeply rooted in the culture of China, and in countries across East and Southeast Asia. The Materia Medica of China lists 1892 species, including 461 animals, used to produce products or treatments for the maintenance of health and the treatment and prevention of illness. Most Asian countries have strong national governments, and view wildlife management as a sovereign issue. The combination of strong governments, and deep cultural history in the use of wildlife, are critical background to any intervention in the management of diseases that affect and move between and among wildlife, livestock, and humans. In this paper, we analyze the suite of wildlife-focused interventions that were used, or could have been used, in containing recent outbreaks of SARS and Avian Influenza virus, and discuss how cultural and governmental constraints can on the one hand limit options in an outbreak, and on the other hand be used to promote actions that benefit wildlife conservation in the short and long-term.

S10-4 **PAPPAIOANOU, MARGUERITE** Centers for Disease Control and Prevention, Atlanta GA, 30333 (mxp1@cdc.gov)

CAN THE CONSERVATION COMMUNITY HELP PREVENT THE NEXT EPIDEMIC?

During the last decades, several serious infectious disease outbreaks in humans (e.g., Ebola fever, West Nile Virus, Monkeypox, SARS, avian influenza), have occurred globally. Approximately 75% of emerging infectious diseases are transmitted from animals to humans. The spread of disease among wildlife, domestic animals, and humans is facilitated by an increasing human population; human encroachment into wildlife habitat; changing climates and ecosystems; increasing international travel and trade; human-made and natural disasters; increased rapid movement of people and animals; globalization of the food supply; and human behaviors, including the consumption of bush meat, and the importation and purchase of exotic animals for pets. Preventing infectious disease outbreaks requires early detection and response in humans and animals at the local level, ongoing disease surveillance in humans, wildlife, domestic animals, and insect vectors, epidemiologic investigation of both human and animal aspects of outbreaks; research on the epidemiology and risk factors of disease, regulating the importation and movement of exotic animals and bush meat, and incorporating health considerations into wild animal translocations. The conservation community is an important partner to public health, locally, nationally, and globally in efforts to prevent emerging infectious disease outbreaks, benefiting people and protecting wildlife and biodiversity.

S10-5 **KOCK, MICHAEL D. and Richard A. Kock** Wildlife Conservation Society Field Veterinary Program, AU-IBAR PARC, PO Box 30786, Nairobi, Kenya (RAK). PO Box 106 Greyton 7233, South Africa, (mdkock@kingsley.co.za) (MDK)

HUMAN HEALTH AND CONSERVATION: SO-CALLED EMERGING AND RE-EMERGING HUMAN AND ANIMAL DISEASES IN AFRICA-POLITICAL, CULTURAL AND INSTITUTIONAL FACTORS THAT INFLUENCE DISEASE MANAGEMENT AND IMPLICATIONS FOR CONSERVATION AND DEVELOPMENT

Whilst Africans' remain poor and poverty dictates choice, conservation and the environment will not be priorities to subsistence communities in Africa. Disease issues impact on the health of people, their livestock, wildlife and natural communities. Many "new" emerging and re-emerging diseases, affecting humans, their livestock and wildlife, have had a negative influence on human health. Animal diseases such as Rinderpest and Foot-and-Mouth have indirectly affected human and ecosystem health through livestock and production losses and have had direct impacts on natural resource areas, their biodiversity and on natural resource users. Diseases such as Ebola are major health issues at the interface that impact on biodiversity as well as human health. Human diseases, such as HIV, have had huge socioeconomic impacts on the African continent and both treatment and preventive measures have been compromised by behavioral, social and political problems- conservation cannot escape these realities. It is clear that the issues are not simply the diseases themselves but how political, cultural and logistical factors impact on the ability of individuals or groups to manage, control and prevent both human and animal diseases whilst maintaining biodiversity.

S10-6 **WILLIAMS, ELIZABETH S., Michael W. Miller, and E. Tom Thorne** Department of Veterinary Sciences, University of Wyoming, 1174 Snowy Range Road, Laramie, WY 82070 (storm@uwyo.edu)(ESW). Colorado Division of Wildlife, Wildlife Research Center, 317 W. Prospect, Fort Collins, CO 80526 (MWM). Wyoming Game and Fish Department, 709 University Avenue, Laramie, WY 82072 (ETT).

CHRONIC WASTING DISEASE: IMPLICATIONS FOR WILDLIFE MANAGEMENT AND SUSTAINABLE USE

Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy (TSE) affecting farmed and free-ranging deer and elk. Eradication of the serious domestic animal TSEs such as bovine spongiform encephalopathy and scrapie of sheep is a goal of many countries. Eradication or control of CWD is being attempted by animal health and wildlife management agencies in North America because of concerns that CWD could negatively impact populations of cervids and because of concerns about potential, though not demonstrated, susceptibility of humans and livestock. Chronic wasting disease, especially in free-ranging cervids, represents a significant challenge to wildlife managers.

S10-7 **COOK, ROBERT A. and William B. Karesh** Wildlife Health Sciences, Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460 (rcook@wcs.org)

PEOPLE, POODLES, PIGS AND PRIMATES (OF THE NON-HUMAN KIND)- THE POTENTIAL FOR ONE HEALTH THROUGH PUBLIC-PRIVATE PARTNERSHIPS

The goals of public health and agriculture agencies are to protect human populations, food supplies and to a lesser extent, pets, from disease threats. Concurrently, the focus of wildlife agencies has been to ensure the health of free-ranging wild animals. Each has been focused on their narrowly defined charge. The emergence of zoonotic diseases such as West Nile Virus, Ebola, SARS, Avian Influenza and Monkey Pox are taking their toll on animals and people. It is clear that we ignore the connection between human, domestic animal and wildlife health at our own peril. These serious disease threats are driving the development of a more holistic paradigm that considers One Health across the taxonomic continuum. In a globalized world, no one government or scientific discipline has the knowledge to prevent the emergence of diseases. Physicians, veterinarians and biologists are defining a more integrated approach to surveillance, prevention and control in unique public private partnerships. Whether it be zoos working with public health officers to enhance surveillance against West Nile Virus or field veterinarians side-by-side with physicians devising controls against Ebola virus, there is little doubt that a broader based approach will be key to the prevention and control of emerging diseases.

S10-8 **WILKIE, S. DAVID, Paul Telfer, and Peter D. Walsh** Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW) (dwilkie@wcs.org). Centre International de Recherches Médicales, B. P. 769 , Franceville, Gabon (PT), Department of Ecology and Evolutionary Biology, Guyot Hall, Princeton, University, New Jersey 08540 (PW)

NONHUMAN PRIMATES, BUSHMEAT CONSUMPTION, AND HUMAN DISEASE: IMPACTS, AND IMPLICATIONS FOR ALTERING HUMAN BEHAVIOR

Throughout Central Africa apes and other primates are hunted and consumed. In most areas primates constitute a small percentage of the animal protein diet of people, relative to other mammals and most particularly fish. In Gabon a survey of over 1800 households showed that apes and other primates represent less than 3% of the wildlife biomass consumed. Though relatively unimportant in dietary and income terms, hunting, butchering and eating apes and primates has and continues to confer a disproportionate public health risk to humans, and puts in jeopardy the long term survival or these slow reproducing wildlife species. Public health education programs combined with effective law enforcement will go a long way to halt the consumption of primates. This will have little adverse economic and dietary impacts on typically poor Central Africa producers and consumers of wildlife, but will have significant positive effects on public health risk factors and on the conservation status of apes and monkeys.

S10-9 **MILLER, PHILIP S., Robert Lacy, Philip Nyhus, Laura Hungerford, Paul Paquet, and Frances Westley** IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124-8151 (pmiller@cbsg.org)(PM, RL). Department of Conservation Biology, Chicago Zoological Society, Brookfield, IL 60513 (RL). Department of Earth and Environment, Franklin & Marshall College, Lancaster, PA 17604-3003 (PN). Department of Epidemiology and Preventive Medicine, University of Maryland School of Medicine, Howard Hall, Room 135, 660 West Redwood Street, Baltimore, MD 21201 (LH). Faculty of Environmental Design, University of Calgary, Box 150, Meacham, SK, S0K 2V0, CANADA (PP). Faculty of Management, McGill University, 1001 Sherbrooke St. West, Montreal, Quebec, H3A 1G5 CANADA (FW).

CONSIDERING DISEASE DYNAMICS IN WILDLIFE CONSERVATION DECISION-MAKING: AN INTEGRATED META-MODEL APPROACH

With the emergence of infectious disease as a global threat to both human and wildlife health, creative new approaches are needed to integrate and synthesize information from diverse disciplines that historically have had little overlap, including human and wildlife epidemiology, population biology, wildlife management, and a broad spectrum of social sciences. An interdisciplinary group of collaborators, the Biocomplexity Research Network, has explored strategies to harness the power of different disciplinary and modeling approaches to better understand disease ecology and endangered species risk assessment by studying the dynamics of interdisciplinary collaboration and by developing integrated open-data meta-models. In these models, the specifications and output of component sub-models are accessible to other components and disciplines, thereby leading to a richer understanding of complex dynamics and emergent relationships than could be gathered through a more narrow-focused analysis within a single discipline. We describe how a linked disease-population dynamics-spatial model can be used as a powerful new tool for understanding complex feedbacks between disease ecology and conservation policy.

S11-1 **ASHE, DAN and Susan Haseltine** U.S. Fish and Wildlife Service, 1849 C St., NW, Washington, DC 20850 (dan_ashe@fws.gov) (DA) U.S. Geological Survey, 12201 Sunrise Valley Drive, Reston, Virginia 20192-0002 (SH)

GENETICALLY ENGINEERED ORGANISMS IN FISHERIES AND WILDLIFE CONSERVATION: PROPOSALS, BENEFITS, AND CONCERNS

The art and science of producing genetically engineered organisms (GEOs) have advanced rapidly in the past few years. GEOs can be used in a wide range of conservation activities, including land management, habitat restoration, endangered species recovery, population supplementation, and control or eradication of nuisance or invasive species. Already, the U.S. Fish and Wildlife Service is facing questions about applications of genetically modified crops in managing the 95 million-acre National Wildlife Refuge System and use of daughterless gene technology in the control of invasive species, such as nutria (Myocaster coypus). Conservation biologists must be equipped to make decisions considering the full range of potential benefits and detriments associated with the use of these new tools, as well as understanding the risk inherent in those applications. The recent announcement that USDA will be reviewing its regulatory processes for commercial approval of genetically modified crops and insects, including a “wide-ranging Environmental Impact Statement,” illustrates the need for proactive Federal oversight to ensure that GEO applications resulting in negative impacts to community stability are avoided. This paper offers the perspective and experience of two Federal agencies (U.S. Geological Survey, U.S. Fish and Wildlife Service) that must prepare to face that challenge.

S11-2 **EHRENFELD, DAVID** Department of Ecology, Evolution, and Natural Resources Cook College, Rutgers University (dehrenfeld@aesop.rutgers.edu)

GENETIC ENGINEERING IS NOT A PROMISING TOOL FOR SPECIES CONSERVATION

Genetic engineering is likely to be of little help in conserving endangered species, and has the potential of doing considerable harm. Few, if any, species are endangered because of one or two substitutable genes; therefore endangered species are not suitable candidates for gene manipulation. The record of genetic engineering in agriculture, an analagous situation in which GM organisms are released into the environment, has been one of exaggerated early claims and subsequent failure, for good biological reasons. Yet preserving an endangered species in its habitat is far more complex than anything undertaken by genetic engineers in agriculture. Release of genetically engineered viruses and other organisms will carry the same risks as introductions of any exotic species. Risk assessment, given the unknowns in such cases, is of no value. Genetic engineering, an expensive technology, will divert scarce resources from legitimate conservation efforts, and create a false reliance on a technological fix based on a mechanistic and incorrect biological premise. In conservation, the more elaborate and complex a preservation scheme, the less likely it is to succeed.

S11_4 **OBERHAUSER, KAREN S. and Erika R.L. Rivers** Department of Fisheries, Wildlife and Conservation Biology, University of Minnesota, St Paul, MN 55108 (oberh001@umn.edu). Conservation Biology Program, University of Minnesota, St Paul, MN 55108 (ER)

MONARCH BUTTERFLY (DANAUS PLEXIPPUS) LARVAE & BT CORN POLLEN: A REVIEW OF ECOLOGICAL RISK ASSESSMENT FOR A NON-TARGET SPECIES

An ecological risk of transgenic Bt crops is the potential for harmful effects on non-target species exposed to the Bt protein. The monarch butterfly (Danaus plexippus) is perhaps the best studied non-target species. We will review research on risks to monarch larvae from Bt corn pollen and discuss remaining questions from the risk assessment that lead to the re-registration of Bt corn in the US. Although the risk to monarch larvae from most varieties of Bt corn has proven to be small, one variety (event 176) posed a significant threat. This variety was registered and commercialized without complete understanding of its risk. In addition, risks due to consumption of corn anthers, which contain more Bt toxin than the pollen, and sublethal impacts were not well-addressed in the original risk assessment. We suggest ways to improve pre-commercialization regulation and ecological risk assessment, with the hopes of preventing negative impacts to non-target species. Among our recommendations: make the pre-commercialization risk assessment broadly accessible, independent, and focused on the unique ecological context for the proposed transgenic crop; increase funding for independent non-target risk assessments; and establish a product registration regime that is based on the best available science and responsive to uncertain science.

S11-5 **PEACOCK, ANTHONY** Pest Animal Control Cooperative Research Centre, Canberra, AU.

ENGINEERING VIRUSES TO COMBAT INVASIVE SPECIES

Viruses have been used with remarkable success for more than half a century to combat the European rabbit (Oryctolagus cuniculus) in Australia. Myxoma virus has been estimated to have killed more than 95% of rabbits in Australia in the 1950s and, despite coevolution of the virus and rabbits, remains an important biocontrol. Rabbit haemorrhagic disease virus was applied in the 1990s, again with great success. Pest animals remain a major cost to the Australian environment and economy and present one of the major threats to Australian biodiversity. The biotechnology age gives us the tools to create viruses that may be used against invasive pests. The Pest Animal Control Cooperative Research Centre has developed several viral vaccines that can potentially be used to sterilise rabbits and the house mouse (Mus domesticus) in the field. The potential for a disseminating genetically modified virus raises national and international social, legal and ethical issues which must be weighed against the environmental and economic benefits.

S11-6 **REGAL, PHILIP J. and Erika R.L. Rivers** Addresses:Department of Ecology, Evolution, and Behavior (PR) and Conservation Biology Program (PR, ER), 100 Ecology Building, University of Minnesota, 1987 Upper Buford Circle, St. Paul, MN 55108 USA, regal001@umn.edu.

BIOPROSPECTING FOR GENETIC FOOL'S GOLD? IMPLICATIONS FOR CONSERVATION BIOLOGY

Abstract:Forests and oceans contain an abundance of genetic material that could be key to the production of a variety of new pharmaceutical, materials, and other chemical products. It has been argued since the 1970s that conservationists should use the preservation of this "genetic gold" as the justification for the preservation of nature, and that conservation can thus "pay its way" with the alleged profits. This concept has grown into a complicated web of geopolitical issues over patents and intellectual property rights, the ownership of communal lands and collective resources, compensation for indigenous knowledge, international debt service, and military operations in developing countries. The interaction of these and other issues threatens to backfire on the conservation movement in several ways and enforces the idea that all conservation science—especially claims of the potential conservation benefits from molecular technologies—need to be carefully evaluated not only scientifically, but within their larger social, political, and economic contexts. This paper reviews the history of the "genetic gold" idea, outlines the alleged benefits, discusses the flaws in the argument, and warns of the potential dangers of promoting the idea as a conservation tool.

S11-7 **SENDASHONGA, CYRIE, Ryan Hill**. Addresses:Secretariat of the Convention on Biological Diversity, Suite 300 – 393 St. Jacques Street, Montreal, Quebec, Canada H2Y 1N9, (cyrie.sendashonga@biodiv.org)

THE CARTAGENA PROTOCOL ON BIOSAFETY – AN INTERNATIONAL INSTRUMENT FOR PROTECTION OF BIODIVERSITY FROM POTENTIAL ADVERSE EFFECTS OF GENETICALLY MODIFIED ORGANISMS.

The Cartagena Protocol on Biosafety was adopted in January 2000 under the auspices of the Convention on Biological Diversity, and entered into force in September 2003. Its objective is to contribute to the safe transfer, handling and use of Living Modified Organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity. The Protocol's provisions include science-based risk assessment, risk management, and procedures for decision-making regarding export and import of LMOs. This paper reviews the key provisions of the Protocol, highlights some key challenges to its effective implementation, and suggests ways by which the Society for Conservation Biology could contribute to its objective at an international level.

S11-8 **SPIELMAN, ANDREW** Harvard School of Public Health (aspielma@hsph.harvard.edu)

EPIDEMIOLOGICAL OBSTACLES TO THE SUPPRESSION OF VECTOR-BORNE INFECTIONS BY MEANS OF GENETICALLY MODIFIED MOSQUITOES

Various research efforts now seek to develop a technology for releasing genetically modified, pathogen-incompetent, vector insects in order to suppress the transmission of such mosquito-borne infections as malaria and dengue. The released mosquitoes would carry a genetic construct that includes a component that would reduce the competence of these insects as hosts for the relevant pathogen linked to a component that would insure that more descendants would carry the construct than would occur by chance. Neither the required level of incompetence nor the desired timeline for this goal have been specified. Ethical considerations would limit the abundance of any hematophagous insects that are to be released and would require that the resulting population of modified mosquitoes must not be nurtured. Insecticide use must not be compromised. Other infections that these insects transmit should not be amplified. Future releases incorporating the same or a related drive mechanism must not be compromised. In the event that the released insects are to be insecticide resistant, this trait must not preclude the future use of insecticides for public health purposes. Any toxin that is to be incorporated into transgenic plants, should be presented in a way that will protect future applications of microbial insecticides.

S11-9 **STRAUSS, STEVEN H. and Scott A. Merkle** Department of Forest Science, Oregon State University, Corvallis 97331; and University of Georgia, Athens 30602 (Steve.Strauss@oregonstate.edu)

GENETIC ENGINEERING (GE) AS A CONSERVATION TOOL: THE CASE FOR TREE BIOTECHNOLOGY

GE trees could have a number of major conservation benefits, but also entail risks. How they are employed, not their method of creation, will be the most important determinant of benefit vs. risk. Like other forms of tree breeding, field trials and early stages of commercial use are functionally part of variety development. However, current regulatory laws, absolute intolerance by “green” certification systems, public unease, and consequent risks for business make GE variety development problematic. If the SCB agrees that some forms of GE can be important conservation tools, it should consider a resolution that opposes organizations whose policies indiscriminately impede all forms of GE research and development.

S11-10 **THRESHER, RONALD and Nic Bax** CSIRO Marine Research, Castray Esplanade, Hobart, Tasmania 7001 Australia (Ron.Thresher@csiro.au)

EVALUATION OF GENETIC APPROACHES FOR MANAGING THE IMPACTS OF INVASIVE SPECIES

Recent developments in recombinant technology offer the possibility of applying genetic approaches to control and possibly eradicate populations of invasive species. Work is underway in both Australia and Europe on such approaches, and being discussed in North America. We use a simulation model, based loosely on an invasive fish (carp), to explore the biological strengths and weaknesses of a number of possible approaches and the effects of life history parameters on the likelihood that if applied they would be successful in controlling the targeted population. We conclude that genetic technologies could be useful in controlling pests, including slowing their rate of spread, and that of the techniques considered, gender manipulation appears to be the most effective under a wide range of life history features. We also touch on some of the social and political issues involved in applying such technology to pest management.

