PROGRAM and BOOK OF ABSTRACTS

Defenders of Wildlife's

CARNIVORES 2006

Habitats, Challenges and Opportunities

NOVEMBER 12-15, 2006 • ST. PETERSBURG, FLORIDA

Compiled by Aimee Delach, Defenders of Wildlife

Cover Art by Steve Oliver

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About Defenders of Wildlife

Defenders of Wildlife is dedicated to the protection of all native wild animals and plants in their natural communities. We focus our programs on what scientists consider two of the most serious environmental threats to the planet: the accelerating rate of extinction of species and the associated loss of biological diversity, and habitat alteration and destruction. Long known for our leadership on endangered species issues, Defenders of Wildlife also advocates new approaches to wildlife conservation that will help keep species from becoming endangered. Our programs encourage protection of entire ecosystems and interconnected habitats while protecting predators that serve as indicator species for ecosystem health.

Visit our website:
www.defenders.org

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PREFACE

Welcome to Defenders of Wildlife's Carnivores 2006: Habitats, Challenges and Opportunities. This year's conference brings us to St. Petersburg, home of Defenders' Florida field office. We are pleased to be holding the conference in such an important area, in a state that not only contains some of our nation's most iconic imperiled wildlife species, but also encapsulates many of the challenges facing biodiversity conservation in general and carnivore protection specifically.

Not far south of St. Petersburg is the core habitat for the Florida panther, the last remnant population of cougars east of the Mississippi River. Once numbering in the thousands and ranging throughout the southeast, only about 80 animals survive in the wild today. The biggest threats to the Florida panther are habitat loss and fragmentation, while the leading causes of death are a result of vehicle collisions and intra-specific aggression. Florida's human population exceeds 18 million, and the state is adding over 1,100 people per day. In the core areas of panther habitat in southwestern Florida, at least 1,000 acres of wetlands are filled and developed every year. In addition to shrinking panther habitat, development brings more roads, and and the resulting vehicle strikes are another leading source of mortality for panthers.

Habitat loss and roads also threaten the state's other imperiled large carnivore, the Florida black bear, and pose a serious threat to carnivores in other regions of the country as well. This year's conference devotes an entire track (Wednesday in the South Ballroom) to conservation planning, habitat connectivity, the impacts of roads, and the design of wildlife crossings, as these issues relate to species locally and across the continent.

How humans and predators interact with each other also plays a huge role in the persistence of carnivore populations. Successful prevention and management of conflicts with livestock, and with residents at the urban-wildland interface, is crucial to successful carnivore conservation. Carnivores 2006 devotes a full track (Tuesday, South Ballroom) to exploring proactive strategies for "Living With" wolves, mountain lions, bears and coyotes.

Carnivores 2006 also marks our first in-depth look at two other leading threats to biological diversity, both in Florida and worldwide: climate change and invasive species. Under some worst-case scenarios of climate change, virtually all of southern Florida – not to mention the Tampa Bay area where we are convening – could be under water by the end of this century. The effects of anthropogenic climate change are already being felt in Arctic and montaine habitats, and responding to this threat will be one of the greatest wildlife conservation challenges of this century. Invasive species also threaten carnivores and their habitats by altering those habitats, causing diseases, and competing with native species. We devote a track on Monday in the South Ballroom to these two challenging and pervasive issues.

As with prior conferences, Carnivores 2006 also brings presentations of cutting-edge research and conservation tools for a wide array of carnivore species: wolves, mountain lions, marine mammals, mesocarnivores, bears, jaguars, and for the first time, reptiles.

Thank you for joining us for Carnivores 2006: Habitats, Challenges and Opportunities.

Rodger Schlickeisen
President, Defenders of Wildlife

Conference Agenda

Conference Events, Sunday November 12:

7:00 A.M. to 7:00 P.M.

Registration and Packet Pickup (Conference Registration Kiosk)
Speaker Prep Room Available (Board Room)

9:00 AM to 5:00 P.M.

Exhibitor and Poster setup (St. Petersburg Ballroom)

9:00 A.M. to 4:00 PM

Field Trips. There will be two buses departing from the South Entrance at 9:00 a.m., one to Myakka River State Park and the other to Egmont Key. Myakka River State Park is a 53- square mile park situated on a designated State Wild and Scenic River. Egmont Key is an island State Park and National Wildlife Refuge, offering opportunities for birding as well as seing gopher tortoises and other species. A second bus will depart for Myakka River State Park at 10:00 A.M.

7:00 P.M to 9:00 PM

Welcome Reception, Sunken Gardens (1825 Fourth Street North). Join old friends and meet new ones at a dessert reception at St. Petersburg's renowned botanical garden. Shuttle buses will operate on a loop from 6:45 PM to 9:30 PM. This event is free for conference participants. Please wear your name badge for admission. Guests may attend for $10, payable at the door.

Conference Events, Monday, November 13:

7:30 A.M. to 5:00 P.M.

Registration and Packet Pickup (Conference Registration Kiosk)

8:00 A.M. to 5:30 P.M.

Exhibit Hall & Posters Open (St. Petersburg Ballroom)
Conference sessions *(see page iv-ix for detailed daily schedule)*

9:30 A.M. to 10:00 A.M.

Coffee Break (St. Petersburg Ballroom)
Poster presenters should be on hand to answer questions. *(Poster abstracts on pages 175-197.)*

10:00 A.M. to 11:00 A.M.

Mission: Wolf Session I (Bayboro Room) *Open to ticket holders only.*

12:15 P.M. to 1:15 P.M.

Press Lunch (Pier/Skyway Room) *Open to credentialed press.*

1:30 P.M. to 2:30 P.M.

Mission: Wolf Session II (Bayboro Room) *Open to ticket holders only.*

3:00 P.M. to 3:30 P.M.

Coffee Break (St. Petersburg Ballroom)

3:30 P.M. to 4:30 P.M.

Mission: Wolf Session III (Bayboro Room) *Open to ticket holders only.*

7:00 PM to 8:00 PM.

The Wildlife and People of Ancient Florida, lecture by Brian Evensen (Williams-Demens Room)

MONDAY, NOVEMBER 13

	GRAND BAY BALLROOM SOUTH	GRAND BAY BALLROOM NORTH
8:00 a.m.	**8:00 A.M.** **PLENARY SESSION FEATURING ALAN RABINOWITZ OF THE WILDLIFE CONSERVATION SOCIETY.....1**	
10:00 a.m.	**CLIMATE CHANGE AND CARNIVORES I.. 2** 1. Conservation in the Face of Climate Change, Lara Hansen 2. The Potential Effects of Climate Change on Ice-Breeding Harp and Hooded Seals, David Lavigne 3. Impacts of Diminishing Snow Cover on Ringed Seals, Brendan Kelly 4. Long-Term Trends in Polar Bear Ecology in Relation To Climatic Change, Nick Lunn 5. Global Warming, the Arctic Region and Preserving Endangered & Threatened Species– Another Case of Pre-Hurricane Katrina Thinking? Michael Belanger	**METHODOLOGIES FOR CARNIVORE RESEARCH.....7** 1. Population Size Determination of Coyotes in Pinellas County, Florida Using Fecal DNA Analysis, Sarah Clavio 2. Grizzly Bear Population Density in Glacier National Park, Montana, Katherine Kendall 3. The Current Status of the African Lion and Spotted Hyena in the Masai Mara National Reserve, Kenya: Population Estimation, Monitoring, and Implications For Large Carnivore Conservation, Stephanie Dloniak 4. Predicting Carnivore Occurrence With Data Collected Via Multiple, Noninvasive Methods, Robert Long 5. A Simple, Generic System of DNA Based Dietary Analysis of Most Carnivora, Odontoceti and Microchiroptera and a Framework To Develop Similar Systems For Other Predator Groups, Glenn Dunshea 6. Capture-Mark-Recapture Analysis of a Population of Wild Dingo Hybrids Near Sydney, Australia, Brad Purcell
1:30 p.m.	**CLIMATE CHANGE II .....24** 1. Climate-Ocean Effects on the Marine and Terrestrial Habitats of the Hawaiian Monk Seal, Jason Baker 2. The Implications of Global Warming on a Snow Dependent Species – A Case For the Wolverine, Jeffrey Copeland 3. Whitebark Pine, Grizzly Bears, and Climate Change, Katherine Kendall DISCUSSION	**MOUNTAIN LION ECOLOGY .....27** 1. The Life Cycle of the City Lion: Reproduction, Dispersal, and Mortality of Mountain Lions in An Urban Landscape in Southern California, Seth Riley 2. Daily Activity Patterns of Mountain Lions in Relation To Their Prey Species in Southeastern Arizona, Emil McCain 3. Co-Occurrence of Cougars, Wolves and Their Prey in the Candian Rocky Mountains, Shelley Alexander 4. Potential Habitat For Cougars in Midwestern North America, Michelle LaRue
3:30 p.m.	**INVASIVE SPECIES.....37** 1. Invasive Species in the Carnivore Context: Global Prey Eating Contests and What to Do When the Wolf Cries "Pig!" Jamie Reaser 2. Heartfelt Approaches to Managing Feral Dogs in Turks and Caicos Islands, Mark Johnson 3. Eradication and Impacts of Invasive Carnivores on Islands, Brad Keitt 4. The American Mink in the UK: Interactions With Two Native Recovering Mustelids (the European Polecat and the Eurasian Otter), Lauren Harrington 5. Habitat Selection of Expanding Exotic Species: the Egyptian Mongoose in Portugal, Maria Santos	**MOUNTAIN LION CONSERVATION .....42** 1. Controversy, Conflict and Conservation: Humans and Mountain Lions in the Western U.S., Christopher Papouchis 2. Cougar Management Guidelines and Implementation and Refinement Project, Darrell Land 3. The Failure of Traditional Management Practices in Conserving Large Predators: The Cougar as a Case Study, Rick Hopkins 4. Florida Panther Recovery Efforts: Past, Present, and Future, Chris Belden 5. Diseases of the Florida Panther, Mark Cunningham 6. Puma Phylogeography: Evolutionary Significant Units and Genetic Restoration in Florida, Melanie Culver

MONDAY, NOVEMBER 13

	WILLIAMS-DEMENS ROOM	HARBOR VIEW ROOM
8:00 a.m.		
10:00 a.m.	**CARNIVORES AND CULTURE: EDUCATION, ATTITUDES AND MANAGEMENT .....13** 1. Protecting People and Panthers: The Florida Panther Response Plan, Darrell Land 2. Bears, Wolves, Coyotes & Lynx: Recovery, Attitudes and Management, Karlyn Atkinson Berg 3. Wildlife Capture As a Profound Experience – Connecting With the Animal, Mark Johnson 4. Of Wolves and Honor Students: Introducing the Methods of Engineering and Technology, George Catalano 5. Assessing Student Learning and Interest in Eastern Coyotes, Jonathan Way 6. Wild Cat Connections: Combining Local and Global Research of Wild Cats With Public Outreach, Lisa Haynes	**HUMAN INTERACTIONS WITH MARINE MAMMALS I.....19** 1. Human Interactions With Marine Mammals in the Wild: An Overview of the Policies, Guidelines and Regulations Developed in the U.S. To Address Activities of Concern, Trevor Spradlin 2. Feeding and Harassment of Wild Bottlenose Dolphins in the Southeast Region: Overview of Activities of Concern and Mitigation Efforts, Stacey Carlson 3. Evidence of Recreational Fishing Interactions in Stranded Indian River Lagoon Bottlenose Dolphins: 1997-2005, Wendy Durden 4. Impacts of Human Activities on a Long-Term Resident Community of Bottlenose Dolphins on Florida's West Coast, Randall Wells 5. Recent Phocid and Canid Interactions in the Cape Cod Area of Massachusetts, Betty Lentell
1:30 p.m.	**CITIZEN SCIENCE .....31** 1. Citizens Contribute to Right Whale Conservation in Coastal Waters of Northeast Florida, Joy Hampp 2. Volunteers to the Rescue: A Program for Beach Nesting Birds, Monique Borboen-Abrams 3. Keeping Track, Susan Morse 4. Earthwatch Institute: Citizen Scientists, Daniela Maldini 5. Citizen Science and Highway Wildlife Crossings: An Example of Citizens Monitoring Wildlife in Crowsnest Pass, Alberta, Canada, Michael Quinn	**HUMAN INTERACTIONS WITH MARINE MAMMALS II .....36** 1. The Impacts on Human/Bear Conflicts: Why We Need To Learn To Coexist, Minette Johnson DISCUSSION
3:30 p.m.	**PREDATOR-PREY RELATIONS.....48** 1. A Study of the Dietary Overlap & Seasonality in Food Habits of Snow Leopard and Tibetan Wolf in Hemis National Park, Ladakh, India, Trishna Dutta 2. Predator Impacts on Elk Calf Survival and Recruitment, Nyeema Harris 3. Annual Predation Patterns of Wolves Near Jackson, Wyoming, Michael Jimenez 4. Spatial Relationships Amongst Lynx, Coyotes and Hare in the Canadian Rocky Mountains, Kimberley McNeil 5. Prey Activity As An Indicator of Prey Selection By a Free-Ranging Population of Wild Canids in New South Wales, Australia, Brad Purcell 6. The Influence of Anthropogenic Resources on the Space-Use Patterns of Jackals in Britania Park, Israel, Guy Rotem	**INCENTIVES FOR CARNIVORE CONSERVATION .....54** 1. Carnivores and Ecosystem Services, Paula Manalo 2. Red Wolves: Creating Economic Opportunity Through Ecotourism in Rural North Carolina, Gina Schrader 3. Species and Habitat Conservation Using an Ecolabeling Approach: a Case Study of Sandhill Cranes in Wisconsin, Frank Casey DISCUSSION

	GRAND BAY BALLROOM SOUTH	GRAND BAY BALLROOM NORTH
8:00 a.m.	**LIVING WITH WOLVES .....57** 1. Management of Wolf/Livestock Conflict in the Northwestern United States, Polly Wheeler 2. Integrating and Evaluating Livestock Guarding Dogs For Reducing Wolf-Human Conflicts on Michigan Farms, Anna Cellar 5. Collaborating With Carnivores: Moving Beyond the Politics of Myth in the Greater Yellowstone Ecosystem, Avery Anderson 4. Taming the Place of Wild Beasts: The U.S. Forest Service Proposed Directive for "Predator Damage Management in Wilderness Areas," Brian Segee 5. Living With Wolves: Nonlethal Methods to Reduce Livestock Depredation Conflicts, Suzanne Stone	**URBAN & SUBURBAN CARNIVORES.....62** 1. Habitat Use and Food Habits of Urban Ring-Tailed Cats in Mexico City, Gabriela Castellanos-Morales 2. Demography and Ecology of Endangered San Joaquin Kit Foxes in Urban & Exurban Environments: Implications For Conservation, Brian Cypher 3. Characteristics of Human-Wildlife Conflict in Brevard County, Florida, Christine Klinkowski 4. An Ecological Study of Coyotes in Pinellas County, Florida, U.S.A. Based on Non-Invasive Fecal Examinations, Denara Manning 5. Female Bobcat Reproductive Behavior and Kitten Survival in a Fragmented Urban Landscape, Joanne Moriarty 6. Creating Prime Mountain Lion Environments in Suburbia: the Cases of Boulder and Colorado Springs, Colorado, Michelle Shuey
10:30 a.m.	**LIVING WITH LIONS.....74** 1. Mountain Lions and People: Strategies for Coexistence, Chris Papouchis 2. Agency Responses To Interactions Between Florida Panthers and People, Deborah Jansen 3. Aversive Conditioning of Florida Panthers By Combining Painful Experiences With Instinctively Threatening Sounds, Roy McBride 4. Cougar Wise and Project CAT (Cougars & Teaching), Patricia Griswold	**MESOCARNIVORE HABITAT ASSOCIATIONS..... 78** 1. Geographic Distribution and Broad-Scale Habitat Relations of the Wolverine in the Contiguous United States, Keith Aubry 2. Habitat Affiliations of Symaptric Carnivores in Southern Illinois, Patrick McDonald 3. Ecology of American Badgers in California, Jessica Quinn 4. Ecological Factors Associated With the Distribution of Canada Lynx Occurrence in Northern Maine, Laura Robinson
1:30 p.m.	**LIVING WITH BEARS.....88** 1. Florida Bear Aware, Judy Gillan 2. The Franklin County Bear Management Initiative; a Case Study, Adam Warwick 3. Determining the Impact of Relocation on Nuisance Florida Black Bears, Kimberly Annis 4. Techniques For Keeping Bears Alive and Wild in the Lake Tahoe Basin, Ann Bryant	**MESOCARN. RE-INTRODUCTION & RECOVERY .....92** 1. Evaluating the Demographic Factors That Affect the Success of Reintroducing Fishers and the Effect of Removals on a Source Population, Roger Powell 2. Re-Establishment of Fisher Populations in Washington, Harriet Allen 3. Estimating Occupancy and Detection Probabilities of American Marten in the Black Hills of South Dakota, Joshua Smith 4. Genetic Diversity Lost and Gained: Conservation Genetics of the Black-Footed Ferret, Samantha Wisely
3:30 p.m.	**LIVING WITH COYOTES.....103** 1. Coyotes in Our Midst: Conflicts, Controversies & Strategies for Coexistence, Camilla Fox 2. Uneasy Neighbors: Ecology of Coyotes and Conflict Management in the Chicago Metropolitan Area, Stanley Gehrt 3. Making the Management of Coyotes More Equitable and Practical, Jonathan Way 4. Practical Ethics For Coyotes and Other Predators, William Lynn DISCUSSION	**MESOCARNIVORE BEHAVIOR..... 107** 1. Assessing Variation in Boldness Levels Amongst San Joaquin Kit Foxes in Divergent Environments and Predicting Individual Suitability For Reintroduction, Samantha Bremner-Harrison 2. Influence of Forest Practices on Winter Habitat Selection and Movement Paths By Canada Lynx in Maine, Angela Fuller 3. Spatio-Temporal Co-Occurrences and Den Use in Female Small Asian Mongoose Home Ranges, Typhenn Brichieri-Colombi 4. Comparison of Vocal Behavior in Pumas and Bobcats With Applications To Conservation, Jacquelyn Potter 5. Geographic Variation in Jungle Cat Body Size: Is Competition Responsible?, Shomita Mukherjee 6. Carnivore Community Response To a Large Wildfire in San Diego County, California, Paul Schuette

TUESDAY, NOVEMBER 14

	WILLIAMS-DEMENS ROOM	OTHER CONFERENCE EVENTS
8:00 a.m.	**DOLPHIN FORAGING ECOLOGY I .....68** 1. Assessing the Effects of Fishing on Bottlenose Dolphins With Qualitative Models, Donald Baltz 2. Bottlenose Dolphin Vocalizations Suppress Calling Rates and Elevate Stress Hormones in a Prey Species, the Gulf Toadfish, Douglas Nowacek 3. How To Catch a Fish? Foraging Tactic Fidelity of Bottlenose Dolphins in Florida Bay, Florida, Leigh Torres 4. Role of Ecological Disturbance in the Foraging Ecology of Coastal Bottlenose Dolphins, Damon Gannon 5. Stomach Content Analysis of Bottlenose Dolphins Stranded in South Carolina, Michelle Pate 6. Variation in Feeding Habits Among Bottlenose Dolphins From Two Southeastern U.S. Estuaries As Determined By Stable Isotope Analysis, Melissa Recks	7:30 A.M. to 5:00 P.M. **Registration and Packet Pickup (Conference Registration Kiosk)** 8:00 A.M. to 5:30 P.M. **Exhibit Hall & Posters Open (St. Petersburg Ballroom)** 10:00 A.M. to 10:30 A.M. **Coffee Break (St. Petersburg Ballroom) Poster presenters should be on hand to answer questions.** 10:30 A.M. to 11:30 A.M. **Mission: Wolf Session IV (Bayboro Room) Ticket holders only.** 12:15 P.M. to 1:00 P.M. **Conservation Detector Dog Demo (details at Pack Leader Booth)** 1:30 P.M. **Silent Auction bidding opens. (St. Petersburg Ballroom III)** 1:30 P.M. to 2:30 P.M. **Mission: Wolf Session V (Bayboro Room) Ticket holders only.**
10:30 a.m.	**DOLPHIN FORAGING ECOLOGY II.....82** 1. Bottlenose Dolphin Population Differentiation and Trophic Studies Using Carbon, Nitrogen, Sulfur Stable Isotopes and Stomach Content Analyses, Nélio Barros 2. Molecular Scatology As a Tool For Investigating Cetacean Diet: Development, Assessment and Application of DNA-Based Diet Investigation Methods For Bottlenose Dolphins, Glenn Dunshea DISCUSSION	**REPTILES (HARBOR VIEW ROOM).....84** 1. Trends and Patterns of Wild American Alligator Attacks on Humans in Florida, Allan Woodward 2. The Effectiveness of Bycatch Reduction Devices on Crab Pots At Reducing Capture and Mortality of Diamondback Terrapins in Florida, George Heinrich 3. Neurological Pathology in Alligators Driven by Ecosystem Change: Thiamine Deficiency Associated With A Shad Diet, James Perran Ross 4. Alligators & Crocodiles: Redefining Our Relationship with Florida's Charismatic Carnivores, Frank Mazotti
1:30 p.m.	**BIRDS OF PREY .....96** 1. Distribution and Habitat Use of the Florida Burrowing Owl in Non-Urban Areas, Mark Mueller 2. Florida Burrowing Owls in a Rural Environment: Elucidating the Spatial Ecology and Comparison of Diet, Robert Mrykalo 3. The Effects of Translocation on Florida Burrowing Owls, Per Nixon 4. The Effects of Other Foragers on the Foraging Success of Piscivorous Wading Birds, Eric Stolen	**REPRESENTING THE ANIMAL (HARBOR VIEW ROOM) .....100** 1. Perceptions of Carnivores, Karlyn Atkinson Berg 2. *Julie of the Wolves* and the Conservation Ethos: Teaching Wildlife To Children in An Urbanizing Age, Rebecca Onion 3. Constructing the Bear: Representing the Grizzly in the American Imagination, Sharon Wilcox
3:30 p.m.	**SEA OTTERS .....113** 1. Patterns of Body Size, Growth and Condition Among Sea Otter Populations: What Can It Tell Us About Population Status? Daniel Monson 2. Persistence of Spilled Oil in Nearshore Sediments and Pathways of Exposure To Foraging Sea Otters, James Bodkin 3. Recovery, Foraging Patterns, and Prey Selection of Washington's Sea Otter Population, Harriet Allen 4. Nutrient Composition of the Diet Consumed By Threatened Southern Sea Otters, Alice Green 5. No Place Like Home: a Comparison of Habitat Use Strategies Between Southern Sea Otter Populations of Varying Density, Gena Bentall 6. Movement Patterns of Female Southern Sea Otters Vary With Reproductive Status, Christine Alfano 7. Sea Otters Translocated To San Nicolas Island: Individual Fates, Population Growth, and Projected Persistence of a Small Population, Lilian Carswell	3:00 P.M. to 3:30 P.M. **Coffee Break (St. Petersburg Ballroom)** 3:30 P.M. to 4:30 P.M. **Mission: Wolf Session VI (Bayboro Room) Open to ticket holders only.** 5:30 P.M. to 7:00 P.M. **Silent Auction and Booksigning Reception (St. Petersburg Ballroom III)** 7:00 P.M. to 9:00 P.M. **Banquet, with featured speaker Jeff Corwin (Grand Bay Ballroom). Tickets $40.** 9:00 P.M. to 10:00 P.M. **Live Auction (Grand Bay Ballroom) Open to all attendees.**

	GRAND BAY BALLROOM SOUTH	GRAND BAY BALLROOM NORTH
8:00 a.m.	**REGIONAL CONSERVATION PLANNING .....120** 1. Regional Conservation Planning: Implementation and Reality in California, Kim Delfino 2. The Florida Ecological Greenways Network and Protecting a Statewide Florida Black Bear Metapopulation, Thomas Hoctor 3. Functional Habitat For Florida Panthers, Randy Kautz 4. Impacts of Roads and Development and Functional Landscape Connectivity For Florida Panther in Eastern Collier County, Daniel Smith 5. Non-Acquisition Elements of Habitat Conservation: Is Protecting Habitat From Development Enough To Protect the Natural Values of the Land? Lynn Sadler	**WOLVES.....125** 1. Recovery of the Gray Wolf in the Northern Rocky Mountains of the United States, Polly Wheeler 2. Mexican Gray Wolf Recovery – Update 2006: Challenges From the Captive Breeding Program To the Recovery of Free Ranging Mexican Wolves in the Southwest United States, Patrick Valentino 3. Wolf Recovery in Wyoming, Outside Yellowstone National Park, 1999-2005, Michael Jimenez 4. Modeling Potential Gray Wolf Habitat in the Grand Canyon Ecoregion, Kurt Menke 5. Effects of Natural Fragmentation on Genetic Structure of Gray Wolves: a Case Study in the Coastal Rainforest of British Columbia, Erin Navid 6. Selection of Grey Wolf Homesites on the Central Coast of British Columbia, Kasia Rozalska
10:30 a.m.	**ROADS AND CARNIVORES.....136** 1. Effects of Roads on Endangered Kit Foxes in Natural and Urban Environments, Brian Cypher 2. Effect of Traffic Volume on Black Bears in Central Florida, USA, Walter McCown 3. Using GIS To Identify Potential Corridors Utilized By North American Badgers in the San Francisco Bay Area and Monterey Counties, Tanya Diamond 4. Spatial and Temporal Interactions Between Carnivores and Off Highway Vehicles in the Livingstone Range of Southwestern Alberta, Canada, Michael Quinn	**BEARS .....140** 1. A Cooperative Approach To Louisiana Black Bear Recovery, David Telesco 2. Reproductive Ecology and Cub Survival of Florida Black Bears, Elina Garrison 3. The Assumed, the Virtual, and the Real: Spectacled Bear Distribution in the Central Andes of Colombia, Gustavo Kattan 4. Population Structure of the Endangered the Black Bear in Mexico, Cora Varas-Nelson
1:30 p.m.	**DESIGN & SITING OF WILDLIFE CROSSINGS .....148** 1. Wildlife Crossing Study For Highway Design of 38 Miles of US 287/26 in Wyoming, Joshua Burnim 2. Examining the Effects of Data Sources on the Prediction of Highway Crossings For Coyotes in the Canadian Rocky Mountains, Victoria Lukasik 3. Partnerships Between Citizens and Agencies To Improve Wildlife Connectivity in Washington's Central Cascades, Charlie Raines 4. Carnivore Crossings and Roads in North America: How Are We Doing? Patricia Cramer	**JAGUARS I .....152** 1. Risk Assessment of the Misiones, Argentina Jaguar Population, Eric Lonsdorf 2. Estimating Jaguar Density Using Camera Traps in the Lowland Tropical Rain Forest of Peru, Samia Carrillo-Percastegui 3. Jaguar-Human Conflicts in Latin America: a Global Survey & Information Network, Alexandra Zimmermann 4. Jaguar and Puma Diets in Eastern Paraguay: Contrasting Top Predators, Gerald Zuercher
3:30 p.m.	**FUNCTIONAL CONNECTIVITY .....160** 1. Carnivore Connectivity in the Greater Yellowstone Ecosystem: Using Scat-Detecting Dogs As a Tool To Examine Linkage Zone Functionality For a Suite of Species, Jon Beckmann 2. Wildlife Linkage Areas: An Integrated Approach for Canada Lynx, James Claar 3. Dispersal Movements of Cougars From the Black Hills of South Dakota, Daniel Thompson 4. Black Bear Movements in a Fractured Florida Landscape: Beating the Odds in an Agricultural Region, Joseph Guthrie	**JAGUARS II..... 164** 1. Connecting the Dots: Preserving Genetic Continuity of the Jaguar Throughout Its Range, Alan Rabinowitz 2. Range-Wide Jaguar Abundance Surveys Coordinated By the Wildlife Conservation Society's Jaguar Conservation Program, Scott Silver 3. Jaguars of the Sonoran Sky Islands: Results of a Feasibility Study and Future Perspectives, Sergio Avila 4. Camera Trapping Jaguars in the Southwestern United States, Results and Implications of a Five Year Field Study, Emil McCain 5. Jaguars' Once-Extensive United States Range Argues For a Northern Jaguar Recovery Plan, Michael Robinson

	WILLIAMS-DEMENS ROOM	OTHER CONFERENCE EVENTS
8:00 a.m.	**INTERNATIONAL PERSPECTIVES ON WILDLIFE CONFLICT .....131** 1. Spatial, Temporal, and Physical Characteristics of Livestock Depredations By Large Carnivores Along a Kenyan Reserve Border, Joseph Kolowski 2. Human- Large Felid Conflict Around Gir National Park, India, Satya Sinha 3. Human- Large Felid Conflicts and Perspectives on Carnivore Management in Lowland Terai, Nepal, Tej Thapa 4. Managing Leopard Population in Human Modified Landscape in Himalayas: Is It Possible? D. S. Chauhan 5. Management of Wild Canids in Israel To Reduce Conflict With Agriculture, Prevent Rabies, and Protect Endangered Ungulates, Simon Nemtzov	7:30 A.M. to 12:00 P.M. **Registration and Packet Pickup (Conference Registration Kiosk)** 8:00 A.M. to 3:30 P.M. **Exhibit Hall & Posters Open (St. Petersburg Ballroom)** 10:00 A.M. to 10:30 A.M. **Coffee Break (St. Petersburg Ballroom) Poster presenters should be on hand to answer questions.**
10:30 a.m.	**CAPTIVE CANID CONSERVATION .....144** 1. Contributions of Captive Canids To Conservation, Jack Grisham 2. Red Wolf Studbook Data: Integrating Captive and Wild Population Management, Will Waddell 3. AZA Maned Wolf Species Survival Plan: Linking *Ex Situ* and *In Situ* Conservation Programs, Melissa Rodden 4. Creating a Large Conservation Impact With Small Canids in Zoos, Karen Bauman	12:15 P.M. to 1:00 P.M. **Conservation Detector Dog Demo (Details at Pack Leader Booth)**
1:30 p.m.	**RARE CANIDS OF THE WORLD .....156** 1. The New Guinea Singing Dog, I. Brisbin 2. Maned Wolf Population and Habitat Viability Assessment: An Important Tool For Next Steps of the Species Conservation, Rogerio de Paula 3. Influence of Human Activities on Health Status of the Maned Wolf, Nucharin Songsasen 4. New Data on the Late Cenozoic Carnivora of South-East Middle Asia, Sharif Sharapov	3:00 P.M. to 3:30 P.M. **Coffee Break (St. Petersburg Ballroom)**
3:30 p.m.	**BIG CATS OF THE WORLD .....169** 1. The Tiger Genome: Implications in Wildlife Forensics, S. P. Goyal 2. What Happens When People Stop Living in Tiger Habitat? A Case Study From the Shivaliks, Abishek Harihar 3. Behavioral Study of Tiger and Habitat Management in Manas Biosphere Reserve, Chhandashree Sarmah 4. Marking Site Selection By Free Ranging Snow Leopards in Hemis National Park, Ladakh, India, Sandeep Sharma 5. Improvements in Sign Survey For Population Monitoring of Snow Leopard, Sandeep Sharma 6. Population Monitoring of Tigers in Ranthambhore National Park, India Using Pugmarks, Sandeep Sharma	

General Information

Conference Registration

All attendees and participants must register for the conference. Anyone not wearing a conference nametag may not be admitted to conference meetings and functions. Spouses and children of registered attendees who wish to attend must register. Media (with credentials) must register, but may do so free of charge. On-site registration fees are as follows:

Defenders of Wildlife Member: $205
Non-member: $225
Full-time student: $205
One-day: $100
Field trip: $40
Tuesday Night Banquet: $40
Defenders of Wildlife membership: $15 (special conference offer)

Conference Registration Desk

Attendees should check in at the registration desk upon arrival at the Hilton St. Petersburg to pick up their registration packet. This packet includes their name tag, which will admit them to conference functions, as well as conference program and tickets for the field trip, banquet and wolf sessions. Information and a message board will also be available at the registration desk. Registration desk hours are as follows:

Sunday, November 12: 7:00 a.m. to 7:00 p.m.
Monday, November 13: 7:00 a.m. to 6:00 p.m.
Tuesday, November 14: 7:30 a.m. to 5:00 p.m.
Wednesday, November 15: 7:30 a.m. to noon

Conference Personnel

Defenders of Wildlife staff will have green ribbons on their nametags and any staff member can provide assistance or answer questions. The following are the lead staff for various aspects of the conference:

Aimee Delach and Nina Fascione – Program, Facilities, Volunteers, Registration
Pat Kiesylis, Elizabeth Fleming – Field Trip
David Tucker – Exhibit Hall
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Notice to Speakers and Poster Presenters

In order to ensure a fair time allotment for all speakers, moderators have been instructed to adhere to the time schedule. Please complete your presentation in the designated time allowed so as not to short-change other speakers or interfere with other conference activities.

Speakers who are using PowerPoint presentations are required to submit their presentations on a CD or a Zip (100 or 250) disk or USB device (flash drive) to the registration desk at least 3 hours prior to their session.

Speakers who are using slides are urged to bring them presorted in a standard carousel, and to check for proper slide positioning prior to your session. The Hilton's Board Room will be available to speakers as a preparation room from 9 a.m. to 7 p.m. on Sunday, 7:30 a.m. to 9:30 p.m. on Monday and 7:30 a.m. to 5:30 p.m. on Tuesday. It will have a slide projector set up.

Speakers and moderators should also arrive at their assigned rooms 30 minutes before the start of their session for a final check of audiovisual materials.

Posters should be set up in the St. Petersburg Ballroom between noon and 7 p.m. on Sunday and must be removed by noon on Wednesday. Velcro and thumb tacks will be provided.

St. Petersburg Area

The Hilton St. Petersburg is located in the heart of downtown St. Pete, at 333 First Street South. Some of the attractions within walking distance or a short drive of the hotel include:

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The Baywalk, and open-air area full of restaurants, shopping and entertainment (www.baywalkstpete.com)

The Waterfront District, home to the Salvador Dali Museum, the Museum of Fine Arts, and others.

AMBASSADOR WOLF WORKSHOPS

Mission:Wolf, based in Colorado, will bring ambassador wolves for six small-group programs to allow attendees an up-close look at a live wolf. The programs will provide information on basic wolf biology and behavior and offer a unique opportunity to interact one-on-one with a wolf. There is no cost for this workshop, but space is limited to the first 200 conference registrants who enroll. Tickets to an assigned session are included in your registration packet and are not transferable to any other session.

EXHIBITORS

Please visit our exhibit hall, in the St. Petersburg Ballroom. Both exhibitors and posters will be set up in this area, and all coffee breaks will be located here. The hall will be open Monday and Tuesday from 8:00 a.m. to 5:00 p.m. and Wednesday from 8:00 a.m. to 3:30 p.m.

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PLENARY SESSION

MONDAY, NOVEMBER 13 •8:00 AM GRAND BAY BALLROOM

Moderator: Rodger Schlickeisen

Dr. Alan Rabinowitz graduated from the University of Tennessee in 1981 with an M.S. in zoology and a Ph.D. in wildlife ecology. He is currently the Executive Director of the Science and Exploration Division for the Wildlife Conservation Society (founded in 1896 as the New York Zoological Society) based at the Bronx Zoo in New York. He has traveled extensively, concentrating his research efforts in places such as Belize, Borneo, Taiwan, Thailand, Laos, and Myanmar (Burma). He has studied jaguars, clouded leopards, Asiatic leopards, tigers, Sumatran rhinos, bears, leopard cats, raccoons, and civets. His work in Belize resulted in the world's first jaguar sanctuary at Cockscomb Basin and helped start the now prosperous ecotourism industry in the country; his work in Taiwan resulted in the establishment of Tawu Mountain Nature Reserve, the country's largest protected area and last piece of intact lowland forest; his work in Thailand resulted in the first field research on IndoChinese tigers, Asiatic leopards, and leopard cats, in what was to become the region's first World Heritage Site; and his work in Myanmar resulted in the creation of five new protected areas: the country's first marine national park, the country's first and largest Himalayan national park, the country's largest wildlife sanctuary, and the world's largest tiger reserve. He also masterminded the creation of the Northern Forest Complex in Myanmar, a set of four contiguous protected areas, more than 30,000 km^2 in size, that comprise one of the wildest, most pristine set of habitats left in the world.

Dr. Rabinowitz's goal in life, and the mission of his Science and Exploration Division, is to find and survey the world's last wild places, with the intention of saving as much land in protected areas as he can and securing homes for some of the world's most endangered large mammals. His research and explorations over the last decade has taken him to rugged, unexplored mountain ranges in the Annamite Mountains between Laos and Vietnam, to the unexplored eastern edge of the Himalayan Mountains of northern Myanmar, and to a little-known, malaria-filled valley along the border with India that was once dubbed "the valley of death." In northern Myanmar, Dr. Rabinowitz discovered the leaf deer, a new species to science and the second smallest, most primitive deer in the world.

He has published over 75 scientific and popular articles and 6 books. His first two books "Jaguar" and "Chasing the Dragon's Tail" are popular accounts of his adventures in Belize and Thailand. His most recent popular book, "Beyond the Last Village" takes the reader on an intensely personal journey through his adventures, explorations, and discoveries in Myanmar. He has also published the "Wildlife Field Research and Conservation Training Manual" that has been translated into seven languages, he has co-published "The Wild Cats of Thailand" in the Thai language with his wife, Salisa, and he has edited a classic volume in conservation biology titled "People and Wildlife: Conflict or Coexistence?"

Currently, Dr. Rabinowitz is firmly committed to the success of two incredibly important, long term objectives: establishing and securing a contiguous wild jaguar corridor on public and private lands ranging from Mexico to Argentina; and setting up the world's largest tiger reserve, an area nearly the size of Vermont, in the Hukaung Valley of northern Myanmar, that will benefit both people and wildlife.

Dr. Rabinowitz's ground-breaking work with jaguars, as well as his personal hurdles, are documented in an award-winning National Geographic Television Special first aired in November 2003 on PBS called "In Search of the Jaguar." His latest accomplishment, the setting up of the Hukaung Valley Tiger Reserve in Myanmar is described in the April 2004 issue of National Geographic Magazine and the January 2005 issue of National Geographic Adventure Magazine.

CLIMATE CHANGE AND CARNIVORES I

MONDAY, NOVEMBER 13 • 10:00 AM • GRAND BAY BALLROOM – SOUTH

Moderator: Lara Hansen

1. Conservation in the Face of Climate Change

LARA HANSEN[1]

Conservation has long focused on protecting the space that species need to survive. But what happens when that space, even when it is protected, starts to change? This is the dilemma we face with climate change. Including climate change in conservation planning requires that we think not only in terms of space, but also time. It also involves taking on a global problem that can at times seem overwhelming and intractable. However, conservation practitioners have more tools to address this issue than they may realize, as the framework for engaging on this issue is already developing, and case studies of how to incorporate climate change into conservation planning are being implemented. This talk will: 1) explore some of the resources available, such as monitoring and modeling for marine and terrestrial systems; 2) present WWF's four tenets to climate change-informed conservation (protecting adequate and appropriate space, reducing non-climate stresses, employing adaptive management approaches that include hypothesis testing monitoring, and working to reduce greenhouse gas emissions); and 3) describe some case studies where these tools and this approach are being used to make conservation more resilient to climate change. Case studies will include conservation projects developing around polar bears, tigers, sea turtles and coral reefs.

[1]World Wildlife Fund, Climate Change Program, 1250 24th Street NW, Washington, DC 20090; Lara.Hansen@WWFUS.ORG

2. The Potential Effects of Climate Change on Ice-breeding Harp and Hooded Seals

DAVID M. LAVIGNE[1]

Pinnipeds (fur seals and sea lions, walrus and true seals) occur mainly in polar and subpolar regions of the northern and southern hemispheres. Their distribution appears to be limited largely to regions where sea-surface temperatures do not exceed 20° C in the warmest month. Changes in global temperature patterns would be expected, therefore, to affect the distribution and abundance of individual species and populations. These effects could include: losses of critical habitat; increases in natural mortality associated with an inability to thermoregulate on land when temperatures are high during the breeding season; changes in behavior that might contribute to increased mortality through depredation or mass mortality events (e.g. from exposure to novel pathogens); or changes in the distribution and abundance of prey species, which could lead to reduced condition, reduced reproductive success and increased natural mortality. Such effects have been observed and documented in the past, for example, during El Niño events. For ice-breeding seals, unseasonably warm temperatures can result in a loss of whelping habitat, leading to increased neonatal mortality and reduced reproductive success. Harp (*Pagophilus groenlandicus)* and hooded seals (*Cystophora cristata*) reproducing off eastern Canada have long coped with interannual variability in the availability of ice during their breeding seasons. But, if a lack of ice during the breeding season becomes the norm because of increasing winter temperatures, they will experience a loss of breeding habitat at the southern end of their annual ranges. Loss of breeding habitat and other less predictable climate-related changes in their environment argue for the implementation of strict precautionary measures when drafting seal hunt management plans for these exploited populations.