S11-11 **WOLFENBARGER, L. LAREESA, John P. McCarty, Page E. Klug, and Lorelle I. Berkeley** Department of Biology, University of Nebraska at Omaha, Omaha, NE 68182-0040 (lwolfenbarger@mail.unomaha.edu).

THE ROLE OF CONSERVATION SCIENCE IN ASSESSING NON-TARGET EFFECTS OF TRANSGENIC CROPS ON COMMUNITIES AND ECOSYSTEMS

Widespread and rapid adoption of transgenic crops engineered with herbicide tolerances or insecticidal properties has dramatically changed agricultural practices. For example, in the United States and Argentina, over 85% of soybeans planted are tolerant to the broad-spectrum herbicide Round-up, changing weed management to this herbicide. Transgenic corn with insecticidal properties from ;Bacillus thuringiensis; (Bt corn) targets specific insect Orders, such as Lepidoptera and Coleoptera compared with the alternative of using broad-spectrum insecticides. Adoption of transgenic crops has significant conservation implications for grassland communities and ecosystems that occur in intensively agricultural landscapes and has the potential to have positive or negative impacts. However, data used prior to commercialization of these crops in the U.S. have severe limitations to evaluate or to predict impacts on communities or ecosystems, and post-commercialization testing and monitoring are not an integral component of the regulatory process. This talk will provide an overview of approaches and methodologies to address these gaps in the regulatory framework and will draw on examples from research conducted in the United Kingdom and the Midwestern United States.

S12-1 **SANJAYAN, M.** The Nature Conservancy 4245 N Fairfax Drive Arlington, VA 22201 (msanjayan@tnc.org)

WHY MEASURES MATTER

Few would argue that measuring the impact of our conservation actions is unimportant. Foundations and the general public who support conservation are keen to know that their support is as effective as it can be in achieving the desired results. Amongst the managers of conservation organizations there is a new burden of responsibility to ask critical questions about the efficacy of strategies that have often been taken for granted. So why then are conservation measures so poorly developed and not more widely accepted? Certainly no for-profit industry would dare to act this way. Here, I argue that the role of science in conservation organizations, how conservation is marketed, how management is held accountable, and the fear of competition if measures are standardized, all contribute to the lack of credible conservation measures. Further, the sense of crisis in conservation deepens the need to “just do something”. Using examples from recently conducted conservation audits, I present evidence for why such thinking is misleading. I show how simple changes in accountability, intra organizational collaboration, and transparency, can lead to far more efficient use of scarce resources all without detracting from the accomplishment of solid conservation results.

S12-2 **SALAFSKY, NICK and Richard Margoluis** Foundations of Success (FOS), 4109 Maryland Avenue, Bethesda MD 20816 (Nick@FOSonline.org)

A COMPARISON OF MONITORING AND EVALUATION SYSTEMS ACROSS CONSERVATION ORGANIZATIONS

Conservation practitioners currently have no common way of assessing the status of the biodiversity they care about, measuring the impact of and improving the effectiveness of their conservation actions, convincing managers, donors, and supporters that their results are credible, and learning from one another in a systematic fashion. To address these issues, the members of the Conservation Measures Partnership came together to pool their efforts, capitalize on their collective experience and expertise, avoid duplication of work, bypass tried but failed approaches, and quickly identify and adopt best practices. One of the Partnership's first products was a "Rosetta Stone" that helps translate commonly used concepts and terms in the various monitoring and evaluation systems currently used by our members. We found that although language may vary, the underlying concepts are actually remarkably similar. From this base, the Partnership has gone on to develop common systems and inter-organizational auditing mechanisms designed to answer two key questions: "Can we demonstrate that our actions are making a difference?" and "How is the biodiversity we care about doing?" In this symposium, members of the Partnership will present our progress to date.

S12_3 **DUTTON, IAN M., P. Kareiva, Z. Lu, R. Mullen, S. O'Connor, and D. Salzer** Conservation Measures Group, The Nature Conservancy, 5410 Grosvenor Lane Bethesda, Suite 130, MD 20814 (idutton@tnc.org)(ID, DS), TNC Pacific Western Conservation Region, 4722 Latona Ave NE Seattle WA 98105 (PK), WWF Conservation Measures and Audit Programme, 39 Stoke Gabriel Rd., Galmpton Brixham Devon TQ5 0NQ UK (SO), CI China Program, College of Life Sciences Peking University, Beijing 100871, China (LZ)

STAKEHOLDER AND AUDITOR PERSPECTIVES ON CONSERVATION AUDITING: A CASE STUDY OF THE TNC CHINA PROGRAM

The Nature Conservancy's (TNC) Yunnan Great Rivers Project (YGRP) is a high profile project NW Yunnan, China. The YGRP has grown rapidly since establishment in 1998. Progress has been most notable in respect of priority setting, building partnerships with local and national stakeholders, agreeing core conservation areas with government, determining the most immediate threats to biodiversity, and determining and implementing strategies to mitigate those threats. The central government has noted that the YGRP could be a model for biodiversity conservation, as well as sustainable development throughout China. The purpose of this review therefore, was to undertake an assessment of (a) the China Program's ability and capacity to achieve tangible and lasting conservation impact in NW Yunnan, and (b) influence how conservation areas throughout China are designed and managed. Review outcomes were used to guide development of a strategic plan for the China program, for prioritizing conservation investments and for more general organizational development. The review engaged members of the Conservation Measures Partnership. It was concluded that such broad engagement greatly enhanced the effectiveness of the review process and enhanced cross-institutional learning in ways that advance the practice of conservation management.

S12-4 **MARGOLUIS, RICHARD and Nick Salafsky** Foundations of Success 4109 Maryland Ave Bethesda, MD 20816 (Richard@FOSonline.org)

DEVELOPING AND IMPLEMENTING OPEN STANDARDS FOR THE PRACTICE OF CONSERVATION

A key question facing all conservation practitioners and organizations is: “Are our actions effective in achieving our conservation goals?” We must answer this question in order to be able to adapt and change our actions over time, learn about which actions work and do not work, and convince our donors and society that conservation is a worthy investment. The organizations involved in the Conservation Measures Partnership (CMP) all apply some form of project cycle management to their conservation projects. While there is consistency among organizations, the conservation community has yet to arrive at a common understanding of the steps and principles of good project management. Our goal in developing open standards is to bring together common concepts in conservation project design, management, and monitoring. To draft the standards, CMP members used principles of project cycle management derived from other fields. Individual member organizations contributed their experience in discussions to refine these principles. The standards include three categories – principles, tasks, and guidance – organized in seven steps that comprise the project management cycle. These steps include conceptualization, planning, implementation, analysis, adaptation, communication, and iteration. CMP designed these standards to assist practitioners across the conservation landscape to maximize the effectiveness of their projects.

S12-5 **O'CONNOR, SHEILA, David S. Wilkie, and Harry van der Linde** World Wide Fund for Nature, WWF International, Avenue du Mont-Blanc, 1196 – Gland, Switzerland (SO soconnor@wwfint.org), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW), African Wildlife Foundation, 1400 Sixteenth Street, N.W. Suite 120, Washington, D.C. 20036, USA (HvL)

AN OVERVIEW OF THE CHALLENGE OF DETERMINING MANAGEMENT EFFECTIVENESS

Providing evidence of the effectiveness of conservation projects is essential for governments to verify that their policies and practices are indeed conserving biodiversity, and for sponsors to assess whether or not their support has had the desired effect. Yet measuring the impact of conservation investments on biodiversity is difficult because: 1) showing cause and effect is a challenge when controlled experiments are impractical, 2) 'natural' inter-annual variability makes short term assessments unreliable, 3) rare species are difficult to monitor, and 4) long-lived species can persist for many years, yet be effectively ecologically extinct. Given this, the conservation community is seeking ways to predict the effectiveness of conservation projects. Across organizations there is considerable collective understanding of how effective conservation projects are designed, implemented and adapted to changing conditions. CMP has compiled these consensus best practices into a set of standards that provide the principles, tasks, and guidance necessary for undertaking effective conservation projects. Use of these standards will improve the practice of conservation and help demonstrate the link between actions taken and observed changes in threats and targets. Auditing the use of these standards by conservation projects will also help predict the likelihood that they will achieve their conservation objectives.

S12-7 **CRONE, NIELS and David S. Wilkie** Conservation International, 1919 M Street, NW, Suite 600, Washington, D.C. 20036 (NC) (niels.crone@conservation.org), Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10468 (DW)

MAKING CONSERVATION COST-EFFECTIVE: DEVELOPING SYSTEMS TO ACCOUNT FOR CONSERVATION SPENDING

For conservation NGOs to say what is and is not cost-effective and thus characterize best practices, it is broadly understood that we need to monitor and evaluate the impacts of our conservation activities. What has been less often discussed is that we need to know how much, in dollar terms, we spent implementing these activities if we want to assess their relative cost-effectiveness. Today, few if any conservation organizations structure their accounting practices to explicitly keeping track of what they spend on individual conservation interventions nor do we systematically record spending on individual efforts to monitor the effectiveness of these activities. Rather, our accounting systems have simply kept track of all the goods and services purchased by a project. To better understand the costs and benefits of accounting for our conservation activities member organizations in the Conservation Measures Partnership are conducting a small set of field tests. Preliminary results of these case studies will be presented, and the challenges to and value of directly tracking the costs of implementing and monitor our conservation actions will be discussed.

S12-8 **HOCKINGS, MARC** School of Natural and Rural Systems Management, University of Queensland (m.hockings@uq.edu.au)

DETERMINING MANAGEMENT EFFECTIVENESS: AN INTERNATIONAL PERSPECTIVE

Over the past decade more than twenty methods for evaluating effectiveness of management of protected areas have been developed and applied around the world. They vary in their scope (from site to system level), in the nature of data used in assessment (quantitative, qualitative, mixed), focus (broad to narrow) as well as in the specifics of the assessment methodologies employed. This diversity arises in part from the varying purposes for evaluation, and the differing regional and institutional contexts and capacities that apply to the evaluation process. Despite this diversity, a number of general principles for sound evaluation on management of protected areas have been identified by practitioners. These principles address issues such as the institutional context of evaluation, the selection of an appropriate evaluation methodology to suit a particular purpose and context, desirable attributes of the evaluation process relating to participation in the evaluation process, communication and use of results and the importance of sound science in supporting management effectiveness evaluation.

S12-9 **KENNEDY, ELIZABETH** Conservation International, 1919 M Street, NW, Suite 600, Washington, DC (e.kennedy@conservation.org)

AN OVERVIEW OF THE CHALLENGE OF ASSESSING CONSERVATION STATUS

Over the last decade, several methodologies for assessing conservation status have been applied. These methodologies range from detailed species population and nested plot-level habitat assessments, tailored towards research efforts, to rapid appraisal and project cycle management approaches, which support basic donor reporting and efficiency objectives. However, there are no globally consistent and quantitative techniques to assess achievement of conservation. The intent of this discussion is to present a summary of some of the efforts to establish more systematic measurement of biodiversity status across the planet and highlight some of the challenges and opportunities to implementing a globally applicable set of indicators.

S12-10 **ERVIN, JAMISON, Jeff Parrish, Dan Salzer, Doria Gordon, and Tim Tear** Conservation Measures Group, The Nature Conservancy (jamie_ervin@tnc.org) (JE); Director of Conservation Planning, Global Priorities Group, The Nature Conservancy (JP): Conservation Measures Manager, The Nature Conservancy (DS): The Nature Conservancy DG: The Nature Conservancy - Eastern New York Chapter (TT)

TNC'S SYSTEM FOR DETERMINING CONSERVATION STATUS OF ECOREGIONS

For seven years, The Nature Conservancy (TNC) has set priorities for biodiversity conservation and created a vision with partners along ecoregional boundaries, resulting in a conservation blueprint of ecological goals, places, and priorities for action. Lacking is a set of standard metrics for assessing the conservation status of biodiversity within ecoregions – the same scale at which priorities are set – to ensure adaptive management, accountability for conservation investment, and to galvanize conservation stakeholders to action. TNC has recently developed a set of five measures for assessing the conservation status of ecoregions. These measures monitor progress toward 1) achieving conservation goals established through ecoregional planning, 2) the degree of legally-binding land and water protection, 3) management effectiveness within conservation areas, 4) threats to key conservation targets within an ecoregion, and 5) changes in natural land cover across the ecoregion. The results from a conservation assessment can be used within an ecoregion to sequence conservation actions and identify geographic priorities. The results can also be used across ecoregions to identify broad-scale conservation trends, and develop strategies to abate widespread threats. This presentation describes the five measures, summarizes findings from two dozen ecoregional status assessments, and identifies implications for conservation NGOs and policy makers.

S12-12 **MACE, GEORGINA M., Andrew Balmford, Peter Crane, and Rhys E. Green** INSTITUTE OF ZOOLOGY (georgina.mace@ioz.ac.uk)

MONITORING WILD NATURE FOR THE WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT 2010 TARGETS

By agreeing to strive for "a significant reduction in the current rate of loss of biological diversity" by the year 2010, political leaders at the 2002 World Summit on Sustainable Development presented conservation scientists with a great opportunity, but also one of their most significant challenges yet. Assessing how rates of loss have changed by 2010 requires that a given attribute has been measured at least three times, but many habitats, species, populations and ecosystem services have not been assessed even once. An emerging consortium of NGOs responsible for compiling most existing measures of biodiversity is discussing the idea of joint reports on a suite of global-level indicators relevant to the 2010 target. This will be yet more powerful if it incorporates, from the outset, independent scientific assessment of the measures, how they are analysed, and what key gaps in data and knowledge now need to be addressed. In July 2004, a Royal Society Discussion meeting will focus on the scientific issues that underpin such measures, and at a follow-up workshop, collaborative plans to measure and report on the 2010 target will be developed. Coming shortly after this workshop, this talk will summarise the outcomes from the Royal Society discussion meeting and workshop, focussing on the emerging measures and the collaborative partnerships necessary for their development, production, and use.

S13-1 **BURGESS, NEIL, Taylor Ricketts, and Andrew Balmford** UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). (neil.burgess@wwfus.org). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC (NB, TR). Conservation Biology Group, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK (AB)

CORRELATION BETWEEN HIGH POPULATION DENSITY AND BIODIVERSITY IN AFRICAN FORESTED REGIONS

Across Africa there is a wide variation in the density of both biological value (measured as species richness, endemism or non-species biological values) and human population density. This paper will explore these relationships, especially as they relate to changes in altitude and will seek to test whether high biodiversity value and high population densities of people are found significantly more often in the mountain regions of Africa. The paper will start at continent-wide scale using WWF's terrestrial ecoregions of Africa database and 1 degree resolution databases compiled in Denmark and Germany, and will then progress down to ecoregion scale (Eastern Arc Mountains) and will provide at least one example at the scale of a single block mountain within the Eastern Arc (the Ulugurus).

S13-2 **DEO, KUJIRAKWINJA, Isaiah Owiunji, and Helga Rainer** Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (DK, IO) (deokujirak@yahoo.fr). International Gorilla Conservation Programme, PO Box 10950, Kampala, Uganda (HR)

TRANSBOUNDARY COLLABORATION TO ENSURE BETTER CONSERVATION IN THE GREATER VIRUNGA LANDSCAPE

Many of the protected areas within the Albertine Rift are contiguous with protected areas across international boundaries. This is particularly true for the Greater Virunga Landscape that includes Virunga National Park in the Democratic Republic of Congo (DRC) and the contiguous protected areas in Uganda and Rwanda. For 13 years the International Gorilla Conservation Programme has been working in the Virunga Volcanoes and Bwindi Impenetrable National Park to foster transboundary collaboration. The results have shown that regular meetings and planning of activities by wardens can lead to better conservation even with countries at war with each other. Despite the wars between the three countries there have been regular meetings and the wardens have been able to collaborate. More recently the Wildlife Conservation Society has started a programme to support transboundary collaboration further north in the landscape so that all contiguous protected areas are working together. Regional planning of threats to the protected areas show major problems in DRC which is just coming out of war and there is a real need to work together to support the Congolese park's authority (ICCN) in tackling these threats in the Virunga Park. About 15% of the park has some form of encroachment (agriculture or pastoralism) and animal numbers have declined significantly according to recent surveys. Many threats are transboundary in nature and there is a need to focus conservation on species that require the whole Greater Virunga Landscape in order to survive and to plan for their management needs.

S13-3 **OATES, JOHN F., Richard A. Bergl, and Roger Fotso** WCS Africa Program, 2300 Southern Boulevard, Bronx, NY (JFO). Hunter College of CUNY, 695 Park Avenue, NY (john.oates@hunter.cuny.edu) (JFO). Anthropology Program, CUNY Graduate Center, 365 Fifth Avenue, NY (RAB). WCS Cameroon, BP 3055 Messa, Yaoundé (RF).

BIODIVERSITY OF CAMEROON HIGHLANDS, WEST AFRICA

The rain-forest zone between the Rivers Niger and Sanaga bordering West Africa's Gulf of Guinea is one of the most biodiverse in all of Africa. It has very high species richness and high levels of endemism, and many of the taxa are endangered as a result of intense anthropogenic pressures. This region's special features are the result of geography and history. Parts of the area have the highest annual rainfalls in Africa, and forest probably persisted here during Pleistocene glacial maxima; ecosystems include coastal mangrove and swamp forest, lowland rain forest, and montane forest and heathland (on West Africa's highest mountain, Mt. Cameroon, and associated highlands); the Cross River flows through the area, and there are crater lakes in Cameroon and on the island of Bioko. Among notable aspects of biological diversity, the region supports 22 primate species, and the Oban-Korup forests are estimated to contain over 1,000 butterflies (the greatest concentration of any equivalent part of Africa). This area is a global hotspot for amphibians, with at least 50 endemic anurans, including some unique bufonid genera. Bird endemism is pronounced only among montane species. High human population densities in and around the region are causing forest loss and fragmentation and levels of bushmeat hunting are very high.

S13-4 **BURGESS, N., J. Lovett, Q. Luke, R. Gereau, L.A. Hansen, J. Fjelds, N. Cordeiro, E. Nashanda, F. Kilahama, N. Doggart, and S. Mashauri** UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). (neil.burgess@wwfus.org). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC (NB). Centre for Ecology, Law and Policy, Environment Department, University of York, York YO10 5DD, UK (JL). National Museums of Kenya (QL). Missouri Botanical Garden (RG), Zoological Museum (LAH, JF). Department of Biological Sciences (M/C 066), University of Illinois at Chicago, (NC). Tanzania Wildlife Research Institute (NC). Forest and Beekeeping Division, Ministry of Natural Resources and Tourism (FK, EN, SM). Tanzania Forest Conservation Group (NG)

THE BIOLOGICAL IMPORTANCE OF THE EASTERN ARC MOUNTAINS OF TANZANIA AND KENYA

Thirteen mountain blocks comprise the Eastern Arc Mountains located in Tanzania and Kenya. Around 3,500 km2 of mountain forest remains, less than 30% of the original area. The Eastern Arc is amongst the most important regions of Africa in terms of endemic biota. At least 88 vertebrate species are endemic to these mountains and 71 species are also threatened by extinction. Large study gaps exist, for example, rates of endemism are estimated around 90% for many groups of invertebrates, but scant knowledge is known about them. Numerous Eastern Arc taxa share ancient affinities with West African, Madagascan and SE Asian elements. Site prioritization shows that the East Usambaras, Ulugurus and Udzungwas are most important for endemic biota, but prioritization results are correlated with remaining forest area and sampling effort; some mountains remain almost unknown for anything but birds. Most forest is found within Government Forest Reserves, with many managed for water catchment where there is no legal forest exploitation. The future of Eastern Arc biodiversity is closely tied to the fate of forests, and especially to management policies and capacity of both governments' natural resources departments. Supporting these agencies in their mandated job is an essential long-term conservation investment.

S13-5 **PLUMPTRE, ANDREW, Neil Burgess, Eric Sanderson, Jon Feldjså, Carsten Rahbek, and John Oates** Wildlife Conservation Society, PO Box 7487, Kampala, Uganda (AP) (aplumptre@aol.com). UNDP-GEF Eastern Arc Strategy Project, P.O. Box 9182, Dar es Salaam, Tanzania (NB). WWF-USA, Conservation Science Program, 1250 24th Street NW, Washington DC, USA (NB). Zoological Museum, Universitetsparken 15, DK-2100, Copenhagen, Denmark (JF, CR). WCS Africa Program, 2300 Southern Boulevard, Bronx, NY, USA (JO). Hunter College of CUNY, 695 Park Avenue, NY, USA (JO).

THREATS TO CONSERVATION IN THE ALBERTINE RIFT, EASTERN ARC AND CAMEROON-NIGERIA HIGHLANDS

The three areas that are focused upon in this symposium are highly threatened because of the high human population densities that live in and around them. All protected areas have some level of impact due to human caused factors. In the Albertine Rift loss of habitat is one of the major concerns particularly forest loss: outside protected areas over 800 km2 has been lost in Uganda alone since the mid 1980s. Hunting of wildlife is also high, particularly in forest reserves that have fewer rangers and a lower ability to enforce the law. Fewer data exist for the other two sites on the threats to the protected areas and the authors will instead analyse measures of forest loss and WCS's Human Footprint analysis as measures of threat and relate it to Biodiversity data at a 1 degree scale across Africa from the University of Copenhagen to look at patterns in species distributions with threats.

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THE PROBLEM OF FOREST FRAGMENTS AND EDGES: EVIDENCE FROM THREE EAST AFRICAN MOUNTAINS

Increase in human population density in sub-Saharan Africa is almost invariably associated with escalating rates of forest destruction and fragmentation. Moreover, it has been shown recently that these surging human populations largely occupy the same land as the most threatened biodiversity, posing an enormous test for conservationists. Efforts to overcome this challenge have been handicapped by a dearth of empirical (process-level) data elucidating the underlying nature of the problems, and hence their effective remedies. We review several recent case studies that provide this vital information for the region, focusing on three high biodiversity areas in eastern Africa. Overall, these findings reveal direct and indirect effects of forest attrition on several taxa, as well as on interactions between taxa (e.g., plant-animal relationships). There is solid evidence of the disruption of key ecological processes and mutualisms, with potentially adverse cascading and synergistic effects. It is clear that, for conservation strategies to be successful in preserving biodiversity in fragmented African ecosystems, they need to be based on sound process-oriented data, and should be at a landscape scale including both within- and between- habitat aspects. We provide a general synthesis of these findings and adduce steps forward towards more evidence-based conservation actions in the region.

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IMPORTANCE OF GENETICS IN UNDERSTANDING AND MANAGING BIODIVERSITY ON ISOLATED AFRICAN MOUNTAINS: CASE STUDIES FROM THE ALBERTINE RIFT AND EASTERN ARC

Mountains and associated habitats across the world are becoming ecological islands due to human impact and fragmentation but basic information about the status of much of the affected wildlife remains scanty. We review data from genetic studies of Afro-montane birds and discuss the implications of these data for conservation. These data unequivocally illustrate that the distinctiveness of isolated montane regions is often under-estimated by traditional methods, an argument that strongly argues for additional conservation measures. A genetic study of Bradypterus Warblers (Sylviidae) highlights relationships and uniqueness of population structure within and between units that have been called species and subspecies. These data also provide accurate information about the distribution of a number of taxa. In reviewing these warblers and other lineages of African birds, we further illustrate that these data emphasize the need to consider smaller outlying areas like isolated African highlands in broader conservation planning. In doing so, we challenge a prevailing view that genetic data cloud the picture for conservationists, focusing particularly on the expressed concern that we cannot save everything.

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HUMAN HARVESTING OF PLANTS AND THEIR IMPLICATIONS ON CONSERVATION IN TWO AFRICAN MOUNTAINS

Growing human populations living adjacent to protected areas in Africa pose a challenge to the conservation of plants because people continue to harvest plants from them. In addition to poor law enforcement, the high value of plant products is perceived to outweigh risks of arrest. We assessed plant harvesting from two African biodiversity hotspots: Uzungwa Scarp Forest Reserve (USFR) and Bwindi Impenetrable National Park (BINP), using interviews and vegetation sampling. We established 100 0.1-ha plots in USFR and 84 0.01-ha plots in BINP to equally cover disturbed and undisturbed forest for USFR and harvested and unharvested areas for BINP. Fifty-six and 46 species from USFR and BINP respectively are harvested for medicinal and basketry uses. Craterispermum longipendunculatum, Strychnos mitis and ‘mkongwa’ (Lauraceae spp.) – restricted to 20% of USFR - are threatened by overexploitation by local communities. While harvesting of bark from Rytigynia kigenziensis and Ocotea usambarensis in BINP was too low to cause any significant negative impact, Loeseneriella apocynoides is overexploited with over 90% being seedlings and resprouts. We conclude a ban on the harvest of the threatened species be enforced, and that sustainable harvesting of common plants be permitted if adequate monitoring can be maintained.

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BUSHMEAT TRADE FROM THE FORESTS OF THE CAMEROON-NIGERIA HIGHLAND RANGE, AND THE ALBERTINE RIFT

Loss of biodiversity from the biologically rich Lower Guinean forests along the Cameroon - Nigerian border region continues at an alarming rate. This loss of biodiversity is particularly high for large and medium mammals and is primarily caused by uncontrolled hunting for the bushmeat trade. Hunting with guns, dogs and wire snares remains rampant across this zone (in both countries), inside protected areas, in forest reserves and in unprotected forests. In the Albertine Rift bushmeat hunting is higher in forest reserves compared with national parks, indicating the effectiveness of regular law enforcement. Markets are generally local except for buffalo and hippo meat. Primate hunting only occurs in DR Congo and bordering areas in Uganda. However there are indications that even this low level of bushmeat hunting is reducing the populations of large mammals and elephants and buffalos have been exterminated from many of the forests where they used to occur. The Wildlife Conservation Society, having worked in this area for the past 16 years, has been focusing on working to regulate bushmeat harvesting in the Banyang Mbo Wildlife Sanctuary in Cameroon. This paper will highlight the trends in Cameroon-Nigeria zone and make comparisons with the hunting of wild meat in both the Albertine Rift. The paper will clearly show alarming similarities between the impacts of the trade in these two mountain chains and equally some subtle but important differences in the trade. Trends in the Cameroon - Nigeria range show that the bushmeat trade, which is totally illegal, is uncontrolled; market driven (nationally and internationally); well-organized with 'open' markets; uneconomic for the hunter; and devastating on the mammal populations in these rich forests. The trade in the Albertine Rift is less driven by external markets but more by local poverty and the desire for meat.

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MITIGATION INITIATIVES TO ENHANCE EFFECTIVENESS OF CONSERVATION IN AFRICAN BIODIVERSITY HOTSPOTS

Any discussion of conservation in areas of high population density in sub-Saharan Africa must include the interactions between people living near protected areas and the diversity being conserved. These interactions often lead to conflict, diminished conservation effectiveness, and may lead to the loss of biodiversity. This paper focuses on biodiversity conservation in protected areas in sub-Saharan Africa with emphasis on specific biodiversity hotspots. Main threats to protected areas in these regions include deforestation and fragmentation, poaching, and harvesting of natural resources. Main mitigation initiatives include tourism, ranger-based monitoring, multiple use zonation, community based conservation programs, and the use of development projects linked to conservation efforts. The presence of research stations has also had a mitigating impact on biodiversity loss. While many of these programs are instigated outside the region and funded with external money, there are several examples of locally initiated mitigation programs. Overall, efforts to mitigate threats to biodiversity in hotspots have offered mixed success, and these initiatives are complicated by political instability and war in the region.

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THE POTENTIAL FOR TOURISM TO PROVIDE INCENTIVES FOR CONSERVATION IN AFRICAN BIODIVERSITY HOTSPOTS

Conservationists and local communities in developing countries are looking to the rapidly expanding enterprise of tourism to help solve natural resource and rural development problems. This paper presents a synthesis of data illustrating the potential linkages between tourism and communities bordering protected areas in the tropical biodiversity hotspots of the African Eastern Arc and Albertine Rift regions. With extremely high rates of endemism, protected areas in these regions offer particularly good examples of how tourism may be used to promote conservation. Of special significance to tourism are African violets in the Arc region, and great apes in the Albertine Rift. Gorilla tourism is an especially important source of revenue in Rwanda and Uganda. Tourism has played a major role in changing people's attitudes towards conservation around the main tourist centres. However, these represent a small proportion of the communities surrounding the park, and the poorest people (who are most likely to carry out illegal activities within the parks) benefit little from tourism. There is little evidence that the attitudinal change results in a direct reduction in illegal resource extraction. Of 600 people interviewed in the Eastern Arc, 90% stated they benefit from forest and land near protected areas, but land tenure has become a serious issue, particularly for public and protected forests. Interviews with local community members indicated health care, schools, and other forms of village development were essential needs, yet there are significant leakages of tourism revenue from protected areas. Studies conducted in these regions indicate where leakages occur and identify opportunities for greater involvement in protected area conservation by tour operators. These regions are also significant for the civil strife they have experienced in the recent past, which puts a stress on tourism and conservation efforts and must be factored in to any conservation plans that include tourism.

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LAW ENFORCEMENT AND CONSERVATION IN AN AFRICAN CONTEXT: ISSUES OF CONSERVING WITHIN AND OUTSIDE PROTECTED AREAS

Public concerns for biodiversity conservation have prompted the establishment of protected areas in many sub-Saharan, African countries. Establishment of protected areas was identified as a key strategy to reduce biodiversity loss in tropical rainforests. However, in many countries, protected areas and wildlife habitats are decreasing in size, due to human activities such as agriculture and urban development. Growing population pressure, poverty, limited land resources, and political instability has resulted in movement and resettlement of populations in or adjacent to protected areas. Such measures pose major challenges to manage protected areas. In some countries protected areas are being degazetted to resettle landless or displaced people. This degazettement fails to consider the ecological processes and flora/fauna dispersal ranges, leading to situations which gravely threaten biodiversity, and forces wildlife outside the protected areas. As a result, conflicts are arising between local communities and protected area management. In this paper we explore strategies of conserving biodiversity within and outside protected areas with specific case studies from Rwanda and Tanzania. We specifically address similarities in law enforcement and policy issues between the two regions, and relate these to necessary site-specific actions required to tackle the different political and socio-economic circumstances of these two regions.

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AN ANALYSIS OF THE EFFECTIVENESS OF INTEGRATED CONSERVATION AND DEVELOPMENT (ICD) STRATEGIES IN THE ALBERTINE RIFT AND CAMEROON

Conservation organizations have invested heavily in ICD over the last 20 years, but there is limited evidence of their effectiveness in achieving conservation goals. We tested the effectiveness of ICD at combining improved livelihoods with increased support for conservation, in terms of the attitudes and behaviors of local communities, in SW Uganda and in Cameroon. Data were collected from previous research, interviews and focal group discussions of surrounding communities and park staff, and surveys of human impact in the parks. Results from the study show that community attitudes to the parks and cooperation with park authorities have improved greatly in the past ten years, and ICD has played an important role in this. However, there is little evidence to show any direct impact of ICD on illegal resource extraction. Law enforcement is by far the most frequently cited reason as to why illegal activities would be reduced, although ICD strategies are sometimes also cited. We conclude that ICD has reduced some types of the threats to biodiversity that are closely related to community attitudes, and can help to increase communities' willingness to accept conservation initiatives. Law enforcement, however, remains an essential part of the conservation equation.

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THE BIODIVERSITY OF THE ALBERTINE RIFT

The Albertine Rift extends from the northern end of Lake Albert to the southern tip of Lake Tanganyika and encompasses a wide variety of natural habitats within about 100 km on either side of the eastern border of the Democratic Republic of Congo. This region has many protected areas because it has been known to be important for conservation. However not until recently has its real value been appreciated. Species lists were compiled for the protected areas and some areas that potentially should be protected for plants, mammals, birds, reptiles, and amphibians. The results show that more than 52% of Africa's birds and 39% of Africa's mammals occur in this region. It has more endemic vertebrates than anywhere else in mainland Africa with 125 species of mammal, bird, reptile and amphibian as well as many endemic species of fish in Lakes Tanganyika, Kivu, George and Edward. A ranking of sites for conservation value has been made using total species richness, endemic species and threatened species (as defined in the IUCN red data book list). This analysis shows that the highest ranking protected areas include; Virunga, Kahuzi Biega, Semuliki, Kibale, Bwindi Impenetrable, Nyungwe parks with Lake Tanganyika and Itombwe plateau.

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THE IMPLICATIONS OF INCOME AND PRICE ELASTICITIES OF DEMAND FOR POLICIES DESIGNED TO REGULATE WILDLIFE TRADE

Results of recent studies show that wildlife consumers are sensitive to the cost of obtaining bushmeat, and consumption of wildlife declines as the price of bushmeat rises and as the price of alternatives drops. Results also show that in economic terms bushmeat appears to be an inferior good with consumption declining as household income rises. As price and income elasticities of demand are log linear, changes in demand are most pronounced when prices are low and consumers relatively poor. Bushmeat prices relative to substitutes are typically higher in urban areas far from the source of wildlife, and household incomes in urban areas are typically higher than in rural areas. Thus attempts to manipulate income and prices to alter consumer demand for bushmeat would have little effect in urban areas. Focusing on rural consumption makes sense based on the results of field studies, however few easy options exist to change rural household income, bushmeat prices and prices of substitutes. Consequently, using prices and income to alter bushmeat consumption may be empirically rational but practically infeasible. Enforcing laws designed to conserve threatened wildlife species is likely to be a more cost effective conservation approach than attempting to manipulate household income and prices.

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LONG-RUN MARKET DATA AS AN INDICATOR OF SUSTAINABILITY - A CASE STUDY OF ATWEMONOM MARKET, GHANA

We analyse changes in price, quantity, method of capture and location of kill of bushmeat species entering the Atwemonom bushmeat market over the period 1987-2002, using data collected by an official of the Ghana Wildlife Department. The analysis was confined to the 7 most commonly traded species and to the open season only, in order to maximise the reliability of the data. Over the period there has been a increase in real bushmeat prices, in the proportion of animals killed by means other than guns, and in the proportion of the trade made up by grasscutters. More animals are now being recorded as coming from distant areas rather than from villages close to Kumasi. Explanations for these patterns are numerous. One potential explanation is that externally-generated price increases are providing an incentive for people to sell trapped animals that would previously have been eaten at home. However, detailed data on hunter behaviour are required in order to confirm this. This case study highlights both the usefulness and the limitations of detailed long-term market data as a tool for assessing the sustainability of wildlife hunting.

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URBAN MARKET SURVEYS DON'T TELL THE WHOLE STORY: LESSONS FROM A NATIONAL BUSHMEAT STUDY IN GABON

Information about bushmeat consumption has come primarily from once-off, short-term, surveys of bushmeat sold in a single urban market. To assess what urban market data do and do not tell us about bushmeat consumption and the implications for wildlife conservation we use data from a national bushmeat market and household consumption study in Gabon. Twelve bushmeat markets distributed across Gabon were surveyed over 30 months. Bushmeat consumption was measured directly by conducting a cross-sectional survey of over 1,500 urban and rural households, and a 3 month longitudinal survey of 144 households. Results show that: 1) bushmeat sold in markets constitutes only 40% of total bushmeat consumed; 2) large-bodied species at risk of depletion and local extinction predominate in urban markets, whereas rural hunters typically capture small-bodied species that are relatively tolerant of hunting; 3) residence location strongly influences the dietary importance of bushmeat to consumers – bushmeat tends to be an infrequently eaten and expensive luxury item for urban consumers and an inexpensive necessity in the diets of rural households; and 4) maybe not surprisingly short-duration market surveys and cross-sectional household surveys only record the most commonly consumed wildlife species, and typically not those that are captured and consumed infrequently.

S14-4 **ROWCLIFFE, MARCUS, Emmanuel de Merode, Kes Hillman-Smith, Katherine Homewood, Richard Pettifor, and Guy Cowlishaw** Institute of Zoology, ZSL, London NW1 4RY, UK; *Department of Anthropology, University College London, UK (marcus.rowcliffe@ioz.ac.uk)

LINKAGES BETWEEN THE URBAN BUSHMEAT TRADE AND PROTECTED AREA EFFICACY IN NORTHEASTERN DEMOCRATIC REPUBLIC OF CONGO

We used the bushmeat trade in urban and rural markets to investigate the impact of war on a protected area in Central Africa (Garamba National Park, Democratic Republic of Congo). The urban market was supplied primarily by illegal hunting in the park, while the rural market was supplied by legal hunting in the surrounding hunting reserves. We found that the urban (illegal) bushmeat trade increased during the conflict, but returned to peacetime levels subsequently. However, this was not a result of changes in park protection effort, which showed a contrary pattern (high before and during the conflict, and low following it). Rather, this pattern was driven by changes in the bushmeat market structure, i.e. by changes in the social institution (the military elite) that controlled the urban trade. Correspondingly, in the rural market where the social institution in power (the traditional chiefs) remained stable, there was no change in bushmeat sales. We then show that park protection can reduce illegal hunting, but a fivefold increase in patrol effort would be required to compensate for the intensification of poaching during conflict. Our findings indicate that protected areas can work during wartime, but that the efficacy of protected areas might be enhanced by working with local social institutions that already play a role in regulating natural resource use.

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CONTRIBUTIONS OF URBAN DATA TO ASSESSING SUSTAINABILITY OF GLOBAL SEAHORSE TRADE

A dearth of formal records initially made it impossible to assess the scale and conservation impact of an apparently large global trade in seahorses for traditional medicines, tonic foods, ornamental display and curiosities. We therefore undertook an international trade review, gathering material through field surveys, semi-structured interviews, correspondence and sparse documentation. Data on uses, volumes, values, and trade routes were then collated and cross-validated in order to infer extraction and trade for each country. Our analysis was strengthened by comparing information collected in fishing communities with what we learned in urban centres such Hong Kong, Singapore, Taipei and Guangzhou. We estimated a global trade in excess of 50 metric tonnes of dried seahorses per annum, even before the majority of mainland China's consumption is known. Hundreds of thousands of live seahorses were also traded. For all its weaknesses, our information proved sufficiently robust to convince the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to add all seahorse species to Appendix II: the 164 signatory nations are now required to regulate the trade in seahorses such that it does not prove detrimental to wild populations.

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THE TRADE IN LIVE REEF FISH IN NORTHERN BORNEO

The live reef fish trade targets some of the largest coral reef species throughout the Indo-Pacific, from the Maldives to the South Pacific. Fish is caught live and shipped to restaurants, where it fetches very high prices as a luxury food item. Because of the remote locations where the fish are caught, relatively little is known of this trade. However, using copies of the receipts given to fishermen by market traders in Northern Borneo, it is possible to draw conclusions about changes in this fishery over the last eight years. The humphead wrasse, the most valuable species as well as a candidate for inclusion in CITES, is shown to decline dramatically, together with several other species. Detailed analysis of the daily catches by individual fishermen also revealed a high degree of specialisation in which species are caught. Thus, what might appear as a multispecies fishery is actually the combination of a specialised fishery that targets rare species with a group of generalists that only occasionally catch such species. This has important implications for the management of this fishery.