[1]International Fund for Animal Welfare, Guelph, Ontario, Canada; dlavigne@ifaw.org

3. Impacts of Diminishing Snow Cover on Ringed Seals

BRENDAN P. KELLY[1], JOHN MORAN[1], BRADLEY SWANSON[2] AND DAVID TALLMON[1]

The vast areas of ice in the polar seas are used by pinnipeds for resting, whelping, lactating, molting, and as a partial refuge from predation. For ringed seals (*Phoca hispida*), additional protection from predators and from extreme cold is provided by lairs excavated in the snow on the ice surface. In northern Alaska, the spring snow melt is nearly one month earlier today than in 1950, and these early snow melts increase the seals' exposure to predators and extreme temperatures. Adaptive responses to predicted decreases in snow and ice cover will depend to a large degree on the ringed seals' population structure. Using radio telemetry, we have discovered a high degree of inter-annual fidelity to breeding sites among ringed seals. If that site fidelity reflects true philopatry, then ringed seals may exist in multiple discrete populations with greater vulnerability to local extinctions than would be the case for one or a few panmictic populations. We are examining population structure using micro-satellite DNA and mtDNA markers extracted from shed skin collected in breeding sites. Small samples collected from the Chukchi Sea, the Western Beaufort Sea, and the Eastern Beaufort Sea suggested separate populations, and an assignment test placed the majority of animals (91%) in their population of capture. We have begun a more extensive sampling program to delineate population structure among ringed seals.

[1]University of Alaska Southeast, School of Arts and Sciences, 11120 Glacier Highway, Juneau, AK 99801; brendan.kelly@uas.alaska.edu

[2]Central Michigan University, Applied Technology in Conservation Genetics Laboratory, Mt. Pleasant, MI 48859

4. Long-Term Trends in Polar Bear Ecology in Relation To Climatic Change

N. J. LUNN[1]

Polar bears (*Ursus maritimus*) live throughout the ice-covered waters of the circumpolar Arctic. Despite some uncertainty with respect to magnitude, scenarios predicted by global climate models suggest increased rates of warming and substantial loss of sea ice throughout the Arctic. Polar bears will be particularly vulnerable to the effects of a warming climate because of their dependence on sea ice. In western Hudson Bay, polar bears spend the ice-free summer months on land. They make little use of terrestrial food and rely on fat reserves built up during the previous spring. Since the early 1970s, rising spring air temperatures have lengthened the ice-free period and the bears' summer fast by approximately 3 weeks. Over a similar time period, declines in body condition have also occurred. From 1984 through 2004, estimates of apparent natural survival for prime age (5-19 yr) bears of both sexes remained stable at approximately 0.940. However, for all other age classes, there was a statistical relationship between earlier summer ice break-up and decreased survival. The size of the Western Hudson Bay polar bear population has declined from approximately 1200 bears in 1987 to 935 bears in 2004. Although polar bears are remarkably adaptable, their long generation time and highly specialized nature make their future uncertain, given the rapid pace of ecological change in the Arctic. Because western Hudson Bay is near the southern limit of their range, these findings may foreshadow how more northerly populations will respond to projected warming in the Arctic.

[1]Canadian Wildlife Service, 5320-122nd Street, Edmonton, AB T6H 3S5, Canada; Nick.Lunn@EC.gc.ca

5. Global Warming, the Arctic Region and Preserving Endangered and Threatened Species– Another Case of Pre-Hurricane Katrina Thinking?

MICHAEL BELANGER[1], JOANNA MACNEIL[2], NESIME ASKIN[2] AND CARIN WITTNICH[1]

Global warming will cause dramatic habitat changes in the Arctic environment. Rising temperatures will create large fluctuating seasonal differences, causing constantly changing shorelines and ice cover, which will be difficult to map accurately and to mark safely for navigation. Arctic shipping will increase resulting in an increase of oil spills, shipping accidents and boat strikes with large marine mammals. Numerous species may suffer large regional population die-offs, resulting in new species becoming endangered and threatened, and accelerating the rate of extinction for species that are already threatened. Environmental disasters such as the Exxon Valdez or Hurricane Katrina have shown that lack of preparedness causes greater loss of life (human/animal), more environmental damage, and higher restoration costs. The response and rehabilitation abilities of the countries bordering on the Arctic will be examined with respect to such environmental challenges. Range of preparedness varies from well-funded, organized plans, to countries that believe marine animal rescue operations are not necessary or feasible in the Arctic. The Arctic environment is a unique region whose protection involves several governments and the cooperation of numerous agencies or departments. However, as seen from previous disasters, response actions and contingency plans should be well defined and developed. All efforts must include governmental agencies, private firms and non-governmental organizations. The Arctic region is a sensitive ecosystem where being unprepared to respond immediately to disasters could lead to the destruction of this fragile ecosystem and the loss of many species already facing numerous threats.

[1]University of Toronto, Oceanographic Environmental Research Society, 12 Burton Avenue, Barrie, ON L4N 2R2, Canada; michael.belanger@utoronto.ca

[2]University of Toronto, Department of Zoology, 1 Kings College Circle, MSB ROOM 7256, Toronto, ON M5S 1A8, Canada

METHODOLOGIES FOR CARNIVORE RESEARCH

MONDAY, NOVEMBER 13 • 10:00 AM • GRAND BAY BALLROOM – NORTH

Moderator: Melissa Grigione

1. Population Size Determination of Coyotes in Pinellas County, Florida Using Fecal DNa Analysis

SARAH N. CLAVIO[1], MELISSA GRIGIONE[1], DENARA MANNING[1] AND RON SARNO[1]

Coyotes (*Canis latrans*) entered Florida relatively recently and their numbers are increasing. Few studies have been completed in Florida on population size, movement, diet, and parasites of coyotes. In addition, no genetic studies have been undertaken. Genetic studies are important as Florida's coyotes may be different from elsewhere in the United States and founder populations are currently unknown. Fecal analysis is becoming an increasingly useful tool for studying elusive species, such as coyotes, in a noninvasive manner. In this study, coyote scat was collected from a preserve in Pinellas County, Florida, and population size was determined using microsatellite analysis. This study is part of a larger study in which diet, parasites, and movement of Pinellas County coyotes will be determined. Fecal samples were collected along trails from August 2005 through May 2006, and DNA was extracted using a fecal DNA extraction kit. To confirm the species identity of each sample, we amplified a region of mitochondrial DNA using PCR. We then followed with restriction enzyme analysis to distinguish between coyote scat and scat from other species that may have been collected, such as bobcat. All positive coyote samples were then analyzed using the Applied Biosystems Canine Kit to identify individuals. Based on field observation, preliminary estimates suggest that there are approximately 10 coyotes residing in the preserve. Knowing the size of coyote populations in Florida is important for conservation and management. This study has shown that fecal DNA analysis will be a useful tool for future monitoring of Florida's coyotes.

[1]University of South Florida, Department of Environmental Science and Policy, 4202 East Fowler Ave. NES 107 Tampa, FL 33620; sclavio@mail.usf.edu

2. Grizzly Bear Population Density in Glacier National Park, Montana

KATHERINE C. KENDALL[1], JEFFREY B. STETZ[2], DAVID A. ROON[3], LISETTE P. WAITS[3], JOHN B. BOULANGER[4] AND DAVID PAETKAU[5]

Population size in Glacier National Park, Montana, (GNP) was last estimated in 1971 using sightings of unmarked bears. We estimated the size and distribution of the grizzly bear (*Ursus arctos*) population in the 8,362 km^2 greater GNP area in 1998 and 2000 using hair sampling with genetic microsatellite analysis to identify individual bears. We employed two methods concurrently to collect bear hair. We distributed 625 baited hair snag stations each year on an 8x8 km grid to systematically sample the study area during 5 14-day sample sessions. The second sampling method collected hair at 2-4 week intervals from over 1,000 unbaited bear rub trees. We collected 10,816 hair snag samples and 8,964 rub tree samples. Bear rub and hair snag datasets were analyzed independently and jointly using closed mixture models in program MARK and traditional Lincoln-Peterson estimators. We present the results of these models and discuss implications of multi-year datasets and multiple sampling methods. Point estimates of population size were similar for all models and data sets but precision was highest for the model averaged estimate using hair snag-rub tree data. Grizzly bear density was highest within GNP and lower outside the park where human development and road density was higher, human foods were more available to bears, and the majority of grizzly bear mortality occurred. We compare the density of grizzly bears in GNP with other populations and discuss potential explanations. This study provides baseline information important for managing one of the few remaining grizzly bear populations in the contiguous United States.

[1]US Geological Survey, Glacier National Park, West Glacier, MT 59936; kkendall@usgs.gov

[2]University of Montana, Glacier National Park, West Glacier, MT 59936

[3]University of Idaho, Fish and Wildlife Resources, Moscow, ID 83844

[4]Integrated Ecological Research, 924 Innes St., Nelson, BC V1L 5T2, Canada

[5]Wildlife Genetics International, P.O. Box 274, Nelson, BC V1L 5P9, Canada

3. The Current Status of the African Lion and Spotted Hyena in the Masai Mara National Reserve, Kenya: Population Estimation, Monitoring, and Implications For Large Carnivore Conservation

STEPHANIE M. DLONIAK[1]

The Masai Mara National Reserve (MMNR) is a protected area of 1500 km^2 in southwest Kenya, and is within the northernmost part of the Serengeti ecosystem. Each year, tens of thousands of tourists flock to the MMNR to see wild large carnivores, and contribute millions of dollars to the local and national economies. Despite the obvious importance of the conservation of large carnivores in the MMNR, little quantitative information has been available regarding the population status of even the largest and most abundant species, lions (*Panthera leo*) and spotted hyenas (*Crocuta crocuta*). Between January and October, 2005, I determined the size of the MMNR lion population through a modified mark-recapture study utilizing individual identification. I also determined an estimate of the size of the spotted hyena population through the use of "call-ins," which involve attracting hyenas to broadcasts of recordings of hyenas interacting with lions over food. I identified 269 lions over 1 year of age utilizing the MMNR; this is a 40% decline in lions since 1991, when the only other individual identification study was done. The population of spotted hyenas was estimated as 424 ± 41 adults, which was lower than expected. Thus, despite having protected area status and being famed for high densities and easy observability of large carnivores, the MMNR appears to conform to the global pattern of decline in these species. Monitoring efforts are now in place for lions and hyenas (and other carnivores) in the MMNR, in addition to an intensive study on lion population ecology.

[1]Masai Mara Predator Research, P.O. Box 86, Karen 00502, Nairobi, Kenya; dloniak@kenyaweb.com

4. Predicting Carnivore Occurrence With Data Collected Via Multiple, Noninvasive Methods

ROBERT A. LONG[1], THERESE M. DONOVAN[1], PAULA MACKAY[2], WILLIAM J. ZIELINSKI[3] AND JEFFREY S. BUZAS[4]

Terrestrial carnivores typically require large areas and exist at correspondingly low densities. Further, as "top level" consumers, carnivores affect the biological structure and composition of the communities to which they belong. While these attributes often result in carnivores being the focus of conservation or management interest, they also render their study challenging. We used multiple, noninvasive techniques – including scat detector dogs, remote cameras, and hair snares – to collect detection/non-detection data for black bears (*Ursus americanus*), bobcats (*Lynx rufus*), and fishers (*Martes pennanti*) throughout Vermont. These data, along with statewide GIS spatial data, were analyzed via an occupancy modeling approach to identify factors associated with each species' presence or absence. Model results were then used to predict occurrence for each species throughout the state. Black bear occupancy was positively associated with amount of forest cover, and negatively associated with amount of human development. Amount of mixed forest and forested wetlands, and relatively lower densities of large roads, were important variables in top-ranking bobcat models. Amount of conifer forest and lower amounts of wetland, were important variables in fisher occurrence models. In addition, human residential areas appeared to be an important positive variable in the top-ranking fisher models. Our results provide managers with predictive occurrence maps that can be used for both species management and land-use planning.

[1]USGS Vermont Cooperative Fish & Wildlife Research Unit, University of Vermont, Burlington, VT 05405; robert.long@uvm.edu

[2]University of Vermont, Burlington, VT 05405

[3]U.S. Forest Service, Pacific Southwest Research Station, Arcata, CA 95521

[4]University of Vermont, Department of Mathematics and Statistics, Burlington, VT 05405

5. A Simple, Generic System of DNA Based Dietary Analysis of Most Carnivora, Odontoceti and Microchiroptera and a Framework To Develop Similar Systems For Other Predator Groups

GLENN J. DUNSHEA[1]

Traditional methods to investigate diet such as stomach or scat hard part analysis, fatty acids analysis and stable isotope analysis have well-recognized limitations and biases. Detecting prey DNA present in predator stomachs or scats is now a proven method. DNA methods can be species specific, are very sensitive and are not dependent on any hard part surviving the digestion process. Most DNA-based approaches employ the polymerase chain reaction (PCR) to detect specific prey species or prey groups (using species or group specific PCR primers). Using such an approach requires an *a priori* knowledge of diet and time-consuming PCR primer development. Ideally, "universal" PCR primers that detect most DNA present would be used, yet these primers are usually overwhelmed by and only detect templates not of interest in diet studies (e.g. predator DNA). Here I outline some of the technical issues involved in PCR amplification of DNA extracted from scats and present a method that actively excludes most carnivora, odontoceti and microchiroptera DNA from PCR amplification, facilitating 'universal primer' analysis of diet samples from these taxa. An analytical framework for developing similar systems in other predator groups is discussed. The method uses software freely available and equipment and reagents rapidly becoming standard in laboratories throughout the world. Some results of using this technique to investigate the diet of various marine mammals are presented.

[1]Australian Antarctic Divsion/ University of Tasmania, Channel Highway, Kingston, Tasmania 7050, Australia; glenn.dunshea@aad.gov.au

6. Capture-Mark-Recapture Analysis of a Population of Wild Dingo Hybrids Near Sydney, Australia

BRAD V. PURCELL[1], ROBERT MULLEY[1], ROBERT CLOSE[2], JASON FLESCH[1] AND PETER FLEMING[3]

The Australian dingo (*Canis lupus dingo*) is considered to be threatened by hybridization with feral domestic dogs (*C. l. familiaris*). There is an uncontrolled population of Australian dingo hybrids within the Southern Blue Mountains World Heritage Area, only 65km west of Sydney. A study to identify individuals and packs and to estimate population abundance began in April 2005. Wild dingoes and their hybrids are cryptic in their behavior and usually crepuscular. This makes it difficult to detect them and to quantify their abundance. In this study, data from novel motion-sensing camera photography, field observations, videography and annual trap-and-release programs, were combined and analyzed using the program MARK. Animals that were "marked" in this way were re-sighted when identifiable features, including pelt color and patterns, and ear tags or collars were observed during any sighting event. Six motion-sensing cameras were placed along two 25km transects at strategic, high activity locations, about five kilometers apart. These were operational for three to six nights per month during one year. Data from daytime field observations and videography complemented trapping records and motion-sensing cameras. A number of estimators in MARK were used to estimate abundance and survival rates were calculated. Monthly and diurnal patterns in activity were also determined from repeated sighting events at particular locations; as were the success of trapping programs, camera locations and camera positioning. All techniques have proved important and should be used simultaneously in future studies with similar aims.

[1]University of Western Sydney, School of Natural Sciences, Building K8, Hawkesbury Campus, Locked Bag 1797, Penrith South DC, New South Wales 1797, Australia; b.purcell@uws.edu.au

[2]University of Western Sydney, School of Biomedical and Health Sciences, Building 21, Campbelltown Campus, Locked Bag 1797, Penrith South DC, New South Wales 1797, Australia

[3]Vertebrate Pest Research Unit, NSW Department of Primary Industries, Orange Agricultural Institute, Forest Road, Orange, NSW 2800, Australia

CARNIVORES AND CULTURE: EDUCATION, ATTITUDES AND MANAGEMENT

MONDAY, NOVEMBER 13 • 10:00 AM • WILLIAMS-DEMENS ROOM

Moderator: Gina Schrader

1. Protecting People and Panthers: The Florida Panther Response Plan

DARRELL LAND[1]

Florida panthers (*Puma concolor coryi*) occur primarily in southern Florida and most individuals reside south of Lake Okeechobee. Recovery actions over the past 25 years, particularly genetic augmentation initiated in 1995, enabled the population to grow from 30-50 to 80-100 panthers. During this same period, the Florida human population has grown 223%, from about 5 million to over 16 million people. Because of increases in numbers of people and panthers, urban/suburban areas now interface with panther habitat, increasing the possibility of panther-human interactions. Since 2002, several panther-human interactions have occurred in south Florida, including four instances of depredation on livestock/pets. These interactions have increased awareness of potential management challenges related to panther conservation. The Florida Fish and Wildlife Conservation Commission, U.S. Fish and Wildlife Service, and National Park Service established the Florida Panther Interagency Response Team in June 2004, comprised of panther experts and agency representatives, which was tasked with developing a Florida Panther Response Plan. This plan provides guidance so that interactions will be handled consistently and quickly, promoting public safety while recognizing the need to recover an endangered species. Appropriate human behavior is a key to coexisting with wildlife; the response plan addresses public education and outreach focusing on living and recreating in panther habitat.

[1]Florida Fish and Wildlife Conservation Commission, 566 Commercial Blvd., Naples, FL 34104; Darrell.Land@myfwc.com

2. Bears, Wolves, Coyotes & Lynx: Recovery, Attitudes and Management

KARLYN I. ATKINSON BERG[1]

This presentation will explore recovery and management of four predator species: bears (*Ursus arctos horribilis*), wolves (*Canis lupus*), coyotes (*Canis latrans*) and lynx (*Lynx canadensis*). These four species were chosen specifically for comparison because of their historic connections, different ecological niches, similar yet distinct political problems, and current litigation regarding them. They were also chosen for what they represent: a smaller less well-known carnivore (the lynx), the awesome and feared grizzly bear, and the better-known and controversial canines (wolf and coyote). Discussion will include comparisons of human attitudes toward each of these predators and human conflicts both real and perceived. Differences in past and proposed management of each will also be reviewed. Do misguided speculations about depredations or the belief in carnivores as having vicious and dangerous natures persist? We will examine how historic and complex cultural images still have an impact on our interactions with carnivores and continue to influence management plans. Can carnivores survive without federal protection? Will proposed Distinct Population Segments and population goals allow large carnivores to utilize their territories, move through their own and other species' habitats when necessary, carry out of their critical behaviors and social traditions, have functioning predator/prey interrelationships and continue to function in their complex ecosystems?

[1]Humane Society of the United States, 44781 Bittner Point Road, Bovey, MN 55709-6595; karlyn@northlc.com

3. Wildlife Capture As a Profound Experience – Connecting With the Animal

MARK R. JOHNSON[1]

Many professionals view each animal handling as a profound, even sacred, experience in which the animal teaches us about ourselves and more. For some, this creates an inner conflict within us considering the trauma and invasiveness of capture and handling. Therefore it is valuable for many people to explore the details of how we handle wildlife. Emphasizing care, honor and respect for each animal, our equipment and techniques are carefully selected and our mannerisms are unambiguous. With this perspective, we combine our practical work-related tasks with a deeper understanding of our Connectedness with the animal and the world as a whole. These practices enhance our science and the passion of our work.

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4. Of Wolves and Honor Students: Introducing the Methods of Engineering and Technology

GEORGE D. CATALANO[1] AND MAGGIE HOWELL[2]

An experimental effort is underway which attempts to bring instruction in design methodologies to both engineering and non-engineering majors through collaboration with the Wolf Conservation Center in New York. One important overarching goal is to increase the technical literacy of students at Binghamton University who are not formally enrolled in engineering classes. Students are confronted with a range of issues associated with wolf (*Canis lupus*) and other endangered species conservation efforts. A formal engineering design methodology is then introduced through a series of lectures and in-class design experiences. Students then identify a project of interest to them, design and implement their proposed solution. The clients for the design projects are a pack of captive timber and arctic wolves. Linkages to a host of issues from environmental stewardship to globalism are easily made in the context of technological impact upon the natural world. The course is offered as part of the university's honors program and recruits students from a wide range of disciplines across campus. A range of assessment tools are incorporated into the course including questionnaires, focus groups and exit surveys.

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[2]Wolf Conservation Center, P.O. Box 421, South Salem, NY 10590-0421

5. Assessing Student Learning and Interest in Eastern Coyotes

JONATHAN G. WAY[1], ERIC G. STRAUSS[2] AND MIKE BARNETT[2]

This study used a mixed methodological (qualitative and quantitative) framework to examine student learning and interest in a curriculum unit based on eastern coyotes (*Canis latrans*). There have been few previous studies examining student learning of animal behavior. We studied the students from two urban environmentally-based high school science courses in the Boston area. Both classroom interventions showed meaningful learning and affective gains from before to after the curriculum unit. The coyote curriculum unit described in this dissertation was successful because it was designed from a local, place-based study, it was authentic in the students' eyes, it used a diverse array of teaching tools to maintain student interest and to encourage their learning and beliefs about coyotes, and it involved a trained scientist teaching the unit. The videos that accompanied the unit were very important in simulating an authentic experience for the students; in other words, they illustrated the unit and provided students with an intermediate vision between text and lecture and the real thing (e.g., coyotes). Place-based activities overwhelmingly show that students can be empowered to care for their surroundings when they are interested and encouraged to do so. Coyotes could potentially be used as a flagship or charismatic species to trigger an increased interest in science and environmental education and the environment near where people live.

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6. Wild Cat Connections: Combining Local and Global Research of Wild Cats With Public Outreach

LISA A. HAYNES[1], MELANIE CULVER[2], JOHN KOPROWSKI[1], WILLIAM W. SHAW[1] AND C. ZOE HACKL[2]

At University of Arizona in Tucson, we have assembled a team of researchers who are combining studies of wild felids with extensive public outreach and involvement. This program has three components, the core of which is long-term research of bobcats (*Lynx rufus*). In suburban Tucson, bobcats routinely live in close proximity to homes in low-density housing developments surrounded by native Sonoran Desert vegetation. We have initiated a series of bobcat studies, starting with a broad, landscape-scale assessment of distribution and genetic structuring (using primarily noninvasive techniques). We will conduct more intensive, localized research in future phases. Bobcats living in backyards and outbuildings are often tolerated and even enthusiastically accepted by homeowners. This presents an ideal opportunity for researchers to educate the public regarding threats to wild cats, such as connectivity and habitat loss, rodenticide poisoning, and human impacts on wild felids worldwide. Therefore, as the second component of this program, we are creating systems where homeowners and volunteers become active participants in the research process, engendering a sense of commitment to the Sonoran Desert and to wild cats. This situation is especially opportune as the university's (and Tucson's) mascot is the Wildcat (a bobcat). We are also involved in studies of pumas (*Puma concolor*) and jaguars (*Panthera onca*) in the region, creating additional public education opportunities. In the third component, to foster collaborations for research and conservation of wild cats worldwide, we are using these research projects as a training and education platform at University of Arizona for international biologists and students.

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HUMAN INTERACTIONS WITH MARINE MAMMALS

MONDAY, NOVEMBER 13 • 10:00 AM • HARBOR VIEW ROOM

Moderator: Randall Wells

1. Human Interactions With Marine Mammals in the Wild: An Overview of the Policies, Guidelines and Regulations Developed in the U.S. To Address Activities of Concern

TREVOR R. SPRADLIN[1], LAURA ENGLEBY[2], STACEY CARLSON[2], LYNNE BARRE[3] AND LISA VAN ATTA[4]

Coastal tourism is increasing annually in the United States, and tourism focusing on marine mammal viewing opportunities has grown rapidly in recent years. Viewing marine mammals in their natural habitat can be an educational and enriching experience if conducted safely and responsibly, but can be detrimental to the animals and dangerous to people if conducted inappropriately. There is growing concern that recreational interactions between the public and marine mammals in the wild disturb the animals, place their health and welfare at risk, and are dangerous to the public. Many of these activities are being conducted in important habitats that the animals use for resting, breeding, calving, nursing, feeding, and/or shelter. Researchers monitoring the impacts of viewing activities have reported boat strikes, disturbance of important behaviors and social groups, separation of mothers and young, abandonment of resting areas, and unnatural habituation to humans. Both the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973 prohibit activities that can harass or injure marine mammals, and the National Marine Fisheries Service has developed national and regional policies, guidelines and regulations for the marine mammals under its jurisdiction (whales, dolphins, porpoises, seals and sea lions) to address activities of concern. The agency has embarked upon several different outreach initiatives with external partners over the years to educate the public about safe and responsible viewing practices (e.g., the "Protect Dolphins" campaign), and is exploring additional ways to support wildlife viewing opportunities while ensuring the overall protection of marine mammals.

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[3]NOAA National Marine Fisheries Service, Northwest Regional Office, 7600 Sand Point Way NE, Seattle, WA 98115

[4]NOAA National Marine Fisheries Service, Pacific Islands Regional Office, 1601 Kapiolani Boulvard, Honolulu, HI 96814

2. Feeding and Harassment of Wild Bottlenose Dolphins in the Southeast Region: Overview of Activities of Concern and Mitigation Efforts

STACEY L. CARLSON[1], VICTORIA CORNISH[1], LAURA ENGLEBY[1], KRISTIN THOMS[1], KATE WELLS[1], TREVOR SPRADLIN[2] AND RANDALL WELLS[3]

Feeding and swimming with wild bottlenose dolphins (*Tursiops truncatus*) are prevalent activities of concern in the Southeast Region (SER). Feeding and harassment of wild dolphins is prohibited under the Marine Mammal Protection Act of 1972. Provisioning wild dolphins is of specific concern because it may result in behavioral changes of the animals, such as habituation on humans for food, teaching calves or other animals this habituated behavior, and associating vessels or people with food and depredating from recreational fishing gear. The latter is leading to an apparent increase in dolphin entanglements in recreational fishing gear in the SER. Researchers are concerned that swimming with wild dolphins and other viewing activities may also cause harassment of dolphins under certain conditions. Both illegal feeding and swim-with activities are increasing in areas of the Southeast despite past educational and enforcement efforts to curtail these activities. The National Marine Fisheries Service's Southeast Regional Office, therefore, is working with other NOAA partners and stakeholders to develop innovative mitigation techniques to enhance current efforts under the Protect Dolphins campaign. Mitigation examples include developing an outreach strategy for priority areas of the SER in which these activities are prevalent, and a Florida-based consortium to provide consistent and constant outreach messages to enhance current conservation messages. Other techniques include continued development and implementation of the Dolphin SMART Program to provide an education and recognition program to encourage responsible viewing of wild dolphins, and collaboration with the Sarasota Dolphin Research Program to characterize the nature of dolphin depredation on recreational fishing gear.

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[3]Mote Marine Laboratory, Sarasota Dolphin Research Program, 1600 Ken Thompson Parkway, Sarasota, FL 34236

3. Evidence of Recreational Fishing Interactions in Stranded Indian River Lagoon Bottlenose Dolphins: 1997-2005

WENDY N. DURDEN[1] AND MEGAN STOLEN[1]

The bottlenose dolphin (*Tursiops truncatus*) is a common inhabitant of the Indian River Lagoon estuary system (IRL). From 1997-2005, stranded IRL dolphins were systematically examined for evidence of fishery interactions. Local fishers were surveyed and archived fishing line from stranded IRL dolphins was examined to investigate possible behavioral interactions between IRL dolphins and recreational fishers. From 1997-2005, a total of 32 stranded IRL dolphins either ingested or became entangled in recreational fishing gear. Fishery interactions ranged from 0-11 yearly with an average of 3.56 ±1.07 (S.E.) per year. Interactions were more prevalent in males (n = 19), followed by females (n = 11), and dolphins of unknown gender (n = 2). In 56.25% (n = 18) of these cases recreational gear interactions caused or significantly contributed to the mortality of the animal. Fisher surveys suggested that IRL dolphins interact with recreational fishers. Based on archived lines that were examined, the majority appeared to have become derelict by the line or swivel breaking. The Indian River Lagoon is an important and productive habitat for many fish species and therefore it unlikely that interactions between fisheries and the local dolphin population will decrease as the two come in contact in search of food sources. This study provides critical baseline information regarding IRL dolphin-recreational fishery interactions. Future studies are warranted to determine the appropriate management implications.

[1]Hubbs-SeaWorld Research Institute, 6295 Sea Harbor Drive, Orlando, FL 32821-8043; mstolen@hswri.org

4. Impacts of Human Activities on a Long-Term Resident Community of Bottlenose Dolphins on Florida's West Coast

RANDALL S. WELLS[1], KIM BASSOS-HULL[2], JASON ALLEN[1], NÉLIO BARROS[3] AND DEBORAH FAUQUIER[3]

As increasing numbers of humans use waters along Florida's Gulf coast, the potential for adverse interactions with marine mammals, such as bottlenose dolphins (*Tursiops truncatus*), is also increasing. The need to control impacts from some forms of human interactions, such as commercial fisheries, has been clearly identified in legislation and management action, and numbers of allowable takes from such activities are provided through calculations of Potential Biological Removal (PBR). However, other potential impacts such as recreational fishing, boat collisions and disturbance, marine construction and demolition, human feeding of and swimming with dolphins, and environmental contaminants have received relatively little management attention, and with few exceptions are not considered in PBR. Studies over the past 36 years, of five generations of year-round resident bottlenose dolphins in Sarasota Bay, FL and vicinity have provided opportunities to evaluate trends in abundance, to document causes of mortality and serious injury, to monitor health of individuals and the community as a whole, and to measure reproductive success. Most of the 150 resident dolphins are recognizable from dorsal fin features, and are of known sex and age, maternal lineages are known for many, and paternities have been identified for some. Carcasses are recovered and examined by the Mote Marine Laboratory Stranding Investigations Program. Findings to date indicate that cumulative impacts from human interactions are not insignificant, suggesting that these factors should be included to a greater extent in management plans. Educational activities have been implemented to attempt to mitigate some of these human interactions.

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[3]Mote Marine Laboratory, Stranding Investigations Program, 1600 Ken Thompson Parkway, Sarasota, FL 34236

5. Recent Phocid and Canid Interactions in the Cape Cod Area of Massachusetts

BETTY J. LENTELL[1], KATIE TOUHEY[2], KRISTEN PATCHETT[2], ANDREA BOGOMOLNI[2,3], BRIAN SHARP[2] AND MICHAEL MOORE[2,3]

An important role of marine mammal stranding response organizations is to monitor trends in the health status of both individuals and populations. The causes of injury, illness and death of marine mammals, and subsequent effects on the population, are important factors in monitoring the health of their habitat and guiding appropriate management strategies. In the last seven years, a growing number of interactions have been observed between phocid seals and canids, primarily of eastern coyotes (*Canis latrans*), on Cape Cod Massachusetts. Since 1998, 3 eye-witness accounts of canid attacks on phocid seals have been documented in the Cape Cod region. A review of seal stranding data also reveals 64 additional suspected cases of canid predation or scavenging. While interactions of scavenging from seal carcasses have been witnessed, live kills of seals had not been observed until 2003. Four species of phocid seals inhabit Cape Cod seasonally or year-round, but the most common target of canid attacks is the harp seal (*Pagophilus groenlandicus*). Preliminary data suggests that the most common area of bodily injury is to the head and neck region. Scavenging and predation are observed throughout the year, but most common in the winter months when harp seals are present in the greatest numbers and fewer people are present to inhibit such actions by the coyotes. Geographically, these cases have occurred over a wide area from Westport (Buzzards Bay) to Provincetown (Atlantic Ocean). Both seals and coyote populations are growing, resulting in an increase in the frequency of these interactions. We will discuss the phocid species involved, geographic distribution of interactions, seasonality, extent and severity of wounds and patterns of the attacks. In addition, we investigate the possible impacts to both seal and canid populations, focusing on the potential introduction or spread of disease between terrestrial and marine populations.

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CLIMATE CHANGE II

MONDAY, NOVEMBER 13 • 1:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Lara Hansen

1. Climate-Ocean Effects on the Marine and Terrestrial Habitats of the Hawaiian Monk Seal

JASON D. BAKER[1], CHARLES LITTNAN[1], JEFFREY POLOVINA[1], DAVID JOHNSTON[2] AND EVAN HOWELL[1]

We show how two processes, climate-ocean variability and rising sea levels, can influence conservation of a critically endangered marine mammal, the Hawaiian monk seal (*Monachus schauinslandi*). The transition zone chlorophyll front (TZCF) is a large-scale oceanographic feature separating the vertically stratified, low surface chlorophyll subtropical waters and the vertically mixed cool, high chlorophyll Transition Zone waters. The TZCF migrates over 1000 km latitudinally during the year and its southern extent in winter varies. We found support for a hypothesized link between variability in the TZCF and survival of young seals at populations closest to the front. When the front remained farther north, survival was poorer. Variation in ocean productivity may mediate prey availability in monk seal foraging habitat and consequently influence juvenile survival in the northern portion of their range. Furthermore, climate models predict that global average sea level may rise considerably this century. Most monk seals live in the remote Northwestern Hawaiian Islands (NWHI), where they rely on primarily low-lying islands to rest, give birth, and rear their pups. We explored the potential for terrestrial habitat loss by creating topographic models of several NWHIs and evaluating the potential effects of sea-level rise by 2100 under a range of basic passive flooding scenarios. Projected terrestrial habitat loss varied greatly among islands: 3% to 65% under a median scenario (48-cm rise). Continued sea level rise after 2100 will likely further reduce habitat important to the Hawaiian monk seal. This threat might be successfully mitigated by carefully planned and executed beach nourishment programs.

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[2]Joint Institute for Marine and Atmospheric Research, University of Hawaii, 2570 Dole Street, Honolulu, HI 96822

2. The Implications of Global Warming on a Snow Dependent Species – A Case For the Wolverine

JEFFREY P. COPELAND[1], KEITH AUBRY[2], KEVIN MCKELVEY[1], AND STEVEN W. RUNNING[3]

References to wolverine (*Gulo gulo*) habitat associations commonly evoke terms such as arctic, tundra-taiga, boreal, or circumpolar as they generalize the species' association with northern latitudes. While the wolverine's distribution extends well south of the arctic, its presence within the boreal and temperate coniferous forest zones is strongly tied to high elevation subalpine communities. Whether this represents an obligate relationship with cold climate related parameters has not been thoroughly investigated. For the wolverine, successful reproduction appears to be tied to the presence of a persistent snow layer that extends into early spring. Deep spring snows provide structure and security for females to rear and protect kits until weaning in early May. Global climate change models predict levels of snow recession through the current century that could dramatically change snow distribution. The impact of global warming on individual species will vary depending on their sensitivity to environmental change. Receding snow presence would mean less suitable denning habitat, which would likely have a significant impact on wolverine persistence. We discuss timing and habitat associations of wolverine reproductive denning, relate wolverine distribution to snow presence, and discuss implications of a receding snowline on wolverine persistence.

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[2]U.S. Forest Service, Pacific Northwest Research Station, Olympia, WA 98512

[3]University of Montana, Department of Ecosystem and Conservation Science, Missoula, MT 59812

3. Whitebark Pine, Grizzly Bears, and Climate Change

KATHERINE C. KENDALL[1] AND DAVID J. MATTSON[2]

Seeds of whitebark and other stone pines are consumed in large quantities by grizzly and brown bears (*Ursus arctos*) wherever their ranges include abundant cone producers in North America and Eurasia. Whitebark pine seeds are such an important food in the Yellowstone ecosystem that bears that consume more whitebark pine seeds experience higher reproductive rates and the bear mortality rate doubles during poor pine seed crop years. Whitebark pine is vulnerable to climate warming in several ways. Losses may come through accelerated successional replacement by shade-tolerant competitors and through competition at stand initiation with early-successional competitors that do better on warmer sites. Climate warming may also hasten the spread of blister rust in whitebark pine through warming or increased variability in weather conditions. Drought associated with climate change will increase the frequency and severity of mountain pine beetle attacks on whitebark pine. As in any complex natural system, the effects of climate warming will not be simple; for example, squirrel densities and cone crops may increase with warming. Strategies for mitigating the impact of climate change on whitebark pine need to be large in scope and long range, and will be difficult to implement at a scale that will be effective. They include developing and planting rust-resistant whitebark pine stock and silvicultural treatments that limit the potential for mountain pine beetle epidemics. Most importantly, for bear populations to remain viable even if the majority of whitebark pine stands are lost, we need to preserve sufficient varied and productive habitats that are free from human activity.

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MOUNTAIN LION ECOLOGY

MONDAY, NOVEMBER 13 • 1:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Chris Papouchis

1. The Life Cycle of the City Lion: Reproduction, Dispersal, and Mortality of Mountain Lions in An Urban Landscape in Southern California

SETH P. D. RILEY[1], JEFFREY SIKICH[1], ERIC YORK[1] AND RAYMOND M. SAUVAJOT[1]

Large carnivores such as mountain lions (*Puma concolor*) represent the most difficult challenge for wildlife conservation in urban areas, because they have the greatest spatial needs and may also come into conflict with humans. Since 2002, we have been studying the ecology and conservation of mountain lions in Santa Monica Mountains National Recreation Area, a national park next to Los Angeles. In 2004, four kittens were born in the Santa Monica Mountains, providing a unique opportunity to monitor mountain lions isolated by roads and development from a very young age (4 weeks old) through dispersal. After more than 18 months of monitoring with implanted VHF transmitters and GPS radio-collars, all 4 young lions still reside within the isolated Santa Monica Mountains and continue to make regular deer kills, while so far avoiding conflicts with humans. However the two young male lions have generally stayed at the far eastern and western borders of the mountains, as far as possible, in this landscape, from the range of their father, a large adult male that also killed their mother. These young males have also ventured up to freeways and outside natural habitat into urban and agricultural areas. To date, two adult lions have died from, and a third lion tested positive for, two different anticoagulants commonly used as rodenticides worldwide. Maintaining or reestablishing connectivity, minimizing human-associated mortality, and a human willingness to coexist will all be critical for long-term persistence of large predators such as mountain lions in urbanizing landscapes.

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2. Daily Activity Patterns of Mountain Lions in Relation To Their Prey Species in Southeastern Arizona

EMIL B. MCCAIN[1], JACK CHILDS[2] AND T. LUKE GEORGE[3]

Food resources are not evenly distributed over space or time; therefore, changes in prey abundances may influence predator behavior both spatially and temporally. Because the prey of carnivores are mobile and differentially active, the availability of these foods is variable throughout a 24-hr period. When prey are active or moving, they are more easily detected by carnivores and may be more vulnerable than when stationary. The mountain lion (*Puma concolor*) has been described as crepuscular at sites where their primarily prey also maintained crepuscular patterns year-round, thus it was assumed mountain lion activity patterns followed those of there prey. In desert environments hot daytime temperatures during summer months may cause shifts daily activity patterns. The javelina (*Tayassu tajacu*) is inefficient at thermoregulation, and is diurnal during winter months and virtually nocturnal in the summer. In the Sonoran Desert, javelina are an important prey item for mountain lions; therefore, this system is ideal to test if mountain lions track changes in the activity patterns of their prey. Alternatively, mountain lions may remain crepuscular and shift their diet to other crepuscular species when javelina become less available. We used the date/time stamps from trail camera photographs to index activity patterns of mountain lions and multiple prey species, and analyzed fecal samples to determine mountain lion diet throughout the seasons.