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PROBABILISTIC METHODS FOR HANDLING MISSING DATA AND CONVERSION FACTORS IN TRADE DATASETS: AN EXAMPLE FROM THE ASIAN SHARK FIN TRADE

The use of market data to assess extraction rates for traded wildlife is often limited by data sparseness and difficulties in relating traded parts to whole animals. In this study of the shark fin trade, these constraints are addressed through the application of Bayesian methods within a hierarchical model framework. A data-filling method was used to estimate a complete set of traded fin weights over an 18-month period based on the factors shark type, fin position, and trader within the available trade records. Further probabilistic modeling converted traded fin weights into the number of individuals and total biomass represented by the traded fins. For each shark type, consistent model predictions were obtained using the different fin positions, except in the case of caudal fins, which have highly variable cutting practices. These probabilistic approaches improve upon corresponding deterministic methods by drawing predictive power from well-characterized categories to inform under-represented ones, and by better representing the underlying uncertainty in the data. Similar methods are advocated for relating market parts such as carcasses, tusks, horns, penises or paws to whole animal equivalents for subsequent evaluation of the sustainability of population off take rates.

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DEFINING 'FRESHWATER RESERVES': GENERAL PRINCIPLES FOR SELECTION AND DESIGN

Marine protected areas have been a focus of discussion within the marine conservation community for several years, and the 2003 World Congress on Protected Areas generated renewed attention for reserves in general. Yet, the discussion of using reserves to protect freshwater biodiversity has barely gotten off the ground. Instead, much of the freshwater conservation community has directed its energies toward developing and implementing integrated basin management. We offer possible explanations for the relative inattention that freshwater-focused reserves have received, and we address the question of when and how such reserves might be positive additions to the existing toolbox of freshwater protection strategies. We then review existing models of freshwater-related reserves (e.g. riparian reserves, headwaters protection), and suggest a paradigm that combines reserves and integrated basin management. Drawing from freshwater ecology, forestry hydrology, marine and terrestrial conservation planning, freshwater fisheries, and other disciplines, we suggest basic principles for freshwater-focused reserve selection and design, and we identify key information gaps. Finally, we discuss how the selection and design of reserves for freshwater protection can help to integrate conservation efforts across the freshwater, terrestrial, and marine realms, and may lead to improved results.

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PROTECTING WATER BY CONSERVING LAND: THE IMPORTANCE OF SPATIAL ARRANGEMENT IN INFLUENCING ECOSYSTEM PROCESSES

Conservation of aquatic ecosystems is often a question of managing upstream terrestrial areas that can act as source areas for nutrients and other pollutants. The percentage of a watershed occupied by agricultural and urban areas is widely used to predict nutrient loadings and in-stream water chemistry because water quality is often linked to non-point sources in a watershed. Measures of the spatial location of source areas have generally not been incorporated into landscape indicators although empirical evidence, watershed models, and agricultural management techniques suggest that spatially-explicit information is useful for predicting loadings. I created a heuristic grid-based surface-flow model to address the discrepancies between spatially-explicit and non-spatial approaches to understanding watershed loading. The mean and variance in loading were compared among thousands of simulated watersheds with varying proportions of randomly located source and sinks. Mean loading increased as the percentages of source cover types in the watershed increased. More importantly, variability in loading was greatest among landscapes with ~65% source. This variance peak suggests considering the spatial arrangement of cover types might be most important for watersheds with intermediate relative abundances of sources and sinks because there is the possibility for different spatial configurations leading to either very high or very low loading. These results provide testable hypotheses for when spatial and non-spatial approaches might be most useful for relating land cover to water chemistry, and suggest improvements for the spatial sensitivity analyses of watershed models. These results also suggest a framework to build upon for determining whether there is overlap in the optimal spatial configuration of land for terrestrial versus aquatic conservation goals.

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INCORPORATING POPULATION FRAGMENTATION AND CONNECTIVITY CONSIDERATIONS INTO FRESHWATER RESERVE DESIGN

Habitat fragmentation, or alternatively a lack of habitat connectivity, is perceived as one of the chief threats to persistence for diverse species worldwide. However, most of the evidence linking fragmentation/connectivity to extinction risk stems from terrestrial systems with far less research on the issue taking place in freshwater systems. Because terrestrial and freshwater systems have such different geometries, it is important to understand the unique ways in which fragmentation affects riverine systems and the consequences for resident species. I will discuss two aspects of fragmentation/connectivity relevant to reserve design for riverine fishes. First, I will present evidence that demonstrates, for a diverse assemblage of native fish species, how interspecific variation in range fragmentation has translated directly into variation in realized extinctions (both locally and at larger spatial scales). Second, I will discuss results from an ecological economics study of dam removal for restoring river connectivity, where the focus is on the tradeoff curves that emerge when one considers alternative strategies for breaching dams by hierarchically clustered groups rather than on a case-by-case basis. The specific study systems involved are native fishes of the Sonoran Desert in the lower Colorado River system and Pacific salmon in the Willamette River, Oregon.

S15-4 **FRISSELL, CHRISTOPHER A.** The Pacific Rivers Council, PMB 219, 1 Second Ave E., Suite C, Polson, MT 59860 (hanfris@digisys.net)

AQUATIC INTEGRITY AREAS FOR WATERSHEDS AND RIVER SEGMENTS: MAPPING THE US PART OF THE YELLOWSTONE TO YUKON BIOREGION

Because restoration is costly, problematic and dependent on changes in existing land use over large areas, conservation of freshwater biota and ecosystems must rely principally on the identification and protection of watersheds and rivers that retain a high proportion of their natural or remnant ecological organization and functions. To provide the basic building blocks for regional reserve design and restoration planning in the US portion of the large Yellowstone-to-Yukon region, we have developed methods to assess and map the relative ecological integrity of stream catchments and river segments using a pragmatic framework that integrates widely available biological, environmental, and land use data into multi-metric models. Mapping has been completed for subwatersheds (defined as 6th-code hydrologic units, catchments ca. 150-200 km2 in drainage area) across the entire Rocky Mountain region from Yellowstone Park north the Canadian border. An analogous procedure for assessing large river segments has been developed and applied in the Upper Columbia and Upper Missouri River Basins in Montana. Conservation applications to date include analysis of conservation status and protection and restoration needs for high-integrity areas, and assessing the complementarity of conservation area design criteria based on aquatic integrity v. core habitat for grizzly bears.

S15-5 **KHOURY, MARY, Paul West, Michael Reuter, Ken Lubinski, Catherine McCalvin, Douglas Blodgett, David Braun, Blane Heumann, David DeGeus, and Larry Clemens** The Nature Conservancy, Midwest-Canada Division, 8 S. Michigan Avenue, Suite 2301, Chicago, IL 60603 (mkhoury@tnc.org)(MK); The Nature Conservancy of Wisconsin, 633 W. Main St., Madison, WI, 53703 (PW); The Nature Conservancy of Illinois, 301 SW Adams St., Suite 1007. Peoria, IL 61602 (MR,KL,CM,DBl,DBr); The Nature Conservancy of Missouri, 2800 S. Brentwood Blvd., St. Louis, MO, 63144 (BH); The Nature Conservancy of Iowa, 303 Locust St., Suite 402, Des Moines, IA (DD); The Nature Conservancy,Upper St. Joseph River Office, Peachtree Plaza, 1220 North 200 West, Suite G, Angola, IN 46703 (LC)

DESIGNING CONSERVATION STRATEGIES FOR THE UPPER MISSISSIPPI RIVER: WHAT IS THE RESERVE AND DOES RESERVE DESIGN APPLY?

Recognizing the global significance of the Upper Mississippi River, The Nature Conservancy has undertaken a five-state collaborative project focused on conserving and restoring this floodplain river ecosystem. Using principles of reserve design - such as representativeness, connectivity, integrity, contiguity, and efficient spatial configuration – we have identified a network of areas that together represent the freshwater biodiversity of the basin. In a watershed that drains 189,000 square miles and is 66% in agricultural land use, we are challenged, however, to apply the concept of a reserve (or reserves) in designing and implementing specific conservation strategies. In a sense, the reserve exists at multiple scales. Using the Conservancy's five-step process to design conservation strategies and a set of peer-review workshops, we have articulated a set of initial strategies that will address conservation needs for targets ranging in scale from a single mussel-species to the entire mainstem Mississippi. Key areas of focus include floodplain reconnection, restoring more natural variation in hydrologic regimes, and promoting alternative agricultural practices. In this presentation, we briefly review the process for assembling the network of priority areas, then discuss the initial conservation strategies and their application across multiple spatial scales.

S15-6 **HILDERBRAND, ROBERT and Jeffrey Kershner** University of Maryland Center for Environmental Science Appalachian Laboratory, Frostburg, MD 21532 (hilderbrand@al.umces.edu) (RH); USDA Forest Service Fish and Aquatic Ecology Unit, Department of Aquatic, Watershed, and Earth Resources, Utah State University, Logan, Utah, 84322 (JK).

RESERVE DESIGN ISSUES FOR PROTECTING CUTTHROAT TROUT AND AQUATIC BIODIVERSITY IN THE BONNEVILLE BASIN

The cutthroat trout is a species of concern in the Bonneville Basin of the Intermountain Western United States. The loss of several conservation populations of cutthroat trout due to wildfires in southern Utah during 2003 highlights the importance of strategic planning when establishing aquatic conservation areas. We used a combination of distribution data, landscape analysis, and demographic modeling to identify and evaluate potential reserve areas for cutthroat trout and a potential site's ability to capture additional fish biodiversity. Major considerations when identifying reserves for cutthroat trout include non-native trout competitors, barriers to movement or migration, land ownership, and ensuring enough habitable stream to maintain viable population sizes. Landscape analysis of distribution data revealed the majority of potential reserves are high elevation streams that are generally lower in diversity of other fish species and low connectance to other streams which makes populations susceptible to catastrophic events. We identified several potential reserves with high connectance among streams in the northern portion of the range, but found few sites in the south where connectivity is more critical because of the increased likelihood of catastrophic events. However, possibilities exist to establish networks of conservation sites even in Southern Utah with modest effort.

S15-7 **ESSELMAN, PETER C.** School of Natural Resources and Environment University of Michigan Ann Arbor, MI 48109 (esselman@umich.edu)

ADEQUACY OF THE CURRENT PROTECTED AREAS NETWORK FOR THE CONSERVATION OF AQUATIC TARGETS IN SOUTHERN BELIZE

Freshwater protected areas have great potential for the conservation of aquatic ecosystems in diverse landscapes around the world, yet their deliberate implementation has been minimal. However, many current protected areas unintentionally protect important structural and functional aspects of aquatic ecosystems, and effectively ;do; serve as freshwater protected areas. This paper presents four criteria for assessing the adequacy of existing protected areas networks for conservation of aquatic ecosystem targets. These criteria are network ;completeness; (every target is assigned a conservation area); ;wholeness; (the degree to which conservation targets are spatially encompassed by protected areas); ;functionality; (the degree to which natural dynamics of key ecological attributes are protected); and ;integration; (the degree to which individual protected areas benefit multiple ecosystem types). Application of these criteria is illustrated with a case study from Belize—Central America's least developed country with great long-term potential for protection of critical aquatic habitats and coastal zone integrity. Outcomes of the assessment include both the identification of underrepresented macrohabitats that need protection, as well as ecological research priorities to support the establishment of deliberately and effectively managed freshwater protected area networks.

S15-8 **ABELL, ROBIN, Bernhard Lehner, Stephen Hamilton, Michele Thieme** World Wildlife Fund, 1250 24th St. NW, Washington, DC 20037 (robin.abell@wwfus.org) (RA, BL, MT); Kellogg Biological Station and Dept. of Zoology, Michigan State University, 3700 E. Gull Lake Drive, Hickory Corners, MI 49060-9516 (SH)

DESIGNING AN INTEGRATED FRESHWATER-TERRESTRIAL CONSERVATION PLAN IN THE SOUTHWEST AMAZON HEADWATERS: ADDRESSING DATA GAPS, PHYSICAL PROCESSES, AND CONNECTIVITY

The southwest Amazon headwaters region, roughly covering the Madre de Dios basin, is a poorly investigated area in which terrestrial and aquatic habitats remain relatively intact and are presumed to be strongholds for Amazonian biodiversity. As part of a project evaluating the efficacy of current and planned reserves, we are developing a systematic plan for protecting the region's freshwater biodiversity and subsequently merging it with an existing terrestrial plan to generate an integrated 'vision.' Our methodology incorporates explicit freshwater reserve design and ecological principles. Representation units are based primarily on hydrogeomorphic characteristics, which largely control local flow patterns. We assess the intactness of those units by analyzing the condition of each area's watershed. We set representation goals using information about turnover of fish species across headwater catchments. We attempt to maximize longitudinal connectivity by utilizing a stepwise selection process that preferentially selects connected segments, moving from downstream to upstream. Finally, we address the basic question of what constitutes a freshwater reserve by applying a three-tiered zoning approach that recognizes the need for different types of protection in terrestrial and aquatic habitats. We present our approach and preliminary results and discuss the applicability of this method to other data-poor headwater areas.

S15-9 **SEMLITSCH, RAYMOND D. and Tracy A. G. Rittenhouse** Division of Biological Sciences, University of Missouri, Columbia, MO 65211(SemlitschR@missouri.edu)

FRESHWATER RESERVE DESIGN FOR AMPHIBIANS

The biodiversity of freshwater ecosystems extends beyond the water, thus the connection between water and land must be incorporated into reserve designs. Although ephemeral wetlands with variable hydrologic cycles provide productive breeding sites, the complex life cycle of amphibians also requires terrestrial habitat surrounding wetlands for feeding and over-wintering. Data complied in the past few years has shown that the core habitat used by frogs and salamanders includes the terrestrial habitat within a mean minimum distance of 159 meters from the wetland edge... far beyond distances currently used for the protection of water resources or biodiversity. Due to the realization that large areas of terrestrial habitat are vital to the conservation of these species, questions are now being asked about the utilization of specific habitats within this core area. Further, new data clearly needs to be collected to address the balance between land use and the protection of biodiversity in wetlands. Here we present the current state of knowledge concerning the components of wetland ecosystems required by amphibians that should be incorporated into reserve design and management. In addition, we suggest the types of studies that will be needed to meet conservation and management needs in the future.

S15-10 **McGRATH, DAVID G. and N. Marcello Crossa** Núcleo de Altos Estudos Amazônicos, Universidade Federal do Pará, Belém, PA, 66.075-900, Brazil; Woods Hole Research Center, 149 Woods Hole Rd., Woods Hole MA 02540 (dmcgrath@amazon.com.br); Instituto de Pesquisa Ambiental da Amazônia, Av. Rui Barbosa 136, Santarém, PA 68.005-080.

INLAND FISHERY RESERVES: DESIGN, MANAGEMENT, AND COMPARISONS WITH CONSERVATION RESERVES

Large river floodplains are an especially important habitat for biodiversity conservation. However, throughout the world their rich economic potential has led to their transformation with drastic consequences for aquatic biodiversity. While Amazon frontier development has concentrated on the uplands, the floodplain has not been immune from the pressures now transforming the basin. In response floodplain communities have sought to take control of local lakes and collectively manage their resources. This approach is regarded by many in the conservation field as a promising strategy for reconciling livelihood needs with the conservation of fisheries and biodiversity. Others criticize the approach, arguing that communities are unreliable conservationists, that land and resource use practices are often incompatible with the conservation of floodplain habitat and that isolated reserves are inadequate for conserving many migratory species. Whether effective or not, the collective knowledge generated by these initiatives constitutes a valuable source of information for the design of reserves to conserve floodplain biodiversity. In this paper I examine these and other issues in light of the last decade's experience in conservation and resource management on the Amazon floodplain of Brazil and identify key principles for the design of floodplain reserves.

S16-1 **EVES, HEATHER and Natalie D. Bailey** Bushmeat Crisis Task Force, 8403 Colesville Road, Suite 710. Silver Spring, MD 20910 (HEves@bushmeat.org)

CONSERVATION AND DEVELOPMENT: OVERVIEW OF THE CONTRIBUTION OF URBAN MARKETS TO THE DEMISE OF TROPICAL FOREST WILDLIFE

Globally, urban development is predicted to contribute an additional 2.5 billion people to the planet in the next generation. Over 90% of these individuals will be born in developing nation cities - primarily in urban slums (Brennan et al. 1999). These statistics describe an alarming scenario with direct impacts on tropical forest wildlife not often at the forefront of development considerations. Increased urban demand, from both numbers of inhabitants as well as spending power, results in unsustainable demands for meat, traditional medicines, and pets from an extremely limited wildlife supply. As trade routes develop and wildlife commercialization increases, opportunities for international trade emerge raising additional concerns for sustainability, agricultural and public health. While studies show that wildlife may contribute minimally to average daily per person intakes the overall potential impacts on rural populations - of wildlife and people - can be enormous. With limited resources available to address the unsustainable wildlife trade, urban centers become a potential target for concentrating actions to address dramatic losses impacting both wildlife and rural community livelihoods. Actions addressing urban consumption including protein and income alternatives, public awareness, enforcement, and policy development are emerging and encourage collaboration among conservation, government and development sectors.

S16-2 **ROBINSON, J. G. and Elizabeth L. Bennett** Wildlife Conservation Society, 2300 Southern Blvd., Bronx, NY 10460-1099, tel: (718) 741-8190, (liz@lizbennett.org)

CAPACITY OF DIFFERENT TROPICAL ECOSYSTEMS TO SUSTAIN COMMERCIAL WILDLIFE HARVESTS

Unsustainable wildlife hunting for human consumption across the tropics threatens both wildlife populations and livelihoods of people who depend on these resources. The probability that hunting can be sustainable depends in part on ecological conditions that affect the 'supply' of and 'demand' for wildlife resources. Supply is estimated across a number of tropical ecosystem types by calculating the theoretical 'maximum sustainable offtake' in kg/km^2 for harvestable wildlife. Demand is estimated from observed harvests in kg/km^2. We examine how supply and demand vary across relatively undisturbed ecosystems, indexed by annual rainfall. Supply is potentially highest in dry forests and wetter savanna grasslands, and decreases in moist forests and more xeric grasslands. Actual demand tends to exceed supply in moist forests and xeric grasslands. Analogous to this ecological variation along the rainfall gradient is the gradient created by human tropical forest conversion. We hypothesize wild meat supply might be greater in secondary forests and forest-farm-fallow mosaics than in undisturbed forests, and test this with available data. We conclude the probability of sustainable hunting varies with ecosystem type and degree of human disturbance, should influence where commercial meat trade hunting has a greater potential to be sustainable, and where such sustainability is unlikely.

S16-3 **FA, JOHN E. and Lise Albrechtsen** Durrell Wildlife Conservation Trust, La Augres Manor Rue, Trinity, Jersey JE3 5BP, English Channel Islands, UK (jfa@durrell.org) (JEF) WildCRU, Department of Zoology, University of Oxford, Oxford OX1 3PS, UK (LA)

WHEN GRAZING COWS CAN BENEFIT WILDLIFE: A CASE FOR BIOKO ISLAND

Uncontrolled, extensive livestock ranching in the humid tropics has no doubt accelerated forestland clearing. Any suggestion of invigorating traditional livestock is thus likely to be regarded with extreme suspicion. There is an alternative belief that non-domesticated animal species "will feed the human race". Yet, while the rearing of 'minilivestock' (animal species smaller than sheep, goats, pigs, rabbits or poultry), could fill another feeding niche in rural and peri-urban situations, it is doubtful, at least at present, that these meats can be produced at levels that will divert pressure from bushmeat sold to large urban centres. This paper describes the use of wildlife in Bioko Island, Equatorial Guinea, and examines the feasibility of rearing domestic stock as a substitute for bushmeat in the island. The main focus of the paper is Malabo, the main city in Bioko. We examine current use and importance of bushmeat in Malabo, and analyse the economic potential of developing a domestic livestock industry on the island to supply the city. Given the growing prosperity in the country because of returns from the oil industry, we look at imports of alternative meats.

S16-4 **ALEY, WILLIAM D.** USDA-APHIS Safeguarding, Intervention, and Trade Compliance (SITC) Program, SITC National Coordinator (William.D.Aley@aphis.usda.gov)

URBAN BUSHMEAT: A GROWING CHALLENGE FOR UNITED STATES AGENCIES

The United States Department of Agriculture, US Department of Interior. Department of Homeland Security, Department of State, and numerous other agencies have an interest in, concern regarding, and mandate to address the importation of illegal animal products into the United States. There is increasing evidence and increasing concern related to wildlife, agricultural, and human health regarding the importation of illegal wildlife products into the United States, particularly with regard to bushmeat (including fresh, smoked, and dried meat from wildlife). The USDA-SITC program is actively engaged in gathering information regarding this illegal trade as well as communicating with a number of programs within the USDA as well as with other departments. The goal of the SITC program is to close illegal foreign pathways, which include animal products that may pose significant pest and disease risk to U.S. Agricultural interests and infrastructure. Recent recommendations to administration officials focus attention on the importance of developing increased coordination among US agencies to address this illegal urban bushmeat trade.

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DETERMINANTS OF URBAN BUSHMEAT CONSUMPTION IN RÍO MUNI, EQUATORIAL GUINEA

Bushmeat consumption and consumer preferences in Bata town were analysed in the context of available substitutes. Interviews were conducted with a stratified systematic sample of 100 households, an opportunistic sample of 160 meat and fish purchasers in the Central Market, and a non-random sample of restauranteurs and their clients. Data were also collected on volume and price of meat and fish sales in the Central Market. This triangulatory approach gave useful insights into the subtleties of bushmeat demand. Results showed a strong preference for food state rather than type, in that fresh produce was strongly preferred over frozen. There was a strong preference for fresh fish, followed by bushmeat. Preferences are consistent across income groups, but consumption is strongly income-dependent, with poorer households consuming more frozen products. Consumption and preferences for particular bushmeat species are interrelated, but appear to be linked to availability rather than price. This may be because bushmeat purchasers have already selected fresh produce over frozen on the basis of income. Bata is currently experiencing an oil boom, hence its economic prosperity and population size are increasing rapidly. This suggests consumers will increasingly demand fresh produce, including bushmeat. This has worrying implications for future bushmeat trade sustainability.

S16-6 **CLAYTON, LYNN and E.J. Milner-Gulland** WILDCRU, Dept of Zoology, U of Oxford, UK. (LC) Reader in Conservation Science, Renewable Resources Assessment Group, Dept of Environmental Science and Technology, Faculty of Life Sciences, South Kensington Campus, Imperial College London, SW7 2AZ, UK (e.j.milner-gulland@imperial.ac.uk)

THE TRADE IN TWO ENDEMIC WILD PIG SPECIES IN NORTH SULAWESI

We collected two long-term datasets documenting the trade in two endemic wild pig species in North Sulawesi, Indonesia - a 6 year survey of the end market and records of all transactions by a wild pig dealer during 3 periods over a 10 year period. Analysis of these data show that the number of babirusas (an endangered, endemic, protected species of wild pig) on sale in the end market is strongly influenced by law enforcement activities, although dealer habituation is reducing the effects of these interventions. We demonstrate that dealers drove significantly further to buy wild pigs, paid more for them and bought fewer in 1997 than 1988. These trends are consistent with resource depletion, but we show that they are also likely to be caused by market changes. We suggest that long-term, spatially explicit studies are important for the assessment of the sustainability of the wildlife trade, as they provide the potential for disentangling the influences of market dynamics from population declines, and thereby assist in interpreting changes in prices and quantities on sale in end markets.

S16-7 **ELKAN, PAUL, Moukassa Antoine, Sarah Elkan, and Germaine Mavah** Wildlife Conservation Society, B.P.14537 Brazzaville, REPUBLIC OF CONGO (pelkan@wcs.org)

DEMOGRAPHIC BOOMS, PROTEIN CONSUMPTION, AND IMPLICATIONS FOR WILDLIFE MANAGEMENT IN LOGGING CONCESSIONS, NORTHERN REPUBLIC OF CONGO

In many Congo Basin forests, commercial logging activities have led to increased access to the forest, population booms, influx of capital, increased demand for bushmeat, and escalating commercial hunting. While comprehensive management and control measures are needed to bring hunting to sustainable levels, availability of alternative protein sources is fundamental to satisfy the animal protein needs of growing population centers and ease pressures on wildlife populations. Over a four year period we documented human population growth at industrial sites and assessed efforts to develop logging company and local community based alternative protein provision systems as part of a wildlife management program in a large timber concession in northern Republic of Congo. Results indicated company management and employee based systems led to up to 20% increases in frequency of protein in diet, seasonal availability of freshwater fish was associated with decreased bushmeat consumption, and scarcities of bushmeat due to law enforcement efforts were followed by increased company and employee motivation to develop alternative protein sources. Demographic growth trends demonstrated the dangers of creating poles of economic attraction and re-emphasizes the importance of siting industrial infrastructure such as sawmills in urban areas away from high biodiversity valued forest areas.

S16-8 **GUMAL, MELVIN** Wildlife Conservation Society, 7 Jalan Ridgeway, Kuching 93200, Sarawak, MALAYSIA (mgumal@wcs.org)

BANNING COMMERCIAL WILDLIFE TRADE IN SARAWAK, MALAYSIA

In 1998, the State Government of Sarawak (Malaysia) banned all commercial wildlife trade throughout the state. To enforce this new policy, major legal changes were made to the existing Wild Life Protection Ordinance, and gun owners were also restricted to cartridges purchases of 10/gun owner/month. Mass publicity, conservation education and enforcement programmes were then carried out repeatedly in the rural and urban areas. Within five years, all visible commercial wildlife trade disappeared from the major markets in the cities and smaller towns, with seizures being the heaviest in the first two years of enforcing the ban. Several factors contributed to the success of ban, among them: the political will and support from the senior decision makers within the government; a good understanding of the wildlife trade through a long-term field presence; a clear and focussed strategy; a government-approved master plan; several committed government staff and a rural population which understood the need for the ban and were supportive of the policy, as they were allowed to hunt non-protected species for their own consumption. Periodic strict enforcement, conservation education in rural and urban areas, and mass publicity must continue to ensure that wildlife trade does not remerge in the state.

S16-9 **WILKIE, DAVID S. Starkey, P. Malcolm, Kate A. Abernethy, and** Wildlife Conservation Society, Gabon Program B.P. 15115, Libreville, GABON (MS), Station d'Etudes des Gorilles et Chimpanzés B.P. 7847, Libreville, GABON (KA), Wildlife Conservation Society, Living Landscapes Program, 2300 Southern Boulevard, Bronx, NY 10468 (DW) (dwilkie@wcs.org).

URBAN BUSHMEAT MARKETS AND THEIR IMPACTS ON WILDLIFE POPULATIONS IN GABON

Results from a national survey show that bushmeat constitutes only 2% of the animal protein consumed by urban families and only 40% of the total wildlife biomass eaten in Gabon. Yet bushmeat consumption in urban areas has a disproportionately large impact on wildlife conservation. High urban prices for bushmeat encourages commercial hunters to travel into unhunted areas where wildlife is still abundant and returns to hunting investment are much greater than from already depleted areas around rural settlements. Large-bodied wildlife species at risk of local or global extinction are thus much more commonly sold and eaten in urban than in rural areas. The ability of hunters to enter, and to transport wildlife from, unhunted areas is greatly facilitated by the presence of logging companies who build roads into once isolated blocks of forest to cut and export logs. Logging concessions cover over 40% of the forest outside of protected areas and only 14 companies dominate the industry. Experience from the Republic of Congo suggests that mandating logging companies to control illegal commercial hunting of threatened and endangered wildlife species within their concessions would do much to halt unsustainable hunting, and have little impact on the diets of urban consumers.

S17-1 **MASTER, LAWRENCE** NatureServe, 11 Avenue de Lafayette, 5th Floor, Boston, MA 02111 USA, (larry_master@natureserve.org)

INCLUDING INVERTEBRATES IN MAINSTREAM CONSERVATION: BUILD THE DATA AND THEY WILL COME

In order to practice conservation, it is necessary to know what species are at risk of extinction, where they are located, what factors threaten their existence, and what their habitat and other requirements are. For the past 30 years, The Nature Conservancy and now NatureServe in collaboration with a network of state and provincial natural heritage programs and conservation data centers have worked to develop this information and inform the conservation of at risk species. In contrast to vertebrate and vascular plant taxa, only a minority of invertebrate taxa are sufficiently well known to be effectively targeted for conservation information development. Analyses of the patterns of occurrence of these focal invertebrates in the U.S. illuminates the necessity of including invertebrates in conservation efforts if biodiversity is to be effectively conserved.

S17-3 **NASKRECKI, PIOTR** Invertebrate Diversity Initiative, CABS Conservation International at: Museum of Comparative Zoology, Harvard University 26 Oxford Street, Cambridge, MA 02138 (p.naskrecki@conservation.org)

OVERCOMING THE TAXONOMIC IMPEDIMENT: THE EMERGENCE OF GLOBAL TAXONOMIC DATABASES AND THEIR APPLICATION FOR CONSERVING INVERTEBRATES

The most important factors that limit our ability to use invertebrates in conservation practices, be it as conservation targets or conservation monitoring tools, are the overwhelming lack of knowledge of their biology and distribution as well as the limited and steadily declining capacity to identify and describe invertebrate diversity, a negative trend known as the taxonomic impediment. For many groups of invertebrates there are no global check-lists or catalogs, yet such works are prerequisite to creating invertebrate identification or mapping tools, ones that can be used directly by conservation authorities and decision makers. Recent advancements in information technologies allow for creation of dynamic, Internet-oriented taxonomic database that act as central, collaborative repositories of knowledge on classification, identification, and biology of invertebrate taxa. For the first time comprehensive information on distribution and systematics of little known, yet ecologically important groups such as flies or katydids are freely available. The existence of global taxonomic databases results in almost immediate increase in scientific activity around the taxon, and allow for creation of more accessible, conservation-related tools.

S17-4 **SPECTOR, SACHA** Manager, Invertebrate Conservation Program Center for Biodiversity and Conservation American Museum of Natural History (spector@amnh.org)

ARE INVERTEBRATE FOCAL TAXA FULFILLING THEIR PROMISE?

Pervasive scarcities of data on the distribution, taxonomy, and population status of invertebrates have seriously impeded the inclusion of invertebrate diversity in the conservation process. For nearly two decades, the development of invertebrate focal taxa has been suggested as a means to pry conservation-relevant information out of this hyper-diverse, poorly known invertebrate realm.. A review of our progress toward establishing such focal taxa reveals decidedly mixed success. While there have been hundreds of studies debating the criteria for selecting focal taxa and detailing the effects of anthropogenic disturbances and ecological changes on dozens of different invertebrate taxa, they have resulted in a fragmented and often incomparable dataset. As a result, virtually none of the many proposed invertebrate focal taxa have been universally embraced, though a slate of promising candidates has been identified. However, we have developed a clearer understanding of the informational, methodological, and taxonomic infrastructure needed to support fully functioning focal taxa, and the coordinated effort necessary to produce it. Rapidly improving information technologies and more focused efforts by collaborative networks of taxonomists, ecologists, and conservation biologists have the potential to rapidly develop a suite of invertebrate focal taxa with utility in a variety of conservation contexts.

S17-5 **ALONSO, LEEANNE E.** Center for Applied Biodiversity Science, Conservation International. 1919 M Street NW, Suite 600, Washington, D.C. 20036 (l.alonso@conservation.org)

PRODUCING CONSERVATION-RELEVANT DATA WITH RAPID INVERTEBRATE FIELD SURVEYS

Field surveys of invertebrate diversity can make a valuable contribution to promoting and achieving invertebrate conservation by providing essential data on invertebrate biology and distribution, training taxonomists and field biologists, developing and testing identification tools for quick recognition of species in the field, and documenting species ranges and new species. The high diversity of invertebrates and the lack of taxonomic identification guides often discourage field surveys. However, invertebrate surveys can be successful if they focus on taxa that can be surveyed using standard protocols and can be identified quickly in the laboratory. Conservation International's Rapid Assessment Program (RAP) included invertebrates in 64% of terrestrial surveys, and in 100% of freshwater and marine surveys, with over 5000 species documented and at least 200 species identified as new to science. Terrestrial taxa surveyed include butterflies, beetles (especially dung beetles and tiger beetles), ants, scorpions, dragonflies and damselflies, aquatic true bugs, and katydids. A wide range of aquatic insects and other invertebrates can be easily surveyed using standard techniques and identification guides are becoming more readily available. Marine invertebrates are key to assessing coral reef diversity and a high rate of new species discovery is always found.

S17-7 **ROBLE, STEVEN M.** Virginia Department of Conservation and Recreation, Division of Natural Heritage, 217 Governor Street, Richmond, Virginia 23219 (sroble@dcr.state.va.us)

INVERTEBRATE CONSERVATION IN PRACTICE: LESSONS FROM VIRGINIA

The Virginia Department of Conservation and Recreation's Division of Natural Heritage is the first comprehensive program for the conservation of the state's biological diversity. Its primary goals are to conserve the habitats of rare, threatened, and endangered species, exemplary natural communities and habitats, and other natural features. To date, the program has protected more than 35,000 acres. Invertebrates are an integral part of the program's inventory and conservation efforts. Field surveys by staff biologists have made substantial contributions to knowledge of the distribution and status of invertebrates in the state. Numerous status surveys have been conducted for specific rare invertebrates, as well as general sampling of the state's invertebrate fauna, often in unique habitats not previously sampled by zoologists. Hundreds of new state records have been documented, many representing significant range extensions, and several dozen new species (and one new genus) have been discovered. Annual monitoring is conducted for selected rare species populations, including those of the federally Threatened northeastern beach tiger beetle (Cicindela dorsalis dorsalis), federally Endangered Mitchell's satyr butterfly (Neonympha mitchellii), and the rare and declining regal fritillary butterfly (Speyeria idalia). Capture-mark-recapture studies also have been conducted on these species, yielding important results for the conservation of metapopulations.

S17-8 **MCELVANEY, SHANNON** SHANNON MCELVANEY CH2M HILL 19 S. Tejon ST, STE 500, Colorado Springs, CO 80903 (Shannon.McElvaney@ch2m.com)

NEED FOR LANDSCAPE LEVEL MANAGEMENT FOSTERS COLLABORATIVE WORK USING GEOSPATIAL TECHNOLOGIES

Over the last 15 years, advances in technology, remote sensing, global positioning systems (GPS), mobile applications, and geographic information systems (GIS) have made it possible to improve and refine our techniques for conducting biological surveys and analysis. These technologies are now widely used by conservationists, ranchers, foresters, and other natural resource managers in both the public and private sectors. The rise in landscape ecology has caused many managers from diverse disciplines to recognize the need to collaborate on the management of complex ecosystem mosaics that often cross several jurisdictional boundaries. Collaborative efforts of this type raise the need for spatial data standards and common practices and procedures for the mapping and collection/organization of biological data so that they can be combined for landscape level analysis. This presentation will cover some of the standards and methods employed by diverse organizations working in collaboration to map, track, and manage biological data across the landscape. Project examples will demonstrate how geospatial technologies are being used to develop biophysical and predictive models as well as site selection applications that help managers make wise decisions in an ever changing and complex landscape.

S18-1 **BEJA, PEDRO, and Rita Alcazar** ERENA, Av. Visconde Valmôr, 11-3º, 1000-289 Lisboa, Portugal (pbeja@erena.pt), Liga para a Protecção da Natureza, Estrada do Calhariz de Benfica, 187, 1500-124 Lisboa, Portugal

CHANGING AGRICULTURE AND AMPHIBIAN CONSERVATION IN MEDITERRANEAN LANDSCAPES: CHALLENGES AND PROSPECTS

In many Mediterranean landscapes, irrigated crops have replaced the traditional production of dry cereals, involving the building of irrigation infra-structures, increased use of agro-chemicals, and loss of valuable freshwater and terrestrial habitats. Here we use a case study in southern Portugal to document the effects of these changes on amphibians, evaluating possible solutions for their conservation under agricultural intensification. In 1997 and 2002, amphibians were sampled in 57 ponds, together with variables describing pond morphology and hydroperiod, water chemistry, agricultural practices and landscape context. Spatial and temporal variations in amphibian assemblages were strongly associated with pond size and hydroperiod. Agricultural intensification resulted in pond drainage and losses in breeding habitats due to the conversion of temporary waters into irrigation reservoirs. Breeding habitats were also negatively affected by the spread of exotic crayfish and fish predators from irrigation channels. Amphibian abundances where lower where traditional agricultural land uses were replaced by the production of vegetables for international markets. Conservation of amphibians in these agricultural landscapes might be achieved through EU agri-environment schemes, compensating farmers for the losses in productivity necessary to maintain networks of temporary ponds with diverse hydroperiods, natural hydrological regimes, isolation from irrigation channels and favorable surrounding land uses.

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ROAD MORTALITY AND THE DEMOGRAPHY OF TURTLES

Road mortality is suspected to have contributed to widespread population declines in turtles in the United States, a country with exceptionally high turtle diversity. We examined the issue in three ways. First, a modeling study that integrated road maps and traffic volume data with simulated movements of turtles suggested that road networks typical of the northeastern, southeastern, and central regions of the U.S. have the potential to limit land turtle populations and, to a lesser extent, populations of large-bodied pond turtles. Second, field studies of freshwater turtle populations indicate that high road density is associated with male-biased sex ratios. Disproportionate road mortality of females on nesting migrations is the most likely cause of skewed sex ratios. Third, a synthesis of all published estimates of population-level sex ratios in freshwater and terrestrial turtles in the United States (165 estimates for 36 species, published 1928 – 2003) indicates that the proportion of males in populations has increased ($P = 0.001$) over the last century. We conclude that the demographic traits of some turtles in combination with their mobility may jeopardize population persistence within road networks typical of the eastern and central United States.

S18-3 **HALLIDAY, TIM** (International Director, DAPTF), Department of Biological Sciences, The Open University, Milton Keynes, MK7 6AA, UK. (t.r.halliday@open.ac.uk)

CAN HUMANS AND AMPHIBIANS COEXIST?

Continuing dramatic declines among amphibian populations and species throughout the world suggest that amphibians are undergoing a mass extinction; about a third of the world's 5500 species are categorized as threatened. The notion that this can be alleviated by setting up protected areas for amphibians is challenged by the fact that amphibian declines are occurring in nature reserves, national parks and other areas not subject to habitat destruction. There is now abundant evidence that amphibians are threatened by a variety of anthropogenic factors, against which boundary fences offer no protection. Of particular concern in this context are emerging infectious diseases. Historically, many amphibian species have flourished in agricultural landscapes, but modern agricultural methods, particularly the use of chemicals, threatens this coexistence. Only a few amphibian species, notably the cane toad and the American bullfrog, appear to have benefited from human activities and they are widely persecuted as pests.