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[2]Arizona-New Mexico Jaguar Conservation Team, Borderlands Jaguar Detection Project, 1165 W. Hawk Way, Amado, AZ 85621

[3]Humboldt State University, Department of Wildlife, Arcata, CA 95521

3. Co-Occurrence of Cougars, Wolves and Their Prey in the Candian Rocky Mountains

SHELLEY M. ALEXANDER[1], TRAVIS LOGAN[1] AND PAUL PAQUET[2]

We examined the spatio-temporal co-occurrence of cougars (*Felis concolor*), wolves (*Canis lupus*), elk (*Cervus elaphus*), and deer (*Odocoileus virginianus* and *O. hemionus*) in the Canadian Rocky Mountains and contrasted predictions across two methods: logistic regression and Geographic Information System (GIS) image correlation. Models were developed using snow-tracking data collected simultaneously for all species from November to March (1997-2000). Logistic regression and Akaike's Information Criterion (AIC) were used to select optimal species-environment relationship models from which we determined species coocurrence by month. Predictive surfaces were then built in a GIS and accuracy measured with a Receiver Operating Characteristic (ROC) curve, and co-occurrence of species was re-analyzed using pairwise correlations of probability surfaces by month. In the Rocky Mountains, the spatial distributions of cougars and wolves converged into the valley floor as winter progressed. Cougars were distinct from wolves and prey in the intensity of this shift. We determined that comparing predictive surfaces alone fails to explain species co-occurrence. The surfaces must be coupled with investigation of respective species-environment models to account for temporal changes in associations. We suspect that the two approaches represent different ecological scales: image comparison may be best for landscape (valley) level analysis, while logistic regression is best for site level analysis. The variability observed over time suggested that annual and seasonal models may obscure important ecological patterns and processes, especially for cougars.

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4. Potential Habitat For Cougars in Midwestern North America

MICHELLE A. LARUE[1] AND CLAYTON NIELSEN[2]

Cougars (*Puma concolor*) are becoming a species of interest to wildlife biologists and the general public in Midwestern North America due to the increasing number of recent cougar confirmations (e.g., carcasses and photographic evidence) in the region. However, there is no research available regarding cougar potential in the Midwest. We created a model of potential cougar habitat in 9 Midwestern states using geospatial data, expert-opinion surveys, and a GIS. Four digital data layers were used in the model: land cover, digital elevation models, roads, and human density. Based on matrices of pair-wise comparisons involving these data layers, experts were surveyed to rank combinations of habitat factors in order of importance to potential cougar habitat in the Midwest. The survey was sent to 29 wildlife biologists; 11 surveys were returned and subsequently evaluated using the Analytical Hierarchy Process and results were processed within a GIS. Experts suggested land cover and human density were the most important factors affecting potential cougar habitat, whereas slope was of only minor importance. We classified habitat suitability on a percentage basis; states with the largest proportions of good potential cougar habitat (≥ 70% suitability) were Missouri (23%) and Arkansas (22%); these states contained areas with large amounts of contiguous forest and relatively low human density. Our model indicates areas in which habitat may be suitable for cougars in the Midwest, thereby providing an important tool for addressing potential cougar-human conflicts and impacts of cougars on other wildlife species.

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CITIZEN SCIENCE

MONDAY, NOVEMBER 13 • 1:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Laurie Macdonald

1. Citizens Contribute to Right Whale Conservation in Coastal Waters Of Northeast Florida

JOY HAMPP[1], JIM HAIN[2] AND JULIE ALBERT[3]

The Marineland Right Whale Project, a partnership between Associated Scientists at Woods Hole and Marineland of Florida, involves local citizens as volunteers in survey and data collection of the endangered North Atlantic Right Whale (*Eubalaena glacialis*) along the northeast Florida coast. The scope of the program, and the results obtained are beyond what government and scientists alone might achieve—particularly in times of decreasing government funding. The coastal waters of the southeastern United States, principally Georgia and Florida, are the only known right whale calving and nursing ground. Monitoring of reproductive rate and calving success is essential. Additionally, in these waters, as elsewhere, there is concern that human impacts (collisions with vessels and entanglement in fishing gear) are inhibiting the growth and recovery of this population. Lastly, this area is experiencing rapid population growth and habitat infringement, and co-existence of whales and humans is likely to become increasingly challenging. Volunteers staff mobile and community survey teams every good weather day from early January until mid-March searching for whales from pre-selected points along the coast from St. Augustine Inlet to Ponce Inlet. On a less-structured basis, citizens living or spending time on the coast are given information for spotting right whales and a toll-free number to report sightings. When sightings are reported, survey volunteers are often the first to arrive onsite to begin data collection and tracking procedures, pending the arrival of a verifier/photographer. Volunteers then assist with focal follows, tracking the whales' movements and reporting on behavior. During the nine-week season in 2006, two paid staff managed about 170 active volunteers who accumulated 1,455 survey hours. The quality of the data received from the volunteers is directly related to the effort expended for their development. Volunteers must be recruited, then trained and monitored for correct procedures. They need to be encouraged and motivated to endure sometimes long cold intervals between whale sightings. Regular feedback and a side-by-side relationship with scientists are essential. The result is far more data than scientists could collect on their own and the fostering of a sense of stewardship in the local community for these whales. After six years, this program can rightly take its place among other well-known citizen science programs, such as water-quality monitoring, Audubon bird counts, monarch butterfly studies, and Riverkeepers.

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[2]Associated Scientists at Woods Hole

[3]Marine Resources Council

2. Volunteers to the Rescue: A Program for Beach-Nesting Birds

MONIQUE BORBOEN-ADAMS[1]

Least terns (S*terna antillarum*) naturally nest on undisturbed beaches. Much of that habitat has been lost to development and nowadays 83% of Least Tern nests in Florida are on top of flat gravel roofs (J. A. Gore, unpublished data, Florida Fish and Wildlife Conservation Commission (FWC), Tallahassee.) Gravel is being phased off as a roofing material and Least Terns are facing the loss of that secondary habitat. In 2001, St. Petersburg Audubon – all volunteer organization- started a project to study and protect Least Terns. Volunteers, collaborating with a local college professor and her students, have worked to 1) census ground and rooftop nesting colonies; 2) improve and assess effectiveness of chick rescue; 3) educate the public; and 4) help create a website to report data to FWC. The project has now expanded to the protection of all Beach Nesting Birds in the area and volunteers complement the work of professionals by: 1) monitoring municipal beaches; 2) providing trained volunteers as needed to land managers; and 3) organizing three meetings a year where land managers, county, state and federal biologists, academia and Audubon volunteers discuss research and management of local Beach Nesting Birds. Volunteers allow for simultaneous census of large areas, contribute expert bird knowledge and, as citizen, can help implement conservation measures.

[1]St. Petersburg Audubon; trinity@ij.net

3. Keeping Track

SUSAN C. MORSE[1]

Keeping Track is a nonprofit organization in Huntington, Vermont with a mission to inspire community participation in the long-term stewardship of wildlife habitat. Keeping Track's cornerstone program is the Keeping Track Monitoring Program, a rigorous program that requires volunteers to successfully complete an intensive field and class training. Empowered by this knowledge, these citizen scientists of professional and community members carefully record their observations in each season to identify critical wildlife habitat worthy of conservation. Keeping Track is the only regionally based monitoring program for wide-ranging mammals currently in existence in North America. This effort coincides with the federal mandate for state agencies across the U.S. to monitor wildlife species in the Comprehensive Wildlife Conservation Strategy (Wildlife Action Plan in Vermont). Keeping Track also offers a range of wildlife and habitat programs and workshops to peoples of all ages throughout the year to people. Florida workshops with Morse, sponsored by Defenders of Wildlife, are designed to train volunteers to identify animal sign, primarily Florida panthers.

[1]Keeping Track, Inc. P.O. Box 444, Huntington, VT 05462; www.keepingtrack.org

4. Earthwatch Institute: Citizen Scientists

DANIELA MALDINI[1]

Many scientific researchers, conservation organizations, and multinational regulatory agencies rely heavily on volunteers to assist in field science monitoring and data collection efforts. Skill level and knowledge of research practices differs widely between volunteers, however, studies indicate that with proper instruction and education volunteer-collected data prove to be reliable. Techniques that can be taught to volunteers without lengthy or specialist training are sufficiently accurate to yield reliable data at a significant time savings to that of an independent researcher. Additionally, volunteers bring enthusiasm and other beneficial skills to a field project while raising their environmental conscience and understanding of the natural world.

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5. Citizen Science and Highway Wildlife Crossings: An Example of Citizens Monitoring Wildlife in Crowsnest Pass, Alberta, Canada

MICHAEL S. QUINN[1], TRACY LEE[1] AND DANAH DUKE[1]

Road Watch in the Pass is an innovative community-based research project that engages local volunteers in reporting wildlife observations along Highway 3 through the Crowsnest Pass in southwestern Alberta, Canada. Through the use of Web-based GIS (see www.rockies.ca/roadwatch), interested citizens can participate in data collection that will be instrumental to decision makers in reducing wildlife vehicle collisions and for developing mitigation measures for proposed highway expansion. Road Watch was designed to test and profile the use of local knowledge and volunteer data collection in the Crowsnest Pass by providing land managers and the community with valuable baseline information related to wildlife highway crossings. The goals of the project are to collect, analyze and communicate information highlighting crossing locations of wildlife along the highway based on local knowledge and observations as well as engage the citizenry of the Pass in local issues around relating wildlife movement and safety. In this presentation we will discuss the challenges, benefits and methodological issues associated with using citizen science for natural resource management decision support. We will also profile a method to validate the use of citizen science data in our context. Our results demonstrate that the use of citizen science increases the knowledge base by providing new emerging knowledge that would not have been explicit from a single source. Furthermore, our research identifies the collateral benefits of involving citizens in the collection and subsequent use of scientific information.

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HUMAN INTERACTIONS WITH MARINE MAMMALS II

MONDAY, NOVEMBER 13 • 1:30 PM • HARBOR VIEW ROOM

Moderator: Randall Wells

1. The Impacts of Human/Bear Conflicts: Why We Need To Learn To Coexist

MINETTE JOHNSON[1] AND CHRIS SERVHEEN[2]

As more humans live and recreate in bear country and as bear populations increase, conflicts inevitably result. Bears may be attracted to garbage, pet food, bird feed, fruit trees and come too close to human habitations. They sometimes kill livestock such as sheep or cattle. Bears may also frequent campgrounds and trails in search of easy access to human foods. Humans may be hurt or killed by bears, property can be severely damaged, and most bears that become accustomed to non-natural foods end up being killed by wildlife managers. For grizzly bears (*Ursus arctos horribilis*), which number only 1,200-1,400 in the lower 48, human-caused mortality – much of it due to conflicts – is a major factor limiting recovery. In the Northern Continental Divide Ecosystem, more grizzly bears have been killed in 2004 and 2005 than in any year since before the bear was listed in 1975 as a threatened species. Most states don't even keep track of the number of black bears (*Ursus americanus*) that are "removed." Many different approaches have been tried to reduce conflicts and keep people, their property and bears safe. Defenders has two programs, The Bailey Wildlife Foundation Grizzly Compensation Trust and The Bailey Wildlife Foundation Proactive Carnivore Conservation Fund, to help humans and bears coexist. Many other groups are working on this issue as well, through education and outreach programs, building Bear Smart Communities, and providing bear-resistant dumpsters in high conflict areas. By taking simple steps we can all play a role in preventing problems and fostering healthy populations of grizzly bears and black bears.

[1]Defenders of Wildlife, 140 South Fourth Street West, Suite #1, Missoula, MT 59801-2722; mjohnson@defenders.org

[2]U.S. Fish and Wildlife Service, 309 University Hall, University of Montana, Missoula, MT 59812

Note: this paper will serve as a jump-start for a discussion on how lessons learned in bear conflict can inform marine mammal interactions.

INVASIVE SPECIES

MONDAY, NOVEMBER 13 • 3:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Jamie Reaser

1. Invasive Species in the Carnivore Context: Global Prey-Eating Contests and What to Do When the Wolf Cries "Pig!"

JAMIE K. REASER[1]

Invasive species place constraints on ecosystem processes and services worldwide and can have significant socio-economic impacts. Consequently, invasive species warrant attention as a conservation science and public policy priority. The relationship between invasive species and carnivores encompasses multiple issues, for example: 1) some invasive species are themselves highly efficient carnivores; 2) introduced carnivores can carry invasive parasites and diseases; and 3) herbivorous invasive species can alter carnivore habitats and prey base populations. Invasive carnivores have been introduced into the environment as game species, biocontrol agents, and unwanted pets. Invasive herbivores move through these pathways and may also be contaminants on a wide variety of commodities and modes of transport. Managing invasive species, especially those that are carnivores, requires a strategic, long-term approach that carefully considers and responds to public opinion. Several innovative programs have been developed to minimize the impact of invasive carnivores, as well as the impact of invasives on carnivores. "Habitattitude" is one such program.

[1]Ecos Institute / Pet Industry Council, 1220 19th Street NW, Suite 400, Washington, DC 20036; ecos@nelsoncable.com

2. Heartfelt Approaches to Managing Feral Dogs in Turks and Caicos Islands

MARK R. JOHNSON[1]

The Turks and Caicos Islands is an independent British colony near the south end of the Bahamas. In 2001, a team from Global Wildlife Resources (GWR) and the Turks and Caicos Society for the Prevention of Cruelty Against Animals conducted an extensive kick-start program on the island of Provodenciales to begin controlling a population of several thousand feral dogs. These unowned dogs were attacking children and adults, local residents and tourists, and even disrupting international flights. In three weeks, 252 community dogs were neutered and 370 feral dogs were captured and euthanized. However, logistical measures alone are not adequate when working in populated areas. Managing invasive species to reinstate a balance must incorporate an ethical balance as well. GWR worked in the context of the local culture, developed humane and ethical methods for capture and handling, and incorporated sacred approaches to address the rigors of these extensive measures.

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3. Eradication and Impacts of Invasive Carnivores on Islands

BRAD KEITT[1], YIWEI WANG[1] AND BERNIE TERSHY[1]

Islands are important for the conservation of biodiversity because they house roughly 15-20% of terrestrial plant and vertebrate species, have suffered 64% of IUCN-listed extinctions and have 45% of IUCN-listed critically endangered species. Yet islands make up only about 3% of terrestrial surface area. The main cause of extinction and endangerment on islands is invasive vertebrates, which can reach high densities due to mesopredator release and island prey species that lack behavioral, morphological and life history defenses against predation. At least 15 species of carnivores in six families have been introduced to islands. After rodents, they are the most damaging order of invasive animals on islands. Cats (*Felis catus*) are the most widespread and have been implicated in the largest number of extinctions and extirpations. Other damaging invasive carnivores on islands include mongoose (*Herpestes javanicus*), foxes (*Alopex lagopus* and *Vulpes vulpes*), dog (*Canis familiaris*), raccoon dog (*Nyctereutes procyonoides*), raccoon (*Procyon lotor*), mink (*Mustela vison*), ferret (*Mustela putorius*), weasel (*Mustela nivalis*), stoat (*Mustela erminea*) and oriental civet (*Viverra tangalunga*). Fortunately, damaging invasive animals can be permanently eradicated from islands, after which ecosystems can recover. We documented 680 invasive animal eradication attempts from islands. Of these, 151 were of invasive carnivores. Based on the impacts of different invasive carnivores on islands and the history of eradication attempts, we discuss the current state of eradication as a management tool and the need for new techniques development.

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4. The American Mink in the UK: Interactions With Two Native Recovering Mustelids

LAUREN A. HARRINGTON[1] AND DAVID MACDONALD[1]

In the UK, two native mustelids, the European polecat (*Mustela putorius*) and the Eurasian otter (*Lutra lutra*), are currently recovering nationally following severe declines in the 19th and mid-20th centuries respectively. Recovery is predominantly due to a cessation of persecution (for the polecat) and improved water quality (for the otter). Much of the habitat available to these two species, however, is now occupied by the invasive American mink (*Mustela vison*), which was introduced to the UK in the 1930s for fur farming. On lowland rivers, the presence of mink is deemed inimical to the survival of the native water vole (*Arvicola terrestris*) and mink are removed locally. Previous work suggests that as the larger otter recolonizes the rivers, mink will decline (ousted through inter-specific aggression). It was therefore hoped that the natural recovery of otters would facilitate mink control efforts. We present data on radio-tracked mink before (1995-2000, n=12) and after (2004-2006, n=11) the recovery of the otter, and on 6 sympatric polecats tracked during 2004-2006. We show that: (1) in the medium term (5 years), mink abundance has not declined, but that mink have changed their activity patterns and may have changed their marking behavior; and (2) that there is overlap in habitat use between mink and polecats, although the implications for polecat recovery are unclear. We also discuss local attitudes towards the three species, with a view to assessing public acceptance of mink trapping and potential conflicts that may arise with the increasing distribution and abundance of the polecat and the otter.

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5. Habitat Selection of Expanding Exotic Species: the Egyptian Mongoose in Portugal

MARIA J. SANTOS[1], LUIS MIGUEL ROSALINO[2] AND MARGARIDA SANTOS-REIS[2]

Human activities and modes of transport have caused the introduction of many species in different geographic areas, causing major changes in regional biodiversity levels. Studies on exotic species' role in the ecosystem can have large constraints, since initial conditions and gradual changes are difficult to assess. The Egyptian mongoose (*Herpestes ichneuman*) is an African mesocarnivore introduced to the Iberian Peninsula in the late 1800s. Our goal was to determine which habitat factors are being selected by Egyptian mongooses using road kills, game and capture campaign data. We found that: 1) Egyptian mongooses were found in 21 different CORINE land cover types, but were more frequently found (58.9%) in large patches of broad leaf forests (average 12,376 ha); and 2) no significant differences were found in habitat diversity between males and females. These results indicate that the Egyptian mongoose is a habitat generalist whose range of distribution is expanding to the northeastern Iberian Peninsula when compared to the 1995 census. The predicted climatic changes and the suggested responses of Egyptian mongooses under a mesopredator release hypothesis may further enhance this expansion. Moreover, mongooses are a game species, often accused of preying upon other small game species. The predicted range expansion may not only affect the natural communities but also create a human-wildlife conflict urging for effective management measures.

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MOUNTAIN LION CONSERVATION

MONDAY, NOVEMBER 13 • 3:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Lynn Sadler

1. Controversy, Conflict and Conservation: Humans and Mountain Lions in the Western United States

CHRISTOPHER PAPOUCHIS[1]

Mountain lions (*Puma concolor*) are currently the only top carnivore sustaining viable populations across most of the western U.S. This wide-ranging and solitary felid is considered an important focal species for conserving native ecosystems. Ensuring well-connected and ecologically effective populations of mountain lions in their current range and facilitating their recovery in historic range offers significant benefit for biodiversity. While the vast network of public lands in the western U.S. provides a substantial reserve of habitat for this adaptable species, expanding degradation and fragmentation of habitat and increased persecution of mountain lions for sport and in response to conflicts represent long-term threats to the viability of some local populations and even regional metapopulations. Unfortunately, no comprehensive conservation strategy for this species exists, and collaboration amongst wildlife and land management agencies with jurisdiction over the species remains negligible. State management policies have focused primarily on the utility of mountain lions to humans as a renewable resource and as threats to game species, livestock and human safety, while largely neglecting conservation issues. Management practices have grown increasingly controversial as a growing segment of the public has challenged their scientific basis and sought access to decision-making processes. This presentation considers contemporary mountain lion management in the western U.S., reviews public attitudes towards the species and offers recommendations for conservation. Enhancing the scientific foundation of mountain lion management, reforming decision making-processes, encouraging collaboration among stakeholders, and expanding conservation efforts are identified as priorities.

[1]Mountain Lion Foundation, P.O. Box 1896, Sacramento, CA 95812-1896; cpapouchis@mountainlion.org

2. Cougar Management Guidelines and Implementation and Refinement Project

LINDA SWEANOR[1], JOHN BEECHAM[2] AND DARRELL LAND[3]

To address concerns that agencies and stakeholders were having difficulty keeping up with current knowledge on cougar (*Puma concolor*) management and research, a facilitated meeting of cougar experts from both academia and wildlife management agencies was held in Boise, Idaho in October 2002. The meeting was the start of a 2-year effort that resulted in the "Cougar Management Guidelines." The participants' goal was to benefit cougar management through guidelines that integrate cougar management history, reliable research results and methodologies, and attendant strategies for cougar management. Guideline contributors included wildlife professionals with numerous publications and decades of direct experience in cougar management and research. The intent for these guidelines is to help management agencies develop regional and adaptive management approaches to cougar management and habitat conservation. The intended target audience for the guidelines is agency wildlife managers in Canada, the western United States, and Mexico. The Cougar Management Guidelines are viewed as a "living document," to be maintained, updated, and rewritten as new information dictates. Consequently, we are presently collecting comments on the current guidelines, the application of the guidelines in state and provincial cougar management programs, and adaptive management results. These will be used to improve future editions of the Cougar Management Guidelines. This presentation will cover the development, goals, and content of the guidelines, discuss the potential of the guidelines to help cougar management programs, and outline our implementation and refinement process.

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[2]Beringia South, P.O. Box 147, Kelly, WY 83011

[3]Florida Fish and Wildlife Conservation Commission, 556 Commercial Blvd., Naples, FL 34104; Darrell.Land@myfwc.com

3. The Failure of Traditional Management Practices in Conserving Large Predators: The Cougar as a Case Study

RICK A. HOPKINS[1], BRETT DICKSON[2] AND BRAD MCRAE[3]

Traditional management practices of cougars in North America are nearly entirely focused on reducing conflicts with humans by reducing cougar (*Puma concolor*) populations – the kill strategy. In the last few years several states have proposed traditional "Management Plans" which expend disproportionate efforts on controlling populations. While conservation is often mentioned, it is rarely discussed. There appears to be an overly simplistic presumption that as long as efforts are sustainable, then conservation has been achieved. We argue that these "traditional kill strategies" not only do little to reduce conflict, but may just as likely fail to conserve the species. We believe that the conservation of wide-ranging carnivores depends on holistic approaches that are proactive and consider the habitat requirements of the species at multiple spatial scales. We use landscape models to develop a long-term conservation strategy for cougars in a highly fragmented landscape in a 35,000 km^2 area of Southern California. We also relied on a circuit-theoretic approach to identify the remaining pathways in the region where landscape resistance was sufficiently low enough between and among core habitat areas that movement was still likely. While natural habitats for the cougar in Southern California are more fragmented than other areas in the species' range, we believe the principles developed here can serve as a framework for long-term planning for the species in other regions in North America. Our results suggest that regional efforts to conserve and manage cougars should reflect the scale-dependent patterns of selection exhibited by this species.

[1]Live Oak Associates, Inc., 6830 Via del Oro, Suite 205, San Jose, CA 95119; rhopkins@loainc.com

[2]Northern Arizona University, Center for Environmental Sciences and Education, Flagstaff, AZ 86011

[3]National Center for Ecological Analysis and Synthesis, 735 State Street, Suite 300, Santa Barbara, CA 93101-5504

4. Florida Panther Recovery Efforts: Past, Present, and Future

CHRIS BELDEN[1]

Florida panthers (*Puma concolor coryi*) once roamed over all of the southeastern United States. However, early settlers to this country attempted to eradicate panthers by every means possible. By 1899, it was reported that panthers were already restricted to peninsular Florida. By the late 1920s to mid 1930s, it was thought by many that panthers had been completely eliminated. However, every survey conducted since then has confirmed that a panther population occurs in southern Florida south of the Caloosahatchee River. A Florida Panther Recovery Team was appointed by the U.S. Fish & Wildlife Service in 1976 for the purpose of preparing a recovery plan for the Florida panther. A revision of this plan was undertaken in 1987 by the Technical Subcommittee of the Florida Panther Interagency Committee, including new data that had become available and delineating new tasks needed in panther recovery efforts. An abbreviated revision of the Florida Panther Recovery Plan was undertaken in 1995 specifically to incorporate a management strategy designed to restore and maintain the historic genetic character of the Florida panther. Most recently, a technical/agency draft of the third revision of the Recovery Plan was completed in January 2006. Since the first Florida Panther Recovery Team was appointed, considerable recovery effort has been made.

[1]U.S. Fish and Wildlife Service, 1339 20th Street, Vero Beach, FL 32960; chris_belden@fws.gov

5. Diseases of the Florida Panther

MARK CUNNINGHAM[1]

As a remnant population, the Florida panther (*Puma concolor coryi*) is subject to a number of anthropogenic and natural diseases. Trauma is the most important mortality factor with intraspecific aggression and vehicular collision causing the greatest number of mortalities. Genetic disorders believed to result from inbreeding depression include atrial septal defects, cryptorchidism, and poor semen characteristics. Environmental contaminants possibly affecting some panthers include methyl-mercury, chlorinated pesticides, and polychlorinated biphenyls. Infectious diseases causing known mortality in Florida panthers include feline leukemia virus, pseudorabies, and rabies. Feline immunodeficiency virus is endemic in the population and may reduce immunocompetence. Many of these diseases may work synergistically to reduce fitness in the Florida panther.

[1]Florida Fish and Wildlife Conservation Commission, 4005 South Main Street, Gainesville FL, 32601; Mark.Cunningham@MyFWC.com

6. Puma Phylogeography: Evolutionary Significant Units and Genetic Restoration in Florida

MELANIE CULVER[1]

Genetic characteristics of pumas (*Puma concolor*) from different geographical areas were examined using three mitochondrial DNA genes and ten nuclear DNA microsatellite markers, to examine the level of subdivision and gene flow among puma populations throughout North and South America. The analysis encompassed 31 of the 32 described subspecies, and results indicated six phylogeographic groupings for pumas throughout their current and historic range. The most ancestral puma population is likely from the Brazilian Highlands of South America, with founder effects observed at the geographic extremes of the range (North America and southernmost South America). The proposed founder event in North America appears to be more recent, and pumas north of Nicaragua are not genetically distinguishable using this set of 11 independent markers. Additional analyses were performed using the highly variable mitochondrial DNA control region, which also supported the conclusion of genetic homogeneity for North American pumas. These results will be discussed, along with the implications these results have for conservation of pumas in the Americas, and the genetic restoration efforts for recovery of Florida panthers (*P. c. coryi*).

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PREDATOR-PREY RELATIONS

MONDAY, NOVEMBER 13 • 3:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Melissa Grigione

1. A Study of the Dietary Overlap and Seasonality in Food Habits of Snow Leopard and Tibetan Wolf in Hemis National Park, Ladakh, India

TRISHNA DUTTA[1], SANDEEP SHARMA[1] AND YASH VEER BHATNAGAR[2]

The snow leopard (*Uncia uncia*) and Tibetan wolf (*Canis lupus chanco*) are highly endangered sympatric large carnivore species of Trans-Himalaya. There is not much information available about resource partitioning between these two species. In an attempt to understand more about coexistence of these two top predators of Himalaya, we studied their food habits and dietary resource partitioning in the Hemis National Park, Ladakh, India, in 2004-2005. The food habits of the snow leopard and Tibetan wolves were studied by analyzing their scats. We studied and analyzed the proportion of various prey items in their diets, calculated their niche breadth and dietary overlap between them. Our results show that there is significant difference between the summer and winter diets of both the snow leopard and the wolf. There is also a difference in the proportion of livestock consumed by the carnivores, and this varies according to season. The niche breadth for Tibetan wolves is greater in summer, while it is wider for snow leopards in winter. There is a high level of dietary overlap between the carnivores in both the seasons, more so in winter. The diet of the carnivores is strongly affected by seasons: snow leopards consume more livestock than wolves in winter, whereas wolves feed comparatively more on livestock in the summer. Both species are highly secretive and many aspects of their ecology yet remain unknown, especially for the wolf. Long-term detailed studies will be able to give a better understanding of the interactions and coexistence of these animals. This study gives an insight for conservation of both species, since both of them are persecuted by locals for livestock damage.

[1]International Snow Leopard Trust, George Mason University, Department of Environmental Science and Policy, 4400 University Drive, MSN 5F2, Fairfax, VA 22030-4422; trishnad@gmail.com

[2]International Snow Leopard Trust, Nature Conservation Foundation, 3076/5 IV Cross Gokulam Park, Mysore Karnataka, India 570 002

2. Predator Impacts on Elk Calf Survival and Recruitment

NYEEMA HARRIS[1] AND DANIEL PLETSCHER[2]

Reported calf:cow ratios in elk (*Cervus elaphus*) obtained during annual green-up surveys in west-central Montana have declined from 41 calves per 100 cows in 1988 to 20 calves per 100 cows in 2001. This project was initiated in response to heightened concerns about elk calf survival and the impact of predators on recruitment. Other studies were also initiated to estimate densities of mountain lions (*Puma concolor*) and black bears (*Ursus americanus*) in the study area. We marked and tracked 170 elk calves to estimate survival from 2002 to 2005. Summer calf survival estimates ranged from 0.421 ± 0.104 in 2002 to 0.792 ± 0.058 in 2005. Minimum lion densities ranged from 1.3-1.6 resident cougars/ 100 km^2 over the study period (R. DeSimone, pers. commun.) and a single black bear density estimate of 11.4 bears/ 100 km^2 was obtained from mark-recapture hair snag techniques in 2004 (R. Mace, pers. commun.). Of the 170 calves marked, we documented 37 deaths, of which 62% were attributed to predation. The primary sources of predation included black bears (46%) and mountain lion (29%). Black bear kills occurred only in early summer and impacted calves within 6 weeks of capture while lion kills occurred within 5-15 weeks of capture. Predator densities were low to average and summer calf survival estimates were relatively high. Therefore, we argue that predators are not suppressing recruitment in elk populations in our study area.

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[2]University of Montana, Wildlife Biology Program, 32 Campus Drive #0596, Missoula, MT 59812-0596

3. Annual Predation Patterns of Wolves Near Jackson, Wyoming

MICHAEL D. JIMENEZ[1], SUSANNAH WOODRUFF[1], EDWARD E. BANGS[2], STEVE CAIN[3] AND SARAH DEWEY[3]

From 1999 to 2006, we monitored wolves (*Canis lupus*) to determine prey selection near Jackson, Wyoming. In winter, we used VHF radio telemetry to locate collared wolves daily. We tracked wolves in the snow to locate carcasses of ungulates killed or scavenged by wolves. In spring, summer, and fall we used 2 techniques to describe food habits of wolves. We collected and analyzed scats from dens and rendezvous sites to estimate frequency of occurrence, relative biomass, and the relative numbers of prey species consumed by wolves. We also radio-collared wolves with downloadable GPS collars programmed to collect location data every half hour. We investigated location points on the ground to locate carcasses of wolf-killed ungulates. Winter prey species consisted of 97% elk (*Cervus elaphus*) and 3% moose (*Alces alces*). Prey composition of elk killed by wolves was 47% calves, 43% cows, and 10% bulls. Mean age of adult elk killed was 9.3 years and the oldest elk was 23 years old. Prey species in spring/summer/fall consisted of 86% elk and 14% moose. Prey composition of elk killed by wolves in spring/summer/fall was 42% calves, 44% cows, and 14% bulls. Prior to wolf recolonization in 1999, elk and moose calf/cow ratios declined from 1989 through 1999 and the 10-year average ratio was 28.8 elk calves/100 cows and 41 moose calves/100 cows. Since wolf recolonization, calf/cow ratios averaged 25.5 elk calves/100 cows and 33 moose calves/100 cows.

[1]U.S. Fish and Wildlife Service, P.O. Box 2645, Jackson, WY 83001; mike_jimenez@fws.gov

[2]U.S. Fish and Wildlife Service, 585 Shepard Way, Helena, MT 59601

[3]Grand Teton National Park, P.O. Box 170, Moose, WY 83012

4. Spatial Relationships Amongst Lynx, Coyotes and Hare in the Canadian Rocky Mountains

KIMBERLEY A. MCNEIL[1] AND SHELLEY M. ALEXANDER[1]

We developed a spatially explicit habitat probability model for Canada lynx (*Lynx canadensis*) using transect data from two areas of the Canadian Rocky Mountains: Banff National Park and Kananaskis Country. Winter-based track data were recorded for lynx, coyote (*Canis latrans*), and snowshoe hare (*Lepus americanus*) simultaneously between November and April, 1997-2000. We used logistic regression and Akaike Information Criterion to develop the predictive models. We found that lynx were related positively to snowshoe hares in both study areas. Coyote had a varying influence on lynx across study areas, exhibiting a positive correlation with lynx presence in the Banff site and a negative correlation in Kananaskis. Dissimilarities between the two models could be due to abundance levels of prey species, variations in the physical characteristics of the study sites, discrepancy in data availability, and a lack of knowledge on interspecific relationships between lynx and other species.

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5. Prey Activity As An Indicator of Prey Selection By a Free-Ranging Population of Wild Canids in New South Wales, Australia

BRAD V. PURCELL[1], ROBERT MULLEY[1], ROBERT CLOSE[2] AND JASON FLESCH[1]

The Australian dingo (*Canis lupus dingo*) is considered threatened due to hybridization with domestic dogs (*C. l. familiaris*). Basic biology and ecology of dingo hybrids is poorly researched as most studies have focused on methods for predator control. Research on free-ranging populations of wild dingo hybrids in the Southern Blue Mountains World Heritage Area, approximately 65km west of Sydney, Australia, commenced in March 2005. In this study, relationships between the activity of hybrid dingoes and red foxes (*Vulpes vulpes*) with their prey were sought between March 2005 and April 2006. Passive Activity Indices (PAI) were calculated per month for these predators and their major prey items. Major prey species were identified from hair and bone fragments in fecal material of these predators, collected each month. Major prey species include macropods (swamp wallaby *Wallabia bicolour*, red-necked wallaby *Macropus rufrogriseus*, and eastern grey kangaroo *Macropus giganteus*), common wombats (*Vombatus ursinus*), brushtail possums (*Trichosurus vulpecula*) and European rabbits (*Oryctolagus cuniculus*). Dietary data were made comparable to activity indices by dividing the occurrence of that species by the total amount of scats collected that month. Both data sets were related to monthly and seasonal variations in activity; recorded weather; and breeding patterns for each species. PAI variance estimates were also incorporated into the analysis of data and the significance of the results were calculated using chi square. Results suggest a large population of dingo hybrids exists: applying significant pressure to swamp wallaby populations and controlling outbreaks in European rabbit populations.

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6. The Influence of Anthropogenic Resources on the Space-Use Patterns of Jackals in Britania Park, Israel

GUY ROTEM[1], HAIM BERGER[2], RONI KING[3], PUA BAR (KUTIEL)[1] AND DAVID SALTZ[2]

The shape and the of an animal's home range are influenced by food availability and distribution over time and space. These factors also influence the behavior and dynamics of the population. The golden jackal (*Canis aureus*) is an abundant predator found throughout most of Israel. In the 1960s the population of this species was negatively affected by poisoning, but in recent years its population has grown and the species has become overabundant. Jackals are generalist predators with a variable diet. A significant portion of the golden jackal population in Israel subsists on anthropogenic foods. In this study we examine how the proximity to anthropogenic food sources (settlements) impacts the space-use patterns of golden jackals. The research was conducted in Britania Park located in the Shfela region. The park area is about 4,000 hectares and is characterized by Mediterranean climate and vegetation. The park consists of a variety of habitats from natural Mediterranean maquee, afforested pine stands, cultivated lands, and human agricultural settlements. Jackal space-use patterns were determined from radiolocations collected from 18 radio collared jackals, 9 near and 9 away from human settlements. I analyzed the data using kernel home range and GIS techniques. Preliminary results indicate that home ranges of jackals close to human settlements are smaller than those of jackals distant from the settlements (mean=8.5km^2 ± SD=7.1 vs. mean=19.5km^2 ± SD=9.4, respectively, p=0.001). We found no difference between the two groups in the number of activity centers per home range, but the ratio between the 50% and 90% isopleth was greater for jackals close to settlements, albeit not significantly so (p=0.071, one sided). These results indicate that human presence influences on the spatial dynamics and density of jackals. Because jackals are probably a key predator, anthropogenic impacts on this species probably influence the entire system. The understanding of the relationships between humans and golden jackals is necessary so sound management protocols can be developed for this and other similar areas.

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INCENTIVES FOR CARNIVORE CONSERVATION

MONDAY, NOVEMBER 13 • 3:30 PM • HARBOR VIEW ROOM

Moderator: Frank Casey

1. Carnivores and Ecosystem Services

TIMM KROEGER[1], PAULA MANALO[1], FRANK CASEY[1] AND J. CHRISTOPHER HANEY[1]

The topic of payments for ecosystem services is gaining more and more traction in public conservation policy. Carnivores perform important ecosystem functions. Depending on their location, several of these functions generate benefits for humans. In that sense, carnivores provide ecosystem services that contribute to human welfare. Conversely, carnivores may also be thought of as being an ecosystem service themselves, to the extent that humans value them for direct use (hunting, wildlife watching) or independently of any direct use (existence, stewardship, and bequest values). The provision of this "carnivore ecosystem service" may impose costs on landowners in the form of changes in land use practices to provide suitable carnivore habitat, or in the form of livestock losses. Landowners may also derive benefits in the form of increased wildlife watching or hunting revenues or reduced losses to carnivores other than those they manage for. At the same time, some or most of the benefits of "carnivore provision" may accrue to individuals other than the landowners. To the extent that management for carnivores generates benefits not captured by landowners, compensation of landowners would be justified on economic grounds. This is already occurring in some instances, but it might be implemented more widely in order to increase acceptance of the presence of carnivores. We discuss several of the impacts of carnivores on ecosystems that have been documented or hypothesized in the literature, and identify the ecosystem services associated with those impacts. We also discuss approaches for estimating the economic value of these services, and the value of carnivore provision as an ecosystem service. Finally, we briefly present possible alternative compensation mechanisms for landowners.

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2. Red Wolves: Creating Economic Opportunity Through Ecotourism in Rural North Carolina

GINA SCHRADER[1]

To ensure the recovery of endangered red wolves (*Canis rufus*) and increase public acceptance, there have been continued efforts to educate the public about the species and address real and/or perceived concerns about the potential negative economic and social impacts of the recovery program. A 2005 study, *Red Wolves: Creating Economic Opportunity Through Ecotourism in Rural North Carolina*, commissioned by Defenders of Wildlife and funded by the Alex C. Walker Educational and Charitable Foundation, evaluated enhancing the local economy within rural northeastern North Carolina through red wolf-related market-based incentives. The primary findings of the report were presented at the 2004 Carnivores conference. Results from the research found that local agricultural producers and residents are interested in locally-based tourism efforts and that their tolerance for recovery efforts would increase if red wolves could help promote increased economic development. The report recommended that increased educational efforts should be implemented to inform both residents and tourists about red wolf recovery and to provide locals with ecotourism training sessions. One project activity implemented as part of the report's recommendations was the establishment of a series of kiosks in key locations to inform potential visitors about the red wolf and to induce increased tourism to the area. Defenders has conducted a stakeholder meeting to engage regional community leaders and local agricultural landowners to explore and develop a strategic eco-tourism plan. This plan identifies the necessary next steps for building sustainable tourism-based economic growth, while benefiting the conservation of red wolves. Defenders of Wildlife will present findings from this meeting and post-report, demonstrating that an incremental and participatory approach to rural tourism development can have lasting benefits in terms of cost-effectiveness and agricultural producer acceptance. Various mechanisms for compensating private landowners for providing red wolf habitat, and hence community tourism benefits, with be explored and compared.

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3. Species and Habitat Conservation Using an Eco-labeling Approach: a Case Study of Sandhill Cranes in Wisconsin

FRANK CASEY[1], TED ANCHOR[2] AND JEB BARZEN[3]

Private market incentive mechanisms such as eco-labeling can complement other public and private conservation incentives such as cost-share, easement, or compensation programs. Private market incentives can allow landowners to capture the public benefits of their conservation actions within standard markets, if the right conditions exist. This presentation will highlight an eco-labeling project effort currently taking place in the Central Sands of Wisconsin that is designed to restore natural habitats on farmlands that support sandhill crane populations, as well as many other species. Through the development of an ecosystem restoration component and the establishment of Natural Community Standards, a third-party certification process is now in place. We will discuss the costs, benefits, and constraints to this ecosystem restoration effort and applying eco-labeling as a tool to conserve sandhill crane habitat specifically, and carnivores in general. We draw some implications of this experience for both private and public carnivore conservation funding mechanisms and conservation policy, including a commentary on the recent emphasis on payments for maintaining ecosystem services.

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LIVING WITH WOLVES

TUESDAY, NOVEMBER 14 • 8:00 AM • GRAND BAY BALLROOM – SOUTH

Moderator: Suzanne Stone

1. Management of Wolf/Livestock Conflict in the Northwestern United States

EDWARD E. BANGS[1], MICHAEL D. JIMENEZ[1], CURT M. MACK[2], CAROLYN SIME[3], STEVE NADEAU[4], LARRY HANDEGARD[5], MARK COLLINGE[6], ROD KRISCHKE[7], DOUGLAS W. SMITH[8] AND POLLY WHEELER[1]

Gray wolf (*Canis lupus*) populations were eliminated from the western United States by 1930, largely because of conflicts with livestock. Currently, over 1,020 wolves are being managed in Montana, Idaho, and Wyoming under the federal Endangered Species Act. Between 1987 and December 2005, over 528 cattle, 1,318 sheep, 83 dogs, 12 goats, 9 llamas and 6 horses were confirmed killed by wolves and over $550,000 was paid from a private damage compensation fund. While only a portion of all wolf-caused losses are confirmed, wolves cause a tiny portion of all livestock death. However, wolf depredation can seriously affect some producers, particularly those using remote public land summer grazing allotments. Large wolf pack territories, increased wolf colonization of private rangeland, mixed public and private land ownership patterns, dispersed nature of livestock grazing, the agricultural tradition in the western United States of ranching without wolves, and seasonal/elevational movements of native ungulates makes effective management of wolf depredation difficult and controversial. We have relocated wolves 117 times and killed 396 wolves to reduce conflicts with livestock. Conflict management by us and a host of agency and private cooperators also includes a wide variety of non-lethal tools such harassment, barriers, guard animals, herders, altering wolf activity patterns, livestock management, and practical research. While non-lethal methods are useful in some circumstances and will continue to be used, none were consistently reliable or effective. We have encouraged state and tribal leadership in wolf management and increased options for problem wolf management by agencies and local private citizens. We believe that effective and focused agency control and regulations that empower the local public to protect their own private property from wolf damage will increase public tolerance of both wolves and lethal wolf control.

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2. Integrating and Evaluating Livestock Guarding Dogs For Reducing Wolf-Human Conflicts on Michigan Farms

ANNA C. CELLAR[1] AND THOMAS GEHRING[1]

As wolf (*Canis lupus*) populations continue to recover, the chance for wolf-human conflicts also increases. Using an experimental design, we test livestock guarding dogs as a non-lethal control tool for reducing wolf depredations on cattle. Furthermore, we include farmers as an important stakeholder in managing depredations. In March 2005, 6 cattle farms in the western Upper Peninsula of Michigan were each given 2 Great Pyrenees pups. Following guidelines we have given them and with our supervision, farmers are responsible for the care and training of their dogs. Pups were raised with calves in order to establish a bond between dog and livestock. At 7 months, pups were integrated into the adult cattle herd and will remain with the cattle. Nine cattle farms, 6 treatment and 3 control, are being monitored for predator activity using sand tracking swaths, data loggers and farmer observation. Dogs were integrated into the pasture after the 2005 monitoring was completed. Visitations in 2005 will serve as a baseline for predator activity. Predator visitation on treatment farms in 2005 will be compared to visitations in 2006. Additionally, the difference in visitations between treatment and control farms in 2005 will be compared to the difference in visitations on farms in 2006. Success will be determined by the dogs' ability to deter wolf use of livestock areas and of farmers' perceived effectiveness of the dogs. This research will provide baseline data for a non-lethal management tool that could reduce the conflict between wolves and agriculture while benefiting both.

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3. Collaborating With Carnivores: Moving Beyond the Politics of Myth in the Greater Yellowstone Ecosystem

AVERY C. ANDERSON[1] AND REBECCA WATTERS[1]

Grizzly bears (*Ursus arctos horribilis*) and wolves (*Canis lupus*) are two of the most controversial species in the Greater Yellowstone Ecosystem. Their management has proven particularly challenging in Wyoming, where the culture of the "Old West" conflicts with the conservation community's ecological values. This presentation examines carnivore-human relationships in two regions of Wyoming experiencing expansion of wolf and grizzly populations: the Upper Green River Valley and the Wind River Indian Reservation. Carnivore-human conflict has been particularly pronounced in the Upper Green region as wolves and grizzlies disperse beyond the borders of Wyoming's National Parks. Economies in the Upper Green are threatened by these expanding carnivore populations, and understanding the attitudes and expectations behind the antipathy is an important step towards resolving the problems. Wolves and grizzlies are also dispersing onto the Wind River Reservation, barely 50 miles from the Upper Green. Some tribal members want to see large carnivores return to the Reservation, and seek the creation of a management plan separate from Wyoming's. The full scope of attitudes towards large carnivores on the Reservation is more complex, however. The parameters and viability of a management plan for carnivores on the Reservation depend on a full contextual understanding of the situation on the Reservation. This presentation examines the implications of cultural, attitudinal, and political diversity on management policy within what is perceived as a single ecosystem and single political entity. Diversity of attitudes illustrates the necessity of adaptive management on multiple scales, and of identifying local leadership and common interest to advance large carnivore conservation.

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4. Taming the Place of Wild Beasts: The U.S. Forest Service Proposed Directive for "Predator Damage Management in Wilderness Areas"

BRIAN SEGEE[1]

In June, the U.S. Forest Service issued a proposed "directive" which would turn back the clock on carnivore conservation efforts by dramatically broadening the circumstances in which predators may be killed within designated Wilderness areas, and handing over final decision-making authority on such killing to Wildlife Services, the agency formerly known as Animal Damage Control. Under the proposed directive, current Forest Service policy emphasis on predators' critical ecological role in natural ecosystems would be replaced by rules allowing predator killing in almost any circumstance involving wildlife "management goals," including management of wildlife diseases and the protection of other wildlife from predation. Additionally, the directive would authorize aircraft landing, travel by off-road vehicle, and use of motorized equipment within Wilderness in order to facilitate predator killing. This talk will provide an overview of the proposal, address the larger context of the intensifying efforts to increase "management" of predator populations, and address efforts by Defenders of Wildlife and other organizations to oppose the proposal.

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5. Living with Wolves: Nonlethal Methods to Reduce Livestock Depredation Conflicts

SUZANNE ASHA STONE[1], STEWART BRECK[2], RICK WILLIAMSON[3], MIKE STEVENS[4], LINDA THURSTON[5], THOMAS GEHRING[6] AND MARCO MUSIANI[7]

Wolf (*Canis lupus*) depredation on livestock is the primary cause of conflict leading to wolf mortality in the USA Northern Rockies. While confirmed wolf depredation losses represent less than one percent of the regions overall annual livestock losses, these conflicts have created substantial political and social challenges and serious impacts for the livestock owners who experience chronic depredation losses. Many methods have been implemented to address these conflicts, including lethal removal of wolves associated with killing livestock. However, lethal control only temporarily reduces conflicts by provisionally easing political and social tension. Research indicates that areas prone to chronic depredation repeatedly attracts wolves thereby encouraging a cycle of conflicts, which results in the recurring loss of livestock and wolves and heightened social antipathy. To address these issues, wolf managers, ranchers and conservationists work collaboratively to identify and implement a range of nonlethal deterrents to reduce wolf depredation livestock losses. In April 2006, researchers, biologists, conservationists, and ranchers gathered near Yellowstone for a nonlethal methods evaluation and training workshop. This workshop, sponsored by the Sand Dollar Foundation, was the first of its kind in bringing science, wildlife conservation and agricultural specialists to examine nonlethal methods including fladry and turbo-fladry, electric and predator-deterrent fencing, range riders and herders, livestock guarding dogs, radio automated alarm systems, and less than lethal ammunitions. We will present a summary of our findings and examples of how these methods are currently being applied in the region.

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URBAN & SUBURBAN CARNIVORES

TUESDAY, NOVEMBER 14 • 8:00 AM • GRAND BAY BALLROOM – NORTH

Moderator: Stanley Gehrt

1. Habitat Use and Food Habits of Urban Ring-Tailed Cats in Mexico City

GABRIELA CASTELLANOS-MORALES[1], NATALIA GARCÍA-PEÑA[1] AND RURIK LIST[1]

The El Pedregal de San Angel Ecological Reserve is a 147 ha reserve located within one of the largest cities of the world, Mexico City, and harbors a population of ring-tailed cat (*Bassariscus astutus*). Ten of eleven ringtails captured were radio-collared but only four males (three adults and one young) produced location fixes (35-71 fixes) to estimate habitat use. Habitat use was greater than expected for perturbed habitat (pesp = 0.256 > pmax = 0.13) and urban areas (pesp = 0.077 > pmax = 0.048); University infrastructure was used in proportion to its availability (p = 0.22). Food habits were determined from 52 feces collected along roads and trails within the reserve. Eighty-one items (1-4 elements per feces) were found, animal and plant remains were the most frequently found items (n = 31 FR = 40.7; n = 32, FR = 39.5 respectively), and anthropic food items were also frequent (n = 13; PO = 25 y FR = 16). A few elements were impossible to identify (n = 3; PO = 5.8 y FR = 3.7). This results show that the Reserve is important for the ringtails as it is the main source of food for them.

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2. Demography and Ecology of Endangered San Joaquin Kit Foxes in Urban and Exurban Environments: Implications For Conservation

BRIAN D. CYPHER[1], CURTIS BJURLIN[1], JULIA NELSON[1], CARIE WINGERT[1] AND CHRISTINE VAN HORN JOB[1]

Wild canids exhibit considerable behavioral plasticity, which facilitates adaptation to varied environments, including some significantly altered by humans. We compared demographic and ecological patterns of endangered San Joaquin kit foxes (*Vulpes macrotis mutica*) at 2 sites in central California to identify adaptive responses by kit foxes to urban environments and their implications for population viability in these environments. Urban kit foxes exhibited higher survival probabilities and longevity than exurban foxes. Larger predators, which are the primary source of mortality for exurban foxes, are both rare and spatially restricted in urban environments. Consequently, vehicles and toxins were the primary sources of mortality for urban kit foxes. Urban foxes also exhibited higher rates of reproductive success, both in terms of proportion of adult females reproducing and mean litter size. Mean number of dens used annually was similar between urban and exurban foxes, as was rate of den change. In both environments, rodents were the primary food items consumed, although kangaroo rats (*Dipodomys spp.*) were the primary prey among exurban foxes and gophers (*Thomomys bottae*) and California ground squirrels (*Spermophilus beechyi*) were the primary prey among urban foxes. Urban foxes also supplemented their diet significantly with anthropogenic foods. Due to suitable environmental conditions and fox ecological plasticity, exploitation of urban environments by kit foxes has been sufficiently successful to produce markedly robust demographic attributes. Consequently, the probability of maintaining viable populations of kit foxes in urban environments appears high, and these populations could contribute to range-wide conservation of this species.

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3. Characteristics of Human-Wildlife Conflict in Brevard County, Florida

CHRISTINE A. KLINKOWSKI[1], MICHAEL KUTILEK[2], SHANNON BROS[2], JOHN MATSON[2], PAULA MESSINA[3] AND KEVIN EARLEY[4]

The close proximity of wildlife to suburban areas leads to an increase in human-wildlife encounters and potential conflicts. Of particular concern are health risks associated with mesopredators such as raccoons (*Procyon lotor*). Currently there is little data indicating which types of habitat or human-related characteristics might increase the risk of conflict in urban and suburban areas. County organizations such as Brevard Animal Services (BAS) collect information on phone calls from the public regarding wildlife, and these data may be useful in determining where high-risk areas might be. The focus of the present study was to determine if areas of human-wildlife conflict are associated with certain habitat features or human development. Calls made by members of the public to Brevard Animal Services during a four-year time period (2000, 2003, 2004 and 2005) were included in a geographic information system (GIS) along with census data, land use, and land cover. Points were geocoded to the location of conflict, and land use and census information was subjected to a random raster function to simulate random quadrat sampling. I used a stepwise multiple linear regression analysis to determine which land use features or human characteristics may be reliable indicators of where human-urban wildlife conflicts are more likely to occur in Brevard County, FL. Logistic Regression analyses were used to determine if human or landscape variables varied among mesopredators.

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4. An Ecological Study of Coyotes in Pinellas County, Florida, U.S.A. Based on Non-Invasive Fecal Examinations

DENARA L. MANNING[1], MELISSA GRIGIONE[1], RICARDO IZURIETA[2], SARAH CLAVIO[1] AND RONALD SARNO[3]

Coyotes (*Canis latrans*) have inhabited Florida since the 1960s. However, there has been minimal research conducted on these new residents to determine what ecological effects they might have on the communities they inhabit. The objective of this study was to obtain information on intestinal parasites and diet of coyotes on sites visited within our study area. Also considered within the study were zoonotic diseases which could be a potential risk, especially to children who are more susceptible due to close contact with soil. Fifty fresh fecal samples were identified and collected from a suburban area in Pinellas County, Florida from June 2005 to May 2006. Two fecal examinations were performed on each sample. Each sample was then heated to 75°C for a minimum of 48 hours to kill any latent parasites. After desiccation, the samples were washed in order to separate hair, bone fragments, and vegetative matter. Diet was determined by identifying the remaining contents of prey species. Every sample was infected by at least one intestinal parasite. Protozoa were most prevalent, followed by nematodes and cestodes. Preliminary diet results show that lagomorphs, rodents, and berries (seasonal) appear most frequently. This research was the first comprehensive study ever conducted on a suburban coyote population in Florida. Documenting these findings is essential in order to develop preventative methods to hinder transmission of parasites between suburban coyote populations, domestic animals, and humans. These methods are especially critical due to the vast encroachment on wildlife habitat by urban areas.

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5. Female Bobcat Reproductive Behavior and Kitten Survival in a Fragmented Urban Landscape

JOANNE G. MORIARTY[1], SETH P. D. RILEY[1], PAUL WILSON[2] AND RAYMOND M. SAUVAJOT[1]

Bobcats (*Lynx rufus*) are found throughout most of North America and are important members of many ecological communities, but their existence is threatened in some areas due to increasing urban encroachment. Many studies have been conducted on adult bobcats, but reproductive behavior, specifically kitten survival, behavior, and dispersal, is less well understood, and nothing is known about the potential effects of urban development on reproduction and kitten dispersal. However, successful reproduction and dispersal may be especially important in fragmented urban landscapes where local population size can be reduced and connectivity is important. We studied female reproductive behavior and kitten survival throughout the remaining habitat pockets of a southern California suburb. Both females, fitted with collars, and kittens, implanted with intraperitoneal transmitters, were monitored through radio telemetry for survival and movements. Survival, home range size and location, and movement patterns were analyzed with respect to land use (urban development, natural, etc.), time of year, and developmental stage of the kittens. Kitten survival was low, with all mortality occurring within the first 5 months and largely due to predation, likely by coyotes. Home range size varied with time of year and kitten development for both the females and kittens, and kitten movement was highly correlated with developmental stage, with older kittens exhibiting more extensive movements. Understanding the way in which altered habitats affect reproduction and kitten survival in bobcats will play an integral role in the conservation of this species along the urban edge.

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6. Creating Prime Mountain Lion Environments in Suburbia: the Cases of Boulder and Colorado Springs, Colorado

MICHELLE L. SHUEY[1]

Beginning in the 1970s Americans began an urban-to-rural movement for the first time in U.S. history. In the 1990s some rural western counties suffered population growth at rates more than double the national average, making the West the fastest growing region in America. Moreover, counties with natural amenities like national parks and wilderness areas experienced significantly greater in-migration than counties without. New migrants are choosing to live in more isolated areas with denser vegetation, for access to vistas and an idyllic "countryside" environment, in effect infringing on prime carnivore habitat. At about the same time, cougar (Puma concolor)-human encounters in the western United States and Canada began occurring in more populated places. As the number of encounters has increased over the years, urbanized places like Denver/Boulder, Missoula, Los Angeles, San Diego, and Sacramento appear to be hubs of cougar-human interaction. The objective of this research was to investigate how landscapes, specifically urban, suburban and exurban residential development affect these interactions. Cougar-human encounter location information reveals significant relationships.

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BOTTLENOSE DOLPHIN FORAGING ECOLOGY I

TUESDAY, NOVEMBER 14 • 8:00 AM • WILLIAMS-DEMENS ROOM

Moderator: Nélio Barros

1. Assessing the Effects of Fishing on Bottlenose Dolphins With Qualitative Models

DONALD M. BALTZ[1], NÉLIO B. BARROS[2] AND MOBASHIR A. SOLANGI[3]

We used qualitative models to begin to evaluate the indirect effects of fisheries on bottlenose dolphin (*Tursiops truncatus*) populations in the northern Gulf of Mexico. Loop models use natural history data to graphically depict direct interactions between species or guilds in complex communities. These graphical models are then translated into community interaction matrices that can be used to evaluate the indirect interactions among species as positive and negative feedback loops. The existing literature on dolphin food habits suggests that sound-producing fish (sciaenids, haemulids and sparids), as well as planktivorous fishes and squid, are important prey. Shrimp are relatively less important components of their diet, and are believed to be consumed secondarily in areas where dolphins feed in association with shrimp boats. The current model over-emphasizes a generalized sciaenid/sparid (e.g., pinfish) life history (eggs through mature adults >10 cm SL) at the expense of other potentially important prey (e.g., planktivorous fishes, squid, and crustaceans). Nevertheless, it offers insights into how limited data may be used to advance our understanding of multispecies interactions and the effects of fishing on large marine predators. From the prediction (adjoint) matrix, we show that expanding the Gulf menhaden (*Brevoortia patronus*) fishery in the Mississippi Sound area may have a negative impact on bottlenose dolphins. Alterations to equilibrium communities due to any combination of positive and negative presses (i.e., sustained pertubations) can also be estimated (direction but not magnitude) by summing several columns of the prediction matrix.

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2. Bottlenose Dolphin Vocalizations Suppress Calling Rates and Elevate Stress Hormones in a Prey Species, the Gulf Toadfish

DOUGLAS NOWACEK[1], LUKE REMAGE-HEALEY[2], ANDREW H. BASS[2] AND DAVID A. MANN[3]

Communication signals can be conspicuous to both intended (e.g. conspecifics) and unintended receivers (e.g. predators or parasites). Animals can modify the conspicuousness of their signals to maximize the benefits of advertisement while minimizing the potential costs. Such 'conspicuousness tradeoffs' are most evident in species that rely on visual communication signals, in which predation pressure limits the intensity of visual displays. Acoustic advertisement signals should also be susceptible to eavesdropping by predators. The passive listening hypothesis proposes that dolphins and whales detect acoustic signals emitted by prey, including sound-producing (soniferous) fishes. Previous work showed that bottlenose dolphins (*Tursiops truncatus*) behaviorally orient toward the sounds of prey, including the advertisement calls of male Gulf toadfish (*Opsanus beta*). In addition, soniferous fishes often comprise over 80% of *Tursiops* diet, and toadfishes alone can account for over 10% of their diet. Here, we asked whether, in turn, male gulf toadfish can detect the acoustic signals of bottlenose dolphins and subsequently adjust their calling behavior. Using underwater playbacks to toadfish in their natural environment we found that low-frequency dolphin clicks within the toadfish's range of hearing dramatically reduce toadfish calling rates by 50%. High-frequency dolphin whistles and low-frequency snapping shrimp pops (ambient control sounds) each had no effect on toadfish calling rates. Furthermore, circulating stress hormone levels were significantly elevated in male toadfish exposed to echolocation clicks vs. snapping shrimp pops. These findings lend strong support to the hypothesis that individuals of a prey species modulate communication behavior in the presence of a predator, and also suggest that short-term glucocorticoid elevation is associated with anti-predator behavior.

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3. How To Catch a Fish? Foraging Tactic Fidelity of Bottlenose Dolphins in Florida Bay, Florida

LEIGH G. TORRES[1] AND ANDREW J. READ[1]

Bottlenose dolphins (*Tursiops truncatus*) in Florida Bay, Florida, exhibit a variety of foraging tactics. Systematic boat surveys of Florida Bay during the summers of 2002-2005 yielded 225 sightings, with foraging observed on 73 occasions (32.4%). Six different types of foraging behavior were observed: mud ring feeding, herd/chase, crater feeding, deep diving/erratic surfacing, poking under seagrass mat, and unknown. Concurrent to dolphin surveys, fish sampling was conducted throughout Florida Bay to determine fish community composition and prey availability. The fish data was converted into various metrics to describe different attributes: Simpson's diversity index, Shannon's diversity index, Margalef's richness index, biomass per unit effort, catch per unit effort, species richness per unit effort, and a subset of potential dolphin prey termed dolphin prey per unit effort. Using GIS, these fish metrics were interpolated into grids, which were sampled at each dolphin foraging location. The spatial and temporal location of dolphin foraging observations was also compared to benthic habitat type (i.e., seagrass, mud, sand, mud bank, hardbottom), group size, depth, distance from mud bank, and zone within Florida Bay. Mantel's test and Classification and Regression Tree (CART) analyses were used to determine the spatial patterns of foraging tactics and the predictor variables correlated with each tactic. Additionally, photo-identification analysis was used to determine the foraging tactic fidelity of individual animals that were sighted multiple times engaged in foraging activities.

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4. Role of Ecological Disturbance in the Foraging Ecology of Coastal Bottlenose Dolphins

DAMON P. GANNON[1], JASON ALLEN[2], ELIZABETH BERENS[1], DEBORAH FAUQUIER[1], JANET GANNON[1] AND RANDALL WELLS[2]

Disturbance can shape ecological communities, depending on frequency, duration, spatial extent, and intensity. Though well-studied in intertidal invertebrate communities, less is known about how disturbance affects marine vertebrates. We investigated the effects of hypoxia and harmful algal blooms (HABs) of the toxic red tide alga (*Karenia brevis*) on the foraging ecology of coastal bottlenose dolphins (*Tursiops truncatus*). In the Neuse River, North Carolina, distribution and availability of the dolphin's primary prey, Atlantic croaker (*Micropogonias undulatus*), changed in response to hypoxia. In Sarasota Bay, Florida, periodic red tides cause mass mortality of dolphin prey fish and sometimes of dolphins themselves. A severe red tide in 2005 reduced the abundance of prey drastically. Correspondence analyses and Shannon-Weaver diversity indices indicated that the composition of the fish community shifted, becoming dominated by pelagic species that are not normally found in the dolphin diet. Elevated biochemical oxygen demand in areas where the red tide was most intense resulted in hypoxia. Dolphin habitat selection changed and group size increased, suggesting a switch to different prey. Following the HAB, reports of dolphins begging for food from humans and depredating on fish caught by anglers increased. Ecological disturbances such as hypoxia and red tide appear to play a major role in shaping estuarine vertebrate communities. Given the behavioral flexibility of dolphins, they appear to be well adapted for responding to ecological disturbance. However, with hypoxia and HABs apparently increasing in frequency, duration, spatial extent, and intensity globally, stress from these disturbances may have an increasing effect on dolphin ecology.

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5. Stomach Content Analysis of Bottlenose Dolphins Stranded in South Carolina

MICHELLE PATE[1], WILLIAM A. ROUMILLAT[2] AND WAYNE MCFEE[3]

The bottlenose dolphin (*Tursiops truncatus*) comprises the largest percentage of cetacean strandings on the coast of South Carolina. The purpose of this study was to determine if prey species observed in dead, stranded bottlenose dolphins are representative of living bottlenose dolphin populations, through a comparison of bottlenose dolphins that exhibited signs of human interaction (presumably otherwise healthy) and those that appeared to have died from natural causes (presumably natural mortalities). Fisheries interactions, extensive wounds from boat collisions, signs of gross mutilation, and other rope or line wounds are indicative of human interaction mortalities. Stomach content analysis was performed on dolphins that stranded between 2000 and 2006 along the coast of South Carolina. Prey identification was determined using fish otoliths, dentary bones, skulls, and cephalopod beaks. Results from this study provide the first quantitative analysis of prey species comprising the South Carolina bottlenose dolphin diet. The results provide regulatory agencies the data necessary for the continuous protection of marine mammals and the critical habitats of prey species.

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6. Variation in Feeding Habits Among Bottlenose Dolphins From Two Southeastern U.S. Estuaries As Determined By Stable Isotope Analysis

MELISSA A. RECKS[1], AARON FISK[2], WAYNE MCFEE[1], GREGORY BOSSART[3], PATRICIA FAIR[1]

Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotopes (SIs) were determined for 90 skin samples collected from free-ranging bottlenose dolphins (*Tursiops truncatus*) (known ages ranging 3.5 to 28 years) in the Charleston Harbor area, SC (CHS) and Indian River Lagoon, FL (IRL), along with nine potential prey species (n = 105) from Charleston area waters. As previous studies have indicated habitat partitioning within the IRL dolphin population, IRL samples were divided geographically by sampling locations (northern and southern). A lack of gender influence on observed SI was consistent with previous dietary studies of blubber fatty acid composition in CHS dolphins and published stomach contents for IRL dolphins. Elevated $\delta^{15}N$ values suggested southern IRL dolphins may have fed at a higher trophic level than northern IRL dolphins (CHS values were intermediate to the two). Prey SI values suggested CHS dolphins consumed a mixture of benthic, low trophic-level prey (i.e., striped mullet, *Mugil cephalus*) and higher trophic-level fish (such as spotted seatrout, *Cynoscion nebulosus*). CHS and southern IRL dolphin $\delta^{13}C$ values were similar, while northern IRL dolphins exhibited enriched $\delta^{13}C$ signatures, possibly reflecting a reduced importance of carbon from freshwater/terrestrial sources to dolphins in that region. Planned sulfur ($\delta^{34}S$) SI analyses should provide more insight into the sources of carbon for these dolphins. On-going fatty acid analysis will complete the suite of biochemical dietary indicators being studied, which can then be compared with dolphin stomach content analyses of CHS stranded dolphins. This powerful combination of analyses should provide the most complete characterization possible of diet for a wild dolphin population.

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LIVING WITH LIONS

TUESDAY, NOVEMBER 14 • 10:30 AM • GRAND BAY BALLROOM – SOUTH

Moderator: Chris Papouchis

1. Mountain Lions and People: Strategies for Coexistence

CHRISTOPHER PAPOUCHIS[1] AND EMILY CUNNISON[1]

Mountain lions (*Puma concolor*) play an important role in maintaining the health and resilience of natural systems. Yet their carnivorous and wide-ranging nature can bring them into conflict with human interests when they prey on deer, elk and other ungulates desired by human hunters; when they prey on livestock and other domestic animals; and when they threaten or attack people. An increase in such conflicts in recent decades has been attributed to the rapid growth and expansion of human populations, development and activity in mountain lion habitat, as well as to an increase in mountain lion populations in some areas due to the growth and spread of deer populations. Even people who hold positive attitudes towards mountain lions may become less tolerant of mountain lions that frequent areas near their homes; thus, conflicts can reduce support for mountain lion conservation. Consequently, finding effective conflict-reduction strategies has become a priority for conservation scientists. This presentation discusses the relationship between humans and mountain lions in the West, reviews currently utilized policies and techniques for addressing conflicts between humans and mountain lions, and considers potential future conflict-reduction strategies.

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2. Agency Responses To Interactions Between Florida Panthers and People

DEBORAH K. JANSEN[1], LAYNE HAMILTON[2] AND ROY MCBRIDE[3]

With the expansion of the human and panther (*Puma concolor coryi*) populations in south Florida, the possibility of interactions is increasing. In the past 5 years of a 25-year monitoring program, 5 complaints have been reported to the agencies responsible for panther management. Three of the 5 cases involved previously radio-collared panthers; in one case an adult female and her 2 male offspring were collared in response to the complaint. In each situation, a prey attractant was present. Two cases were resolved quickly by securing or removing the attractant. In one case, the panther was moved to another part of its home range and immediately returned to the attractant. In another case, a juvenile male panther was relocated to an area outside its home range. It was killed by an adult male 7 months later. One panther had previous injuries that necessitated its reliance on an easy food source (unprotected pet livestock), so was removed from the wild and placed in captivity permanently. Another panther was placed in captivity permanently because the extent and availability of the prey attractant, again unprotected pets and livestock, couldn't be remedied in time to prevent an encounter. An Interagency Florida Panther Response Plan and Environmental Assessment were prepared by state and federal agency personnel to address future interactions in a timely manner and on a consistent basis. Human safety, decision-making based on panther behavior, and education are key factors of the plan.

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3. Aversive Conditioning of Florida Panthers By Combining Painful Experiences With Instinctively Threatening Sounds

ROY T. MCBRIDE[1], DEBORAH JANSEN[2], STEVE SCHULZE[2], ANNETTE JOHNSON[2] AND ROCKY MCBRIDE[3]

Following a groundbreaking genetic restoration program that began in 1995, the documented Florida panther (*Puma concolor coryi*) population has tripled. This success, coupled with the growing human population in south Florida, escalates the probability for conflicts between panthers and humans. In 2004, 2 such complaints involving public safety were received. Because the Florida panther is an endangered species, removal of the offending animal was not a preferred option. Therefore, an effective method to aversively condition panthers was needed. We developed a 3-stage aversive conditioning program and tested it on the 4 Florida panthers involved in the 2 complaints. Stage 1 involved treeing the panthers with hounds, then tranquilizing and fitting them with radio transmitters. Stage 2 reinforced this initial aggravation by treeing them again when they returned to the vicinity of the complaint. The panthers were then provoked into leaving the tree while the hounds were restrained from further pursuit. Our intention was to teach the panthers that they could escape the hounds by leaving the area. Stage 3 simulated these previous uncomfortable experiences by approaching the panthers while broadcasting taped recordings of the same hounds. Stages 2 and 3 were implemented 13 times over a 2-year period and resulted in varying responses on the part of the panthers. It appears that some degree of avoidance and fear of humans can be instilled in panthers when combining instinctively threatening sounds such as baying hounds with reinforcement by painful experiences.

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4. Cougar Wise and Project CAT (Cougars and Teaching)

PATRICIA D. GRISWOLD[1], LISA BROWITT[2], KODI JONES[3], DAVID (DJ) LANDES[3] AND SPENCER OZBOLT[3]

The Cle Elum-Roslyn School District and the Washington Department of Fish and Wildlife began a program in 2001 called Project CAT (Cougars and Teaching). This effort combined a scientific investigation on cougar (*Puma concolor*) use of space and prey in an area undergoing development. As part of a community outreach to educate the local residents about the ecology of cougars living among the development, the 8th grade science and social studies classes developed a program known as Cougar Wise. Cougar Wise is a student-centered program that focuses on students educating others about living with cougars. The 8th grade students share their knowledge with the community from information they acquire through fieldwork, including snow tracking and telemetry monitoring of cougars, participating in the capture and collaring of cougars, inspection of predation sites, and necropsies of deceased cougars. Other activities include classroom discussions, viewing wildlife documentaries, and lab investigations. During 2005/2006, the 8th grade developed Cougar Wise to educate the community about the possible consequences of feeding deer and elk in residential areas during the winter. These activities may attract predators, particularly cougars, which may result in conflicts with livestock and pets and could pose risks to human safety. Prevention and protection are emphasized and the Voter Initiative process is explored as alternative ways to discourage wildlife feeding.

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MESOCARNIVORE HABITAT ASSOCIATIONS

TUESDAY, NOVEMBER 14 • 10:30 AM • GRAND BAY BALLROOM – NORTH

Moderator: Jeffrey Copeland

1. Geographic Distribution and Broad-Scale Habitat Relations of the Wolverine in the Contiguous United States

KEITH B. AUBRY[1], KEVIN MCKELVEY[2] AND JEFFREY COPELAND[2]

Conservation of wolverine (*Gulo gulo*) at the southern extent of its range in North America requires reliable understandings of historical and current distribution patterns and broad-scale habitat associations. We compiled wolverine occurrence records from the contiguous U.S. and spatially referenced all verifiable and documented records that had temporal precision <10 yr and spatial precision <36 mi^2 (93.2 km^2). We located 820 wolverine records from 24 states dating from 1801 to 2005, and spatially referenced 729 records dating from 1827 to 2005. Historical (pre-1960) records are located primarily in the western mountains and the Great Lakes region; we found little evidence of wolverine occurrence in the northeastern U.S. Our results and ancillary genetic studies show that the historical distribution of wolverine in the Pacific states was disjunct, not continuous as previously believed. Wolverine range contracted substantially in the contiguous U.S. during the 20th century. Current (1995-2005) wolverine distribution is limited to north-central Washington, northern and central Idaho, western Montana, and northwestern Wyoming. Causal factors for the extirpation of wolverines in California, Colorado, and Utah are unknown, but are probably related to high levels of human-caused mortality and low or nonexistent immigration rates. We also investigated hypotheses that wolverine may be associated with attributes of alpine vegetation, very cold temperatures, or deep and persistent snow cover, and found strong associations with alpine habitat conditions in the western mountains. However, the only habitat layer that fully accounted for historical distribution patterns was snow cover that persists throughout the wolverine denning period.

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2. Habitat Affiliations of Sympatric Carnivores in Southern Illinois

PATRICK T. MCDONALD[1], CLAY NIELSEN[2], TONNY OYANA[3] AND WANXIAO SUN[3]

Few researchers have developed large-scale models of habitat use by sympatric carnivore species. We created habitat models for sympatric red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), and bobcats (*Lynx rufus*) over a 370,000-ha region in southern Illinois using multivariate statistics, remotely-sensed landscape data, and sighting data within a GIS. Our objectives were to determine potential habitat differences among species and create spatial maps of those differences. Habitat variables were quantified for 1-km^2 buffered areas around carnviore sighting locations. Following variable reduction, 5 variables were used for further analysis. Only one variable differed between coyote-red fox and coyote-bobcat pairings, demonstrating significant overlap in habitat affiliations for these 2 species groups. However, all 5 variables differed between red foxes and bobcats, indicating considerable differences in habitat affiliation between this species-group. We used the Penrose distance statistic to create habitat maps for red foxes and bobcats, respectively, based on the 5 variable dataset. Red foxes were affiliated with mixtures of agricultural and grassland cover, whereas bobcats were associated with a combination of grassland, wetland and forest cover. An independent set of sighting locations were used to validate these models; model fit was good with 65% of carnivore locations within the top 50% of Penrose distance values. Percent differences in species-specific Penrose distance values were then mapped. The greatest overlap in habitat affiliations between red foxes and bobcats were found at the interface between forested areas and more open habitats. Our study provides insight into habitat partitioning and overlap among sympatric carnivores.

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3. Ecology of American Badgers in California

JESSICA H. QUINN[1]

The American badger (*Taxidea taxus*) is currently listed as a Species of Special Concern in California. Badger populations seem to have declined or disappeared locally in several parts of the state, and suitable habitat is becoming increasingly fragmented by suburban and agricultural development throughout their range. Methods for assessing, monitoring, and managing badger populations statewide are currently lacking, in part due to a paucity of data on basic badger ecology in California. I am currently investigating the movement, behavior, and habitat use of 10 radio-implanted badgers in a fragmented landscape in Monterey County, California. Estimated badger home ranges are between 1 and 10 km^2. Male and related female ranges overlap, while non-related females occupy exclusive home ranges. Badgers use grassland and coastal sage scrub habitat more often than expected and avoid coastal oak woodlands. They are occasionally located in close proximity to residential areas. In the coming year, I plan to use these data to inform the development of monitoring methods for badgers than can be applied on a larger scale.

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4. Ecological Factors Associated With the Distribution of Canada Lynx Occurrence in Northern Maine

LAURA ROBINSON[1], DANIEL J. HARRISON[1], WILLIAM B. KROHN[2], JENNIFER H. VASHON[3] AND MARK A. MCCOLLOUGH[4]

Critical habitat has been proposed for the federally threatened Canada lynx (*Lynx canadensis*) in four areas of the USA, the largest of which would occur in Maine. We used an information theoretic approach to evaluate the associations among ecological variables and the occurrence of lynx tracks detected during systematic snow-tracking surveys conducted over 3 winters on 46 100 km^2 townships in northern Maine. Models were built using track detections (n=56) and non-detections (n=92) within 3.15 km^2 home ranges simulated within surveyed townships; model validation was based on reserve data from the 46 townships surveyed (n=10 detections, n=138 non-detections). Bobcat (*Lynx rufus*) occurrence, snow depth, fisher (*Martes pennanti*) harvest density, elevation, and snowshoe hare (*Lepus americanus*) density were predictor variables incorporated into 16 models hypothesized to explain presence versus absence of lynx. The relative performance of alternative models was evaluated using AIC. Hare density was determined by applying stand-scale estimates from field studies to a 2004 satellite-derived land cover map for northern Maine. The best logistic regression model associated the distribution of lynx occurrence with high estimated hare densities (associated with regenerating clearcuts) and the absence of bobcats. Overall model accuracy was 78% for the build dataset and 72% for validation data. The area predicted to have a high probability of lynx occurrence by the best model closely coincides with the area proposed for critical habitat designation in Maine. These results should be interpreted in light of model assumptions and data limitations and should not be applied to other regions of North America with different ecological conditions.

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BOTTLENOSE DOLPHIN FORAGING ECOLOGY II

TUESDAY, NOVEMBER 14 • 10:30 AM • WILLIAMS-DEMENS ROOM

Moderator: Damon Gannon

1. Bottlenose Dolphin Population Differentiation and Trophic Studies Using Carbon, Nitrogen, Sulfur Stable Isotopes and Stomach Content Analyses

NÉLIO B. BARROS[1], PEGGY OSTROM[2], CRAIG STRICKER[3] AND RANDALL WELLS[4]

We used a combined approach of stable isotope and conventional stomach content analyses in dietary and population differentiation studies of bottlenose dolphins (*Tursiops truncatus*) from central west Florida. Teeth obtained from dolphins stranded in Sarasota Bay (resident animals of known feeding history), the adjacent Gulf of Mexico, and from Charlotte Harbor were analyzed for their carbon ($\delta^{13}C$), nitrogen ($\delta^{15}N$) and sulfur ($\delta^{34}S$) isotopic signatures. Selected fish prey species collected in Sarasota Bay were also analyzed for C and N isotopes (ranges of $\delta^{13}C$: -16.2 to -10.2‰ and $\delta^{15}N$: 2.9 to 8.6‰). Sarasota Bay dolphins (n= 31) had significantly higher $\delta^{13}C$ and lower $\delta^{15}N$ values (ranging from -15.2 to -8.2‰ and 9.7 to 15.2‰, respectively) than Gulf and Charlotte Harbor animals. Isotope data for Sarasota Bay are consistent with preference for seagrass-associated fish prey, particularly pinfish (*Lagodon rhomboides*), as determined from stomach content analyses and behavioral observations. Ontogenetic trends for carbon enrichment ($\delta^{13}C$: r^2= 0.27, $p< 0.01$) and nitrogen depletion ($\delta^{15}N$: r^2= 0.32, $p< 0.01$) in Sarasota Bay dolphins suggest shifts in prey preference, prey movement between habitats (e.g., seagrass meadows, mangroves) and/or dolphin habitat use. Preliminary analysis of sulfur isotope data suggests nearly non-overlapping ranges in the few specimens analyzed, where estuarine < Gulf < offshore dolphins. Thus, animals inhabiting the Charlotte Harbor estuary, an area influenced by runoff from three major rivers, had significantly lower $\delta^{34}S$ values (7.2 ‰ ± 2.1 SD, n= 5) compared to other populations (inshore animals stranded in Gulf beaches: 10.3 ‰ ± 1.5 SD, n= 5; animals from the offshore ecotype: 17.3 ‰ ± 1.1 SD, n= 4), likely reflecting the freshwater signature acquired in these brackish waters. Stable isotopes hold great promise in tracing energy flow in pelagic, neritic and estuarine bottlenose dolphin populations and, together with stomach content analyses, can be used as tools in understanding trophic ecology, assessing ontogenetic variability at the individual and population levels, and assigning population identification of stranded animals of unknown history.

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2. Molecular Scatology As a Tool For Investigating Cetacean Diet: Development, Assessment and Application of DNA-Based Diet Investigation Methods For Bottlenose Dolphins

GLENN J. DUNSHEA[1], RUTH CASPER[1], SIMON JARMAN[1], MARK HINDELL[2], NÉLIO BARROS[3] AND NICK GALES[1]

Knowledge of diet is a fundamental aspect to understanding the ecology of any species. As observation of cetacean foraging is rare and inevitably biased, alternate indirect methods are currently used to investigate cetacean diet, including opportunistic stomach hard part analyses on stranded animals, as well as assessing the assimilation of fatty acids and stable isotopes from prey to predator tissue. While these methods have specific advantages dependent on the question being asked, they also have well-recognized limitations and biases. We investigated the efficacy of different polymerase chain reaction (PCR) molecular techniques to examine bottlenose dolphin (*Tursiops truncatus*) diet using scat samples collected under experimental conditions from captive animals fed a known diet. We compared two techniques that have different initial assumptions; detection of single prey species using Real Time PCR (RT-PCR) and species-specific primers and also detection of diet diversity using a modified "universal" primer approach. The results of these experiments are discussed in terms of the initial assumptions of each method and their ability to describe the known diet from the captive animals both qualitatively and quantitatively. With the experimental limitations of these methods defined, we apply them to examine the diet of free-ranging bottlenose dolphins from Sarasota Bay, Florida. A description of diet from these individuals is presented as well as a discussion of the implications of these methods for examining diet in a broader population context and testing hypotheses about foraging ecology.