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WINNERS AND LOSERS: THE IMPACTS OF MODIFYING NATURAL LANDSCAPES ON AMPHIBIAN AND REPTILE ASSEMBLAGES IN EASTERN AUSTRALIA

Human modified landscapes produce a range of new habitats for wildlife. We examined herpetological species composition in several studies comparing continuous and fragmented natural areas, agricultural landscapes and golf courses of eastern Australia. The collated results indicate that the conservation value of modified landscapes varies enormously – providing an excellent opportunity to suggest management guidelines to enhance conservation values of these areas. Some species thrive in heavily modified habitats (the winners) while many species disappear (losers). We compare the ecological characteristics (geographic range, habitat specialization, reproductive ecology, etc.) of these herpetofaunal groups. The “winners” provide insight into the ecological pre-adaptations that allow some species to cope with habitat modification, while the “losers” allow us to predict species that are susceptible to extinction processes. Both groups demonstrate the magnitude of change in habitat and community dynamics resulting from landscape modification across eastern Australia.

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CONSERVATION OF AMPHIBIANS IN INTENSELY USED AGRICULTURAL LANDSCAPES: CORRIDORS INCREASE CONNECTIVITY

The Netherlands are a densely populated country with high urbanization pressure. The suitable habitat for amphibians has become highly fragmented. In addition industrialized agriculture has increased the resistance of the matrix between suitable habitat. In former studies it has been shown that the distribution pattern of Hyla arborea is affected by habitat fragmentation and shows characteristics of a metapopulation structure. In recent years the research has been focused on the influence of the agricultural landscape on connectivity. Data are presented from movement studies on two amphibian species: a habitat specialist Hyla arborea and a habitat generalist Rana temporaria. Both species show a high preference for natural elements in the landscape and avoid open agricultural fields. For Rana temporaria it is shown that this preference is stronger for newly metamorphosed juveniles compared to adults. The simulation model SMALSTEPS is used to extrapolate local individual movements to differences in connectivity between ponds on a landscape level. The implications for nature conservation are that sustainable amphibian habitat networks should not only focus on size and distance between habitat patches but also incorporate ecological corridors.

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URBANIZATION AND ITS EFFECTS ON AMPHIBIANS: GEOGRAPHIC VARIATION AND VARIATION AMONG SPECIES

The sprawl of human settlements can negatively affects the distribution of species. During the construction of urban areas habitat is destroyed, resulting in direct negative effects. The indirect effects of urban areas may extend well beyond their area, for example when urban areas reduce connectivity between remnant habitat patches. We study the effects of urban areas and other human-dominated land-uses (agriculture, roads, etc.) on the distribution of amphibians in six areas of Switzerland, Europe's most heavily populated country. The structure of the landscape and the intensity of land-use varies among areas, yet a similar assemblage of amphibians (newts and anurans) inhabits them. We extracted land-use data from digital 1:25000 maps using GIS. We extracted land-use information in circles of varying width, from 100 radius around breeding sites to a maximum radius of 3 km. We determine which land-uses affect the distribution of amphibians and determine the spatial scale of the effects. We report whether and which land-uses affect species in all areas and which ones vary geographically. We also describe whether species living in the same landscapes are affected similarly by land-use. Finally, we show how such analyses can be used to define areas most suitable for amphibian conservation.

S18-7 **SINSCH, ULRICH** Institute of Integrated Sciences, Dep. Biology, University of Koblenz-Landau, Universitaetsstr. 1, D-56070 Koblenz, Germany (sinsch@uni-koblenz.de)

DO GRAVEL PITS COMPENSATE FOR THE LOSS OF RIPARIAN FLOOD PLAINS? A 15-YEARS CASE STUDY ON CENTRAL EUROPEAN NATTERJACK TOADS (B. CALAMITA)

During the past 150 years most central European rivers have been canalized resulting in an almost complete loss of flood plains with temporarily water-filled ponds and little vegetation - the primary inland habitats of the natterjack toad Bufo calamita. Despite the severe loss of natural habitats, natterjacks are far from being endangered because they successfully colonized sandy gravel pits and many kinds of industrial areas which were often placed into the former flooding areas. In 1986, we started to analyze the dynamics of two large metapopulations inhabiting neighbouring gravel pits near the River Rhine aiming to identify the key features of life history and habitat structure which probably enabled the habitat shift. The most important life history features were (1) risk spreading by spawning in any (shallow) water body available, (2) heliothermic accelaration of larval growth, (3) refilling of sinks by dispersing first-breeders from source populations, and (4) longevity (>8 years). The key feature of primary and secondary habitats is the landscape dynamic, either natural or man-made, maintaining habitats in an early stage of succession. In conclusion, pioneering amphibians such as B. calamita may persist in former flood plains provided that industrial acitivities mimick natural landscape dynamic.

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SAVING MADAGASCAR'S BIODIVERSITY: WHO BENEFITS AND WHO PAYS? A BRIEF HISTORY

Madagascar is one of the richest countries in endemic biodiversity. In traditional culture, forests are a gift of the Ancestors for human use. In 1881, the Merina government forbade peasants' felling primary forest, valuing timber above local food crops. In 1927, the French Colonial government set aside the first nature reserves as "integral wilderness" for scientific research, while displacing villages. After 1975, a nationalist government rejected conservation as the ethos of interfering foreigners. By 1985, the bankrupt government identified biodiversity as their chief fish-hook for foreign aid. Multi-donor missions led by 1990 to three projected 5-year phases of a National Environmental Action Plan . The first phase was largely based on Integrated Conservation and Development Projects around reserves. The second, enlarged the scope to a regional approach, while emphasising tourism to compensate locals. The chief economic advantage of forests is now seen as watershed protection. An increasing number of Malagasy now also share international conservation ethics. The President in 2003 announced an unprecedented tripling of the protected forest estate. These new protected areas may be based on the European Park system of people integrated with landscape, rather than on the American ideal of reserves as "pristine" nature without people.

S19-2 **KREMEN, CLAIRE, Alison Cameron, and Chris Raxworthy** Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ (ckremen@princeton.edu)(CK) Department of Herpetology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192 (CJR)

CROSS-TAXON BIOGEOGRAPHY - DO CENTERS OF ENDEMISM MATCH UP, AND LESSONS FROM EVOLUTIONARY PROCESSES FOR CONSERVATION

Madagascar contains an irreplaceable biota: in many taxonomic groups, species-level endemism is between 70 to 100%. Not only is Madagascar a global center of endemism (with high species richness and environmental threats that make it a global hotspot for biodiversity), but many species groups within Madagascar exhibit patterns of regional or micro-endemism. These narrow-ranged species present a challenge for conservation planning. In this talk, we analyze geographic patterns of species distributions for three taxonomic groups, butterflies, chameleons, and plants in the genus Colea (Bignoniaceae), to ask whether patterns of micro-endemism show concordant or discordant distributions. We use a variety of methods to (1) examine individual species distributions (from simple mapping of distribution points to modeling of distributions based on environmental data), (2) delineate centers of micro-endemism (from simple measures of overlap of the distributions of narrow-ranged species to grid-based inverse range-size rarity measures) and (3) compare cross-taxonomic patterns of micro-endemism (simple mapping of hotspots of micro-endemism, partial Mantel tests that statistically look for cross-taxonomic correlations in range-size rarity and community composition, and Parsimony Analysis of Endemicity). These findings will be examined with respect to current protected area coverage and the anticipated tripling in protected areas mandated by the Malagasy government.

S19-3 **DURBIN, JOANNA, Helen Crowley, Guy Suzon Ramangason, Lisa Gaylord, Koto Bernard, and Lanto Andriamampianina** Durrell Wildlife Conservation Trust, BP 8511, Antananarivo 101, Madagascar (JD) (joanna.durbin@durrell.org). Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (HC,LA). National Association for the Management of Protected Areas, Ambatobe, Antananarivo 101, Madagascar (GSR). USAID, 6th Floor Tour Zital Zone Industriel Taloumis Ankorondrano Madagascar (LG). Ministry of Environment, Ampandrianomby, Antananarivo 101, Madagascar (KB)

CONSERVATION SUCCESSES AND LESSONS LEARNED IN MADAGASCAR

Madagascar's National Environmental Action Plan, operational since 1991, was the first in Africa and has been the most sustained, fostering a remarkable collaboration between State, funding agencies and NGOs and enabling development and analysis of conservation strategies. There have been some clear successes during this period: deforestation rates are significantly lower in protected areas; 8 new laws have enabled a range of effective conservation actions such as community management; integrated land use planning at a regional level has allowed "buy in" to conservation from a range of stakeholders and enabled conservation to be tackled at an appropriate scale; and political support for conservation has increased, based on recognition that it is a foundation of sustainable development and poverty reduction. The following mechanisms have contributed to these achievements. A new Malagasy Parks Service has enhanced protected area management and enforcement. A new national forestry policy and laws have enabled transfer of land to local communities transforming open access resources to controlled access with exclusion of others. Experience has been gained on catalyzing local consensus and collaboration to agree on objectives and rules for conservation and sustainable resource use, by building on traditional culture and social structure.

S19-4 **CROWLEY HELEN, Frank Hawkins, David Meyers, and Joanna Durbin** Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (HC,DM)(hcrowley@wcs.org). Conservation International Madagascar, BP 5178, Antananarivo, Madagascar (FH). Durrell Wildlife Conservation Trust, BP 8511, Antananarivo 101, Madagascar (JD)

WHAT DO WE REALLY NEED TO CONSERVE THE BIODIVERSITY OF MADAGASCAR

The papers in this symposium show that, in Madagascar, the technical conservation issues are getting answered. We will soon know where we should put conservation efforts to stem the loss of biodiversity. A new vision of protected areas and conservation sites shows that the long-term protection of biodiversity in Madagascar is technically feasible, and that the costs of establishment and monitoring are known and attainable. Analysis of costs and benefits of conservation will enable us to develop more effective mechanisms to minimize opportunity costs and target benefits. What is missing? Two key pieces; firstly, how do we assure that the benefits of biodiversity conservation are transferred to a dispersed, poor, risk-averse, suspicious and rapidly growing rural community. Secondly, a coherent set of macro-economic strategies to attract people away from forest degradation into productive, interesting, stable and well-planned economic activity. This paper will highlight how far Madagascar has come in implementing conservation and the great challenges ahead.

S19-5 **MEYERS, DAVID, Leon Rajaobelina, Ramy Razafindralambo, Bart Minten, Jean-Christophe Carret, and Martin Jenkins** Wildlife Conservation Society, BP 8500, Antananarivo 101, Madagascar (DM: meyersconsult@yahoo.org). Conservation International Madagascar, BP 5178, Antananarivo, Madagascar (LR, RR). Cornell Food and Nutrition Policy Program, Cornell University Ilo program, BP 6317, Antananarivo 101, Madagascar (BM). World Bank, 1818 H St NW, Washington, DC, 20433 (JCC). IUCN-UNEP World Conservation Monitoring Centre, 219 Huntingdon Road, Cambridge CB3 0DL (MJ).

ECONOMICS, FINANCE AND CONSERVATION IN MADAGASCAR

In Madagascar, analyses of watershed benefits have produced results that justify investments in conservation; however, current conservation effort is inadequate for forest, wetlands and near coastal marine ecosystems, where almost all important biodiversity is found. Various forms of market failure preclude appropriate local levels of investment in conservation activities. Economic costs and benefits fall on different segments of the national and international population. In some cases, the local, regional and national benefits are adequate to incite conservation but the institutional structures and financial instruments are not available. Local economic benefits from direct exploitation such as the animal trade are difficult to capture and expensive to control. Investors in conservation can provide a bridge from current market failures to a future situation where benefits to local and regional stakeholders are sufficient incitement for nature conservation. Economic options for this approach emphasise minimizing the opportunity cost of conservation. We estimate the costs of tripling the area managed for conservation and review approaches that could address this need.

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CONSERVATION PRIORITY-SETTING OVER MULTIPLE LANDSCAPES IN MADAGASCAR

The planned tripling of Madagascar's protected areas network must capture as much unprotected biodiversity as possible, while maximizing compatibility with other potential land use options. Clear management goals are needed, at the scales at which land-use decisions are made, and the process must be transparent, science-based, defensible and adaptable. Local conditions impose constraints on this process. Most important biodiversity is restricted to forest, with the remainder in freshwater and coastal marine environments. Some forests occur in large tracts, not all of which will be available for conservation. Knowledge of biodiversity distribution is very patchy. Most small species are very poorly known. Some kind of environmental modelling will be needed to capture overall genetic variation. Focus on threatened and restricted-range species will provide short-term priorities. Most biodiversity knowledge is held at the national and international level, whereas land-use planning occurs at the regional and local level. Biodiversity conservation issues are poorly understood at the local and regional levels. Global biodiversity values must therefore be conveyed through national objectives to regional and local benefits through a combined top-down and bottom-up approach. We present an integrated vision of mechanisms to achieve this, mediated through a multiple-use conservation site approach.

S19-7 **RASOAMAMPIANINA, VANESSA, Tiana Rahagalala, Evah Andriamboavonjy, Harison Rabarison, Nora Bynum, Eleanor J. Sterling.** Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th St., NY, NY 10024 (VR, NB, EJS) (vanessar@amnh.org). Wildlife Conservation Society, BP8500, Antananarivo 101, Madagascar (TR). Conservation International BP 5178 Antananarivo 101, Madagascar (EA, HR).

DEVELOPING THE TECHNICAL CAPACITY FOR CONSERVATION IN MADAGASCAR

Six million hectares of Madagascar will require management targeted specifically to biodiversity conservation and ecosystem benefits in the next five years as the protected area network will be tripled. However, at present, half of Madagascar's 40 parks and protected areas have no full-time trained management personnel. In-service training and capacity building initiatives at the government agencies charged with conservation consists of brief training workshops with the aim of delivering specific sets of technical skills over short timeframes. At the university level, biodiversity conservation topics are typically covered within fundamental science courses; and a few institutions offer specific courses on biodiversity conservation. At present, as is the case in many places around the world, university training in biodiversity conservation tends to emphasize theory rather than practice, while professional training is tool-specific. In the second decade of the Malagasy National Environmental Action Plan and as the "Durban Vision" unfolds, biodiversity conservation education and training needs continue to grow. These needs are currently under review and a network of conservation educators and practitioners has been established with an immediate aim of providing locally adapted teaching materials for university and professional biodiversity conservation training.

S20-1 **PEARL, MARY** Wildlife Trust, P.O. Box 1000 Palisades NY 10964 (pearl@wildlifetrust.org)

HUMAN WILDLIFE CONFLICT TRENDS IN AN URBANIZING WORLD: WILL LANDSCAPE TRANSFORMATION SURROUNDING CITIES DOOM SUSTAINABILITY?

Habitat fragmentation near urban areas, when viewed from the perspective of the built environment, is also known as urban sprawl, yet this latter term fails to encompass its serious consequences to living organisms. Urbanizing landscape transformation results in increasing human-wildlife competition for space, food, and other resources; mutual loss of health and well being from pollutants and pathogens that cross species boundaries; an upsurge in novel species, from pathogens to exotic competitors; and a narrowing of species diversity, including the loss of some species that provide direct and indirect services to ecosystem function, stability, and resilience. The vortex of native biodiversity loss, breakdowns in ecosystem function and services, and an upsurge in exotic species and pathogen abundance will create unprecedented challenges in land use management, especially when faced in the context of climate change and newly extreme weather fluctuations. Will cities attain new stases of relative species abundance, or face continuous and unpredictable natural upheavals with deleterious consequences for survival of many species? This overview will conclude with an examination of the alienation from nature that occurs in city dwellers buffered from direct experience of their impact on ecosystems.

S20-2 **PADUA, SUZANA** University of Brasilia, IPË-Instituto de Pesquisas Ecológicas (Institute for Ecological Research, and Wildlife Trust Alliance, UnB Colina Bloco G Apto 503, Brasilia, DF, 70910-900, Brazil, (ipe@alternex.com.br)

RE-LINKING URBAN DWELLERS TO THEIR NATURAL ESSENCE

Human concentration in urban centers usually helps people forget their natural essence. Upon returning to rural areas, a re-learning process is frequently needed so human beings can perceive themselves as part of nature, can better understand the intrinsic values of the natural world and thus increase the chances of more harmonious relationships. This is especially important in regions where biodiversity is still present and where unprivileged human conditions can lead to unsustainable practices, which commonly leads to more threats to already endangered ecosystems. This is the case of the so called “landless movement”, the most organized social movement of Brazilian history. Some participants never left the rural settings, while some are from urban centers or still others have lived in cities for some time. Their motivation to return to the rural settings has been created by the movement itself, as the ultimate goal is for families to acquire a piece of land. This is the case of the Pontal do Paranapanema region, Western São Paulo State, where last remnants of Atlantic Forest are still found, inhabited by endangered species like the black lion tamarin (Leontopithecus chrysopygus). The same region has been one of the main targets of a massive migration of the landless movement, which at first seemed to be the utmost threat to the remaining natural environment. However, through a broad environmental education program, it has been possible to introduce sustainable development alternatives that include agro-forestry practices which benefit both humans and nature. The main practice has been tha planting of trees in the deserted plots of land the “landless receive, improving the overall conditions of soil, water and other to historical reasons of land tenures aThe challenge is to sensitize people to change their attitudes, their values and their behaviors. If the cities are mostly composed of concrete, nature needs to creep back into people’s minds and thus be incorporated as an essential aspect of life itself. Through environmental education programs a new look can be introduced, where human beings perceive their natural essence and re-link themselves to a broader world, celebrating biological and cultural diversities and sharing the responsibility for their well being.

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BATS AND HUMAN CONFLICTS IN TROPICAL URBAN AREAS OF BOLIVIA

Within most developing countries exist risks to wildlife due to uncontrolled human population growth, overtake of natural areas, and creation of artificial spaces where sometimes they do not naturally exists. Bats are a good example on how wildlife is affected within urban areas, especially in tropical countries. We evaluated the local bat faunas in two tropical cities of Bolivia by means of mist netting, acoustic and roost survey to observe how the urbanizing environment affects them, compared with natural bat assemblages in similar areas but without human disruption. We found that bat assemblages within cities is very poor compared with the country side and that several species are affected positively (aerial insectivores, fruit-nectar eating bats) and others negatively (gleaning insectivores). Most of the conflicts between bats and humans occurred mostly because the occupation of buildings by bats for roosts and occasional attacks of vampire bats to people. These situations create reluctance by people to develop proper bat population controls destroying roosts and bats. Public education was an important tool to create public awareness on the need to preserve urban bat populations mainly as insect population controllers.

S20-4 **POWELL, JAMES and Cyndi Taylor** Wildlife Trust, Florida and Katherine Frisch, Florida Marine Research Institute. (powell@wildlifetrust.org)

MANATEE SURVIVAL IN MIAMI: BOAT TRAFFIC MANAGEMENT IN THE CROWDED COASTAL WATERS OF FLORIDA

Regulated boat speed zones aimed at reducing watercraft related mortality and injuries of manatees are ubiquitous around the coastal and inland waterways of Florida. Boat speed zones are viewed as a “common sense” approach to reducing the largest identifiable cause of manatee deaths. Intuitively, boat speed zones should provide more time for the boater to see and avoid hitting manatees, allow manatees additional time to detect and react to on-coming boats and reduce the force of impact should a collision occur. Many of Florida’s waterways, shared by manatees, have high levels of boat traffic. Presently, there is little information available to evaluate the efficacy of these speed zones. Our study presents information on manatee use, behavior, human disturbance and reaction to watercraft in one of these zones. Recent litigation and challenges to using boats speed zones as a tool for manatee conservation, demonstrates the importance of assessing speed zone effectiveness. Our work provides data for adaptive management by providing a better understanding of the dynamics of manatee/boat interactions. This information can be used to improve effectiveness and reduce human inconvenience resulting, perhaps, in higher voluntary compliance with speed rules and less conflict between stakeholders.