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REPTILES

TUESDAY, NOVEMBER 14 • 10:30 AM • HARBOR VIEW ROOM

Moderator: Laurie Macdonald

1. Trends and Patterns of Wild American Alligator Attacks on Humans in Florida

ALLAN R. WOODWARD[1], DENNIS N. DAVID[2], JOHN M. WRUBLIK[3] AND PAUL S. KUBILIS[1]

We evaluated the trends and patterns of 279 unprovoked American alligator (*Alligator mississippiensis*) attacks on human beings during 1948-2005. The estimated frequency of attacks increased (P = 0.001) at an annual rate of 2.9% during 1971-2004, but the rate of attacks per Florida resident did not show a significant trend (P = 0.635). Most victims (93.2%) were Florida residents and attacks generally occurred in residential areas (72.6%). Monthly frequency of attacks was positively correlated (r = 0.94) with air temperatures and not correlated (r = -0.25) with testosterone concentrations in adult male alligators, suggesting that attacks are more related to temperature than mating season aggression. Most attacking alligators were males (76.9%). We found only one instance where an attack was associated with an adult female alligator defending her eggs or young. Victims were predominantly male (83.2%), and no specific age group was at greater risk. Most victims were in the water or at the waters edge (87%) when attacked. Attacking alligators were not observed prior to biting the victim in 79% of attacks, suggesting that alligators usually used stealth when attacking humans. Evidence of attacking alligators being fed prior to the attack was documented in 34.7% of cases. Seventeen fatalities were attributed to alligator attacks. Alligators involved in fatal attacks were in good condition with few deformities or injuries. Alligator attacks in Florida appear to be feeding attempts, although in slightly over half of the incidents (53%), the attack consisted of a single bite then release, suggesting that alligators were unsure of their prey. The risk of alligator attack can be limited by better educating humans likely to interact with alligators and by more aggressively removing large alligators in residential areas.

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2. The Effectiveness of Bycatch Reduction Devices on Crab Pots At Reducing Capture and Mortality of Diamondback Terrapins in Florida

JOSEPH A. BUTLER[1] AND GEORGE L. HEINRICH[2]

Diamondback terrapins (*Malaclemys terrapin*) drown in blue crab (*Callinectes sapidus*) pots throughout their range. The objectives of this study were to: 1) test if bycatch mortality of diamondback terrapins in commercial crab pots is reduced by using bycatch reduction devices; 2) determine if bycatch reduction devices affect crab catch in Florida by comparing sex, size, and number of blue crabs captured in standard crab pots with those captured in pots equipped with bycatch reduction devices; and 3) formulate recommendations to the Florida Fish and Wildlife Conservation Commission for regulations that reduce terrapin bycatch mortality in Florida waters. We fished 15 standard crab pots (controls) and 15 crab pots with bycatch reduction devices (experimentals) at study sites located in eight Florida counties from 2002-2005. We determined sex of all captured terrapins and crabs and took measurements of each that would allow us to evaluate if bycatch reduction devices affected the size of either species. Thirty-seven terrapins were caught in control pots and four in experimentals. We found that 73.2% of the terrapins in this study could have been prevented from entering crab pots with functional bycatch reduction devices. There were no significant differences between the sex, measurements, or number of legal-sized crabs captured in control and experimental pots at any of the study sites. We recommend that the Florida Fish and Wildlife Conservation Commission devise and adopt regulations that require the use of 4.5 x 12 cm bycatch reduction devices on all commercial and recreational crab pots in Florida without delay.

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3. Neurological Pathology in Alligators Driven by Ecosystem Change: Thiamine Deficiency Associated With a Shad Diet

JAMES PERRAN ROSS[1], DALE C. HONEYFIELD[2], DWAYNE CARBONNEAU[3], SCOTT TERRELL[4], ALLAN WOODWARD[3], TRENTON SCHOEB[5], H. FRANKLIN PERCEVAL[6] AND JOY P. HINTERKOPF[2]

We have demonstrated that an episode of unusually high mortality of adult alligators (*Alligator mississippiensis*) between 1998 and 2001 in one lake (Lake Griffin) in central Florida is associated with neurological symptoms and lesions. Alligators from Lake Griffin with these symptoms have lower levels of thiamine in their muscle and liver than apparently healthy alligators or alligators from other lakes where this pathology is not reported. We also investigated and rejected possible alternative causes of alligator mortality including a standard suite of pesticide contaminants, organochlorines, heavy metals, and bacterial and viral disease. We examined, but were unable to demonstrate an association between alligator mortality and blooms of cyanobacteria (*Cylindrospermopsis raceborskii*).

We investigated the diet of alligators and demonstrated that alligators in Lake Griffin and several other nearby lakes eat primarily fish and consume a significant quantity of gizzard shad (*Dorosoma cepedianum*) their diet. Shad occurred in 57% of Lake Griffin alligator stomachs and comprise up to 87% of the total biomass consumed. We measured thiaminase activity in gizzard shad of 16,409+ 4.9 pmol/g/min.

In a controlled experiment with seven wild adult alligators held captive, we induced low levels of blood and muscle thiamine in alligators fed exclusively on gizzard shad for 4-12 months. These alligators demonstrated a syndrome of reduced activity, anorexia, low thiamine and neurological lesions similar to alligators in Lake Griffin. In two cases we reversed this syndrome by feeding supplementary thiamine, although in one case the alligator retained neurological lesions after return to normal thiamine status.

Over the period of this study 2000-2002 the rate of alligator mortality in Lake Griffin declined. This change was associated with higher water levels, improved water quality, removal of large quantities of shad from the lake by commercial fishing and a reduction in the intake of shad by wild alligators.

We hypothesize that the neurological pathology and mortality in Lake Griffin alligators was a result of a diet of shad containing high levels of thiaminase, similar to the syndrome demonstrated for andromodous fish in the Great Lakes and Baltic. In Lake Griffin, this syndrome appears to be associated with, and possibly driven by, changes in water level and water quality that affect the euotrophic state and composition of fish (shad) fauna in the lake. This association of environmental change and degradation, and pathology of a top predator driven by faunal and diet shifts, suggests the complex interaction of factors leading to aquatic ecosystem disruption. The function of cyanobacteria blooms and toxins in mediating these effects deserves further study.

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4. Alligators and Crocodiles: Redefining Our Relationship with Florida's Charismatic Carnivores

FRANK J. MAZZOTTI[1]

Florida is the only place in the world where both alligators (*Alligator mississippiensis*) and crocodiles (*Crocodylus acutus*) occur. The American alligator reaches the southern end of its range in Florida, where more than a million alligators are estimated to live in just about any body of water large enough to contain one. The American crocodile reaches the northern end of its range in southern Florida, where about 1000 crocodiles live in coastal areas between Fort Myers and Fort Lauderdale. In some locations, especially in Everglades National Park both alligators and crocodiles can be seen together. As a result of growing populations of crocodiles and humans, increasing interaction between both crocodilian species and humans, and continued degradation and destruction of their habitat, both state and federal governments are reevaluating the status of crocodilians and research, management and monitoring programs. There are more American crocodiles, and nests, in more places now than in 1975 when they were declared endangered by the USFWS. As a result of this improvement of crocodile population the USFWS has the reclassification of the American crocodile from endangered to threatened under review. In Florida, increasing interactions between alligators in humans, culminating with three fatal attacks in two weeks last May has the FFWCC reevaluating management programs for alligators in Florida. In spite of increasing attention paid to interactions between crocodilians and humans perhaps the most important role for both species today is as indicators of ecosystem change. Greater Everglades ecosystems in southern Florida are undergoing an extensive and ambitious restoration effort that is now estimated to cost more that 10 billion dollars. The strong and well documented linkages between both alligators and crocodiles and natural hydrological patterns have rendered both species as vital ecological components for both evaluation and assessment of ecosystem restoration efforts. In Florida, it is clear that charismatic, crocodilian carnivores communicate critical conservation concerns.

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LIVING WITH BEARS

TUESDAY, NOVEMBER 14 • 1:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Minette Johnson

1. Florida Bear Aware

JUDY GILLAN[1] AND LAURIE MACDONALD[2]

In Florida, human population growing at a rate of 1,100 people per day, coupled with bear movement across a shrinking habitat base due to development, roads and intensive public land use, has led to an increase in human-bear conflicts. Preventing negative human-bear incidents is integral to public safety and to support for sustaining and recovering the state threatened Florida black bear (*Ursus americanus floridanus*). Proactive efforts to educate the public and respond to bear encounters through partnerships and individual actions by Defenders of Wildlife, the Florida Fish and Wildlife Conservation Commission and the U.S. Forest Service include: Florida Bear Aware activities and materials, the Florida Black Bear Curriculum Guide and trainings, the Bear Agent Response program, the Annual Florida Black Bear Festival and funding of bear proof equipment. Through education and visitation programs, thousands of children and adults have directly received information about the conservation needs of the Florida bear and how to responsibly avoid or respond to encounters with bears in order to protect property, people and wildlife. Outreach through radio PSAs, press releases and providing timely, accurate information to news outlets has enabled many tens of thousands more to receive the bear aware messages. Surveys and studies have shown that periodically repeating community activities, as well as, significant expansion of the program, are both needed to successfully address bear and human needs.

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2. The Franklin County Bear Management Initiative; a Case Study

ADAM WARWICK[1], ROBBIE EDALGO[2] AND BILLY SERMONS[3]

This paper will evaluate an experimental approach used by The Florida Fish and Wildlife Conservation Commission (FWC) in its attempt to generate and promote collaborative efforts to address conflict between humans and bears (*Ursus americanus floridanus*). Out of this approach grew The Franklin County Black Bear Management Initiative, a case study that will be used elsewhere if it proves successful. The lessons learned and successes enjoyed in this initiative unfold in a three-phase approach used in the case study. Phase I gave participants an opportunity to acquire an appreciation for the bear-human conflicts from multiple perspectives and then address those viewed as most important. The objective Phase II was to create strategies (Action Plans) that specifically addressed the major bear related issues identified in the Phase I. The Actions Plans that were most successful were those areas that could most easily be affected during participants' daily work routine. The goal of Phase III was to identify those participants that had the greatest potential to positively influence certain portions of the implementation strategies. This paper evaluates the Franklin County Black Bear Initiative as a Case Study and seeks to serve as an example for citizens, local/state governments seeking to achieve progress in human-wildlife conflicts.

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3. Determining the Impact of Relocation on Nuisance Florida Black Bears

KIMBERLY M. ANNIS[1] AND MELVIN SUNQUIST[2]

Despite the widespread use of relocation as a management tool to reduce human-wildlife conflicts, few guidelines have emerged and questions remain concerning the efficacy of the technique. The Ocala National Forest Region (ONFR) in central Florida has dense and rapidly growing human communities along the forest boundary where human-bear interactions, and subsequent bear relocations, are frequent. The purpose of this study is to investigate the impact of relocation on nuisance Florida black bears (*Ursus americanus floridanus*) in the ONFR, and to examine the efficacy of relocation as a management tool as practiced by the Florida Fish and Wildlife Conservation Commission (FWC). Our objectives are to quantify the effects of relocation on survivorship, movement, home-range, and continued nuisance activities, and to determine relocation "success" based on these factors. Forty-three bears were uniquely tagged, tattooed, fitted with radio-collars and relocated into ONFR between 25 May 2004 and 31 December 2005. Twenty-four are currently collared and will be monitored until 31 December 2006. Preliminary data suggest that the mortality rate may be lower than anticipated; two bears are confirmed dead, one bear is presumed dead. To date, eight bears returned to capture area traveling 24-80 kilometers from release site. Twelve bears continued with nuisance activities and four were recaptured for these activities. Seven bears reside near dense human communities with no current documentation of continued nuisance activities. The results of this study will provide state managers information needed to assess the value of relocation as a management tool.

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4. Techniques For Keeping Bears Alive and Wild in the Lake Tahoe Basin

ANN BRYANT[1]

A variety of techniques have been utilized by BEAR League and the Tahoe Council for Wild Bears (TCWB) to prevent and address human/bear (*Ursus americanus*) conflicts in Lake Tahoe, California. Community outreach and education are major components of the work these groups do, including giving presentations, slide shows, and talks and distributing educational materials to local homeowners associations, tourists, businesses, and other interested groups throughout the year. A regular column in the local newspapers keeps bear awareness prominent in the community. In addition to their educational efforts, the BEAR League works with local governments to establish and enforce trash storage ordinances in areas with high conflicts, and to buy equipment to reduce problems. The Tahoe Council for Wild Bears secured funding to replace commercial dumpsters with bear-proof receptacles. TCWB also purchased bear-resistant backpacking canisters, which are available for loan at local Forest Service Visitor Centers, to promote coexistence between recreationists and bears. The BEAR League also manages a 24-hour hotline, and works closely with volunteers and local law enforcement officials to ensure a quick response when conflicts are reported. They use aversive techniques, such as noisemakers and Karelian bear dogs, to convince the bears that the best place for them is in the forest, and not in a residential neighborhood eating human trash. By informing residents and visitors in bear country of simple ways to properly store garbage, food, and other bear attractants, conflicts between humans and bears have been reduced significantly in the Tahoe area.

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MESOCARNIVORE RE-INTRODUCTION & RECOVERY

TUESDAY, NOVEMBER 14 • 1:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Nina Fascione

1. Evaluating the Demographic Factors That Affect the Success of Reintroducing Fishers and the Effect of Removals on a Source Population

ROGER A. POWELL[1] AND WILLIAM J ZIELINSKI[2]

In California, fishers (*Martes pennanti*) persist only in northwestern California and in the southern Sierra Nevada Mountains. The population in the southern Sierra Nevada is assumed to be small and its viability is uncertain. We modeled fisher populations using Vortex to gain insight into 1) whether re-establishing a fisher population in the northern Sierra Nevada Mountains is feasible; 2) whether the fisher population in northwestern California will remain viable if fishers are removed for release elsewhere; and 3) if fishers dispersing from a re-established population in the northern Sierra Nevada could possibly benefit the southern population. We used probability of extinction as an index of population viability. Removal of up to 20 fishers per year for as long as 8 years from the northwestern California population is predicted to have little effect on the viability of that population. The probability of a successful reintroduction of fishers to the northern Sierra Nevada Mountains increases with the number of years that fishers are released and with the number of females released. Dispersing fishers from a re-established population in the northern Sierra Nevada that might reach the southern population are predicted to reduce the probability of extinction for that southern population. If reintroduction is to proceed, the next steps are: 1) a more critical examination of the characteristics of the northwestern population to validate our modeling assumptions; 2) a thorough investigation of the distribution and abundance of habitat and prey in potential reintroduction areas; and 3) an evaluation of the genetic implications of transplantation.

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2. Re-Establishment of Fisher Populations in Washington

JEFFREY C. LEWIS[1], HARRIET L. ALLEN[1], GERALD E. HAYES[1] AND PATTI HAPPE[2]

Fishers (*Martes pennanti*) historically occurred throughout much of the low to mid-elevation forested areas of Washington, but were extirpated primarily as a result of historical over-trapping and loss and fragmentation of habitat. The fisher was state listed as Endangered in Washington in 1998 and the Washington Department of Fish and Wildlife (WDFW) has written a recovery plan for the species. The recovery plan identifies reintroduction as the only means of recovery and the WDFW has initiated planning efforts with partners for the first reintroduction into the state. A feasibility assessment for the Olympic Peninsula and the Cascades was conducted to determine the amount and configuration of suitable fisher habitat in Washington and to evaluate its capability to support a fisher population. Three potential reintroduction areas were identified. The Olympic Peninsula had the largest amount of suitable fisher habitat; the largest amount of habitat on public lands; the largest amount of suitable habitat in protected status, the largest land area with >50% suitable habitat; and the highest predicted carrying capacity of fishers. The west side of Olympic National Park (ONP) was identified as the best location for the first reintroduction. Genetic analyses indicate that British Columbia and western Alberta would be the most suitable source populations for Washington. A NEPA analysis is being conducted for a proposed fisher reintroduction on ONP and an implementation plan has been written to guide the reintroduction. If approved, approximately 100 fishers would be reintroduced to ONP over a period of 2-3 years. Additional reintroductions are planned in the Cascades.

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3. Estimating Occupancy and Detection Probabilities of American Marten in the Black Hills of South Dakota

JOSHUA B. SMITH[1], JONATHAN JENKS[1] AND ROBERT KLAVER[2]

Following a fifty year absence, American marten (*Martes americana*) were reintroduced to the Black Hills of South Dakota in 1980. Baseline data to determine the distribution and abundance for the population post-reintroduction was obtained in 2002 using a track-plate box survey methodology. While estimating abundance through indirect sampling techniques is a widely used concept in wildlife management, results are often biased when a species has low detectibility, which obscures the true occupancy level. Our objectives were to estimate the occupancy rate (psi) and determine the probability of detection (p) when marten occur at low (≤ 1 marten) or high (>1 marten) densities within 10.2 km^2 survey quadrants. Of 26 quadrants surveyed with track-plate boxes, eight (31%) detected marten. Upon completion of this survey, we initiated a mark-recapture study to obtain density estimates for seven of the eight quadrants where marten were detected. We placed 20 live traps in each quadrant for a minimum of 200 trap nights per quadrant. Using the occupancy model in program MARK, we determined that occupancy rates differed between the northern (psi=0.452, se=0.073) and central (psi=0.069, se=0.026) Black Hills. We estimated detection probabilities for marten occurring at low (0.101, se = 0.064) and high (0.615, se = 0.066) densities. Results from this study combined with ongoing research will be used to estimate marten distribution and abundance in the Black Hills.

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4. Genetic Diversity Lost and Gained: Conservation Genetics of the Black-Footed Ferret

SAMANTHA M. WISELY[1], SARA MUETING[1], RACHEL M. SANTYMIRE[2], TRAVIS M. LIVIERI[3] AND JOGAYLE HOWARD[4]

The black-footed ferret (*Mustela nigripes*) has lost more than 90% of its historical genetic diversity and monitoring the remaining diversity is a management priority. During a genetic survey of reintroduced populations, one of 25 sampled individuals from Arizona contained a unique microsatellite allele not found in the captive, founding population. As a consequence, Arizona had higher average allelic diversity than any other reintroduction site. Reintroduced individuals in South Dakota had an average of 2.0 alleles per locus, Wyoming's average was 1.43, and Arizona's was 2.14. Two explanations exist for the unique genetic signature in Arizona. The most likely explanation is that the new allele was the result of mutation. The second explanation is that a small remnant population of native black-footed ferrets introgressed with the reintroduced population. Although a remote possibility, the importance of such a population would be so great, that we surveyed DNA from museum specimens of historical populations in the area to assess the probability of such an occurrence. Mitochondrial DNA control region proved unsuitable, as historical diversity was extremely low (nucleotide diversity = 0.001). The microsatellite allele that was unique to the contemporary Arizona population was also present in the historical population. Further screening for a microsatellite locus diagnostic of historical or contemporary populations will be needed to identify the origin of the unique allele. Regardless of the outcome, the increase in genetic diversity is a bright spot in the conservation of this endangered species.

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BIRDS OF PREY

TUESDAY, NOVEMBER 14 • 1:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Kim Delfino

1. Distribution and Habitat Use of the Florida Burrowing Owl in Non-Urban Areas

MARK S. MUELLER[1], MELISSA GRIGIONE[2] AND RONALD SARNO[3]

Statewide distribution and habitat use of the Florida burrowing owl (*Athene cunicularia floridana*), a "Species of Special Concern," is not well-understood, particularly in remote, non-urban areas. This study expanded our knowledge about non-urban burrowing owls. We first compiled existing databases of historic sighting observations. Fieldwork verified and updated existing point records and also yielded new locations. Using a GIS, we characterized observed landuse, landcover, relevant soil attributes, and managed area status for selected points. We quantified landcover within set distances around burrows from our own field-verified records. Using standard resource selection methods, we compared observed and available proportions of habitat, calculated selection indices, and determined selection/avoidance for each landcover class. These empirical results were used in combination with expert opinion and literature reviews to finalize "suitable" landcover criteria. Suitability of relevant soil attributes were also empirically determined and used to further reduce the overall "suitable" area. Both distributions were compared and mapped. The final habitat maps appear to relate well to the overall distribution of known non-urban burrowing owl records and demonstrate that a great deal of potentially suitable breeding habitat exists throughout Florida's central interior. Improved pasture, the most prevalent landcover class, also appears to be the most strongly selected in our study and may be of high importance to non-urban breeding burrowing owls. These results may assist wildlife managers. Our recommendations include improving surveys and conservation efforts in non-urban areas and enhancing cooperation with landowners, particularly ranchers, as success on private lands seems critical to the long-term persistence of this species.

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2. Florida Burrowing Owls in a Rural Environment: Elucidating the Spatial Ecology and Comparison of Diet

ROBERT MRYKALO[1], MELISSA GRIGIONE[2] AND RONALD SARNO[3]

Most of the ecological data on Florida burrowing owls (*Athene cunicularia floridana*) was collected in the late nineteenth and early twentieth centuries on dry prairie habitat in south-central Florida. Besides these early observations, there have been no detailed studies of burrowing owls in rural areas to document productivity, survival, prey preference, dispersal, or habitat requirements (breeding and post-breeding). Our study consisted of elucidating the spatial ecology of juvenile burrowing owls in a rural environment utilizing necklace radio transmitters and comparing the diet and potential prey of burrowing owls in a rural versus urban environment. Radio-telemetry data indicate that juvenile burrowing owls remained close to main and satellite burrows on pasture land during daylight and avoided the pasture at night. Dispersal of juvenile burrowing owls coincided with the flooding of burrows during the rainy season. Juvenile owls did not return to the pasture after surface water had dissipated and instead utilized saw-palmetto and live-oak habitat surrounding the pasture. The diet and potential prey comparison indicates that insects and arachnids were the most frequent prey item at both the urban and rural study area. Burrowing owls in the rural environment had a significantly different diet than burrowing owls in the urban environment with birds and reptiles more frequently preyed upon in the urban study area. Pitfall trapping indicated that certain insect families may be more abundant in the rural versus urban study area.

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3. The Effects of Translocation on Florida Burrowing Owls

PER A. NIXON[1], MELISSA GRIGIONE[2] AND RONALD SARNO[3]

At present, the Florida burrowing owl (*Athene cunicularia floridana*) is being threatened by extensive habitat development throughout their small range in the state. Unfortunately, developers are able to collapse burrowing owl burrows during the nonbreeding season and flush the owls from an area. In other areas such as Arizona and British Columbia, translocation is being utilized to mitigate the effects of development on burrowing owls. In February 2006, the only translocation of burrowing owls in Florida was conducted by Mosaic Phosphate Company. Our study examined the effects of this translocation on prey availability and diet for a population of Florida burrowing owls in Hillsborough County, Florida. To analyze diet, we dissected regurgitated pellets collected before, during and after the translocation to yield the proportions of prey items consumed by the owls. Insect trapping was conducted at control and translocation sites to quantify the potential prey items present in these habitats. We combined the results from the diet analysis and insect trapping in an abundance index in order to develop an ecologically meaningful prey availability score. Preliminary results indicate that the presence of prey is lower at the translocation site. Conversely, results from the diet analysis show similar proportions and numbers of insects consumed in the study areas. It appears that prey availability for burrowing owls is not affected by lower relative abundance of insects at the translocation site. Indeed, there may be a point of prey saturation, where more prey present does not mean more prey available.

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4. The Effects of Other Foragers on the Foraging Success of Piscivorous Wading Birds

ERIC D. STOLEN[1] AND JAIME COLLAZO[2]

Many studies of bird-prey interactions assume that prey availability is important in determining foraging success. Factors that affect prey availability include habitat structure, prey abundance and the hunting skill of the predator. However, social factors such as the effects of other foragers on prey availability are often overlooked. We investigated the relative importance of fish density and the presence of other foragers on the foraging success rate of great egrets (*Ardea alba*), snowy egrets (*Egretta thula*) and tricolored herons (*E. tricolor*). Our objective was to test the hypothesis that individual foragers benefited from the presence of other nearby foragers (the social facilitation hypothesis). We measured the success rate of piscivorous wading birds foraging alone and in mixed-species aggregations, and also measured prey density and other environmental variables at foraging sites and nearby unused sites. Foraging sites had higher biomass (but not density) than the average level available throughout the landscape. Foraging groups occurred at the sites with higher prey density (but not biomass) than solitary foragers. We found that great egrets benefited from foraging in groups, while tricolored herons did not. Snowy egrets appeared to suffer a cost for foraging in groups. Thus, the social facilitation hypothesis was supported for one species, but other explanations are needed for group foraging as a general trait for piscivorous wading birds.

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REPRESENTING THE ANIMAL

TUESDAY, NOVEMBER 14 • 1:30 PM • HARBOR VIEW ROOM

Moderator: Sharon Wilcox

1. Perceptions of Carnivores

KARLYN I. ATKINSON BERG[1]

This presentation will provide an unusual pictorial view of the humorous and frightening ways in which carnivores have been depicted in art, history, editorials and advertisements, ranging from ancient visions to current depictions. The illustrations will go far beyond commonly seen images of Goldilocks and Little Red Riding Hood to discuss more complex and mythic portrayals of several carnivore species. The depth and persistence of these themes cannot be explained by citing childhood stories or lack of scientific knowledge. Some multiple complex and overlapping themes persist even in light of current knowledge and continue in modern versions of the same myths. Our established perceptions of carnivores have been grounded in a tapestry of fear, woven with grim images of wilderness spaces. This historic review will demonstrate how attitudes shaped depictions, and how caricatures became established as the true nature and behavior of the species. Discussion will focus on how these images still shape peoples' perceptions of predator and carnivore species that may be reflected in their fears or lack of tolerance of carnivores that, as a consequence, will have impact on carnivore management. Cultural attitudes have defined objectives of wildlife management and continue to define which species humans desire in greater numbers, and which species remain targets for elimination as hostile obstacles to human progress.

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2. *Julie of the Wolves* and the Conservation Ethos: Teaching Wildlife To Children in An Urbanizing Age

REBECCA ONION[1]

Jean Craighead George's 1978 young-adult novel *Julie of the Wolves* is a coming-of-age story about an Inuit girl who, at thirteen years old, gets lost on the North Slope of Alaska and manages to get adopted by a wolf (*Canis lupus*) pack. Julie communicates with the wolves through body language, befriends pups, eats the regurgitated stomach contents of the hunting adults, and even nurses from a female wolf. The book won the Newbery Medal for children's literature, and has been popular ever since, perpetually assigned in middle school language arts curricula and spawning two novel-length sequels, as well as several picture books for younger children. Native Alaskans have criticized George's novel for its numerous cultural inaccuracies. However, for us as conservationists, the book raises other questions about the production of lasting conservation ideals in its readers. Although George's stance is one of conservation—in her acceptance speech for the Newbery Medal, she waxed eloquent about the beauty of the tundra and of the wolves, and about the need to protect both from human encroachment—her book assumes an unnatural intimacy between wolf and child, one which may produce more confusion than elucidation about the nature of wildlife. What is the impact of the book's assumptions about the society of the wolf pack, and about humanity's ability to access that society? What is the picture that children who grow up in a suburban or urban location, far from regular interaction with wildlife, get from this book? This paper will examine these questions using the text of *Julie of the Wolves*; other books from this time period that present children with images of wildlife as companions, including George's *My Side of the Mountain* (1969) and Scott O'Dell's *Island of the Blue Dolphins* (1960); contemporary reception, including book reviews and newspaper articles; and the responses of present-day children to the book.

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3. Constructing the Bear: Representing the Grizzly in the American Imagination

SHARON WILCOX[1]

In 2005, *Grizzly Man* premiered at the Sundance Film Festival, where audiences and critics greeted it with enormous enthusiasm. Exploring the life and violent death of controversial wildlife activist Timothy Treadwell, the film was subsequently released to theaters, on DVD, and on the cable station The Discovery Channel, reaching widespread audiences throughout America. Attaining a level of recognition not normally granted to documentary film, *Grizzly Man* became one of the most prevalent representations of grizzlies (*Ursus arctos horribilis)* in contemporary popular culture, contributing to larger social understandings of the bear. The film's popularity is indicative of an ongoing fascination with grizzlies in the collective American imagination. This paper is concerned with the representation and perception of the grizzly bear in American society. Examining the plurality of ways in which the grizzly bear is represented in American culture, this study seeks to understand what these constructions tell us about how Americans understand and communicate about grizzlies, and even more importantly, how this affects attitudes, actions, and policies related to these animals. This paper will address how representations of the grizzly bear in popular culture have very real effects "on the ground" in grizzly inhabited areas and in the arena of public policy. Specifically, this paper will examine the role of anthropomorphism in understanding wildlife, arguing for a reconsideration of the place of grizzly bears, and wildlife in general, in American society.

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LIVING WITH COYOTES

TUESDAY, NOVEMBER 14 • 3:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Camilla Fox

1. Coyotes in Our Midst: Conflicts, Controversies & Strategies For Coexistence

CAMILLA H. FOX[1]

The extirpation of large predators, coupled with habitat conversion, has led to increases in coyote (*Canis latrans*) numbers and range throughout much of North America. Humanized landscapes have worked to the coyote's advantage by offering an abundance of edge habitat as well as food, water, and shelter. Intentional and unintentional feeding of coyotes has led to increasing encounters and conflicts. How communities address such conflicts lies at the center of public debate, with passionate viewpoints on both ends of the political spectrum. However, many state wildlife agencies and local municipalities lack the resources to effectively implement proactive strategies before sightings and encounters escalate to conflicts. The lack of agency coordination, combined with a populace largely uneducated about wildlife and conflict issues, hinders effective conflict resolutions. As a result, community response to coyote conflicts is usually reactive and fails to address the root of most conflicts: a constant food source. Failure to address these systemic issues often leads to a vicious cycle of trapping and killing. This presentation provides case studies of effective strategies for reducing coyote conflicts, and suggestions for how communities can implement proactive measures that address the root of conflicts.

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2. Uneasy Neighbors: Ecology of Coyotes and Conflict Management in the Chicago Metropolitan Area

STANLEY GEHRT[1]

In recent years, coyotes (*Canis latrans*) have expanded their presence in major metropolitan areas across the United States. Their increased presence has resulted in real, and perceived, conflicts with people. However, information is needed on the extent of conflict that actually occurs between coyotes and people in urban systems. I report on ecological aspects of coyotes in the Chicago area, the results of a 6-year study as they relate to coexistence between coyotes and people. These aspects include landscape use by coyotes, food habits, and the relative number of coyotes that become nuisances. Radiotracking has revealed coyotes using most areas of the landscape with extensive movements. Coyotes, whether resident packs or solitary transient, exhibit tremendous variation in the ways individuals exploit the landscape. Removal efforts with the goal of reducing local populations are unlikely to succeed due to re-colonization by solitary transients. Dietary analysis has revealed that most coyotes do not rely on human-related foods (only 2% of scats with anthropogenic foods). Consequently, only 2% of 175 coyotes radiotracked in this study eventually became nuisance animals. In each case, these nuisance animals were exposed to feeding by people. These results strongly suggest that education may play an important role in modifying human behavior in the form of increasing awareness and tolerance, combined with discouraging wildlife feeding, to prevent coyote-human conflicts in urban systems.

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3. Making the Management of Coyotes More Equitable and Practical

JONATHAN G. WAY[1] AND ERIC G. STRAUSS[2]

Traditional coyote (*Canis latrans*) management has been largely ineffective at reducing populations and resolving site-specific conflicts. Yet the majority of states have an unlimited season on coyotes (42 of 49; 85.7%). Legal killing methods include hunting, hounding, poisoning, trapping, and snaring, depending on state. One argument in favor of open seasons and lethal control is that coyote numbers have to be controlled because of their growth potential. Another contention in favor of lethal control is that it will keep coyotes scared of people. However, there is little quantified data on whether point and non-lethal aversive conditioning (e.g., chasing, making loud noises, using negative physical stimuli like paint ball guns) might be just as effective in the long run, especially in conditioning particular individuals to stay away from certain areas. Data indicate that coyotes regulate their own numbers in localized areas by living at low densities in guarded territories and that they are able to recolonize areas where other coyotes are killed very quickly. In addition, coyotes often have either larger litter sizes or higher litter survival when their numbers are artificially suppressed. Rather than setting liberal harvest seasons, which have proven ineffective in reducing coyote populations and resolving site-specific conflicts, managers should stress education and the value of predators as a primary management technique, especially to an urban public that often does not understand wildlife ecology. As a growing number of non-consumptive users recognize the coyote's ecological, economic (tourism), educative (using coyotes to teach science education), aesthetic, ethical and intrinsic value, these stakeholders ought to have a say in how coyotes and other wildlife are "managed."

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4. Practical Ethics For Coyotes and Other Predators

WILLIAM S. LYNN[1]

The argument for ethics in managing the relationship between humans, animals and their shared landscapes is compelling, and has initiated a moral turn in predator conservation. Over the last several years, the theoretical outlines of a practical ethics for predator conservation have emerged. First, ethics is an indispensable complement to the scientific and political processes of defining, implementing and assessing public policy. Second, like human counterparts, non-human animals have intrinsic moral value, distinct from but similar to that of human beings. Third, wildlife management has consequences for the well-being of people and wildlife, and therefore has an intrinsic moral dimension. Fourth, the most important questions of wildlife management and environmental protection are those over conflicting values about how we ought to live with people and other animals. To put these theoretical insights into practice, we need a methodology of practical ethics. This presentation outlines the use of principles and maxims in this regard. A principle is a moral concept used to identify the big-picture values at stake. Questions about whether coyotes have moral value, and how we balance the moral, social and ecological value of coyotes (*Canis latrans*), are examples where principled thinking is best suited. A maxim is a moral concept used to clarify our actions, to provide more focused guidance about what we ought to do, that is, what actions we should take on in every day. How we ought to live with coyotes in urban landscapes, or whether to use lethal or non-lethal control measures on 'problem' coyotes, are examples where a maxim is best used. By carefully attending to the contextual features of an ethically problematic case, the use of principles and maxims help produce a situated moral understanding. This should not be confused with rigid or absolute rules of behavior. Rather a situated ethic distinguishes better from worse ways of understanding the moral dimensions of a concrete situation. In so doing, it provides guidance into what the ethical issues are, and how we might best act for the well-being of people, animals and nature.

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MESOCARNIVORE BEHAVIOR

TUESDAY, NOVEMBER 14 • 3:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Keith Aubry

1. Assessing Variation in Boldness Levels Amongst San Joaquin Kit Foxes in Divergent Environments and Predicting Individual Suitability For Reintroduction

SAMANTHA BREMNER-HARRISON[1], BRIAN CYPHER[1] AND STEPHEN HARRISON[1]

Previous research strongly suggests that behavioral traits of individuals are an important consideration in conservation efforts. Environmental variation in optimal boldness levels plays an important role in terms of evolutionary and individual success. Reintroduced swift fox (*Vulpes velox*) showed lower optimal boldness levels when released in areas with predators. Reintroduced Channel island foxes (*Urocyon littoralis catalinae*) with high boldness scores paired and reproduced, suggesting that in the absence of predators higher boldness levels facilitate increased fitness. These studies indicate that optimal boldness levels exist for environments with differing selection pressures. Reintroduction of San Joaquin kit fox (*V. macrotis mutica*) is becoming increasingly possible due to habitat restoration, thus improving long-term recovery prospects. If animals are to be moved, it is imperative to select individuals with the greatest chance of survival. Behavioral profiling of individual kit foxes in one natural and one urban population in central California has been conducted to determine whether levels of boldness vary between the two habitats. Following live-trapping and marking, novel-object tests are conducted to provide individual behavior scores. Behavioral scores will be compared between the 2 sites, thus identifying foxes with the maximum suitability for becoming founders of a reintroduced population. Appropriate individuals would be those that show optimal levels of boldness for the release environment. Including behavioral suitability with the more traditional criteria of age, sex and genetic variability would boost opportunities for survival, fitness, and individual adaptability within a new environment, whilst reducing the number of individuals removed from source populations.

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2. Influence of Forest Practices on Winter Habitat Selection and Movement Paths By Canada Lynx in Maine

ANGELA K. FULLER[1], DANIEL HARRISON[1] AND JENNIFER VASHON[2]

Canada lynx (*Lynx canadensis*) are distributed widely, but little is known about lynx-habitat relationships in eastern North America. We studied winter habitat selection and compared frequency of snowshoe hare kills and tortuosity of foraging paths among 5 forest types to evaluate whether lynx selected stands based on highest snowshoe hare (*Lepus americanus*) densities (i.e., prey density hypothesis); on accessibility of hares (i.e., prey access hypothesis); or on areas with highest thermal and escape cover for lynx (i.e., thermal and escape hypothesis). At the stand-scale, lynx selected tall regenerating clearcuts (4.4-7.3 m, 11-26 years post-harvest) and established partially harvested stands (11-21 years post-harvest) and selected against short regenerating clearcuts (3.4-4.3 m, 11-26 years), recent partially harvested stands (1-10 years), and mature second-growth stands (>40 years, coniferous, deciduous, and mixed coniferous-deciduous). Further, fractal dimension of foraging paths was also greater in tall regenerating clearcuts and established partially harvested stands, suggesting that lynx were actively foraging in stands that provided intermediate to high hare density, intermediate cover for hares, and intermediate levels of canopy closure and live-tree basal area. Conversely, lynx exhibited lower relative preference for stand types with the highest densities of hares (>14,000 coniferous stems/ha). In managed landscapes within the Acadian forest, preferred foraging habitat for lynx is provided by regenerating areas with few overstory trees dominated by an intermediate-high density of conifer and deciduous saplings in the stem exclusion stage. Our results suggest that lynx base their foraging decisions on prey accessibility rather than solely on prey density.

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3. Spatio-Temporal Co-Occurrences and Den Use in Female Small Asian Mongoose Home Ranges

TYPHENN A. BRICHIERI-COLOMBI[1], PATRICK A. LEIGHTON[2], SHELLEY M. ALEXANDER[1] AND DONALD D. KRAMER[2]

The small Asian mongoose (*Herpestes javanicus*) is a solitary species in the family Herpestidae about which little is known concerning its social organization. Previous studies have shown evidence of social coalitions among males, but few studies have examined female interactions. The objective of this study is to determine whether females exhibit similar social coalitions to males by comparing spatio-temporal interactions among females on home and den ranges. Six female small Asian mongooses were radio-tracked during their active diurnal period for 3 months in Bath Beach, Barbados. Six nights per week, each mongoose was also tracked to its final resting location and den site locations were recorded. These data were imported into a Geographic Information System, and home range extent was determined using a 95% kernel estimator. We determined the extent of home range and den range overlap among all pairs of individuals using polygon subtractions. To determine spatio-temporal interactions, a 10x10m grid was generated across the overlapping area for each pair and point frequencies within each grid cell were compared using Spearman's correlation. Dens shared by several mongooses were analyzed for frequency and time of use. Home range overlap was high: 8 of 15 possible pairs had overlapping home ranges ranging from 68%-94%. Four pairs showed a significant positive correlation for interaction within overlapping home ranges. However, den range overlap was considerably less and few pairs shared common dens. These results suggest that there are social coalitions among females in Barbados, with implications for group territoriality.

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4. Comparison of Vocal Behavior in Pumas and Bobcats With Applications To Conservation

JACQUELYN G. POTTER[1] AND JEANETTE THOMAS[2]

Two years of data collection resulted in the first detailed, quantitative comparison of vocal behavior in two captive felid species; the puma (*Puma concolor*) and the bobcat (*Lynx rufus*). Recordings were taken of vocal behavior in a semi-natural setting at Wildlife Prairie State Park, Illinois. Acoustic data were logged into a database with behavioral information. Sonographic and statistical analysis resulted in a repertoire of 17 sound types for the pumas and a repertoire of 10 sound types for the bobcats. Further statistical analysis revealed associations between sound types and behaviors, allowing basic functional classification. These results were used for comparison between the two species. Two of the female pumas were observed in estrus, which presented the opportunity to record the effects of estrus on puma vocal behavior. Both species produced loud calls that carried at least 400 meters through the park. Since both species are protected under CITES Appendix II, applications to conservation are addressed. Specifically, acoustic analysis of field recordings based on known species' vocal characteristics and differences in individual voice structure has potential as a non-invasive population assessment tool. This may be of interest since pumas appear to be returning to areas where they were once extirpated (e.g., Michigan, Missouri). To date, studies of puma and bobcat acoustic communication have not been carried out in the wild, and data remains descriptive or undiscovered. Use of comparable sonograms, measurements, and descriptions from captive studies that can be compared to field recordings may improve recognition of sounds produced in the wild.

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5. Geographic Variation in Jungle Cat Body Size: Is Competition Responsible?

SHOMITA MUKHERJEE[1] AND COLIN GROVES[2]

There is a striking difference in body size of jungle cats (*Felis chaus*) in the west and the east of their distribution, with Israeli cats being 43% heavier than Indian cats. We tested the hypothesis that increasing competition from other small felids towards the east is responsible for the difference in body size. We measured jungle cat skulls for eight cranial and dental variables and related these to independent variables such as species richness (local and regional), latitude, longitude, temperature and precipitation. Data from a narrow band between latitudes 24.0° N and 33.9° N, where Bergmann's rule was largely not observed, showed that the western population (60.0° E longitude) showed size difference, most evident in the upper carnassials (P4L). Species richness at the regional level showed a significant negative relation to P4L. An even spacing in CBL for a small-cat guild from India through null model analysis indicated the occurrence of character displacement. The results support the hypothesis that competition is responsible for geographic variation in jungle cat body size in the region where Bergmann's rule does not apply.

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6. Carnivore Community Response To a Large Wildfire in San Diego County, California

PAUL A. SCHUETTE[1], JAY DIFFENDORFER[2], DOUGLAS DEUTSCHMAN[1] AND SCOTT TREMOR[3]

Understanding wildlife response to fire is crucial for assessing fire management practices in fire-prone habitats such as chaparral in southern California. From 10/25/03 to 11/5/03, the largest recorded wildfire in California history burned 113,425 hectares of this diverse, semi-arid shrubland in San Diego County. Beginning August 2005, we examined the impact of this wildfire on the carnivore community through motion-sensor cameras, track plots, and hair snares, three times per year along the fire perimeter, within the burn interior, and in unburned chaparral. Cameras detected coyotes (*Canis latrans*) at 59% of sites in the fall and 16% of sites in the winter. In contrast, gray fox (*Urocyon cinereoargenteus*) and bobcats (*Lynx rufus*) were detected at fewer sites in the fall (9% and 3%, respectively) than the winter (34% and 22%, respectively). No significant difference in activity among burn edge, burn interior, or unburned sites has been identified. Hair samples have been collected at 30% of camera stations and 70% of track plots, suggesting differences in detection methods. Hair analyses can increase sample size for presence/absence surveys and provide genetic structure to carnivore communities. Through these methods, we will continue surveys to determine carnivore activity differences across site categories and seasons.

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SEA OTTERS

TUESDAY, NOVEMBER 14 • 3:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Jim Curland

1. Patterns of Body Size, Growth and Condition Among Sea Otter Populations: What Can It Tell Us About Population Status?

DANIEL H. MONSON[1], JAMES BODKIN[1], JAMES ESTES[2] AND TIM TINKER[3]

An international fur harvest decimated sea otter (*Enhydra lutris*) populations during the 18th and early 19th centuries. Since that time sea otter populations have existed at every stage in the recovery process, allowing us to examine populations at various stages of resource limitation from newly founded populations with abundant food resources to long established populations existing at the limit of resource availability. Several metrics have been proposed to measure population status, including measurements of foraging efficiency and time activity budgets. Both have merit and can be measured with or without capturing individual animals, but generally require extended time in the field for observation work. Capturing animals to collect morphometric data provides direct morphological measures that can be used to evaluate body size and condition at a particular point in time. Here we examine sea otter length and mass data collected from several thousand individual otters over their entire modern-day range, and spanning several decades in time. Results suggest over-all length, mass and condition (mass/unit length) are sensitive indicators of food availability/quality, but across populations of varying status these measures change in a non-linear fashion in part because of other factors such as the cost of reproduction in females. Our goal is to find patterns in the body size, growth rate and over-all condition of sea otters relative to population status. Ultimately, the relations between sea otter morphological data and population status may inform our assessments of status of other species where similar data are available.

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2. Persistence of Spilled Oil in Nearshore Sediments and Pathways of Exposure To Foraging Sea Otters

JAMES L. BODKIN[1], BRENDA BALLACHEY[1] AND DANIEL MONSON[1]

In 1989, 11 million gallons of crude oil spilled in Prince William Sound, Alaska, causing widespread acute mortality and chronic effects in marine species that persisted at least through 2005. Unanticipated long-term consequences included retention of relatively fresh crude oil in sub-surface intertidal habitats and subsequent exposure to a suite of vertebrate species that occupy nearshore habitats and forage intertidally. Sea otters (*Enhydra lutris*) are one such species for which there is strong evidence that population recovery from the spill had not occurred by 2006. Hydrocarbon exposure, assessed by the cytochrome P4501A biomarker, was significantly higher in sea otters residing in oiled areas than in unoiled areas through 2002, but differences were declining over time and were no longer evident by 2003. Elevated mortality among prime age adults and liver pathology consistent with oil exposure were factors contributing to protracted recovery. In 2003-2004, we instrumented sea otters in Prince William Sound with radio transmitters and archival time-depth recorders (TDR's) in areas where lingering oil was most abundant to evaluate use of the intertidal zone by foraging sea otters and identify pathways of potential exposure to lingering oil. We recovered 16 TDR's in 2004 and 2005, representing more than 15 animal-years of continuous behavior recordings. We identified 1,075,212 forage dives with an average of 197 foraging dives per individual per day and a mean proportion of intertidal dives of 0.10 (range 0.02-0.25), or about 20 intertidal dives/d per individual. We detected a strong seasonal component to intertidal foraging with nearly twice the extent of intertidal foraging occurring during the spring as compared to the summer (0.33 vs. 0.18). Our results provide quantitative estimates of the use of the intertidal zone by foraging sea otters and demonstrate a direct pathway of exposure between a nearshore consumer and persistent intertidal oil.

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3. Recovery, Foraging Patterns, and Prey Selection of Washington's Sea Otter Population

HARRIET L. ALLEN[1], KRISTIN L. LAIDRE[2], RONALD J. JAMESON[3], STEVEN J. JEFFRIES[4] AND MONIQUE M. LANCE[4]

Sea otters (*Enhydra lutris kenyoni*), a State endangered species in Washington, were previously extirpated from the state and 59 were reintroduced in 1969-70. The population has been increasing at an average annual rate of 8.2% and with 814 otters counted during the 2005 survey. Recovery objectives, based on carrying capacity estimates, were identified in the State's sea otter recovery plan. The growth and expansion of this small, isolated population provided a unique opportunity to examine the relationship between dietary diversity and population status. Focal observations of foraging patterns and prey selection were collected between 1993 and 1999. Records consisted of 13,847 individual dives from 841 feeding bouts ranging from 1 min to >4 h. Average dive time was 55 s ± 0.9 SE and average surface time was 45 s ± 2.3 SE. At least 77% of all dives (n = 10,636) were successful prey captures. Prey capture success was significantly lower for sub-adults (63% ± 5 SE) than adults (82% ± 1 SE) (p 60% red urchins, *Strongylocentrotus franciscanus*), with only two other prey species comprising >10% of their diet. Significant increases in areal extent of two kelp species were found (0.4-0.5 km2 per year, $p < 0.05$) and suggest increasing suitable habitat for the growing population.

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4. Nutrient Composition of the Diet Consumed By Threatened Southern Sea Otters

OLAV OFTEDAL[1], KATHERINE RALLS[1], M. TIM TINKER[2] AND ALICE GREEN[3]

The slow rate of growth of the threatened sea otter (*Enhydra lutris nereis*) population in California has been perplexing to researchers and managers. Nutritional inadequacies are among the many factors potentially limiting recovery, and some recent findings including declining mass to length ratios, increasing time spent foraging, high dietary diversity, and high rates of infectious disease – are consistent with the hypothesis of nutritional limitation. We investigated potential nutritional constraints on this population by examining the nutrient composition (water, energy, fat, protein, amino acids, minerals and vitamins) of all significant prey species consumed by sea otters off central California, a region of high otter density with no population growth. We collected seasonal samples of more than 80 species of intertidal and subtidal invertebrates, including crustaceans, echinoderms, bivalves, gastropods, and sipunculans. We found a high degree of variation in the edible dry fraction (ranging from about 13-29% of whole prey) and energy density of otter prey, but most individual diets may be well-balanced. Otter prey tend to be low in fat (<10%, dry matter basis) and variable in protein content (ranging from about 36–70%, dry matter basis). Amino acids and most minerals are abundant in otter prey. Vitamin A and E levels appear to be low in some prey types compared to known requirements of other carnivores. We will characterize sea otter diets in more detail and compare them to the requirements of other mammalian carnivores to identify possible nutritional constraints on the California population.

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5. No Place Like Home: a Comparison of Habitat Use Strategies Between Southern Sea Otter Populations of Varying Density.

ALISHA H. KAGE[1], GENA B. BENTALL[2] AND LAURA C. YEATES[2]

Resources such as food and mate availability are tightly correlated to fitness and can exert a strong influence on predator movement and habitat selection. There is a growing body of evidence that California's southern sea otter (*Enhydra lutris nereis*) population is food limited at the center of its range. Due to high energetic requirements, sea otters are sensitive to reductions in prey availability, and at high densities face the challenge of balancing energetic and reproductive demands. Several strategies for achieving both reproductive and foraging success have been described in terms of spatial use in male sea otters: 1) territorial (single, multi-use home ranges), 2) semi-territorial (multiple, spatially divided home ranges), and 3) "sneaker" (non-territorial, highly mobile). We tested the hypothesis that these strategies are density-dependent, by comparing telemetry-based location data for male sea otters from four California study sites: San Simeon and Monterey (both high density), Pt. Conception (southern range periphery, low density), and San Nicolas Island (low density). Sea otters movements were analyzed using adaptive kernel home range analysis to determine home range size and identify core use areas. Additionally, analysis of morphometric and activity data provided insight into the extent and effect of energetic costs. Despite differences in population density, males from San Nicolas and Monterey were territorial, although body condition in Monterey males was considerably poorer. In contrast, males from the southernmost (San Simeon and Pt. Conception) sites employed the semi-territorial strategy, traveling as much as 300 km between areas of high female density and presumably superior prey availability.

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6. Movement Patterns of Female Southern Sea Otters Vary With Reproductive Status

CHRISTINE V. ALFANO[1]

The cost of provisioning offspring places a substantial energetic demand on the provisioner and can have a significant impact on an individual's activity patterns. This is particularly the case for mammalian carnivores, where solitary female parental care is common. Sea otters (*Enhydra lutris nereis*), unlike other marine mammals, do not have the capacity to store large quantities of fat as blubber and must rely on their daily food intake to meet their energetic needs. Resource acquisition is strongly tied to movement patterns; thus, it can be expected that the movement patterns of individual females will vary according to reproductive status. The frequency and mean distance of movements by individual female sea otters were compiled from telemetry data collected in California between 1984 and 2005 and categorized according to reproductive status. Analyses revealed that both the frequency and mean distance of movements differed significantly according to reproductive status for individual females, but that the magnitude and direction of these differences varied among individuals. Thus, there may be multiple strategies with the population to meet the energetic demands of caring for offspring.

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7. Sea Otters Translocated To San Nicolas Island: Individual Fates, Population Growth, and Projected Persistence of a Small Population

LILIAN P. CARSWELL[1], BRIAN HATFIELD[2], M. TIM TINKER[3] AND JAMES ESTES[4]

Analysis of the outcomes of past translocation efforts is crucial to guide future decisions about the viability of translocation as a tool in the recovery of threatened and endangered species. The translocation of 140 southern sea otters (*Enhydra lutris nereis*) to San Nicolas Island beginning in 1987 resulted in a colony approximately one-tenth that size shortly after the last sea otters were released in 1990. We examine the patterns of disappearance of translocated sea otters to determine whether there are correlations between age, sex, and type of release of translocated animals and the length of time they remained at the island. Although it is unknown how many of the missing animals died or were reabsorbed by the parent population along the coast of central California, we estimate these proportions based on documented mortalities or resightings of translocated sea otters subsequent to their release at the island. Since the colony stabilized in the early 1990s, questions have been raised about whether unusual levels of mortality are suppressing population growth. We use a simple age-structured demographic model to determine whether population growth at San Nicolas Island falls within 95% confidence intervals of expected outcomes given the age- and sex-structure of the founding population and observed vital rates for sea otters in the mainland portion of the range. We then develop a stochastic population model, with variance terms parameterized using the past 15 years of survey data, to investigate the probability of future persistence of the colony over short-term and long-term scenarios.

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REGIONAL CONSERVATION PLANNING

WEDNESDAY, NOVEMBER 15 • 8:00 AM • GRAND BAY BALLROOM – SOUTH

Moderator: Kim Delfino

1. Regional Conservation Planning: Implementation and Reality in California

CYNTHIA R. WILKERSON[1,2], LAURA H. WATCHMAN[3] AND KIM DELFINO[1]

Regional Conservation Planning has become an important tool in balancing development and conservation of endangered species habitat. In Regional Conservation Plans (RCPs), local governments allow some development of endangered species habitat in exchange for conserving most endangered species within the jurisdiction. In California, the Natural Community Conservation Plan (NCCP) is a state level equivalent to a Habitat Conservation Plan (HCP) with additional standards. Combined HCP/NCCPs are beginning to emerge throughout California. As Regional Conservation Plans have moved into implementation, a variety of issues arise, which generally fall into two categories: 1) compliance and 2) biological effectiveness. State and federal agencies have limited capacity to monitor implementation of RCPs, and biological effectiveness can often be compromised by issues that arise during implementation. Also, while compliance is relatively straightforward to determine, determining and ensuring the biological effectiveness of RCPs requires expensive long-term monitoring of habitat and individual species, as well as adaptive management that is tied to monitoring. The biological effectiveness of some RCPs will never be known because of the lack of biological monitoring. Whether an RCP fulfills its biological goals is affected by multiple factors, including adequacy of funding for acquisition, land availability for preserve acquisition, threats to habitat on preserve lands, local implementation and enforcement capacity, and status, trends, threats for the species overall. Examples will be discussed from the San Diego Multiple Species Habitat Conservation Plan (MSHCP), the Western Riverside HCP/NCCP, the Solano County HCP, the Coachella Valley MSHCP, and the San Joaquin Valley MSHCP.

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2. The Florida Ecological Greenways Network and Protecting a Statewide Florida Black Bear Metapopulation

THOMAS S. HOCTOR[1]

Work on a statewide Florida greenways network began in the early 1990s. This resulted in the creation of the Florida Greenways Program, which is administered by the Office of Greenway and Trails in the Florida Department of Environmental Protection. The Florida Ecological Greenways Network (FEGN) is the ecological component of the program, and identifies the best opportunities for protecting large, connected landscapes across the state. In the last five years the FEGN has been prioritized, updated, and reprioritized in 2005. Most of the highest priorities in the FEGN, called Critical Linkages, are extremely important for maintaining or restoring connections between Florida black bear (*Ursus americanus floridanus*) populations. These projects, including the Ocala National Forest-Osceola National Forest-Okefenokee National Wildlife Refuge reserve network and the Northwest Florida Greenway project, will be discussed. If protection of these large landscape linkages is successful, there is still a great opportunity to protect a statewide bear metapopulation that will better maintain genetic diversity and overall population viability. As a flagship and umbrella species, protecting large landscapes for the Florida black bear will greatly benefit overall biodiversity conservation efforts. However, development and loss of habitat are rapidly occurring, and efforts to expand land acquisition programs and sound growth management planning will be essential for accomplishing these goals. Initiatives include extending the current state land acquisition program beyond 2010 and significantly increasing funding levels, modifying growth management to decrease sprawl and protect important landscapes, protecting road frontage from development within critical wildlife corridors, and encouraging expansion of local land acquisition programs.

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3. Functional Habitat For Florida Panthers

TOM H. LOGAN[1] AND RANDY KAUTZ[2]

Recovery of the Florida panther (*Puma concolor coryi*) is dependent upon maintaining a sufficient quantity of habitat that functions at optimal biological levels throughout the effective range of the species. Occupied landscapes exhibit certain spatial and vegetative characteristics that define panther habitat. However, some areas that appear to be habitat for Florida panthers because they contain natural cover types that panthers are known to use, are not occupied. Functional habitat consists of one or more of the following features: (1) breeding female home ranges, (2) breeding age male home ranges, (3) temporary home ranges of dispersing sub-adult males, (4) landscape linkages, and (5) buffers against human disturbance. We identified the extent and concentration areas of functional panther habitats by using panther radio-telemetry data from 1981-2005 to generate and then overlay fixed kernel home ranges for individual panthers in each age and gender class. We reviewed least cost path models to identify important landscape linkages, and we proposed sites for highway underpasses to reduce vehicle-related mortality. Preservation of breeding female home ranges is the highest priority for maintaining functional Florida panther habitats. Population dynamics must be considered when assessing habitat functionality. The principal tools available for protection of functional panther habitats are provision of private landowner incentives, preservation of priority lands, and regulatory programs. Various management options, including habitat preservation, habitat restoration and enhancement, and funding of highway underpasses in strategic locations, should be considered as eligible for mitigation value as part of a comprehensive strategy to preserve and manage functional panther habitats.

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4. Impacts of Roads and Development and Functional Landscape Connectivity For Florida Panther in Eastern Collier County

DANIEL J. SMITH[1], REED F. NOSS[1] AND MARTIN B. MAIN[2]

Two primary landscape linkages were identified in eastern Collier County by the USFWS Florida Panther Subcommittee for conservation of the endangered Florida panther (*Puma concolor coryi*). These linkages connect protected habitat areas to the north and south. Portions of these corridors were designated by Collier County as Habitat Stewardship Areas and include restrictions on development and land use. Concessions given to landowners in exchange for these designations include allowances for increased development densities outside the stewardship areas. Population growth in the county (a 21% increase from 2000 to 2004) has resulted in rapid levels of habitat loss and fragmentation that threaten the integrity and functionality of these critical habitat corridors. Along with rapid development in the rural areas of the county comes construction of new roads and widening of existing alignments. Since 2000, the road mortality rate of Florida panthers on rural roads in Collier County has quadrupled in relation to previous decades, primarily due to increased levels of development, agricultural activities, and traffic and increased population size. We conducted initial wildlife movement surveys in 2005-06 along roads within and adjacent to these stewardship areas. Methods included road-kill and track surveys and remote camera traps. Along with recent land cover and radio-telemetry data on collared Florida panthers, collected by the Florida Fish and Wildlife Conservation Commission, we identified preferred movement corridors and road crossing sites of Florida panthers and other wildlife. We describe our methodology, and based on preliminary data, propose sites on existing roadways for wildlife passages and evaluate the adequacy of the habitat stewardship areas in providing functional landscape connections between surrounding protected areas in the region for the Florida panther and other key wildlife. We further suggest implementing a buffering strategy that utilizes a land-use gradient whereby intensity/density decreases as proximity to the core areas of the habitat corridors decreases.

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5. Non-Acquisition Elements of Habitat Conservation: Is Protecting Habitat From Development Enough To Protect the Natural Values of the Land?

LYNN SADLER[1]

What management policies and practices can render otherwise excellent habitat useless or, worse, detrimental to wildlife? We catalog myriad management issues that impact wildlife survival on both public and private lands, from known issues such as campground placement, road development, lighting, water quality, exotic species, depredation policies, noise pollution, grazing, tolerance of potentially dangerous wildlife, recreation trends, attractive nuisances, and transmittable diseases, to less predictable issues such as global warming. Further, we examine systemic issues, such as public access requirements for publicly funded land, that can create conflicts between wildlife needs and human desires. All of these issues are important when trying to secure critical core and linkage habitat for wildlife in the context of any conservation planning program. This checklist, with case examples, will inform decision-making and funding requirements for land stewards, land use planners, developers, regulators and policy leaders and ultimately determine the practical outcomes of land-use planning efforts.

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WOLVES

WEDNESDAY, NOVEMBER 15 • 8:00 AM • GRAND BAY BALLROOM – NORTH

Moderator: Chris Haney

1. Recovery of the Gray Wolf in the Northern Rocky Mountains of the United States

EDWARD E. BANGS[1], MICHAEL D. JIMENEZ[2], CARTER C. NIEMEYER[1], JOSEPH A. FONTAINE[1], DOUGLAS W. SMITH[3], CURT MACK[4], CAROLYN SIME[5] STEVE NADEAU[6] AND POLLY WHEELER[1]

Gray wolf (*Canis lupus*) populations were eliminated from the western United States by 1930. Naturally dispersing wolves from Canada first denned in Montana in 1986. In 1995 and 1996 wolves from western Canada were reintroduced to central Idaho and Yellowstone National Park, Wyoming. By December 2005, 1,020 wolves were being managed in the northern Rocky Mountains (NRM) under the federal Endangered Species Act. The current wolf population occupies most of the suitable wolf habitat in the NRM and the population is biologically recovered. Wolf restoration proceeded more quickly, with more benefits (public viewing and restoration of ecological processes), and fewer problems (livestock and pet depredation and impacts to wild ungulate populations) than predicted. However, from 1987-2005, a minimum of 528 cattle, 1,318 sheep, 83 dogs, 12 goats, 9 llamas, and 6 horses were killed by wolves and over $550,000 was paid from a private damage compensation fund. In addition to a wide variety of non-lethal tools, the U.S. Fish and Wildlife Service (Service) and its cooperators relocated wolves 117 times and killed 396 to reduce conflicts. Wolf depredation and wolf control are uncommon but are inordinately controversial. In early 2005, a new nonessential experimental rule increased options for problem wolf management, and allowed state and tribal leadership in states like Montana and Idaho that had approved state wolf management plans. In early 2006, the Service published an Advance Notice of Proposed Rulemaking to propose to delist the NRM wolf after Wyoming developed a state regulatory framework for wolf management that the Service could approve.

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2. Mexican Gray Wolf Recovery – Update 2006: Challenges From the Captive Breeding Program To the Recovery of Free Ranging Mexican Wolves in the Southwest United States

PATRICK C. VALENTINO[1] AND DANIEL MORIARTY[1]

Formidable challenges facing the Mexican Wolf Recovery Program include the release of captive raised wolves and local opposition in the field. This presentation will outline the status of the captive breeding program and the challenges of recovering wolves in the Southwest. Listed in 1976 under the Endangered Species Act, the Mexican gray wolf (*Canis lupus baileyi*) is one of the rarest land mammals in the world. The goal of the Mexican Wolf Recovery Plan is the re-establishment of wild populations from captive-raised wolves. The U.S. captive population is managed by the American Zoo and Aquarium Association. Today about 340 Mexican wolves survive, with about 300 held at 47 facilities in the United States and Mexico. The others are free ranging in the Apache and Gila Forests of Arizona and New Mexico. Mexican wolves are held in a variety of facilities creating management challenges. Critical issues include the improvement of husbandry practices to increase chances of wild survival. While more pups are being born in the wild, political boundaries have restricted free recovery of Mexican wolves. The number of wolves released and the number that need to be managed in captivity will determine the focus of captive wolf managers. The program's 5 Year Review recommends a larger recovery area for Mexican wolves. Increased opportunities for releasing more Mexican gray wolves from captivity will increase the genetic diversity in the wild and also benefit northern ranging gray wolves.

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3. Wolf Recovery in Wyoming, Outside Yellowstone National Park, 1999-2005

MICHAEL D. JIMENEZ[1], EDWARD E. BANGS[2] AND RODNEY F. KRISCHKE[3]

From 1999 to 2005, the wolf (*Canis lupus)* population in Wyoming, outside Yellowstone National Park (YNP), increased each year on average > 25%. At least 200 pups were produced with average litter size of 4.4 pups. Pack sizes ranged from 2-23 wolves and averaged 8.8 wolves. In 2005, at least 134 wolves inhabited western Wyoming outside YNP. Thirteen packs contained 112 wolves and at least another 22 wolves (single wolves and smaller groups of non-breeding wolves) were located throughout northwest Wyoming. Pack sizes in 2005 ranged from 5 to 15 wolves and averaged 8.6 wolves. Wolves and their effects on big game and domestic livestock remain highly controversial. In 2005, 11 of the 13 packs in Wyoming were involved in at least 1 depredation and responsible for killing at least 103 livestock (81 confirmed and 22 probable depredations). One guard dog and 7 horses were injured by wolves. The total number of confirmed depredations recorded in 2005 decreased approximately 12% from 2004 due to timely control of wolves that chronically kill livestock. In 2005, 41 wolves were killed in control actions. On an industry-wide scale, wolf depredation was responsible for a very small fraction of livestock mortality. However, in areas in western Wyoming where wolves have recolonized, livestock producers believed wolves killed significant numbers of cattle and sheep. Prior to wolf reintroduction, producers reported annual losses at approximately 2-3% of their herds that grazed on public allotments. Post-wolf reintroduction, producers typically reported 8-10% loss in areas where wolves have recolonized. Wyoming ranchers believed financial reimbursement compensated only a small portion of their livestock losses because significant numbers of livestock losses could not be confirmed and therefore did not qualify for compensation. Wolf management in Wyoming balances the need for public tolerance of wolves by removing wolves that kill livestock, yet still protects wolves and allows wolf numbers to increase each year as wolves disperse to new areas. Future population growth will be limited by the lack of suitable habitat free from conflicts within rural communities.

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4. Modeling Potential Gray Wolf Habitat in the Grand Canyon Ecoregion

KURT A. MENKE[1], PAUL SNEED[2], LARRY STEVENS[2,3], NICOLE CORBO[4], KELLY BURKE[3] AND KIM CRUMBO[3]

The gray wolf (*Canis lupus*) historically inhabited much of the Grand Canyon Ecoregion but has been extirpated for much of the last century. The 36 million-acre Grand Canyon Ecoregion is bounded on the west by the Grand Wash, on the east by the Little Colorado River, and extends from the Mogollon Rim in central Arizona north to southern Utah's High Plateaus. As part of an ongoing effort to rewild this region, Grand Canyon Wildlands Council generated a GIS-based static wolf habitat suitability model. The results will be used to estimate what portions of the ecoregion can potentially support wolves under current conditions. The model was based on four assumptions: 1) wolves are habitat generalists whose main habitat requirement is prey; 2) they require remote areas with little human disturbance; 3) they tend to hunt in packs pursuing their prey and thus prefer flatter terrain; and 4) the ecoregion is an arid environment and availability of surface water is a limiting factor. The model used elk and mule deer density to represent available prey. Three datasets were used to represent human impact to the landscape: roads, population density, and land ownership. Slope and proximity to water were used to represent the final assumptions. These data were weighted and combined in an arithmetic overlay using ArcGIS 9.1. The resulting grid was classified into core habitat, minimum patch habitat, and dispersal areas. One core area was identified measuring nearly 7,000km^2 along with 12,000km^2 of minimum patch areas, and 24,000 km^2 of dispersal areas.

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5. Effects of Natural Fragmentation on Genetic Structure of Gray Wolves: a Case Study in the Coastal Rainforest of British Columbia

ERIN L. NAVID[1], CHRIS DARIMONT[2,3], PAUL PAQUET[3,4] AND MICHAEL QUINN[5]

Worldwide, habitat is becoming increasingly fragmented, resulting in the isolation of wildlife populations. From a conservation perspective, understanding the effects of fragmentation on the life history and fitness of animals is essential. In particular, we need to know how fragmentation influences the genetic structure of wild populations. The Central Coast of British Columbia is a naturally fragmented archipelago and series of inlets. The region faces imminent additional fragmentation from industrial logging. However, planning processes to alleviate anticipated adverse impacts lack scientific information, particularly regarding wide-ranging and sensitive large terrestrial carnivores. Accordingly, we examined the genetic structure of coastal wolves (*Canis lupus*) using non-invasive molecular tracking techniques. DNA was extracted from feces. Microsatellite loci identified individual genotypes. Our analysis revealed segregation between mainland and island populations, suggesting that genetic distance is better predicted by island versus mainland occupation rather than geographical distance. Such knowledge will inform proactive management strategies and provide an understanding of how fragmentation can affect genetic structure of wolf populations.

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6. Selection of Grey Wolf Homesites on the Central Coast of British Columbia

KASIA ROZALSKA[1] CHRIS DARIMONT[2,3], PAUL PAQUET[3,4] AND SHELLEY ALEXANDER[1]

Reproductive habitat is crucial to the persistence of animal populations. In order to ensure successful management of species, it is essential to understand landscape and resource features selected during reproductive periods. We examined the homesites of gray wolves (*Canis lupus*) from the central coast of British Columbia, part of the largest contiguous coastal temperate rainforest in the world. During spring to early fall, wolves use homesites for reproduction and for rearing and protecting pups. Field surveys from 1993 to 2005 determined the locations of homesite presence and absence. We used Geographic Information Systems (GIS) and remotely sensed data to extract biological, physical and anthropogenic information surrounding each location for a multi-scale analysis of homesite distribution. Variables included vegetation characteristics, prey availability, topography, access to freshwater, shoreline characteristics, road density, and areas of historical habitation by First Nations people. Logistic regression evaluated the influence of each variable on homesite presence, and predicted the probability of homesite presence in unknown locations. In addition, we conducted an assessment of homesite disturbance caused by logging, which is encroaching on this landscape. We determined the proximity of homesites to disturbed areas by mapping land cover changes from satellite images acquired at different times. The knowledge gained from this research not only can assist in planning for protection of the coastal wolf but also increase our understanding of how animals select landscape and resource features to meet their reproductive requirements.

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INTERNATIONAL PERSPECTIVES ON WILDLIFE CONFLICT

WEDNESDAY, NOVEMBER 15 • 8:00 AM • WILLIAMS-DEMENS ROOM

Moderator: Gerald Zuercher

1. Spatial, Temporal, and Physical Characteristics of Livestock Depredations By Large Carnivores Along a Kenyan Reserve Border

JOSEPH M. KOLOWSKI[1] AND KAY HOLEKAMP[1]

Most large mammalian carnivores are in global decline, in part due to their involvement in livestock depredation. Research that advances our understanding of predator-livestock interactions is crucial to conflict mitigation and carnivore conservation. We investigated the influence of environmental and socio-ecological factors on livestock depredation by carnivores in pastoral villages adjacent to the Maasai Mara National Reserve, Kenya. We attempted to identify factors associated with temporal and spatial variation in depredation rates, incorporating space use and behavioral data from a closely monitored spotted hyena population known to be involved in depredation events. Spotted hyenas (*Crocuta crocuta*), leopards (*Panthera pardus*) and lions (*Panthera leo*) were responsible for 53%, 32%, and 15% of attacks on livestock, respectively. Monthly depredation frequency was correlated positively with rainfall and negatively with natural prey abundance. Radio-telemetry revealed that hyenas defending a group territory within the Reserve spent more time outside the Reserve during months when hyena attacks on livestock were most frequent. Results of logistic regression models indicated notable differences between villages attacked by leopards and those attacked by hyenas. We discuss the influence of spatial location, fence type, and size of villages on relative attack frequency by leopards and hyenas and consider the implications of our results for conflict mitigation.

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2. Human-Large Felid Conflict Around Gir National Park, India

SATYA P. SINHA[1] AND BITAPI CHAAYA SINHA[1]

The Gir Wildlife Sanctuary and National Park in Gujarat, India is the only place where lions (*Panthera leo persica*) exist today in India and is the only place where lion and leopard (*Panthera pardus*) are living together in India. Cultivation of sugarcane and mango plantations has increased man-made forests around Gir. This has allowed large felids and other wild animals to stray out of the protected area and find shelter here, leading to increased interaction with humans and cases of conflict. This paper discusses the problems of agriculture, livestock, mining and other development in the area of Gir, the impacts of these activities on large felids, and the nature and magnitude of wildlife conflict in this area. We will also discuss means to contain conflicts, including improvement in agricultural technology and integrated rural community development programs.

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3. Human-Large Felid Conflicts and Perspectives on Carnivore Management in Lowland Terai, Nepal

TEJ B. THAPA[1]

Many carnivore populations have increased in Nepal during last three decades as a result of effective protections, habitat restoration, implementation of an anti-poaching program, and changes in public attitudes. However, encounters between carnivores, livestock, and humans are increasing, raising concerns about long-term management. This paper aimed to evaluate causes of livestock depredation by tiger (*Panthera tigris*) and leopard (*P. pardus*); spatial and temporal distribution of depredation; and effectiveness of the conflict mitigation programs in the Chitwan National Park (CNP), Nepal. I gathered data through literature review, field study, public complaints, participatory appraisals and evaluating landscape variables. Over 800 livestock killed by large cats around CNP between 2000 and 2003. Verified kill sites were mapped and correlated with environmental variables, population abundance and habitat use of felids. Depredation pattern varied geographically, seasonally, and in relation to type/size of livestock and proximity to forests. Habitat fragmentation, increase of felid population, proximity to domestic livestock, behavior of particular predator and intra guild predation are factors forcing felids to kill livestock. In spite of damage, the local people still had a positive attitude towards the felids, because of tangible benefits derived from the buffer zones. Economic compensation, participatory conflict management, and capacity building through the strategy of integrated conservation and development in the buffer zone are considered to be successful to some extent in reducing conflicts and developing local guardianship in conservation. This study clearly indicated that a shift in attitude of people towards wider recognition of carnivore for ecosystem function and adaptive management.

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4. Managing Leopard Population in Human Modified Landscape in Himalayas: Is It Possible?

D. S. CHAUHAN[1] AND S. P. GOYAL[1]

The leopard (*Panthera pardus*) is widely distributed in India and survives in a variety of environmental situations in and outside Protected Areas, but lacks 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 (5444km^2) is worst affected due to leopard-human conflicts among thirteen districts of Uttaranchal. From 1987-2002, 200 people were killed by leopards, and 110 leopards were killed in control efforts and by irate villagers. We classified areas in four categories based on severity of conflicts: none (29.5%), low (23.9%), medium (31.4%) and high (15.2%). We found that 69% of leopard victims were children under age 15 years. Most of these kills (68%) occurred between 1600-2100 hrs. We noticed more conflicts in areas of high forest degradation and dominated by shrubs. Other factors associated with conflict are presence of dog, lack of electricity, distance of house from main village, and presence of adult males. We discuss mitigation measures to reduce conflicts.

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5. Management of Wild Canids in Israel To Reduce Conflict With Agriculture, Prevent Rabies, and Protect Endangered Ungulates

SIMON C. NEMTZOV[1] AND RONI KING[1]

An integrated management program has been instituted in Israel for maintaining natural canid populations in the wild. Three canids (red fox, *Vulpes vulpes*; golden jackal, *Canis aureus*; and gray wolf, *Canis lupus*) that occur in the wild in Israel are overabundant in some areas due to anthropogenic food sources, generating human-wildlife conflict and the threat of illegal poisoning. All wild canids are fully protected by law; none are designated as pests. In certain parts of Israel, overabundant foxes and jackals can be vectors of rabies; jackals and wolves are responsible for depredation on cattle and sheep; jackals and foxes cause damage to vegetables, melons and other crops; and all three species damage plastic drip-irrigation pipes. The canid management program involves mainly non-lethal methods: an oral rabies vaccination (ORV) program has greatly reduced rabies cases, with no evidence of concomitant increases in wild canid populations; livestock-guarding dogs, conventional and electric fencing, and chemical repellents, reduce conflicts, while population control is assisted by efforts that reduce the availability of garbage and livestock carcasses. Research on new methods for fertility control and conditioned taste aversion are being planned. Canid populations are counted twice a year, and culling (by shooting or trapping only, not poisoning) is carried out to reduce the threat of illegal poisoning in designated areas where populations are overabundant (mainly close to settlements and dumps), and where non-lethal means do not effectively reduce agricultural damage. Overabundant jackals are sometimes culled in areas where they harm endangered ungulates.

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ROADS AND CARNIVORES

WEDNESDAY, NOVEMBER 15 • 10:30 AM • GRAND BAY BALLROOM – SOUTH

Moderator: Trisha White

1. Effects of Roads on Endangered Kit Foxes in Natural and Urban Environments

BRIAN CYPHER[1], CURTIS BJURLIN[1], JULIA NELSON[1], CARIE WINGERT[1] AND CHRISTINE VAN HORN JOB[1]

We examined the effects of roads on endangered San Joaquin kit foxes (*Vulpes macrotis mutica*) on natural and urban study sites in Kern County, California. The natural site encompassed three busy 2-lane roads. On this site, only 1 of 63 (2%) transmittered foxes was struck by a vehicle. Fox survival probabilities, reproductive success, litter size, nocturnal movements, den placement, and foraging patterns all were not affected by fox proximity to roads. The urban site encompassed numerous roads ranging from 2-lane local roads with low traffic volumes to 6-lane arterial roads with very high traffic volumes. On this site, at least 21 of 229 (9%) transmittered foxes were struck by vehicles. Vehicle strikes were more common on roads with more lanes, higher speed limits, and higher traffic volumes. Most (73%) road crossings observed occurred on local roads, although foxes did successfully cross 4 and 6-lane roads. We did not detect any adverse affects on kit foxes from 2-lane roads in natural environments, although facilitated human access and associated habitat loss could affect long-term population viability. Vehicles were the primary source of kit fox mortality in urban environments, but this mortality does not appear to be limiting urban fox populations. This mortality might be reduced by installing crossing structures where movement corridors (e.g., canals, golf courses) intersect roads.

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2. Effect of Traffic Volume on Black Bears in Central Florida, USA

WALTER MCCOWN[1], PAUL KUBILIS[1], THOMAS EASON[2] AND BRIAN SCHEICK[3]

The population of black bears (*Ursus americanus floridanus*) in central Florida's Ocala National Forest (ONF) has accounted for 45% of the state's vehicle-caused mortality from 1976-2003, and the area contains 8 of 15 chronic roadkill areas. State Road 40 (SR-40), which bisects this population, had the greatest number of mortalities. Interest in widening this road provided an opportunity to document bear movements and road crossing rates associated with 2 different traffic levels. Traffic volume on SR-40 is 5,100 vehicle trips per day in ONF and averaged 15,700 vehicle trips per day in the adjacent community of Lynne. We radiocollared 86 bears (48F:38M) in ONF and Lynne and monitored them 1-3 times per week from May 1999 through May 2003. Based on consecutive locations, bears crossed SR-40 a minimum of 388 times. ONF male bears were 4.8 times more likely to cross SR-40 than ONF females and 11.3 times more likely to cross than were Lynne females. Most (58%) of the mortality was caused by vehicular collision. Females and bears in high traffic areas appear to cross less often than males and those females in low traffic areas, but suffer greater risk of vehicle collisions when they do cross. The traffic level that restricts crossing seems to be between 5,100 and 15,000 vehicles per day. We recommend a minimum of 6 crossing structures be incorporated along this highway within our study area.

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3. Using GIS To Identify Potential Corridors Utilized By North American Badgers in the San Francisco Bay Area and Monterey Counties

TANYA DIAMOND[1] AND SHANNON BROS[2]

Small populations of North American badgers (*Taxidea taxus*) live in fragmented habitats within the San Francisco Bay Area and Monterey Bay Counties in Northern California. Due to increasing fragmentation of badger habitats, it is important to identify potential corridors that badgers may utilize to facilitate movement between the habitat patches. Using GIS, a habitat suitability model for badgers was created using soil, vegetation, slope, urban areas, and road layers. A Least-Cost Corridor analysis was performed on the cost surface layers to identify potential corridors within the region. Road kill data was then compared with the delineated corridors to test the model and identify the primary areas currently utilized by badgers for implementing future corridor plans. As an example of how this model could be used, five badgers have been killed by vehicles along Reservation road in Monterey County, which runs through existing badger habitat. Comparison with the corridor model shows this is one of the primary areas to implement a future corridor to allow for badger movement among the fragmented habitats.

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4. Spatial and Temporal Interactions Between Carnivores and Off Highway Vehicles in the Livingstone Range of Southwestern Alberta, Canada

MICHAEL S. QUINN[1], DANAH DUKE[2] AND DAVE GARROW[1]

Human access to critical carnivore habitats via roads, trails, and other linear features is recognized as a significant vector of wildlife disturbance and mortality. The management of access is an essential component of landscape approaches to maintaining the long-term viability of many carnivore populations. Resource managers require quantitative information and decision support to develop and implement defensible access management plans. The type, timing and intensity of human use rather than the presence of linear disturbances *per se* is hypothesized to influence the response of carnivores. We assessed human movement (primarily motorized, off highway vehicle) and wildlife movement using remote, digital, infrared cameras in the headwaters of the Livingstone and Oldman Rivers in the Rocky Mountains of southwestern Alberta, Canada. The area is ecologically significant, unprotected, public land that provides core habitat and a linkage zone between protected area complexes for a diverse suite of large carnivores, including grizzly bears (*Ursus arctos horribilis*), black bears (*U. americana*), cougars (*Puma concolor*), lynx (*Lynx canadensis*), bobcat (*L. rufus*), wolf (*Canis lupus*) and coyote (*C. latrans*). Recreational use in the area consists primarily of off-highway vehicle (OHV) use, random access camping and flyfishing. The area is also subject to intensive industrial use by the forestry and petroleum sectors. Cameras were deployed on OHV trails and wildlife trails in a systematic, random sampling design over three summers (2004, 2005 and 2006). The research design allows for temporal and spatial analyses of interactions between humans and wildlife. In this presentation we provide a preliminary analysis of human and wildlife use patterns with a particular emphasis on grizzly bears.