S20-5 **CULLEN, L. IPÊ** Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance, C.P 31. Teodoro Sampaio, SP. 19280 Brazil (Lcullen@stetnet.com.br)

JAGUAR AS LANDSCAPE DETECTIVES FOR THE ATLANTIC FOREST, BRAZIL

A large-scale approach to conservation calls for large, connected core reserves with their full complement of native species. This work links spatial data with population viability analysis and uses the jaguar as a landscape detective for the Atlantic Forest. Landscape detective species can be defined as organisms that show us how to plan and manage reserves and large interconnected eco-regions. The main hypothesis is that by using jaguars as a landscape detective we can identify and assess three important and independent features that characterize large carnivores and large scale conservation planning: (1) Prey diversity and density, (2) Large core areas and habitat patches for biodiversity conservation, and (3) Landscape connectivity. Preliminary results will be presented to the following questions that are linked to the three broad scientific arguments that constitute the landscape detective approach. 1. What is the absolute density of jaguars in high priority protected areas in the Atlantic Forest? 2. How do jaguars select habitats? What are their home ranges and movement patterns? 3. How is the spatial structure of the jaguar metapopulation; their location, sizes, initial abundances, carrying capacities and distances from each other? 4. What is the minimum area we need to secure viable jaguar populations?

S20-6 **WIKRAMANAYAKE, ERIC, Balagalle, Suchitra, Kalinga Padmalal, and John Seidensticker** Department of Zoology, The Open University, Nawala, Sri Lanka (SB, KP). Conservation Science Program, World Wildlife Fund, United States, 1250, Twenty-Fourth Street, NW. Washington DC 20037 (eric.wikramanayake@wwfus.org) (EW). Smithsonian's National Zoological Park, 3001 Connecticut Ave. NW, Washington D.C. 20008 (JS).

MESO-CARNIVORES AS URBAN CONSERVATION FLAGSHIPS: THE ROLE OF FISHING CATS IN SRI LANKA'S CITIES

As urban sprawl takes a toll on natural habitat there is a greater realization of the need for urban 'green areas' for aesthetic and practical considerations such as flood control, recreation, and biodiversity conservation. If conservation plans can be infused into city plans, the green refuges can be more effective for biodiversity conservation, including for conserving ecological functions. Resembling a small leopard, the fishing cat (Prionailurus viverrinus) has flagship status for raising conservation awareness in urban Sri Lanka. As a habitat specialist the fishing cat requires riparian habitats, swamps, and wetlands; critical ecosystems for preserving watershed and drainage functions, but among the first to be reclaimed or converted during urbanization. We determined the presence and distribution of fishing cats in urban habitats of Sri Lanka using camera-traps. We found that fishing cats are active during the day and night in areas adjacent to dense human habitation. Based on the distribution of fishing cats in urban habitats, we proposed the creation of 'urban bioparks' for biodiversity conservation.

S20-7 **RODRIGUEZ, JON PAUL and Kathryn M. Rodríguez-Clark** Centro de Ecología, Instituto Venezolano de Investigaciones Científicas and Wildlife Trust Alliance, Apdo. 21827, Caracas 1020-A, Venezuela, (jonpaul@ivic.ve jonpaul@ivic.ve)

FROM HABITAT TO URBAN CENTERS IN LATIN AMERICA AND ON THROUGH THE MIAMI GATEWAY: THE ILLEGAL TRADE IN NEOTROPICAL WILDLIFE

Urban areas around the world are among the principal markets for wildlife products. Wildlife trade can negatively impact native species both at the product source (via overexploitation) and destination (via exotic wildlife and pathogen introductions). The United States (US) is the world's single largest market for wildlife products, and South America (SA) one of its main suppliers. Here we analyze a unique database of 52,933 legal and illegal wildlife shipments entering the US from SA between 1993 and 2002. Three countries together (Brazil, Colombia and Peru) account for over 75% of all trade, while just one city in the US (Miami) receives ~65% of shipments. The overwhelming majority of shipments (~80%) correspond to freshwater fishes. However, they are predominantly labeled as simply "live tropical fish," which renders impossible th! e evaluation of potential impacts on native species in both supplier and recipient nations. Our analysis suggests the need for a reassessment of current wildlife trade practices, including accurate labeling of shipments, increasing surveillance for pathogens, enhancing the capacity to enforce trade regulations, and funding research to better understand the causes and consequences of wildlife trade. That trade is concentrated in relatively few ports of exit and entry should facilitate this reassessment.

S20-8 **BUCHORI, DAMAYANTI, David Ardhian, Bandung Sahari, Akhmad Rizali1, and Shinta Puspitasari** 1 Center for Conservation and Insect Studies (CCIS) and Wildlife Trust Alliance, Komplek Perumahan IPB Alam Sinar Sari, Jl. Kecipir I Blok A No. 33, Cibeureum, Darmaga, Bogor 16610 West Java,Indonesia (kpkai@indo.net.id) (DB,BS,AR. SP) Department of Plant Pests and Diseases, Faculty of Agriculture, Bogor Agricultural University-IPB Campus Dramaga, Bogor 16680 Indonesia (DB) Wildlife Trust Alliance, New York (DB,BS,AR,SP) Nastari Foundation, Jalan Daya Prakarsa no 5, Sindangbarang, Bogor,16610 Indonesia (DA)

FEEDING AN INCREASINGLY URBAN POPULATION: INTENSIFICATION OF AGRICULTURE, BIODIVERSITY LOSS, AND AGRICULTURAL PEST EXPLOSIONS ON FARMS

Agriculture and conservation has mostly been at the opposing end. Currently, about 30% of the lands in Indonesia are used as agricultural lands. Most of these lands are lowlands, where monoculture has replaced diversity due to land conversion, and where uses of chemical pesticides and fertilizers are high. In contrasts, the highlands are still characterized by mosaics of landscapes. We conduct studies of insect diversities at different rice fields across different landscapes using transect that cut across various habitats. We are particularly interested to study the effects of different landscapes toward insect (particularly parasitoid) diversity. How does landscape structure affect insect diversity and parasitoid assemblages? Our study showed that one of the impacts that can be seen is the dwindling of beneficial insects, and increase of pest explosions. In landscapes dominated by natural ecosystem, the insect communities in rice fields consists of 32% herbivore, 16% predator, 15% parasitoid, 11% saprofag, and 26% transient species. Transient species (Ephemeroptera, Trichoptera) is unique in that it could be used as indicator for healthy ecosystem. In contrast, landscapes dominated by monoculture-agricultural fields are dominated by pest species and has much less insect diversity. Implications of these findings to link agriculture and biodiversity conservation practices are discussed.

S20-9 **BORDINO, PABLO** Fundacion AquaMarina-CECM, Calle 307 N 560, (7165) Villa Gesell, Buenos Aires, Argentina.(bordino@aquamarina.org)

DOLPHINS, SEA LIONS AND FISHERMEN SURVIVAL ALONG THE BUENOS AIRES COAST, ARGENTINA

Over 40 percent of the Argentina's population lives in the Buenos Aires Province. The unplanned growth produces urban environmental deterioration, and commercial exploitation affects marine biodiversity. Although the number of species is comparatively low, the health of the ecosystem depends on volume. Significant coastal upwelling occurs along the coast; currently one half of the fishing fleet operates in the area. Overfishing is extensively recorded and human-wildlife conflicts exist, especially with marine mammals. Three dolphin species are currently incidentally caught. Sea lions steal fish from nets and they are killed by fishermen. The objective is to promote the use of bottom longlines as an alternative fishing practice. Five local fishermen were randomly selected in 2003 by using longlines and gillnets, and production was compared. Fishing boats carried observers recording geographic position, depth, and biomass of fish evaluated by species, sex and size. Bottom longlines are an effective fishing method in the area. Marine mammal interaction and catch of non-target fish were reduced. The use of longline helped fishermen to protect fishing gear and to have a more rentable activity due to a higher fish price on market. Bottom longlines could be implemented as a fishery management strategy in the study area.

S20-10 **BONACIC, CRISTIAN** Fauna Australis, Av. Vicuña Mackenna 4860, Macul Santiago,Chile (Bonacic@puc.cl)

CONFLICT RESOLUTION BETWEEN TWO WILD ENDANGERED UNGULATES AND INDIGENOUS PEOPLE IN THE ANDEAN MOUNTAINS OF NORTHERN CHILE

Guanaco and Taruca are two Chilean native ungulates facing conservation problems in the northern border of Chile with Peru. Particularly, the Taruca is considered one of the most endangered terrestrial mammals in Chile, protected by national laws and registered as appendix I species in CITES. Internationally is also classified almost extinct by the IUCN red book. In Chile it is considered vulnerable by the Chilean red book of terrestrial vertebrates and the national hunting laws. The main reasons for its vulnerability are that only a single small and scattered population inhabits the Andes of the northern border of Chile with Peru and Bolivia. In turn, the Guanaco is considered endangered in that particular region of the country. This project faces two main conservation challenges: conflict resolution between people and wildlife and conservation medicine. We discuss how to promote and ensure taruca and guanaco conservation without causing conflicts upon the human activity in the area. It is important to consider that the farmers are Aymaras, the second largest ethnic group in the country and most of them are considered to live below the poverty line and their culture and agricultural traditions are also endangered.

S20-11 **NAVA, ALESSANDRA** IPÊ – Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance. C.P 31. Teodoro Sampaio. SP. 19280. Brazil. (Alenava@stetnet.com.br)

PECCARIES AS SENTINEL SPECIES: CONSERVATION, HEALTH AND TRANING IN ATLANTIC FOREST FRAGMENTS, BRAZIL

To implement a conservation medicine program for the conservation of forest fragments in the Brazilian Atlantic Forests. Using wild ungulates as sentinel species - animals that are good integrators of what's happening in the environment over space and time - we are surveying for the relationship between forest fragmentation and ecosystem health. Blood samples, internal and external parasites are collected from wild peccaries and domestic animals for analysis of possible diseases. Preliminary results demonstrate that this environment harbours infections agents for brucellosis and leptospirosis, and that these diseases appear to be in contact with wild peccary populations. Leptospirosis can cause illness, reproductive abnormalities and death. Finding evidence of the presence of this organism has relevance to the population dynamics of Atlantic Forest peccary populations. In addition to the research component, the project seeks to meet the challenge of training skilled professionals in conservation biology in Latin America, and is involving a team of young and enthusiastic students and local rural leaders who participate as full or part time trainees and field assistants. Building local awareness benefits humans and healthy rural fragmented landscapes.

S20-12 **SUKUMAR, RAMAN** Professor, Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560012, India (RS) (rsuku@ces.iisc.ernet.in); Visiting Professor, South Asia Program, Cornell University, Ithaca, NY 14853 (MR)

WILDLIFE-HUMAN CONFLICTS: ECOLOGICAL AND SOCIAL PERSPECTIVES

It is being increasingly realized that the conflict between wildlife and people is an important dimension that has to be resolved in order to achieve lasting conservation. Such conflict arises when wildlife cause damage to property and crops or even kill people and livestock. The extent and intensity of conflict depends on cultural attitudes of people towards animals in the local environment and their responses to depredation. The ecological basis and the social context of wildlife-human conflict have to be understood if we are to devise effective mitigation strategies. This paper reviews the ecology of wildlife-human conflicts in terms of the proximate and ultimate (evolutionary) causation using case studies from several large mammalian herbivores and carnivores including elephants, rhinos, tigers, lions and wolves. It draws upon theory from several disciplines including landscape ecology, foraging ecology, social organization and cultural anthropology. We review the influence of cultural attitudes towards animals across several continents and societies on the survival of wildlife in conflict with humans. Finally, we make suggestions as to how such experiences may still offer lessons for workable compromises to promote the co-existence of people and wildlife.

S20-13 **VALLADARES-PADUA, CLAUDIO** IPÊ – Instituto de Pesquisas Ecológicas & Wildlife Trust Alliance UNB Colina Bloco G Apto 503, 70910-900 Brasilia, DF, Brazil. (cpadua@unb.br cpadua@unb.br)

USING CONSERVATION BIOLOGY RESEARCH TO INFLUENCE HUMAN COMMUNITY SETTLEMENT POLICIES: A SIGN OF HOPE FROM THE PONTAL DO PARANAPANEMA REGION OF BRAZIL

The Atlantic Forest of the Interior in the Pontal do Paranapanema, São Paulo, Brazil, is one of the world most threatened ecosystems, as only 1.8% of its original coverage is left. It hosts many endangered species like a small primate known as the black lion tamarin (Leontopithecus chrysopygus). The conservation of the region's biodiversity has been a continuous challenge, intensified in the last decade by conflicts over land ownership that seemed to increase the threats to the species' survival. A study of L. chrysopygus began 15 years ago and from it derived a conservation model that includes: ecological research, environmental education, community involvement through sustainable development alternatives, habitat restoration, landscape planning and the promotion of pertinent policies. This synergy is influencing the entire region. By linking field research with the generation of a GIS map that plots natural characteristics, it has been possible to envision an overall landscape plan that takes into consideration the conservation of remaining forests, the recovery of degraded areas and the planting of corridors that link forest fragments. Among the most tangible results are the creation of a new protected area for the black-lion tamarin and a broad conservation plan approved by state and federal authorities.

S21-2 **LAPORTE, NADINE and Tiffany Lin** The WOODS HOLE RESEARCH CENTER P.O. Box 296 Woods Hole, MA 02543-0296 (nlaporte@whrc.org)

UNDERSTANDING HUMAN IMPACTS

Central Africa contains the second largest tropical forest on Earth, covering more than 1.2 million km2. As part of the NASA funded INFORMS project, “An Integrated Forest Monitoring System for Central Africa,” we are developing remote sensing tools to support operational monitoring of this forest. Habitat maps and logging history of one of the most pristine tropical forests, the Tri- National Park Area at the border of Republic of Congo, Central African Republic and Cameroon, were constructed using a time series of corrected Landsat imagery for the period 1970-2000. This region has an exceptionally high concentration of large mammals, but unfragmented forest is becoming an habitat island in a sea of timber logging roads. The resulting maps are now being used by conservation organizations for biodiversity monitoring, by the forest industry to aid development of reduced-impact logging techniques, and by the national forest service of Republic of Congo to monitor logging activity.

S21-3 **GELLER, GARY N.** Jet Propulsion Laboratory (gary.n.geller@jpl.nasa.gov)

INCREASING ACCESS AND USABILITY OF REMOTE SENSING DATA: A PROTECTED AREA IMAGE ARCHIVE

Although remote sensing data are now widely available, much of it at low or no cost, many protected area managers do not have the expertise or tools to view or analyze it, effectively blocking access to it by this community. The Protected Area Archive will help increase access to remote sensing data by creating a collection of satellite images of protected areas. This collection is accessed using a map-based image-finding tool that displays the locations of protected areas and associated scenes. The user can locate the area and image of interest by zooming in, then display the image or information about the area. A set of simple visualization and analysis tools will be provided so the user can explore the data and employ it to assist in management and monitoring of their area. The CD version requires only a Windows-based computer and basic computer skills, and may be of particular help to protected area managers in developing countries. Planned capabilities include pan, zoom, vector overlay display, image annotation, and distance and area measurement. Because the target users generally have little experience with remote sensing, simplicity is an overarching principle. A Web-based version that includes multiband images is also being considered, as this would allow some additional analysis capabilities.

S21-4 **PAINE, SETH, William Stefanov, and Elizabeth Wentz** 2230 East Monterey Way Phoenix AZ 85016 (sethalpaine1@cox.net) Geological Sciences Arizona State University Tempe AZ 85287 (WS). Geography Department Arizona State University Tempe AZ 85287 (EW)

ESTABLISHING CONSERVATION PRIORITIES FOR THE PHOENIX METROPOLITAN REGION

The primary objective of this study was to identify priorities for conservation efforts on the urban fringe of the greater Phoenix metropolitan area of Arizona. A secondary objective was to use satellite imagery to approximate values of vegetation field survey data. Rapid development on the outskirts of the Phoenix metropolitan area threaten the native Sonoran desert ecosystem and reduce the quality of life for urban inhabitants. Biodiversity gap analysis has been widely employed in recent years to identify coarse-grain statewide priorities for biodiversity protection. This research uses principles of gap analysis to identify specific local conservation targets. No correlation was found between remote sensing data and field data. Inverse distance weighting was used to extrapolate vegetation field data to the entire study area. Extrapolated vegetation data and satellite imagery were used in an overlay analysis to identify conservation gaps on public land. Four general areas for conservation priority were located in the north and west of the greater Phoenix metropolitan area. Locating conservation target areas allows city and regional planners to set aside open space for conservation and recreation before development fragments or degrades the ecosystems.

S21-5 **ROBINSON, JULIE A., Serge Andréfouët, Jennifer Gebelein, S. Alan Spraggins, Marco Noordeloos, Edmund P. Green, Lauretta Burke, Frank Muller-Karger, Gene Feldman, and Norman Kuring** Earth Sciences & Image Analysis Laboratory, Johnson Space Center, Houston, TX 77058 (julie.a.robinson1@jsc.nasa.gov) (JAR, SAS). UR Coreus - Institut de Recherche pour le Developpement, BP A5, 98848 Noumea cedex, New Caledonia (SA). Department of International Relations, Florida International University, Miami, FL 33199 (JG). ReefBase, World Fish Center, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Malaysia Penang, Malaysia (MN). United Nations Environment Programme-World Conservation Monitoring Centre, 219 Huntingdon Road, Cambridge CB3 0DL, UK (EPG). World Resources Institute, 10 G Street NE, Washington, DC 20002 (LB, JM). Institute for Marine Remote Sensing, University of South Florida, 140 7th Ave South, St. Petersburg, FL 33701 (FM-K). Goddard Space Flight Center, Greenbelt, MD 20770 (GF, NK). Center for Coastal Monitoring and Assessment, NOAA National Ocean Service, 1305 East-West Highway, Silver Spring, MD 20910 (RPS).

GLOBAL MAPS OF CORAL REEFS—ASSEMBLING A GLOBAL DATASET, MAKING THE MAPS, AND MAKING SURE THAT THEY ARE ACCESSIBLE AND CONTRIBUTE TO CONSERVATION NEEDS

Current knowledge of the location and extent of coral reefs in the world is not sufficient as a baseline for monitoring change. In a NASA-sponsored partnership between remote sensing scientists, international agencies and NGOs, new efforts are being made to develop new remote sensing-based global reef maps, and to improve their distribution to the conservation and management communities. We discuss the tradeoffs between remote sensing data sources, mapping objectives, and practical considerations in meeting various user needs. SeaWiFS data was used to produce a composite global shallow bathymetry map at 1 km resolution. Research methods using Landsat 7 date were converted to operational methods for the production of hundreds of maps of coral reef geomorphology. We discuss the challenges faced in developing archives and GIS-based distribution networks for the project. Conservation applications of these maps includes a new assessment of the distribution of the world's marine protected areas (by UNEP-WCMC), and improved spatial resolution in the Reefs at Risk analysis for the Caribbean, (by the WRI). The production of a major new global map and data archive also pays significant dividends for local and regional conservation projects. Complete details of the project are available at http://eol.jsc.nasa.gov/reefs .