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BEARS

WEDNESDAY, NOVEMBER 15 • 10:30 AM • GRAND BAY BALLROOM – NORTH

Moderator: Craig Miller

1. A Cooperative Approach To Louisiana Black Bear Recovery

PAUL L. DAVIDSON[1] AND DAVID TELESCO[1]

The Black Bear Conservation Committee (BBCC) is a broad-based coalition of private and government partners working together to restore the federally threatened Louisiana black bear (*Ursus americanus luteolus*). Habitat loss, fragmentation, and subsequent isolation of bear populations were the primary causes for the bear's decline. The BBCC is addressing these issues through their Landowner Assistance Program (LAP) and Repatriation Project. LAP prioritized a 3.5 million acre area for habitat restoration, linking existing forests and bear populations together. The Black Bear Management Handbook was written to include an incentive program guide and information on bear ecology, research, and conflict management. LAP provides workshops to encourage private landowner involvement in conservation programs. Since 2003, 15 LAP workshops have been given in 12 parishes (i.e., counties) to 302 landowners. Over $150,000 has been awarded to LAP to restore 1,200 acres of forest habitat for 17 private landowners in 8 parishes. While the BBCC's LAP program is aimed at providing connections between forest blocks, they are also attacking the isolation issue from a population expansion standpoint. The Repatriation Project moves bears from existing populations to suitable habitat where bears are rare or absent. Establishing a new population between existing populations will increase opportunities for genetic exchange. Between 2001 and 2006, a total of 30 adult females and 69 cubs were moved from northeastern to east-central Louisiana. Most females have stayed in and around the new area, and 6 previously repatriated females have been found with new cubs, further indicating the project's success.

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2. Reproductive Ecology and Cub Survival of Florida Black Bears

ELINA P. GARRISON[1], J. WALTER MCCOWN[1] AND MADAN OLI[2]

The Florida black bear (*Ursus americanus floridanus*), a threatened subspecies of the north American black bear, currently occurs in several geographically isolated sub-populations. Successful management of the remaining black bear populations in a human-dominated landscape requires an understanding of population ecology, but data on critical demographic variables for the Florida black bear are scarce. We investigated reproductive ecology and cub survival of Florida black bears in Ocala National Forest (ONF) and the adjacent residential area of Lynne, Florida, from 1999 to 2004. We documented production of 81 cubs from 39 litters. Average (± SE) litter size was 2.08 ± 0.11 cubs. The mean age of first reproduction was 3.25 ± 0.27 years (range 2-5). Excluding females that reproduced in consecutive years due to litter loss, inter-litter interval was 2.11 ± 0.11 years. The mean annual fecundity rate was 0.57 ± 0.06 (range = 0.45-0.70). We used expandable radio collars to monitor the fate of 41 bear cubs. The probability of cubs surviving to 9 months of age was 0.46 ± 0.09. The most important cause of cub mortality was infanticide. Our results indicate that reproductive rates of female black bears in the Ocala study area are similar to other black bear populations, but the cub survival rate in our study area is lower than those reported for most black bear populations.

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3. The Assumed, the Virtual, and the Real: Spectacled Bear Distribution in the Central Andes of Colombia

CARLOS VALDERRAMA[1], GUSTAVO KATTAN[1], GOSIA BRYJA[2] AND ISAAC GOLDSTEIN[2]

The spectacled bear (*Tremarctos ornatus*) is the only bear in South America and the second largest mammal in the Colombian Andes. Due to their size and habits, bears have the largest habitat requirements of all species in the region. The Colombian National Parks Unit, with the collaboration of other conservation organizations, is using the spectacled bear as a focal species for conservation planning, based on its assumed presence in parks. As an initial step we quantified how much habitat is still available in the Central range of the Andes, based on GIS models, and verified presence/absence of the species throughout some of the habitat patches identified in the GIS model. Our results show great differences among the traditionally assumed distribution, the GIS model, and the reality on the ground regarding the size, shape and amplitude of the bear's distribution. The GIS-based habitat model is more fragmented than the traditionally assumed distribution, whereas ground surveys revealed the bear's absence in certain patches that were assumed as good habitat both traditionally and by the GIS model. Moreover, some areas that where not assumed as habitat by the GIS model had spectacled bear presence. We argue that the history of the sites regarding human intervention, habitat quality (regardless of distance from human presence), and dispersal capabilities of bears among habitat patches are important parameters to take into consideration when analyzing the presence of bears in the Central Andes of Colombia.

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4. Population Structure of the Endangered the Black Bear in Mexico

CORA VARAS-NELSON[1], JUDITH RAMÍREZ[1], CARLOS GONZALEZ LOPEZ[2], PAUL KRAUSMAN[1] AND MELANIE CULVER[1]

The amplification of genetic markers in combination with non-invasive sampling collection is useful in obtaining information about carnivore species. In wild animals, obtaining direct blood or skin samples for DNA isolation, in addition to be technically difficult, can lead to severe perturbation of the animals under the study. Scat and hair samples can be obtained from the field. Scats contain epithelial cells shed from the intestinal lining, hairs and hair roots can then be used to isolate DNA from the host. Mitochondrial DNA (mtDNA) can be amplified in a variety of endangered mammals. We collected and extracted DNA from 192 scat samples from the El Pinito Ranch in the northern part of the Sierra Madre Occidental in Mexico and 12 hair samples from Los Ajos-Bavispe National Forest and Wildlife Refuge. Two mtDNA regions, Control Region and ATPase 8 gene, were PCR amplified. We obtained 70 clean sequences from the scat samples (36.5% amplification success rate) and 12 sequences from the hair samples (100% amplification success rate). The data shows black bears (*Ursus americanus*) from El Pinito Ranch and Los Ajos-Bavispe shared a mtDNA haplotype with black bears from the sky islands in Arizona, and the Mogollons mountains in New Mexico, USA.

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CAPTIVE CANID CONSERVATION

WEDNESDAY, NOVEMBER 15 • 10:30 AM • WILLIAMS-DEMENS ROOM

Moderator: Karen Bauman

1. Contributions of Captive Canids To Conservation

JACK M. GRISHAM[1] AND KAREN BAUMAN[1]

Zoos have made great efforts to ensure that each canid species in captivity plays a role in conservation. Decisions on which species are kept in captivity are made by the Taxon Advisory Group (TAG) of the Association of Zoos and Aquariums (AZA). A Regional Collection Plan created by the TAG facilitates efforts to network with zoos, field researchers, universities, conservation and governmental agencies. Data from the IUCN Canid Specialist Group is incorporated into collection management decisions. Zoo-based programs provide support for conservation in a variety of ways: education, captive breeding, reintroduction, scientific research and funding. Over one hundred and thirty million people per year visit AZA zoos, which provide a tremendous opportunity to educate them on the importance of the conservation of wild dogs, wolves, foxes and jackals. Zoos have contributed to successful recovery programs through captive breeding and reintroduction of red (*Canis rufus)* and Mexican wolves (*Canis lupus baileyi*). Studies of captive animals can provide insight into their biology. Many techniques, such as hormone assays, medical treatments, vaccine regimes are tested and validated in captivity for later transfer to the field. Lastly, the financial contribution zoos make to captive breeding programs and direct support for *in-situ* projects is substantial. Although no figure exists for the amount spent directly on canid programs, estimates put the amount in excess of $1.5 million per year. Modern zoos are now places where the animals are ambassadors to educate the public of their conservation and research needs.

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2. Red Wolf Studbook Data: Integrating Captive and Wild Population Management

WILL WADDELL[1], ART BEYER[2], JENNIFER ADAMS[3] AND LISETTE WAITS[3]

Accurate and up-to-date animal records are the basis for sound animal management programs and provide information needed to guide animal management decisions. Like many species managed under the auspices of the Association of Zoos and Aquariums, complete red wolf (*Canis rufus*) records are kept in the form of a studbook. In addition to maintaining a comprehensive record of an individual wolf's life history and its pedigree, the studbook traces the entire history of each individual in the population, allowing an assessment of changes in the population's genetic and demographic condition. This information is used to determine annual breeding recommendations and evaluate issues needed to sustain the captive population into the future. However, there are inherent limitations when using animal record systems, developed primarily to monitor captive populations, to examine the wild population's status. For the wild red wolf population, the largest limitation has been the maintenance of comprehensive records within the studbook due to difficulties encountered when tracking individuals. Recently, studbook data combined with multilocus genotypes and parentage analysis have helped to fill in missing data for the wild population. This information has also been incorporated into more sophisticated population modeling software for detailed analysis of the wild red wolf pedigree. While population management software continues to evolve, the principle tenet of maintaining accurate studbook data remains a valuable resource for program managers in the captive and free-ranging settings.

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[3]University of Idaho, P.O. Box 441136, Moscow, ID 83844-1136

3. AZA Maned Wolf Species Survival Plan: Linking *Ex Situ* and *In Situ* Conservation Programs

MELISSA RODDEN[1]

The American Zoo Association's Species Survival Plan (SSP) program was initiated in the early 1980s, focusing initially on a small number of endangered species with active captive breeding programs. Among these were the Maned wolf (*Chrysocyon brachyurus*), an endangered canid endemic to the grasslands of Brazil, Argentina, Paraguay, and Bolivia. The Maned Wolf SSP was established in 1985; 28 zoos participate in the program currently. MWSSP activities initially focused on developing strong education and research programs that investigated many aspects of the species' biology, including reproduction, nutrition, and health, resulting in numerous scientific publications. The MWSSP published a husbandry manual, translated into both Portuguese and Spanish, that is used us a guideline for management of captive maned wolves in North and South American zoos. Recently, the MWSSP has focused on developing linkages between *ex situ* and *in situ* programs as well as fund raising to support research directed at conservation threats to wolf populations in the species' range countries. Finally, SSP zoos were actively involved in raising funds and organizing the First Maned Wolf Population and Habitat Viability Assessment (PHVA) workshop, held in Brazil in October, 2005. At the PHVA, representatives from range countries, including biologists, educators, and policy-makers, developed a series of Action Steps aimed at preserving the maned wolf and the fragile grassland ecosystem it inhabits.

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4. Creating a Large Conservation Impact With Small Canids in Zoos

KAREN L. BAUMAN[1], ALAN VARSIK[2] AND MARILYN MCBURNEY[3]

Until recently, field biologists have directed the majority of their work towards the larger and more charismatic canid species. Similarly, zoos have historically focused their efforts on the larger canids despite exhibiting small canids. This bias can be demonstrated by the number and longevity of AZA Species Survival Plan (SSP) programs for the large canids: red wolf (*Canis rufus)* established in 1984, maned wolf (*Chrysocyon brachyurus*) in 1985, African wild dog (*Lycaon pictus*) in 1991, an Mexican wolf (*Canis lupus baileyi*) in 1993. These programs have become integrated with ex-situ conservation efforts and are quite successful. In 2001 the Canid Specialist Group Canid Biology and Conservation conference, the creation of the AZA Canid Taxon Advisory Group (TAG) Regional Collection Plan and a request for husbandry advice as part of on-going Island fox (*Urocyon littoralis*) efforts, all coincided and made clear the need for more concentrated efforts on small canids. Since that time, the Canid TAG has responded by creating three small canid SSP programs for fennec fox (*Fennecus zerda*), Island fox and swift fox (*Vulpes velox*). Additionally, support for field initiatives for these species and for the bush dog (*Speothos venaticus*) has also increased. The SSP program for the swift fox was customized to complement on-going conservation efforts coordinated by the U.S. Swift Fox Conservation Team. Likewise, despite having no foxes from the Northern Channel Islands in AZA facilities, the Island Fox SSP was created based on the needs of the U.S. Fish & Wildlife Service Island Fox Recovery Team. Zoos have been a valuable partner in the conservation of large canids and have begun to make significant contributions to small canid contributions as well.

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DESIGN AND SITING OF WILDLIFE CROSSINGS

WEDNESDAY, NOVEMBER 15 • 1:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Trisha White

1. Wildlife Crossing Study For Highway Design of 38 Miles of US 287/26 Crossing Togwotee Pass Between Moran Junction and Dubois, Wyoming

JOSHUA W. BURNIM[1] AND DAVID YOUNG[2]

Wildlands adjacent to Yellowstone National Park in Wyoming are bisected by U.S. 287/26 as it winds east some 55 miles from the Snake River and Moran Junction of Grant Teton National Park to Dubois, Wyoming. Built in the early 1950s, Highway 287/26 crosses the Continental Divide at 9,500-foot Togwotee Pass and courses through a wildlife-rich landscape that includes grizzly bear (*Ursus arctos horribilis*), wolf (*Canis lupus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), cougar (*Puma concolor*), coyote (*C. latrans*) and bobcat (*L. rufus*). Maintaining habitat connectivity and minimizing vehicle-wildlife collisions are two major concerns associated with the 38-mile reconstruction project. The Federal Highway Administration and Wyoming Department of Transportation agreed to implement a long-term study to gather data about wildlife movement across the highway to aid in project design and construction. They sit on a steering committee with representatives from the U.S. Forest Service, Wyoming Game and Fish and the conservation community (American Wildlands). The committee oversees the study through decision making about the study scope, design, methods and data analysis. Results thus far include three years of snow tracking surveys (1,402 wildlife crossings), 10 years of road kill data, and one year of remote camera surveys of culverts. This year the committee is turning its efforts to more detailed evaluations of potential wildlife crossing solutions on two of the five highway sections that cross habitat for the Yellowstone grizzly bear population as well as other carnivores. The study plan includes a decision matrix to prioritize 15 possible locations for wildlife undercrossings, 40 possible locations for upsizing pipe culverts, and other design features.

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[2]Western EcoSystems Technology (WEST), Inc., 2003 Central Ave., Cheyenne, WY 82001

2. Examining the Effects of Data Sources on the Prediction of Highway Crossings For Coyotes in the Canadian Rocky Mountains

VICTORIA M. LUKASIK[1], TARA STEPHENS[1] AND SHELLEY ALEXANDER[1]

The objectives of this study were two-fold: 1) to create habitat suitability models for coyotes (*Canis latrans*) in Banff National Park (BNP) and Kananaskis Country (KC), Alberta; and 2) to compare models created from transects versus road crossing data. Coyote presence data were collected along roads and transects adjacent to roads in BNP and KC from November to April (1997-2000). A Geographic Information System (GIS) was used to generate predictive models from each dataset, for each site. We used a logistic regression approach where our dependent variable was coyote presence and pseudo-absence and our independent variables included distance to roads, distance to movement corridors, distance to water bodies/courses, distance to open/closed canopy, aspect (eastness and northness), slope, ruggedness, elevation, brightness, greenness, and wetness. For each site, the validated road and transect models were compared using a chi-square test. In both BNP and KC, there was no significant difference in the probability of coyote road crossings between the two models. Our results suggest that transect data could be used to predict not only suitable habitat adjacent to roads, but also linkages between habitats fragmented by roads. Although road crossing data may be more efficient to collect, our results suggest that they are inadequate at predicting coyote habitat use beyond roadways. Our results have important implications for the use of transect data to determine the optimal placement of highway crossing structures in the Canadian Rocky Mountains.

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3. Partnerships Between Citizens and Agencies To Improve Wildlife Connectivity in Washington's Central Cascades

CHARLIE RAINES[1] AND JEN WATKINS[1]

Just east of Snoqualmie Pass in the Cascade Mountains of Washington State, the state Department of Transportation (DOT) is proposing to expand Interstate 90 from four lanes to six. This stretch of freeway cuts across several north-south wildlife corridors that must be protected and restored to preserve healthy wildlife populations. State citizens and the U.S. Congress have spent tens of millions of dollars over the last few years to acquire and protect habitat within these corridors. The freeway expansion, known as I-90 Snoqualmie Pass East, can actually improve the situation for wildlife with new structures that allow wildlife to safely travel over or under the freeway. Therefore, over forty local and national organizations joined to form the I-90 Wildlife Bridges Coalition to advocate for high wildlife standards in this project and educate the public about the wider issues surrounding transportation and wildlife. The coalition grew out of a history of grassroots activism and collaboration around the Central Cascades region. Citizen involvement has played a critical role in the management policies of this area. The coalition has worked closely with DOT in the design, mitigation, funding, and monitoring plans for this project to date. This project stands to be the leader for restoration in hydrological systems and linkages for wildlife in the nation. The I-90 project will be a greater success due to the high level of attention and input received from the public. Public involvement resulted in thousands of comments in the spring of 2005 on the Draft Environmental Impact Statement, and has continued to gain momentum through coalition sponsored projects like Bridging Futures, which involved statewide school children designing billboard ads to educate the public about safety concerns for wildlife and drivers on Interstate 90.

[1]I-90 Wildlife Bridges Coalition, 3414 1/2 Fremont Ave N, Seattle, WA 98103-8812; ccraines@comcast.net

4. Carnivore Crossings and Roads in North America: How Are We Doing?

PATRICIA C. CRAMER[1] AND JOHN BISSONETTE[1]

We present information on the practice and science of wildlife crossings for carnivores in North America. Results were generated from a North American telephone survey of transportation and ecology professionals who are knowledgeable about wildlife transportation mitigation measures in each state and Canadian province. There are a minimum of 400 terrestrial wildlife crossings in the United States, and at least 135 of these were built with at least one carnivore species as their target species. The black bear (*Ursus americanus*) was the most often cited target carnivore species, with 84 crossings built at least in part for black bears. The puma (*Puma concolor*) and its subspecies, the Florida panther (*P. c. coryi*), were target species for 53 of existing crossings. The Canada lynx (*Lynx canadensis*) was the main target species for 21 crossings. There are six ocelot (*Leopardus pardalis*) crossings, and one wolf (*Canis lupus*) -specific crossing. Common mesocarnivores such as bobcat (*Lynx rufus*), coyote (*C. latrans*), mink (*Mustela vison*), otter (*Lontra canadensis*), and raccoons (*Procyon lotor*) were listed as target species for a minimum of 23 passages. In Canada there are 143 terrestrial underpasses and overpasses for wildlife. A minimum of 27 of these passages are installed for a suite of target species that include carnivores, including: grizzly bear (*U. arctos horribilis*), black bear, wolf, puma, lynx, and mesocarnivores. We also examined the list of target species for future passages, the most common dimensions of current crossings, and the trends in the science of monitoring carnivore use of passages. We end with future recommendations for practices and research priorities.

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JAGUARS I

WEDNESDAY, NOVEMBER 15 • 1:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Anthony Novack

1. Risk Assessment of the Misiones, Argentina Jaguar Population

ERIC V. LONSDORF[1], JOANNE EARNHARDT[1], MARIO DIBITETTI[2], LAURY CULLEN[3] AND LISA FAUST[1]

Jaguars (*Panthera onca*), like many top predators, are considered a threatened species throughout their range. Managers who strive to prevent the further decline and extinction of jaguar populations need models to project estimates of population viability. Here, we present the methods and results of an individual-based, spatially-explicit model to estimate jaguar population viability in the Misiones region of Argentina. We parameterized survivorship and fecundity parameters by using baseline data from 30 years of data from captive zoo populations, and then modified the data to fit expected effects of field conditions as a result of a two-day workshop with jaguar field biologists. Prior to the model, it was assumed that habitat loss most limited jaguar population growth. The results of the model suggest that human-related threats, such as poaching and road kill, most likely limit growth, and habitat augmentation improves viability only when these threats are reduced or removed. The Argentine National Parks Administration will use the model as a decision analysis tool to select management options that best facilitate jaguar conservation. Our work illustrates the potential for models to provide insight into complex conservation issues and enhance future conservation work of rare and threatened species.

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[3]Instituto de Pesquisas Ecologicas, C.P 31, Teodoro, Sampaio SP., Brasil

2. Estimating Jaguar Density Using Camera Traps in the Lowland Tropical Rain Forest of Peru

SAMIA E. CARRILLO-PERCASTEGUI[1], MATHIAS TOBLER[2], RAFAEL MARES[1] AND GEORGE POWELL[1]

The jaguar (*Panthera onca*) is the largest cat species on the American continent, and although several studies have been gathering baseline ecological data during the last two decades, many questions important for the management and conservation of this species remain unanswered. Between September and November 2005, we carried out a camera trap survey at Los Amigos, Madre de Dios, Peru, with the primary objective of estimating population density of jaguars. The research design consisted of 24 camera stations (two cameras facing each other) set out in a regular grid along a trail system with 2km between cameras. A total of 9 individuals were identified based on their different coat markings. Using capture-recapture models we estimated a total number of 12 jaguars to be present on the 52km^2 grid. We also estimated the effective study area to be 204 km^2 by using a buffer of 3.5 km around our study area, and calculated a density for jaguars ranging from 4.4-5.9 jaguars/100km^2. We had an equal number of capture events for pumas (*Puma concolor)* (N=14) and jaguars (N=14), suggesting a similar abundance of both species though individual pumas were not identified. The activity patterns of the two species showed clear differences. Jaguars were active both day and night, while pumas were almost exclusively nocturnal. There was also a difference in habitat use. Pumas showed a preference for terra firme forest (Chi^2=4.39, df=1, P=0.045) while jaguars used both terra firme forest and floodplain forest according to their availability (Chi^2=0.93, df=1, P=0.409). Although expensive, camera trapping proves to be a very useful tool on gathering information on the abundance, ecology and habits of elusive species in tropical forests. As this study was more focused on jaguars, additional research on larger mammals throughout a smaller grid will be necessary to understand the population dynamics in the area for conservation of this felid species.

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[2]Botanical Research Institute of Texas, Andes to Amazon Biodiversity Program, 509 Pecan St., Forth Worth, TX

3. Jaguar-Human Conflicts in Latin America: A Global Survey and Information Network

ALEXANDRA ZIMMERMANN[1]

The jaguar (*Panthera onca*) occurs in a variety of habitats throughout Central and South America, including forests, swamps, grasslands and areas adapted for cattle ranching. Predation on livestock occurs frequently and conflicts with farmers are widespread. With a shortage of undisturbed habitat for jaguars, reliance on range outside protected areas is inevitable. Jaguar-human conflicts occur in all 18 range states, but their characteristics vary greatly and are determined by ecological, economic and sociological settings. A large-scale survey of jaguar-human conflicts across the range is underway, examining the patterns and dynamics that influence levels of depredation and the perception of conflicts. This paper will present the preliminary results of this survey, providing baseline information about jaguar conflicts across Latin America, and introducing a new, web-based forum for the exchange of jaguar conflict research and management information, which should prove useful for scientists, students, project managers, and others working on jaguars or other large felids.

[1]Chester Zoo & WildCRU Oxford University, Caughall Road, Chester CH2 1LH, UK; a.zimmermann@chester-zoo.org

4. Jaguar and Puma Diets in Eastern Paraguay: Contrasting Top Predators

GERALD L. ZUERCHER[1], RENE PALACIOS[2] AND MYRIAM VELAZQUEZ[2]

The jaguar (*Panthera onca*) and puma (*Puma concolor*) co-exist as top predators in the Mbaracayú Forest Nature reserve in eastern Paraguay. An investigation of their feeding habits has been ongoing at this site since 1999. Although both species consume a similar spectrum of prey, their diets are relatively dissimilar with only modest dietary overlap. Jaguars rely most heavily on collared peccaries (*Tayassu tajacu*) while pumas rely on several other species (i.e., deer, caviomorph rodents, and small mammals). The result is a contrast: jaguars appear more specialist and pumas appear more generalist. This pattern also holds true when compared with other mammalian carnivores in the community. A comparison with other published studies of jaguar and puma diets, via standardized niche breadth, further supports the observed specialist-generalist dichotomy at the Mbaracayú Reserve; jaguars appearing relatively narrow and pumas appearing relatively broad. Finally, a comparison of diet composition with an independent assessment of wildlife abundance in the Mbaracayú Reserve indicates that neither top predator species is consuming prey relative to their availability. Thus, it appears that some prey selection is occurring. These findings emphasize the importance of a long-term management plan for top predators and their prey.

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RARE CANIDS OF THE WORLD

WEDNESDAY, NOVEMBER 15 • 1:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Jeff Flocken

1. The New Guinea Singing Dog

I. LEHR BRISBIN[1] AND JANICE KOLER-MATZNICK[2]

The New Guinea Singing Dog (NGSD) is a wild dog indigenous to the mountains of New Guinea. The NGSD, first described and named by E. Troughton (*Canis hallstromi* 1957), has subsequently been designated *Canis familiaris hallstromi, C. f. dingo, C. dingo, C. d. hallstromi* or *C. lupus hallstromi.* Genetic, anatomical, behavioral, and physiological observations on the captive North American NGSD population support their separation from both the dingo and modern *C. familiaris*. It now seems likely that the NGSD is not, as commonly assumed, merely a feral form of *C. familiaris.* For example, V. Simonsen (1976) reported that NGSDs have two blood enzymes that match coyote (*C. latrans*) or red fox (*Vulpes vulpes),* rather than *C. familiaris* or *C. lupus*. Recent inferences from mtDNA dating indicate that the NGSD has been genetically separated from C. familiaris for a minimum of 12,000 years. NGSDs have several distinctive developmental and behavioral characteristics compared to C. familiaris and C. lupus. At least two NGSD behaviors, the Head Toss solicitation and Cheek Rub, appear to be unique for the genus, as are several NGSD vocalizations. There are <50 highly inbred specimens currently in the documented captive breeding population. Never studied in the wild, virtually nothing is known concerning free-ranging NGSD behavior or ecology. Native informants report the wild NGSD is becoming rarer, and the increasing numbers of *C. familiaris* in the Highlands may pose a hybridization threat. Time is running out for the opportunity to determine if the NGSD is, indeed, a unique taxon.

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2. Maned Wolf Population and Habitat Viability Assessment: An Important Tool For Next Steps of the Species Conservation

ROGERIO C. DE PAULA[1] AND PATRICIA MEDICI[2]

The maned wolf (*Chrysocyon brachyurus*) is the largest Neotropical canid, with a geographic distribution ranging throughout central and southeastern South America. Although this species presents a wide distribution area, populations have been increasingly threatened due to several impacts. Despite the maned wolf's endangered status, its population numbers, precise distribution, the severity of anthropogenic impacts, and other aspects related to its conservation were never discussed deeply by specialists. In October 2006, CENAP/IBAMA and the Brazilian Network of the IUCN-CBSG gathered 53 of the species' specialists from several countries in order to compile and discuss the information available about the species and produce population viability models for each range country. The compilation of data resulted in a population viability model generated by Vortex®, which confirmed the five most important threats for its conservation. The most negative impacts were common for all the countries where the species occurs, resulting in general strategies to be applied locally as well as throughout the species geographic distribution. Conservationists believed that habitat disturbance was the most important cause for the decline of the species populations. However, results coming from this PHVA demonstrated that the species is plastic enough to maintain viable populations in large mosaics of farming/ranching areas as long as natural areas are preserved. However, the loss of individuals by direct removal, such as road kills or hunting, cause more damage to the population. An updated action plan was developed including the population models and the main goals and actions designed to guide future steps for maned wolf conservation.

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3. Influence of Human Activities on Health Status of the Maned Wolf

JOARES A. MAY[1], FERNANDA CALVACANTI[1], JEAN SANTOS[1], ROGERIO C. DE PAULA[2], C. FILONI[3], F.H.G. RODRIGUES[1,4], M.D. RODDEN[5], D.E. WILDT[5], R.G. MORATO[1,2] AND NUCHARIN SONGSASEN[5]

Environmental changes caused by humans affect wildlife health and ultimately impact their survival. This study is examining the influence of human activity on heath status of maned wolves (*Chrysocyon brachyurus*), a flagship species of the Brazilian Cerrado, a severely altered ecosystem. Twenty wolves living 1) inside the park (n = 10); 2) around the park borders (n = 6); or 3) on surrounding farmlands (n = 4), were captured, and biological samples were collected and analyzed. Individual living in farmlands had higher red (RBC, 5.4 ± 0.1 x 10^6/µl vs. 4.6 ± 0.1 x 10^6 and 5.2 ± 0.1 x 10^6/µl) and white blood cell (WBC, 15.4 ± 2.2 x 10^3/µl vs. 11.5 ± 0.9 x 10^3 and 10.6 ± 0.7 x 10^3/µl) counts, hematocrit (43.0 ± 1.3 % vs. 37.7 ± 1.1 and 40.6 ± 1.1%) and hemoglobin (14.0 ± 0.3 vs. 12.0 ± 0.3 and 12.8 ± 0.4 g/L) than those ranging in and around park border ($P < 0.05$). Microcytic and hypochromic RBC were often found in wolves living around the park and on farms. These animals also had higher levels of tick infestation and two wolves were positive for the tick-transmitted disease *Erlichia canis*. Cholinesterase was significantly lower in wolves living inside the park ($P < 0.05$). However, home range location had no influence on blood chemistry values and levels of parasitic infestation. This study demonstrates that human activities (i.e. farming) affect health status of maned wolves, which could potentially impact long-term survival of this threatened species.

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4. New Data on the Late Cenozoic Carnivora of South-East Middle Asia

SHARIF SHARAPOV[1]

During the Late Cenozoic the South-East Middle Asia biocenosis, systematically and ecologically different mammals of Order Carnivora fauna were present, as indicated by numerous discoveries of remains from the Tertiary and Quaternary continental deposits of the Afghan-Tajik depressions, the northwestern Tien Shan mountains (Kyrgyzstan and China) and Hyssar-Alay. The 21 genera and 30 species of carnivores from 6 families (Canidae, Ursidae, Mustelidae, Viverridae, Hyaenidae, and Felidae) may be distingushed on the basis of the morphology of the cranial, dental and postcranial skeletons. The most ancient members of order Carnivora have been found from Late Miocene-Early Pliocene (Pikermian) deposits, where they are represented by the following genera: *Progenetta* (Deperet, 1892), *Adcrocuta* (Kretzoi, 1938), *Ictitherium* (Wagner, 1848) and *Machairodus* (Kaup, 1829). In the Late Pliocene (Middle-Upper Villafranchian) of South-East Middle Asia, new Carnivora forms had appeared including *Nyctereutes megamastoides*, *Canis navrukhoensis*, *C.* ex. gr. *lepophagus*, *C. etruscus*, *C.* cf. *adoxus*, *Vulpes aff. corsac*, *V.* cf. *alopecoides*, *Indarctos* sp., *Ursus verestchagini*, *Chasmaporthetes lunensis*, *Pliocrocuta perrieri kuruksaensis*, *Lynx* ex gr. *issiodorensis*, *Acinonyx pamiroalayensis*, *A.* cf. *pardinensis*, *Megantereon vakhshensis*, *Homotherium darvasicum* and *Hemimachairodus* sp. At the boundary of the Eopleistocene and Pleistocene (uppermost Villafranchian-Galerian) appeared more evolved carnivores: *Canis lupus mosbachensis*, *Xenocuon lycaonoides*, *Meles* ex gr. *meles*, *Pliocrocuta brevirostris*, *Acinonyx* sp., *Panthera gombaszoegensis*, *Homotherium teilhardi-piveteaui*. In the Middle and Late Pleistocene, South-East Middle Asia was inhabited by the following genera and species of carnivora: *Canis lupus*, *C.* cf. *aureus*, *Vulpes* sp., *V. v. karagan*, *Cuon priscus*, *Ursus deningeri*, *Ursus arctos*, *Martes vetus*, *M. foina*, *Meles anacuma*, *Hyaena prisca*, *Panthera leo spelaea*, *P.* cf. *pardus*, *Lynx spelaea*, *Lynx lynx* and *Uncia uncia*. The Holocene assemblage is characterized be impoverishment and rearrangement of the fauna, brought about by a complex of factors, with the environment having the primary role.

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FUNCTIONAL CONNECTIVITY

WEDNESDAY, NOVEMBER 15 • 3:30 PM • GRAND BAY BALLROOM – SOUTH

Moderator: Jeff Lerner

1. Carnivore Connectivity in the Greater Yellowstone Ecosystem: Using Scat-Detecting Dogs As a Tool To Examine Linkage Zone Functionality For a Suite of Species

JON P. BECKMANN[1]

In the Greater Yellowstone Ecosystem (GYE), isolation is of particular concern for large carnivore species that currently occur inside the Yellowstone and Grand Teton National Park core areas. The Centennial Mountains along the Montana-Idaho border are a high priority concern for connecting the Yellowstone to Yukon (Y2Y). Lower levels of connectivity, higher road densities and fewer refugia in the southern Y2Y region make this link particularly important. Because the Centennials have been delineated not only as an area of possible linkage within Y2Y, but also identified as a possible peripheral sink area inside the GYE, it is critical to identify those human activities that potentially prohibit the Centennials from being used as a linkage zone by carnivores. The aim of this project is to utilize a novel, non-invasive DNA sampling technique to examine connectivity for carnivores in the Centennials and surrounding valleys. We are sampling the Centennials using search dogs specifically trained to locate the scat of four species: black bear (*Ursus americanus*), grizzly bear (*U.arctos horribilis*), cougar (*Puma concolor*), and wolf (*Canis lupus*). Using DNA extracted from scat samples we identified individuals for all four species. We utilized a multiple logistic regression analysis with respect to habitat parameters, changes in land use patterns, and measures of human activity, in combination with GIS spatial analyses to examine human impacts on each species' distribution and movements. The resulting models and maps allowed us to highlight areas of highest priority for conservation action. We will discuss merits and limitations of this novel method for carnivore conservation at landscape scales.

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2. Wildlife Linkage Areas: An Integrated Approach for Canada Lynx

JAMES J. CLAAR[1], TIMOTHY BERTRAM[1], ROBERT NANEY[2] AND NANCY WARREN[3]

Conservation planning for forest carnivores now appropriately includes management considerations for habitat connectivity at a landscape scale level. We provided direction for connectivity and linkage area mapping in the Canada Lynx Conservation Assessment and Strategy, 2nd edition, August, 2000. We have mapped "lynx linkage areas" by conducting interagency meetings in the western states within the historic Canada lynx (*Lynx canadensis*) range and incorporating pertinent research. Participants in these meetings included representatives from state wildlife agencies and state departments of transportation, and federal agencies including Federal Highway Administration, Bureau of Land Management, National Park Service, USDA Forest Service, tribal governments, private conservation groups and others. One of the benefits of this approach was to receive professional input and raise the level of awareness of the importance of wildlife connectivity and lynx linkage areas amongst a diverse group of managers. We view this approach as an ongoing process that involves information gathered at the meetings and incorporation of new research data to refine map products. We will present the maps of Canada lynx linkage areas for the western United States, define our concept of linkage areas within the context of lynx conservation and discuss management implications.

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3. Dispersal Movements of Cougars From the Black Hills of South Dakota

DANIEL J. THOMPSON[1] AND JONATHAN JENKS[1]

Cougars (*Puma concolor*) were native to the Black Hills of South Dakota and Wyoming, but were nearly extirpated from the region during the late 1800s and early 1900s. However, the species has become reestablished in the Black Hills through remnant populations and immigration. Cougar dispersal movements have been documented from most western cougar populations, however the semi-isolated nature of the Black Hills cougar population warrants investigation. The objective of this study was to document dispersal movements of cougars captured in the Black Hills of South Dakota and Wyoming, an area encompassing approximately 8,400 km2. During the winters of 2003-2006, cougars were treed via hounds, immobilized, and fitted with radio transmitters. Radioed cougars were monitored weekly from fixed-wing aircraft using aerial telemetry techniques. Animal locations were plotted in ArcView, and dispersal distances calculated. Dispersal movements were calculated for 9 subadult males and 5 subadult females. Eight subadult males and one female left the study area, with dispersal distances ranging from 28.8 to 1,067.0 km (straight-line distance). Four females dispersed from their natal area. No radioed male cougars were recruited into the Black Hills cougar population, with 4 animals traveling > 370 km from capture sites. Cougars leaving the study area had to traverse typically unsuitable habitat, possibly influencing travel distances. Results generated from this study combined with ongoing research will be used to evaluate cougar dispersal movements across atypical habitat along with evaluating possible effects of density dependence on dispersal.

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4. Black Bear Movements in a Fractured Florida Landscape: Beating the Odds in an Agricultural Region

JOSEPH M. GUTHRIE[1], DAVID S. MAEHR[1], WADE A. ULREY[1], AND CARY LIGHTSEY[2]

Most Florida black bear (*Ursus americanus floridanus*) populations inhabit large forested conservation areas on public land. In south central Florida (Glades and Highlands counties) the black bear inhabits a privately-owned, fragmented landscape. Similar landscapes have difficulty supporting resident bears, but this population persists. More than 50 bears have died on local roads here since 1972. Recently, roadkills have approached or exceeded 10 annually. Habitat loss, mortality, and avoidance of habitat near roads in south central Florida could cause genetic impoverishment and allow stochastic events to cause local extinction. This would be problematic for statewide conservation because south central Florida bear habitat represents an important link in a statewide metapopulation. It has recent demographic ties to the Big Cypress region, and is a potential source for recolonizing nearby habitat such as Green Swamp. We have captured and studied 36 black bears in this population since 2004. Documented mortality includes 2 roadkills and 1 illegal kill. Another 6 died suspiciously or disappeared without a trace suggesting that 25% of the sample population may have died from human causes. Thirteen bear home ranges overlapped busy highways, and 16 bears crossed roads at least 192 times. Seven bears effectively traveled between 2 of the 3 primary population centers. Only 1 male moved among all 3. Two bears (1 female) came within 1 km of the Caloosahatchee River – an area of proven large carnivore crossings from the Big Cypress region. Although the threshold for local extinction is unknown, reducing functional connectivity due to new roads and habitat loss will diminish the survival probability of this black bear population. Private land stewardship, highway planning, and recognizing this population's strategic conservation values are keys to the future of bears in Highlands and Glades counties.

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JAGUARS II

WEDNESDAY, NOVEMBER 15 • 3:30 PM • GRAND BAY BALLROOM – NORTH

Moderator: Eva Sargent

1. Connecting the Dots: Preserving Genetic Continuity of the Jaguar Throughout Its Range

ALAN RABINOWITZ[1], KATHY MARIEB[2] AND KATHLEEN CONFORTI[1]

Genetic loss is an important factor in extinction probability. The jaguar (*Panthera onca*) is the only large, wide-ranging carnivore in the world that shows no genetic variation at the subspecies level from samples analyzed to date. This presents a unique opportunity to identify and preserve dispersal pathways between known jaguar populations and help ensure the future survival of the species range-wide. Using best available data and expert knowledge, we used GIS to develop a landscape permeability matrix showing the most likely dispersal corridors between Jaguar Conservation Units – known jaguar populations in areas of intact habitat and relatively abundant prey species – from Mexico to Argentina. While optimal jaguar habitat has decreased by more than 50% over the last century, the jaguar permeability matrix, which includes suboptimal habitats through which jaguars can travel, has decreased by only 16%. This level of permeability has allowed for enough genetic exchange between jaguar populations to prevent genetic isolation. Parts of this matrix however are clearly at risk, if not lost already. In order to keep this genetic corridor a reality, we must now ground truth these potential dispersal pathways and work with decision makers to promote or maintain particular land use practices that are conducive to jaguar survival.

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2. Range-Wide Jaguar Abundance Surveys Coordinated By the Wildlife Conservation Society's Jaguar Conservation Program

SCOTT C. SILVER[1], LEONARD MAFFEI[1] AND LINDE OSTRO[1]

Since 2001, the Wildlife Conservation Society has coordinated a program to estimate jaguar (*Panthera onca*) population abundances using a statistically rigorous mark and recapture closed population model, using remotely triggered camera traps to help identify individual jaguars based upon their pelage. With survey sites based upon a previously undertaken priority setting workshop, a database of more than 50 jaguar population surveys has been collected. These surveys have been conducted in approximately 40 sites in 11 jaguar range countries. Because all these surveys have utilized an identical methodology, clear indications of the relative health of jaguar populations throughout much of their distribution have emerged. This talk will give a brief overview of the survey methodology, and focus on the relative results of these surveys on a range-wide perspective. The presentation will also outline some of the possible caveats of interpreting these results when formulating management action plans, and finally point out regions and habitats throughout jaguar range where more surveys and information are needed to help implement a comprehensive jaguar conservation strategy.

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3. Jaguars of the Sonoran Sky Islands: Results of a Feasibility Study and Future Perspectives

SERGIO AVILA[1], JANICE PRZYBYL[1] AND CORY JONES[1]

In the last decade a number of jaguars (*Panthera onca*) have made their way northward from Mexico into the United States. While information on jaguars is emerging from east-central Sonora and southern Arizona, little data exist within the 150 miles of habitat in between. Sky Island Alliance is committed to securing jaguar recovery and believes that by maintaining habitat connectivity, jaguar conservation will benefit other species and the ecosystems they occupy. Threats such as habitat degradation and loss of wildlife linkages compromise the ecological integrity of the landscape and jeopardize jaguar survival. The purpose of this study was to evaluate the feasibility of conducting ongoing research on the presence and movement of jaguars in northern Sonora. With the participation of volunteers, we visited eight mountain ranges, identified fourteen species of mammals and utilized Geographic Information Systems to depict field observations and a variety of topographical and social features. Sky Island Alliance is convinced that making a connection with landowners and the understanding of their needs will help the implementation and success of this project. With landowner cooperation we propose the use of remote cameras, track surveys and scat collection to further identify jaguar habitat and landscape permeability needs in the Sonoran Sky Islands.

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4. Camera Trapping Jaguars in the Southwestern United States, Results and Implications of a Five Year Field Study

EMIL B. MCCAIN[1] AND JACK CHILDS[2]

Jaguars (*Panthera onca*) remain virtually unstudied in the desert environments at the northern extent of their historic range. Scientific data on current status, distribution and basic ecological requirements are essential for managers to substantiate appropriate conservation actions for the species in the U.S. Jaguars were common residents in the American Southwest until the beginning of the 20th century when western expansion resulted in habitat loss, and predator control programs wiped out remaining populations. Historic records in the Southwest indicate a scattered and declining resident jaguar population into the 1940s, after which point an occasional jaguar was reported approximately every ten years until the present date. Following two jaguar sightings in southeastern Arizona in 1996, we used trail cameras and track transects to monitor several mountain ranges with potentially suitable jaguar habitat along the U.S./Mexico border. We maintained 13 to 50 trail cameras from March 2001 through May 2006, for 22,549 working camera nights, producing 5,574 discernable photographs of native wildlife species, 46 of which were jaguar. Photographs of each jaguar's unique spot pattern allowed individual identification, and "re-sightings" facilitated tracking individuals over space and time. We have identified two adult male jaguars and possibly a third unidentified individual. Within the limitations of non-invasive techniques and small sample sizes, we describe general movement patterns and habitat utilization for jaguars in the American Southwest. These findings reinforce the urgency for conservation work to better identify and protect jaguar habitat and movement corridors across the border between the southwestern United States and Mexico.

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5. Jaguars' Once-Extensive United States Range Argues For a Northern Jaguar Recovery Plan

MICHAEL J. ROBINSON[1]

The jaguar (*Panthera onca*) deserves a recovery plan for its United States range. "Tygers" were reported in 1711 and 1737 in the North Carolina mountains and on the Carolina coast. In the 1840s and 1850s, a "vast number" of jaguars lived in Texas, their pelts were on sale in San Antonio, a "large tiger" was reported in the Texas Panhandle, and Comanches sported jaguar skin quivers, holster coverings and saddle cloths. Texas's last jaguar died in 1948. Audubon reported jaguars at the headwaters of the Rio Grande, and in 1843, a "leopard" was sighted in northern Colorado. In California, jaguars ranged up to Monterey Bay. In 1860, an Indian near Palm Springs, hunting with a deer head disguise, was attacked by a jaguar and shot it dead. Most recorded jaguars in the U.S. herald from New Mexico and Arizona, including a female and two kittens killed in the Grand Canyon in the late 1880s, one killed on the Great Plains of northern New Mexico in the 1930s, three apparent melanistic (black) jaguars in 1916, 1973 and 1999 in New Mexico, and the last female known in the U.S. killed in 1963 at 9,000 feet elevation in the White Mountains of Arizona (where Mexican wolves currently roam). A Northern Jaguar Recovery Plan could take advantage of millions of acres in New Mexico and Arizona identified by the interagency Jaguar Conservation Team as potential jaguar habitat, including extensive roadless areas with robust deer and elk populations. This presentation includes maps and unpublished historic photos.

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BIG CATS OF THE WORLD

WEDNESDAY, NOVEMBER 15 • 3:30 PM • WILLIAMS-DEMENS ROOM

Moderator: Jeff Flocken

1. The Tiger Genome: Implications in Wildlife Forensics

S. P. GOYAL[1], REETA SHARMA[1], S. MISHRA[1] AND S. RAJPUT[1]

The primary goals of tiger (*Panthera tigris*) conservation are to have viable population throughout the species' range and to curb illegal poaching. Recent years have seen an increase in tiger poaching in India for skin and body parts, and according to the Wildlife Protection Society of India, 72 tigers were killed in 2001 alone. India has 27 tiger reserves and it is essential to evaluate the current status of each wild regional population for short- and long-term survival as well as proper enforcement. In addition, it is also very important to determine which tiger populations are most vulnerable to poaching. Identification of species from parts and products is a serious problem for enforcement. This study attempts to address these issues by genotyping all regional populations of tigers in India. DNA was taken using noninvasive techniques, including scats collected within twenty-four hours and by collecting hair using hair snares and skin samples wherever possible. Fifty to 70 scats samples have been collected from Corbett, Ranthambhore and Panna tiger reserves. A simple PCR-RFLP technique for identifying species has been standardized which is suitable for dealing short DNA fragments found in scats. Sex specific premier (120-190 bp) has also been designed for identifying sex. We will use cat specific twelve microsatellite markers, representing different loci of cat genome. The information gathered would improve implementation of the Indian Wildlife (Protection) Act of 1972 and strengthen tiger conservation scenario by better targeting enforcement measures for the areas prone to poaching.

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2. What Happens When People Stop Living in Tiger Habitat? A Case Study From the Shivaliks

ABISHEK HARIHAR[1], BIVASH PANDAV[1] AND S.P. GOYAL[1]

Successful tiger (*Panthera tigris*) conservation in human-dominated landscapes has proved quite elusive. This study aims to monitor populations of tiger and its prey species in a protected area (Chilla range of Rajaji National Park, northern India) that has recently made free of human habitation (2004). The population of tigers was estimated using photographic capture-recapture analysis. Two primary occasions (January to February 2005 and January to February 2006) of 15 secondary occasions each were used to estimate the population parameters. Ungulate prey density was estimated over the years (2005 and 2006) by walking 9 permanently marked spatial replicates 8 times each using distance sampling methods. Field collected scats were analyzed to study the food habits of tigers. The current annual biomass off take (~3%) and the relatively high prey density (~100 individuals/km^2) and biomass (~6000 kg/km^2) suggests that this area, which presently supports a low tiger density (~3 tigers/100km^2), serves as prime tiger habitat. This emphasizes the need to ensure the long-term survival of the tiger.

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3. Behavioral Study of Tiger and Habitat Management in Manas Biosphere Reserve

CHHANDASHREE C. SARMAH[1]

We studied feeding behavior, breeding behavior (limited), and social behavior of 20 mammal species, including tigers (*Panthera tigris*) in the Manas Biosphere Reserve in Assam, India. The resources taken into consideration included food materials, water and safe refuge from predators and environmental extremes. We also studied the social environment in which a species can engage in reproductive activities including courtship, mating and rearing of the young. After field survey, it was seen how these factors could be manipulated according to management requirements. For habitat estimation, relative values of the habitat were determined by chi-square application wherever the species dimension allowed. Apart from this the taxonomy, food range and feeding habits, breeding habits and social habits of the species were undertaken for study in this present work.

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4. Marking Site Selection By Free Ranging Snow Leopards in Hemis National Park, Ladakh, India

SANDEEP SHARMA[1], TRISHNA DUTTA[1] AND YASH VEER BHATNAGAR[2]

Marking plays a major role in managing the land tenure in solitary carnivores. It is an effective means of communication with con-specifics to advertise their presence, for delineating territory and signaling of reproductive stages. Snow leopard (*Uncia uncia*) is a rare and elusive felid species of Himalayas in Asia, occuring at a low density in a landscape where intraspecific communication is essential for its survival. Snow leopard largely uses scrapes and scent marking on rocks for communication. We studied marking site selection by snow leopards in Ladakh, India, in winter 2004. We found that the selection of marking site selection largely depends on the terrain features, rock characteristics and anthropogenic disturbance. We also investigated the factors responsible for site selection at micro level. The study results will help in studying behavioral aspects of snow leopards. It will also help in designing precise and reliable sign surveys for population monitoring of snow leopards and thus they help in the conservation and management of their populations.

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5. Improvements in Sign Survey For Population Monitoring of Snow Leopard

SANDEEP SHARMA[1], TRISHNA DUTTA[1] AND YASH VEER BHATNAGAR[2]

Snow leopard (*Uncia uncia*) is very a secretive, sparsely distributed, endangered big cat species of the Himalayas and adjoining high altitude area. Being a large carnivore, the snow leopard occurs at a low density, and is sparsely distributed even in high prey-biomass areas. Their solitary nature, wide-ranging behavior, and the rugged steep terrain in their habitat make their observation difficult in wild and create a major problem in monitoring snow leopard populations, forcing researchers to rely on indirect methods of population estimation. We studied the efficacy of sign surveys for population monitoring and abundance estimation of snow leopards. We monitored sign frequency in 6 permanent and 9 random transacts and also compared change in sign frequency with conduciveness of habitat for sign deposition. Along with this we monitored change in sign frequency after visitation of the trails by snow leopards. Another study aspect was to investigate the correlation between snow leopard density and sign frequency. We found that scrapes are the most predominant type of signs and could be used effectively to monitor the changes in snow leopard population. Sign frequency is also a positively correlated with snow leopard visitation and their density. We also attempted to design the effective sign survey protocols for precise estimation of change in snow leopard abundance. We also investigated the use of pugmark for individual identification of snow leopards and their eventual use in population monitoring and conservation of snow leopards.

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6. Population Monitoring of Tigers in Ranthambhore National Park, India Using Pugmarks

SANDEEP SHARMA[1], TRISHNA DUTTA[1] AND BELINDA WRIGHT[2]

Tiger (*Panthera tigris tigris*) is an endangered cat species of India. Their effective conservation and management requires reliable and precise population estimates, which are often difficult to obtain by conventional population monitoring methods, owing to the species' solitary nocturnal nature and large home-ranges. Ranthmabhore National Park in India is probably the westernmost population of tigers in the world, and the population faces survival threats due to anthropogenic pressure. Continued decline of tiger population in Ranthambhore NP called for a population estimation exercise in May 2005, where we used an objective multivariate technique for identification of individual tigers from their pugmarks using the digital photographs of their hind pugmarks. We used a systematic sampling framework along with an objective statistical technique for precise population monitoring of tigers. We obtained 2000 pugmarks and 200 pugmark sets from Ranthambhore and compared our results of tiger population estimates with those of camera traps and the traditional pugmark tracing and plaster cast methods. We found that the digital pugmark technique is very accurate, reliable, cost effective and easy to use. We also demonstrated that this technique requires minimum level of training compared to others used for tiger population estimation.

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POSTERS

Evolutionary Relationship Between Striped Skunks and Rabies in the Central Great Plains

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Historically, epidemiology, pathology, and etiology are well-studied aspects of rabies research. Scientists are now realizing the importance of host ecology (patterns of migration, dispersal and sociality) in rabies transmission and evolution. The striped skunk (*Mephitis mephitis*) and rabies provide a model system to study the relationship between host ecology and rabies dynamics. Two genetically distinct variants of striped skunk rabies occur in the northern and southern Great Plains. The border between the northern and southern skunk variants was stable near the Kansas-Nebraska border until 2003, when the southern variant began to shift north, displacing the northern variant to northeastern Nebraska. We are investigating genetic diversity in these two rabies variants and in corresponding striped skunk populations using the rabies N gene and striped skunk microsatellites. Our preliminary results suggest a higher genetic diversity among northern rabies variant haplotypes from South Dakota skunk populations than among southern rabies variant haplotypes from Kansas skunk populations. Because parasite phylogeny tends to parallel host phylogeny, we predict that striped skunk populations in South Dakota should have higher genetic diversity than Kansas populations. Interpreting genetic diversity of skunk populations and rabies in Nebraska is more difficult because of the recent shift and possible overlap of rabies variants. Understanding the genetic diversity of striped skunk populations in Kansas, Nebraska, and South Dakota will provide insight into how host population genetics may influence pathogen dynamics as well as the possible cause for the border shift between skunk rabies variants in the central Great Plains.

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Health Assesment of California Sea Lions Utilizing Fluctuating Asymmetry

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Fluctuating asymmetry (FA), the subtle random deviations within bilateral traits, is an indirect marker of developmental instability and hence a useful indicator of population health. Results from numerous studies indicate that individuals exposed to higher levels of developmental stress (genetic or environmental) tend to exhibit increased asymmetry and also increased susceptibility to disease and other mortality factors. These individuals also tend to experience lower reproductive success. Previous work indicated that the level of FA exhibited by California sea lions (*Zalophus californianus*) has increased significantly over the past century (Schaeff and Coy, In prep.). We assessed biological significance of this increase, and hence the usefulness of FA as an indicator of population health, by examining the relationship between the level of FA exhibited and susceptibility to disease in 200 necropsied adult sea lions provided by the Marine Mammal Stranding Center located in Sausalito, CA. FA, the difference in left and right length estimates for a given bilateral trait, was estimated for 11 cranial traits using measurements obtained with both digital calipers and a microscribe. Cause of death included both condition-dependent and independent factors (cancer, leptospirosis, trauma, and domoic acid toxicity).

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Individual Variability in the Temperament of Domestic Dogs: the Case of Dogs Housed in a Public Shelter and Veterinary Hospital

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Seventy-four dogs (*Canis familiaris*), housed in a public shelter and veterinary hospital in Rome, were observed using the "focal animal sampling" and "all occurrences" methods on the basis of a specific ethogram (De Palma et al. 2005). Nine observations were carried out for each dog. In addition, three fecal samples were collected from each dog on three consecutive days during daily routine, to measure the levels of cortisol metabolites (CM) and to evaluate adrenocortical activity. A Principal Component Analysis (PCA) has been utilized with the aim of defining the main "factors" characterizing the observed animals. The values of these factors have been correlated with the levels of CM by means of the Spearman rank correlation test. The PCA identified five primary factors (F1 "subordination/ aggressiveness," F2 "intra-specific dominance-activity," F3 "anxiety-sociability towards dogs," F4 "playfulness," F5 "sociability towards humans") with eigenvalues greater than 1 that accounted for 56% of the total variability. Any correlation of 0.50 or above is deemed relevant for the variable loading on each factor. An inverse correlation has been found between CM levels and the fifth factor of PCA (rho=-.276, N=39, p=0.08). The results show a very high individual variability. In general a distinction may be introduced between a confident-independent temperament more common in stray dogs and, on the other hand, a sociable temperament which is more likely to be observed in dogs already accustomed to human beings. A low level of anxiety and aggressiveness has been recorded with no depression, apathy, self-mutilations and other stereotypies.

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Evaluating the Effectiveness of Predator Coexistence Programs in the United States

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As predators such as coyotes (*Canis latrans*) and mountain lions (*Puma concolor*) have expanded their ranges to include metropolitan areas, and as humans have moved into territories traditionally occupied by predators, conflicts with humans are inevitable. Increasingly it is recognized that people need to learn to coexist with wildlife such as avian and mammalian predators. There is tremendous variety in the methods of predator coexistence programs in the United States. However, there has been little work to examine which types of outreach efforts are most effective in building tolerance for predators and achieving greater levels of coexistence with wildlife. Moreover, it is not yet understood if certain types of outreach programs are more effective than others under specific conditions (urban v. rural, larger v. smaller predators, etc.). As most predator coexistence programs work on tight budgets, addressing this question will help organizations allocate resources to develop projects that will have the greatest likelihood of success. This study examines the various types of coexistence programs that operate in the United States, categorizing them by type of outreach effort. We look at the specific metrics that various programs use to evaluate their actions. According to these evaluations, we determine what types of programs have been the most successful. Finally, the idea of standardized metrics for predator coexistence programs is explored. By comparing the results of various programs through sufficient, standardized metrics, these organizations could maximize their ability to minimize the number and impact of human-predator conflicts.

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Noninvasive DNA Analysis To Evaluate Abundance and Genetic Status of Recolonizing Black Bears in Oklahoma

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By the early 1900s, black bears (*Ursus americanus*) were extirpated in Oklahoma and nearly extirpated in Arkansas. The translocation of 254 individuals from Minnesota and Canada during 1958-1968 led to the restoration of black bears to Arkansas by the mid-1990s. Black bears are currently dispersing west across mountain ridges of the Ouachita Mountains from Arkansas into areas in southeastern Oklahoma devoid of bears since 1915. The incidence of quality habitat within dispersal range of a large bear population is rare due to increasing spatial limitations on available habitat. Genetic monitoring of this event provides an opportunity to examine the unique characteristics of recolonizing populations. Natural recolonization is valuable as a potential tool for management of wildlife populations in the absence of adequate funding and public support. We collected hair samples noninvasively from 128 hair snares set at a frequency of 1 trap per 23 km^2 across the 3,420 km^2 study area. Hair collection occurred during two 7-week periods from June–August 2004 and 2005. We collected 650 hair samples. Of 315 (48.5%) extracted, 234 (74.3%) of these were sexed and genotyped at ≥ 7 of 10 microsatellite loci. Of these, 142 (60.7%) are unique individuals represented by a male-biased sex ratio of 1.6:1, and 46 (32.4%) are recaptures. The remaining 46 are duplicate samples. Genetic diversity in this population (0.78) is similar to its source population in Arkansas (~0.75) as well as other large black bear populations (~0.79). No negative effects from inbreeding or reduced population size are evident.

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Discovery of a Modern-day Midden: Continued Exploitation of the Suwannee Cooter, *Pseudemys concinna suwanniensis*

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Exploitation of turtles for human consumption has a long history in Florida, and includes marine species, gopher tortoise (*Gopherus polyphemus*), diamondback terrapin (*Malaclemys terrapin*), alligator snapping turtle (*Macrochelys temminckii*), and Suwannee cooter (*Pseudemys concinna suwanniensis*). The Suwannee cooter occurs in river systems draining into the Gulf of Mexico (USA), from the Ochlockonee River in the Florida panhandle, southward in the peninsula to the Alafia River. A May 2004 discovery of Suwannee cooter carcasses at a rural dumpsite near Cedar Key, Florida, confirmed continued exploitation. A minimum number of 170 turtles was determined; these represented 164 Suwannee cooters, one peninsula cooter (P. *floridana peninsularis*) and five Florida red-bellied turtles (*P. nelsoni*). The Florida Fish and Wildlife Conservation Commission (FFWCC) currently lists the subspecies P. *c. suwanniensis* as a Species of Special Concern, but the take of *P. concinna* statewide is allowable with a possession limit of two per individual and a closed season from 15 April to 31 July. Considering the broad range of conservation challenges facing this species, the FFWCC should immediately address those threats that can be controlled. A regulatory change eliminating the legal take, and development of adequate education and enforcement programs, would be effective actions toward conserving North America's largest emydid turtle.

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Characterization of Badger Burrows At Hart Mountain National Antelope Refuge, Oregon

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The North American badger (*Taxidea taxus*) is considered a keystone species in some ecosystems and is abundant at Hart Mountain National Antelope Refuge in southeastern Oregon. Approximately 280,000 acres, the Refuge includes several habitat types of conservation interest: low sagebrush (*Artemesia bigelovii*), mountain sagebrush (*Artemesia tridentata vaseyana*), bitterbrush (*Purshia tridentata*), and Wyoming big sagebrush (*Artemesia tridentata wyomingensis*). However, cheatgrass (*Bromus tectorum*) and clasping pepperweed (*Lepidium perfoliatum*), both exotic species, are rapidly expanding in the Refuge. We sought to characterize badger burrows in an attempt to better understand their habitat needs at the Refuge. Badger burrows were located via systematic 100-meter wandering transects within selected 1 mi^2 plots at Hart Mountain NAR. Upon detection, each badger burrow was described according to: aspect of burrow entrance(s), microtopography, plant alliance, plant association, and other variables. The majority of badger burrows had a single entrance (77.5%) and burrows typically opened uphill (95.4%). Aspect of these burrow openings ranged from predominantly east-facing (29.8%) to predominantly west-facing (21.8%). Over 90% of badger burrows were located in habitats dominated by five types of vegetation: Wyoming big sagebrush (28.13%), low sagebrush (20.62%), cheatgrass (18.56%), clasping pepperweed (14.86%), and bottlebrush squirreltail (*Elymus elymoides*) (11.19%). Burrows located in Wyoming big sagebrush and low sagebrush most often occurred >100 meters from the next nearest vegetation type while burrows located in cheatgrass, clasping pepperweed, and bottlebrush squirreltail were most often located <50 meters from the next nearest vegetation type. These data suggest that areas dominated by exotic plants are less favored for burrow locations unless an alternative native vegetation type is near.

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Effectiveness of Bridge-sign Surveys in Determining the Presence or Absence of River Otters Reintroduced in Pennsylvania

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The Pennsylvania River Otter Reintroduction project was initiated in 1982 and has monitored reintroduced populations primarily through sign surveys (detecting scats). Many states, including Oklahoma, Arkansas, Georgia, California, Nebraska, and Indiana, have conducted surveys at bridge crossings to detect presence of river otters (*Lontra canadensis*). We conducted surveys to detect scats from river otters at 26 bridge-suites (all associated with riverine habitats), which included a bridge, a random site, and a selected site (high quality site based on the presence of riparian habitat variables previously identified as being associated with river otter latrine sites in Pennsylvania) to determine the efficacy of using bridges only to detect the presence of river otters. The quality of survey reaches were evaluated from aerial photographs and subsequent on-site evaluations. From surveys conducted in autumn 2004, scat was documented at 4 (15.4%) of the bridge sites, 5 (19.2 %) of the random sites, and 11 (42.3%) of the selected sites. A similar pattern was detected in spring 2004, with scats being detected at 3 (11.5%) of the bridge sites, 4 (15.4%) of the random sites, and 14 (53.8%) of the selected sites. Our results indicate that scat occurred more frequently at sites selected based on sections of streams containing habitat features previously identified as being associated with river otter latrines in Pennsylvania. Our results suggest monitoring river otters' distribution using bridge-crossings only may not be an effective method in determining their presence in a water system.

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Feasibility Study For the Reintroduction of Fisher To New Jersey

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Fishers (*Martes pennanti*) were extirpated from New Jersey by the mid-1800s. Since that time, improved conservation measures have allowed for extensive forest re-growth and hunting regulations. This study sets out to determine the feasibility of reintroducing the fisher to portions of its historic range in northwestern New Jersey. A comprehensive study was conducted utilizing aerial photography and field studies to compile a GIS of suitable fisher habitat. In addition to this habitat assessment, a prey survey was conducted to determine the density and diversity of fisher prey in this region implementing track plates and camera traps. Lastly, a preliminary survey was conducted to determine the presence/absence of fishers in this area. Recommendations for release numbers and areas are provided along with detailed habitat mapping.

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Endogenous Conservation and the Trade of Crocodile Organs for Traditional Medicine Purposes in Bénin

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The study was carried out in subhumid soudanian zone in northern Bénin to determine the current distribution of crocodile species, the endogenous methods of their conservation and the trade of crocodile organs used in traditional medicine. We sampled 108 locations where the presence of crocodiles was established. Three habitat types utilized by crocodiles were distinguished: dams (57%), ponds (25%) and rivers (18%). The three crocodilian species found in Africa are present in Bénin: *Crocodylus niloticus*, *Crocodylus cataphractus*, and *Osteolaemus tetraspis*. Depending on the localities, crocodiles were protected because they represent a divinity for certain local people and a totem for others. Such beliefs or customs are the grassroots of endogenous conservation and represent the most important method of crocodile protection in Bénin. This pact creates a relationship between crocodiles and people based on reciprocity and mutual respect. Our investigations on 31 local markets in Bénin, on 2 markets in Nigeria Republic (Banana and Samia) and on Gaya market in Niger Republic yielded an inventory 17 organs of crocodile for sale: skin, muzzle, legs, bone, fat, eggs, eggshell, anus, dropping, teeth, bile, liver, lungs, heart, penis, stones contained in crocodile stomach, and a live animal. Crocodile organs were twice as expensive in Nigeria and Niger, which centers of commercialization of wildlife products; accordingly, localities bordering these big markets in Nigeria and Niger lacked conservation measures. This study indicates that when wildlife parts become marketable without control, local customs and beliefs could be weakened and endogenous conservation jeopardized.

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Phylogeography and Demographic History of Gray Foxes From Eastern North America

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Gray foxes (*Urocyon cinereoargenteus*) are widely distributed in North America, Central America and northern South America. In spite of their extensive range there is suprisingly little known about their basic ecology, demography and phylogeography. In this study we used a phylogeographic approach to analyze gray fox populations along the east coast of North America. We examined mitochondrial DNA variation in 103 foxes from areas distributed throughout the Eastern USA including samples from South Carolina (n=48), Virginia (n=6), New England (n=19), and New York (n=30). These samples cover the range of three subspecies: *U. c. borealis* in northern New England and New York, U. *c. cinereoargenteus* east of the Mississippi and north of Georgia, and *U. c. floridanus* in the Gulf Coast states. Analyses of the mtDNA control region revealed 20 haplotypes, each closely linked in a star-shaped phylogenetic network. Most of the variation was found in *U. c. floridanus* with potential bottlenecks found in *U. c. cinereoargenteus* and *U. c. borealis*. Results of a "mismatch distribution analysis" and the deviation from neutrality suggest a recent rapid demographic/ range expansion. Our expansion hypothesis is supported by paleontological evidence that during the last glaciation gray foxes did not extend into the current range of *U. c. borealis*. Additionally, historical evidence suggests a second southward range shift in the 17th century when they disappeared from Canada at the same time red foxes were introduced. They have since recolonized and extended the previous northernmost limit of their range.

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Experimental Release of Red Wolves on Cape St. George Island, Florida

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The red wolf (*Canis rufus*) recovery program utilizes barrier islands to raise red wolves in controlled wild settings. Young red wolves born on these islands augment wolf populations in recovery areas. Islands can also be used to introduce or maintain wolves in a wild setting prior to release elsewhere. We released a pair of sterilized red wolves on Cape St. George Island, a 2,300 acre undeveloped barrier island, to test if a pair of red wolves could be managed on a small barrier island. Red wolf programs have been successful on St. Vincent Island, Florida (12,000 acres), Bulls Island, South Carolina (5,000 acres) and Horn Island, Mississippi (3,500 acres). The male and female red wolves roamed free for just over 14 and 18 months, respectively, before being removed from the island. The wolves successfully obtained prey, adequate fresh water and maintained a territory on the island. The wolves displaced a resident coyote from the island, reduced the raccoon population and also preyed on feral hogs. In addition, the wolves depredated sea turtle nests. Future releases of red wolves on small barrier islands should carefully consider all aspects of having a top level predator in a closed setting.

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Riparian Habitat Use By Mammalian Carnivores in Two Contrasting Mediterranean Matrix Landscapes in Southwestern Portugal

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Riparian habitats are linear landscapes with enormous ecological value. Since riparian habitats' economic value is negligible they are often disregarded and subjected to increased loss and fragmentation, usually lacking effective management policies. In Mediterranean landscapes riparian habitats are rare and threatened, being listed in the Annex I of the European Union Habitats Directive (EU Directive #92/43/CEE). Integrated in an ongoing project our goal was to understand the importance of riparian habitats to mammalian carnivores (POCTI/MGS/47435/2002). We assessed carnivore use of riparian habitats in two contrasting Mediterranean landscapes (cork oak woodlands and extensive cereal plantations) with track plate surveys. Our main results were that: 1) track plates surveys detected 67% of the carnivore species potentially occurring in the study area; 2) the majority of detections occurred in the cork oak matrix (n cork oak = 349; n extensive cereal = 98) with an even distribution throughout the sampling areas; 3) in extensive cereal plantations species were mostly detected in riparian habitats. Our results indicate that riparian habitats are used by carnivores independently of the surrounding matrix. Moreover, our results emphasize riparian habitats importance in extremely human altered landscapes and stress the need for effective riparian habitat conservation guidelines.

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Ecology of the Florida Black Bear At the Urban-Wildland Interface of Ocala National Forest

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Black bears (*Ursus americanus floridanus*) have disappeared from most of their former range as a result of habitat conversion and direct persecution by humans. Human-bear interactions are a critical issue for bear managers in rapidly growing Florida. Understanding how bears utilize areas at the urban-wildland interface (UWI) is crucial to their management and conservation. In Florida, urbanization adjacent to the state's largest bear population in Ocala National Forest has created the juxtaposition of human communities and bear habitat. We are investigating home range size, habitat use, and activity patterns of bears within UWIs and comparing them to similar characteristics for forest dwelling bears. In 2005 a total of 18 bears (9M, 9F) were captured. Of the bears collared 6 (3M, 3F) are sub-adults and one is a yearling (M). Diel monitoring is being used to determine bear activity patterns and habitat use. Six cubs (1M, 5F) of females that denned in 2006 were equipped with expandable radio collars to document mortality sources. Bears will continue to be trapped in 2006 and monitored into 2007.

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Life History of Carnivora: Phylogeny, Body Size and the Fast-Slow Continuum

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Associations among life-history traits of the order Carnivora are re-assessed to determine the effects of phylogeny and body size on life-history patterns and to see whether or not the fast-slow continuum holds for Carnivora after these effects are removed. Fast species are short-living, develop quickly, and reproduce at young age with high investment per reproductive event, while slow species live longer, develop more slowly, and invest less per reproductive event. The traits included in the analysis are: longevity, inter-birth interval, age at sexual maturity, age at independence, weaning age, gestation length, litter size, birth weight, litter weight and adult female weight. Before correcting for the influence of phylogeny or body weight, correlations corresponded to the theory of the fast-slow continuum and adult female body weight was strongly correlated with all variables. After correcting for effects of phylogeny, correlation coefficients decreased, but correlations with adult female weight remained strong, indicating that life-history traits are ranked according to body size. After effects of both phylogeny and body size were removed, few correlations remained significant. These correlations corresponded to the fast-slow continuum, except for the association between inter-birth interval and weaning age. Results suggest that the fast-slow continuum may hold for only certain life-history characteristics. For Carnivora, age at sexual maturity and litter size and inter-birth interval seem to play key roles in life-history.

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Carnivore Restoration in the Greater Northern Appalachians: Integrating Population Viability Analyses Into a Wildlands Network Design

CONRAD REINING[1] AND NADIA STEINZOR[2]

Our poster presentation will detail the habitat needs and viability of three carnivores – lynx (*Lynx canadensis*, marten (*Martes americana*), and wolf (*Canis lupus*) – in the greater Northern Appalachian region (comprising the Adirondacks, northern New England, and eastern Canada) and the integration of these data into the Wildlands Project's Wildlands Network Design (WND) for the Northern Appalachian region. This is the sixth of the Wildland Project's WNDs – science-based plans detailing how the protection and connection of habitat across large areas can be achieved. Through a combination of mapping and biological analysis, WNDs identify core wild areas where natural processes function normally; wildlife linkages that facilitate the migration and genetic mixing of wildlife species; and stewardship lands that buffer cores and linkages while supporting human communities. Although the lynx, marten, and wolf vary in their requirements for survival, they are all threatened in portions of the greater Northern Appalachians, play significant ecological roles, and are particularly affected by habitat disturbance. On behalf of the Wildlands Project, Dr. Carlos Carroll of the Klamath Conservation Center has developed regional-scale analyses of habitat, population viability, and conservation needs for these three focal carnivores. Today, the protected pockets of natural habitat that remain in the Northern Appalachians are too small, too isolated, and represent too few types of ecosystems to maintain native biodiversity. The realization of a WND based on the restoration and survival of carnivores such as the lynx, marten, and wolf will help combat the fragmentation and degradation of habitat and strengthen biodiversity.

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Maneless Male Lions in the North Western Sector of the Selous Game Reserve, Msolwa-Tanzania

ISMAIL J. SAID[1]

This poster describes a research proposal to determine the causes for the birth of maneless (appearing female) male lions (*Panthera leo*) in the northwestern sector of the Selous Game Reserve in Tanzania, and to determine if this phenomenon is likely to have adverse impacts on the reproductive success and viability of the population. The research will be carried at Msolwa. The sector seems to be a terrestrial island as it is geographically separated from other areas of the park by rivers and huge mountain ranges of the Udzungwa Mountains National Park. The study will investigate the reasons for the birth of maneless male lions in the area, assess impacts of tourism, and examine reproduction and genetic impacts. Priority issues will include enhancing game staff participation by creating awareness in data collection and assisting local communities dealing with environmental conservation at Msolwa village. The research is expected to take 4 years from January 2007 to January 2011. Anticipated cost of the study is $60,000, to cover materials, travel, data analysis and other costs.

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Canine Width Can Determine the Age of Wild Black-Footed Ferrets

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The recovery program for black-footed ferrets (*Mustela nigripes*), a carnivore indigenous to North America's Great Plains, uses intensive monitoring to assess reintroduction success. Age determination is difficult because juveniles are adult-size by 100 days old around the time of dispersal when monitoring efforts are conducted. Aging animals would assist in estimating population recruitment and the success of the reintroduction site. Our objective was to assess the ability of using the base width of the upper, right canine for aging black-footed ferrets. We validated this method on known-aged captive-bred individuals and tested it in an intensively monitored, known-aged free-ranging population. In captive-born individuals ($n = 127$), canine width was different ($P < 0.001$) among juvenile (3 to 5 months old; $n = 21$), 1-year old ($n = 9$) and > 1-year old ($n = 30$) males and between juvenile ($n = 24$) and adult (> 1-year old; $n = 43$) female ferrets. Similarly, *in situ* males could be classified as juveniles if canine width measured < 3.50 mm, as a 1-year old if the canine measured between 3.90 and 4.30 mm and as a > 1-year-old if width is > 4.30 mm. *In situ* females could be classified as juveniles if canine width was < 3.23 mm or as adult (> 1-year old) if the canine was > 3.80 mm wide. Data revealed that canine width is an effective tool for determining the age of wild-born black-footed ferrets, allowing for the assessment of population dynamics and the success of recovery efforts.

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Evidence of Human Interaction in Pinnipeds Stranded in New York State

REBECCA A. SCOTT[1], ROBERT A. DIGIOVANNI, JR.[1] AND KIMBERLY F. DURHAM[1]

The Riverhead Foundation for Marine Research and Preservation responds to stranded marine mammals and sea turtles throughout New York State. Between 1996 and 2005, the stranding program examined 1,137 pinnipeds. Determination of human interaction was made based on criteria developed by National Marine Fisheries Service (NMFS) from level A (basic minimum data), level B (supplementary on-site information) and level C (necropsy examination) data. Thirty-eight (3%) animals presented with evidence of human interaction. Of these cases, seventeen were described as fishery interaction (45%), two as gunshot (5%), and nineteen were described as "other" (50%), Entanglement in gear was the only type of fishery interaction described and was the most commonly seen type of human interaction. Of these cases, ten harbor seals (*Phoca vitulina*) (59%), five gray seals (*Halichoerus grypus*) (29%), and two harp seals (*Pagophilus groenlandicus*) (12%) presented with evidence of fishery interactions. Both human interaction cases resulting in injuries from gunshot took place in 1996 and involved harbor seal. Types of human interaction listed as "other" were oil contamination, motor vehicle interaction, human disturbance, traumatic injury, unauthorized capture, and ingestion of man-made debris. Species composition of those encountered with other human interaction was eight harp seals (42%), seven harbor seals (37%), three gray seals (16%) and one hooded seal (*Cystophora cristata*) (5%).

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Threats To the Tundra: Development and Diversity in the Land of the Midnight Sun

RICHARD K. SNOW[1] AND MARY SNOW[1]

During the last 100 years, portions of the tundra have warmed by 10°C, which is 10 times the global average. Sea ice has diminished by 15% across the Arctic Ocean over the past 20 years, and 75% of the Canadian arctic tundra is predicted to disappear along with one in five of its native species. Amidst this backdrop of rapid warming is the heated debate over drilling in the Alaskan Arctic Wildlife Refuge (ANWR). While proponents point to U.S. dependence on foreign oil, opponents of drilling note that increased fuel efficiency from 24 to 39 miles per gallon could save 51 billion barrels of oil over the next 10 years and that the most optimistic predications of the total yield within ANWR is 16 billion barrels or enough to meet U.S. demand for a 6 months. This research examines the climate characteristics, the vegetation, and the myriad concerns facing carnivores such as the arctic fox (*Alopex lagopus*), snowy owl (*Bubo scandiacus*), and polar bear (*Ursus maritimus*) within the fragile tundra ecosystem.

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21st Century Otters: Using Technology To Monitor a Reintroduced Population of North American River Otters

LEI LANI STELLE[1], MELISSA SKYER[1], DARREN DOHERTY[1], BARBARA MCELWEE[1] AND LESLIE SCHRECK[1]

River otters (*Lontra canadensis*) have been extirpated from much of North America, so many states have initiated reintroduction programs to restore natural populations. The New York River Otter Project relocated 279 otters from the Adirondacks to Western New York, but was unable to continue monitoring the population. We are using a multi-pronged approach combining traditional methods with new technologies to evaluate the success of the reintroduction. We survey three creeks off the Genesee River on a weekly basis throughout the year, and record evidence of otters such as latrine sites and tracks. Scat analysis reveals that their diet consists mainly of centrarchid fish with a seasonal shift from fish in the winter to crayfish during summer months. Captive feeding experiments are being conducted at the Seneca Park Zoo to assess prey preferences. DNA extracted from scat is being used to confirm species identity and evaluate levels of genetic diversity in the population. We are performing a GIS analysis to determine if there is a relationship between indices of water quality and otter habitat selection. If able to identify individual animals with DNA fingerprints, we will also utilize GIS to map home ranges and movement patterns. Remote video systems have been established along all three creeks to estimate population sizes and observe the behaviors of these elusive animals. Results from this study will provide useful information for future river otter reintroductions.

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Visitation Patterns and Behavior of River Otters at Latrine Sites

SADIE S. STEVENS[1] AND THOMAS L. SERFASS[1]

Little is known about the visitation patterns and behavior of Nearctic river otters (*Lontra canadensis*) at latrines. However, such information is important for proper management of the species. We used remote camera and video camera systems manufactured by TrailMaster® to determine when river otters in Pennsylvania and Maryland visit latrines, what the group composition is during visits, and if either variable changes by season. We also determined what behaviors river otters exhibited during visits. We documented 173 visits to latrines by river otters. The majority of visits (102) were by single river otters. One hundred and fifty of the total visits occurred at night. Most (111) lasted <1 minute. The largest peak in visitation to latrines occurred immediately prior to and during the breeding season. River otters at latrines spent most of their time investigating the site, wrestling (when visiting in groups), and marking. We never observed a river otter eating or resting at a latrine, and observed allogrooming only once.

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Evidence for Sloth Predation by an Owl in the Neotropics

Bryson Voirin[1] and Roland Kays[2,3]

We detected the nighttime (23:xx) death of a radio-collared three-toed sloth (*Bradypus variegatus*) with an automated radio telemetry system on Barro Colorado Island, Panama. Our inspection of the carcass the following morning revealed five sets of paired, bloody punctures around the head and right forearm, which we interpret as the killing wounds. The predator plucked some hairs, and cleanly eviscerated the sloth, but did not damage other parts of the carcass or attempt to hide the remains. These wounds and treatment of the carcass are inconsistent with mammalian predators but are similar to those found on owl prey. Telemetry data, feces in the colon, and old sloth feces at the base of the tree suggest the sloth was descending to the ground to defecate when it was killed. In the following account, we outline the killing patterns and typical prey of sizeable predators in the lowland forests of Panama. We also present evidence suggesting owl predation on sloths.

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INDEX OF AUTHORS

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Please submit a single-spaced abstract (up to 500 words) with your full contact information, affiliations and authors by e-mail to Suzanne Stone at: **sstone@defenders.org.**

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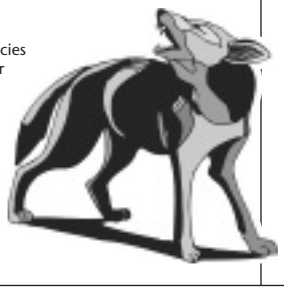

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