S21-6 **HORNING, NED** Center for Biodiversity and Conservation American Museum of Natural History Central Park West at 79th Street New York, NY 10024 (horning@amnh.org)

USING REMOTE SENSING DATA TO IMPROVE CONSERVATION PRIORITIES: FINDING THE DATA YOU NEED WHEN THE DATA YOU WANT CANNOT BE ACQUIRED

When using remotely sensed imagery to help define conservation priorities one can put together a “wish-list” of ideal data characteristics. Unfortunately, in most cases the ideal data sets for a particular project cannot be acquired for one reason or another such as budget constraints, cloud cover, or a lack of imagery in an archive. During this talk I will outline this problem and will present multiple examples of how we used alternative data sets in selected projects from different areas of the world. Each example will include an overview of the compromises that had to be made in choice of spatial resolution, data frequency, and cost, and what impact these compromises had on the project. A variety of imagery will be illustrated including some non-traditional types and information provided with regard to how these data can be acquired. The goal +of the talk is to provide information to make the best out of a less than ideal situation when searching for remotely sensed data for a conservation project.

S22-2 **LOVELAND, THOMAS** (loveland@usgs.gov)

A NATIONAL ASSESSMENT OF THE GEOGRAPHICAL AND ECOLOGICAL CHARACTERISTICS OF THE FEDERAL PUBLIC LAND NETWORK

The Federal protected lands network encompasses 24 percent of the conterminous U.S. and represents the Nation's most significant opportunity for managing biological resources. This network includes most of the Nation's unvegetated lands, nearly half of the arid shrublands, one-third of the forests, and only limited amounts of the Nation's grasslands and wetlands. The adequacy of this network for conservation purposes has been questioned due to the small percentage of land actually managed for the purpose of protecting habitat and biodiversity. An additional and perhaps equally significant is issue is the lack of protection of the most productive landscapes. A comparison of national maps of protected lands with maps showing relative levels of habitat productivity illustrates that lands with the lowest levels of productivity generally receive the highest protection and the most productive lands are generally unprotected. Considering the relationship between productivity and biodiversity, the protected lands net is not optimized for conservation. Furthermore, the protected land net is geographically and ecologically skewed toward western regions, and especially high elevation mountain or barren or sparsely vegetated ecological regions. Considering the objectives of different land management agencies, it becomes clear that greater balance is needed if a goal is broad-spectrum biodiversity conservation.

S22-3 **TEAR, TIMOTHY H., Paul L. Angermeier, Mark Bryer, Pat Comer, Brian Czech, Chris Iverson, Peter Karieva, Randy Kautz, Laura Landon, David Mehlman, Karen Murphy, Elizabeth Rodrick, Mary Ruckleshaus, J. Michael Scott, and George Wilhere** The Nature Conservancy, Eastern New York Chapter, 200 Broadway, Suite 301, Troy, NY 12180 (ttear@tnc.org), . U.S. Geological Survey, Virginia Tech, Blacksburg, VA 24061-0321 (PLA); The Nature Conservancy, 4245 North Fairfax Dr., Suite 100, Arlington, VA 22203 (MB); NatureServe, 1101 Wilson Blvd., 15th Floor, Arlington, VA 22209 (PC); U. S. Fish and Wildlife Service National Wildlife Refuge System, 4401 N. Fairfax Drive - MS 670, Arlington, VA 22203 (BC); U.S. Forest Service, Cooperative Forestry/International Programs, Washington, DC. (CI); The Nature Conservancy of Washington, 217 Pine Street, Ste 110, Seattle WA 98101 (PK); Florida Fish and Wildlife Conservation Commission, 620 South Meridian Street, Tallahassee, FL 32399-1600 (RK); The Nature Conservancy, 490 Westfield Road, Charlottesville, VA 22901 (LL); The Nature Conservancy, 322 Tyler Road NW, Albuquerque, NM USA 87107 (DM); U.S. Fish and Wildlife Service National Wildlife Refuge System, Anchorage, AK (KM); Washington Department of Fish and Wildlife 600 Capitol Way N., Olympia, WA 98501-1091 (ER, GW); NMFS Northwest Fisheries Science Center, 2725 Montlake Blvd. E, Seattle, WA 98112 (MR); U.S. Geological Survey, University of Idaho, Moscow ID 83844-1141 (JMS).

“HOW MUCH IS ENOUGH” IN CONSERVATION: THE NEED FOR CLEAR THINKING WHEN SETTING CONSERVATION OBJECTIVES

Resource management agencies, environmental laws, conservation practitioners, and environmental NGO’s all establish measurable objectives that define what they hope to accomplish. Unfortunately, this setting of conservation objectives often gets muddled by a lack of clear thinking. This is a serious problem because the quantitative objectives we set for conservation can profoundly shape where and what we do in conservation. In this paper we develop guidelines that are meant to help steer conservation biologists and conservation practitioners through the process of objective-setting, particularly concerning the role of feasibility in the objective-setting process. We use several regional-scale examples to illustrate the utility of these guidelines. We promote embracing the true spirit of using “best available science” in the objective-setting process to not only clarify our thoughts and improve our efforts at setting quantitative objectives, but to obtain important legal benefits. We also identify crucial gaps in our science that must be filled if we ever hope to get beyond a process that is currently dominated by intuition and educated guesses, and move swiftly to incorporating the scientific principles or testable scientific hypotheses necesary to advance this critical component of conservation.

S22-4 **DINERSTEIN, ERIC, John Morrison, and Adam Tomasek** World Wildlife Fund US (Eric Dinerstein@wwfus.org)

ECOREGION CONSERVATION AS THE FOUNDATION OF A CONSERVATION ESTATE FOR NORTH AMERICA

By embracing the major goals of biodiversity conservation, ecoregion conservation serves as a foundation for protecting biodiversity. A unique attribute of ecoregion conservation is the creation of a biodiversity vision, a 50-year blueprint for conservation. Three case studies are presented where ecoregion conservation is underway in North America. In the Northern Great Plains unique partnerships are enabling the creation of a restored prairie landscape of 3.5 million acres. In the Klamath-Siskiyou market-based certification is shaping economic opportunities while protection of 1 million acres of roadless areas depends on national policy. In the Bering Sea bi-national cooperation is improving protection of important marine habitats and stemming illegal fishing. We also analyze progress towards meeting large-scale conservation targets both in North America and globally. Efforts to improve protection, mobilize political will and increase conservation-related economic opportunities face different and distinct challenges in North America as compared to other parts of the globe.

S22-5 **SVANCARA, LEONA K., Ree Brannon, J. Michael Scott, Craig R. Groves, Reed F. Noss, and Robert L. Pressey** Dept. of Fish and Wildlife, University of Idaho, Moscow, ID 84844 (LKS, RB), (leonab@uidaho.edu). US Geological Survey, University of Idaho, Moscow, ID 83844 (JMS). Wildlife Conservation Society, Bozeman, MT 59715 (CRG). Dept. of Biology, University of Central Florida, Orlando, FL 32816 (RFN). New South Wales National Parks and Wildlife Service, Armidale NSW 2350 Australia (RLP).

HOW MUCH REALLY IS ENOUGH? A REVIEW OF NOMENCLATURE, TARGETS AND THE ARCHITECTURE OF CONSERVATION PLANNING

Over the last 30 years, conservationists, scientists and policy-makers have tried to suggest or legislate management target levels to adequately protect biodiversity over the long-term. We reviewed over 200 references addressing, reporting or proposing conservation targets to determine what values have been used in policy and analysis arenas as well as what thresholds have been established by scientific endeavors. Our results reinforce previous suggestions that no single value of historical or extant area answers the 'How much is enough?' question. Conservation efforts identified thresholds that varied by orders of magnitude. We suggest some definitions to clarify and standardize the conservation planning literature, we propose a simple architecture for conducting and implementing plans and we provide a summary of research results to guide our understanding of how thresholds may inform our objectives and define our targets.

S22-6 **SHAFFER, MARK L.** SHAFFER, MARK L. Doris Duke Charitable Foundation, 650 Fifth Avenue, 19th Floor, New York, NY (mshaffer@ddcf.org).

ESSENTIAL PRINCIPLES FOR BUILDING A CONSERVATION ESTATE IN THE UNITED STATES

Over a century after the beginning of broad-scale wildlife management by government authorities, and a third of a century after the beginning of comprehensive biodiversity management, the United States finds itself on the cusp between success and failure. A third of the nation's plant and animal species are at risk of being lost in the near future and an equal or greater percent of our natural community types are poised to disappear from the landscape. At the same time, state-of the art information on the elements of biodiversity, and sophisticated reserve design protocols suggest that there is a solution to the habitat portion of the biodiversity dilemma and that the United States is about half way there. Will we make? What will it take? Experience suggests that if we are to succeed, our efforts will have to become more pro-active, more state-based, and more incentive-driven. We will also have to bring conservation funding to a scale commensurate with the problem.

S22-7 **PARRISH, JEFFREY D., Craig R. Groves, Leo Sotomayor, Jonathan V. Higgins, Wayne Ostlie, and Laura L. Landon** The Nature Conservancy, Global Priorities Group, 3368 West 37th Avenue, Denver, CO 80211 (JP)(jparrish@tnc.org); Wildlife Conservation Society, 2023 Stadium Drive Suite 1-A, Bozeman MT 59715 (CG), The Nature Conservancy, Global Priorities Group, 4245 N. Fairfax Drive, Arlington VA 22203 (LS, JH, WO, LL)

A CONSERVATION BLUEPRINT FOR THE UNITED STATES, FROM PLAN TO PRACTICE

A science-based vision of conservation success is critical if biodiversity is to be maintained on an ever-dwindling natural landscape. For 7 years, The Nature Conservancy (TNC) has worked globally with public and private partners to draft a conservation blueprint for biodiversity within an ecoregional context. TNC's Ecoregional Assessments involve (1) identifying species, communities and ecosystem "targets" that represent all biodiversity within an ecoregion, (2) setting conservation goals, (3) screening target representations for ecological integrity, (4) designing portfolios of conservation areas, that, if conserved, will achieve conservation goals, and (5) analyzing threats and setting priorities for action. Across the lower 48 United States, assessments are complete for 57 of 68 terrestrial ecoregions. Though inspiring, this science-based vision has little value unless it galvanizes conservation action, measures conservation progress and inspires land managers to implement that vision. To shift a plan into practice, we advocate the identification and engagement of key conservation stakeholders throughout the planning process, effective data management so that results can be shared with implementers in their own geographic or thematic terms, priority setting to inform conservation strategies, and flexibility to develop analyses that compel society to value and manage biodiversity on the remaining land and waterscape.

S22-8 **ORGAN, JOHN F. and Terry B. Johnson** U.S. Fish and Wildlife Service (john_organ@fws.gov) Arizona Game and Fish Department (TBJ)

CONSERVATION FOR THE FUTURE: A VISION WITH GRASS ROOTS

Development of a comprehensive holistic view of wildlife conservation for North America is a long sought after goal. Theodore Roosevelt's Conference of Governors on Conservation in 1908 and Aldo Leopold and colleagues' 1930 American Game Policy each called for a national vision that would include all wildlife. In 2004 we have not yet achieved this vision or broad funding support needed for implementation, but we are within reach. Congress has provided funding to State fish and wildlife agencies to develop Comprehensive Wildlife Conservation Strategies by October 1, 2005. These strategies must (1) provide information on the distribution and abundance of wildlife; (2) describe locations and relative conditions of key habitats and community types; (3) describe problems affecting species and habitats and identify priority research and survey needs; (4) describe conservation actions deemed necessary; (5) propose monitoring plans; (6) describe procedures for strategy review and updates; (7) identify plans for coordination and implementation with other agencies; and (8) include broad public participation in development and implementation. Development and implementation of these strategies will provide the leadership and framework for preventing species from becoming endangered. Broad public support fostered through development of these strategies will be key in securing permanent funding for long-term implementation.

S23-1 **STOCKWELL, PHD., DAVID R.B.** University of California, San Diego NPACI/SDSC, MC 0505 9500 Gilman Dr, Bldg 109 La Jolla, CA 92093-0505 (davids@sdsc.edu).

WHYWHERE? – AN ADVANCED SURROGATE-BASED MODELING APPROACH

The goal of the project was to develop an ecological niche modelling algorithm ready for the grid information infrastructure, which can readily utilize parallel cluster computers and databases of environmental and biological data with thousands of variables. The features of the WhyWhere system (http://biodi.sdsc.edu/ww_home.html) that enable those goals are algorithmic design and heavy use of image processing methods, and a specification-based analytical interface. This enables a novel data mining approach to identifying those few factors that best predict the distribution of species, with excellent scalability on parallel machines up to 60 processors. We show its implementation in a custom interface for predicting species in the marine environment.

S23-2 **PETERSON, A.TOWNSEND, and Monica Papes** Biodiversity Research Center, University of Kansas, Lawrence, Kansas 66045 (town@ku.edu)

MODELING ECOLOGICAL NICHES TO IMPROVE CONSERVATION STRATEGIES AND CONSERVATION ACTION

Ecological niche modeling provides a predictive basis for understanding ecological and geographic distributions of species. As such, it has numerous benefits to offer to conservation biology—geographic aspects of distributions of species can be summarized, interpolated, extrapolated, and predicted. I present three case studies to illustrate this capacity: (1) using conservative niche evolution to anticipate discovery of species new to science, (2) using time-specific niche models to evaluate actual distributional areas and to identify ineffective management strategies, and (3) using forward projections onto future (modeled) climate scenarios to anticipate distributional changes and potential range retractions of species. Overall, niche modeling offers the opportunity for excellent predictivity regarding a number of geographic phenomena related to biodiversity, and as such constitutes a new tool of potentially great utility to conservation biology.

S23-3 **ANDERSON, ROBERT P., Steven J. Phillips, and Robert E. Schapire** Department of Biology, City College of the City University of New York, Convent Avenue at 138th Street, New York, NY 10031 (anderson@sci.ccny.cuny.edu; RPA). AT&T Labs-Research, 180 Park Avenue, Florham Park, NJ 07932 (SJP). Computer Science Department, Princeton University, 35 Olden Street, Princeton, NJ 08544 (RES).

MODELING THE GEOGRAPHIC DISTRIBUTIONS OF SOUTH AMERICAN MAMMALS USING THE MAXIMUM ENTROPY METHOD

We introduce the use of the Maximum Entropy method (Maxent) for modeling species geographic distributions with presence-only data. Maxent is a general-purpose machine learning method with a simple and precise mathematical formulation, and it shows a number of advantages over current techniques. Using environmental data available worldwide and occurrence records from recent taxonomic revisions, we present continental-scale case studies of two Neotropical mammals: a wide-ranging lowland species of sloth, ;Bradypus variegatus;, and a small montane murid rodent with an ecologically narrow range, ;Microryzomys minutus;. Maxent provided reasonable estimates of the species' ranges, far superior to the shaded outline maps available in field guides. All models were significantly better than random in both binomial tests of omission and receiver operating characteristic (ROC) analyses. Maxent predictions compared favorably with those of a commonly used presence-only modeling method, the Genetic Algorithm for Rule-Set Prediction (GARP). We also examine the weights given to each environmental variable in the models, identifying the factors most strongly affecting the species' macrodistributions. The Maxent interface is simple and user-friendly, and this approach merits further research and development for use in biogeography and conservation.

S23-4 **SASSAN SAATCHI and Donat Agosti** Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109 (Saatchi@congo.jpl.nasa.gov) (SS, DA)

SPECIES AND PIXELS: INTRODUCING A NEW MODEL TO LINK BIOLOGICAL AND REMOTE SENSING DATA

Conservation of biodiversity on a regional or global scale requires data sets that can provide information about the geographical distribution of species, environmental variables that define the resilience of ecosystems and species habitats, and processes that produce and maintain biodiversity. In this paper, we present a new mathematical model to integrate the specimen locality data with environmental variables measured or derived from earth observing satellites. The model is based on a stochastic decision rule approach that associates probabilities to species presence or absence on gradients of landscape and environmental variables defined or sampled at the level of one pixel. These variables often coincide with natural factors that provide the environmental stability for existing biological communities and species abundance. Although the model concentrates on the multivariate relationships between species habitats and measurements of environment, the renewable parameters from remote sensing data allows the model to incorporate the spatiotemporal heterogeneities and dynamics as a result of changes in landscape and climate conditions. As test bed, a subset of Malagasy ant species representing major distribution patterns and habitats is used. They were collected in a grid of over 100 standardized sampling stations by Brian Fisher, allowing inferring presence as well as absence at a given site.

S23-5 **HIJMANS, ROBERT J. and Catherine Graham** Museum of Vertebrate Zoology University of California 3101 Valley Life Sciences Building Berkeley, CA (rhijmans@berkeley.edu) RJH Department of Ecology and Evolution State University of New York (CG)

MAPPING SPECIES RICHNESS: CAN ECOLOGICAL NICHE MODELS CORRECT FOR SAMPLING BIAS?

Species richness maps are used to study biodiversity patterns and set conservation priorities. Richness maps are usually based on: 1) expert opinion which is often insufficiently supported by data; or 2) point locality data, which due to insufficient and biased sampling can lead to an underestimation and skewed distribution of richness; or 3) range maps which often include areas where the species is absent, and can lead to overestimating richness. Ecological niche models (ENMs) use localities and environmental data to produce hypothetical species distribution maps that can overcome some of the problems with range maps and locality data. However, ENMs also introduce problems, including choice of model and variables, and selection of a cut-off above which a species is present. Moreover, the assumption that the known localities capture the environmental distribution of a species may not hold and leads to underestimation, whereas disregarding competition and dispersal limitations leads to overestimation of a species' range. We illustrate the strengths and weaknesses of ENMs with a study of the herpetofauna in California. Although they cannot make imperfect data perfect, ENMs are useful for improving richness maps, and for screening for spatial bias in distribution data, and setting priorities for exploration.

S23-6 **GRAHAM, CATHERINE** Department of Ecology and Evolution, State University of New York, Stony Brook, New York 11794 (cgraham@life.bio.sunysb.edu)

INCORPORATING HABITAT ALTERATION AND SPECIES SPECIFIC INFORMATION INTO ENVIRONMENTAL NICHE MODELS

Environmental niche models have great potential to aid in conservation decision-making because they can be used to generate accurate distribution maps of a given species and potentially to assess the influence of human induced habitat changes. Nonetheless, to date little effort has been made to relate landscape ecology metrics (e.g., mean patch area, connectivity) of existing habitat to species-specific information on tolerance of habitat alteration or minimum patch size requirements. Using data for bird and frog species from the Ecuadorian Andes, I use vegetation data and biological information about a given species to refine the results from climate based environmental niche models. I combine species distributional models with maps of deforestation to obtain a refined map of the current potential distribution for a given species. Then I use landscape metrics to quantify the spatial parameters of the new distribution map. Finally, I explore fragmentation scenarios based on area requirements and dispersal abilities of a given species to study how the current configuration of habitat may impact the actual distribution of a given species.

S23-7 **AGOSTI, DONAT, Sassan S. Saatchi, Brian L. Fisher** Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA, agosti@amnh.org, (DA, SSS); Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118 (BLF)

THE IMPACT OF DETAILED FIELD SAMPLING: THE CASE OF MADAGASCAR'S ANTS.

It is an old truism, that one never knows enough. This holds especially true for areas in the tropics where biodiversity information is sparse and often even basic maps do not exist. In this paper we explore the potential of the combination of highly accurate georeferenced field samples (up to few meters), standard sampling and recently created and easily accessible remote sensing data layers covering entire regions. Remote sensing data sets discussed will include from TM data and the new 90m SRTM - Digital Elevation Model to derived products such as the Global Tree Cover product. Specific questions are asked and illustrated such as what can be derived from data at a certain level of imagery resolution, what the limitations of the currently most commonly used one minute precision georeferenced museums specimen data in distribution range modeling are, or what the added value is by using absence data. A case is presented, based on an extensive collection of Malagasy ants, that field data should be collected at the best possible GPS resolution to make use of the rapidly increasing amount of remotely sensed environmental data layers.