Conference *AT-A-GLANCE*

Raptor Research Foundation • 2008 Annual Meeting • Missoula, Montana

Thursday	BALLROOM B	BALLROOM C
8:00-8:30	Announcements and Introduction, **J. Engen** AND The Craighead Legacy, **J. Berger** (Ballrooms B & C)	
8:30-9:00	**Special Speaker: K. Dial** Raptors, Maniraptoran Dinosaurs, and the Evolution of Flight (Ballrooms B & C)	
9:30-10:00	*Coffee Break*	*Coffee Break*
10:00	**S. Alsup** Productivity of Swainson's Hawks...	**B. Bedrosian** Blood Lead Levels of Eagles...
10:20	**D. Bittner** Human Distrubance Issues...	**R. Domenech** Blood Lead Levels of Golden Eagles...
10:40	**M. Giovanni** Ferruginous H. Nest Survival...	**H. Langner** Mining-related Contaminants...
11:00	**E. Strasser** Reproductive Success in A. Kestrels...	**L. Rivera-Rodrigues** Organochlorines in Ospreys...
11:20	**E. Greene** Landscape Analysis of Baling Twine...	**M. Stuber** Exotoxicological Risk and Exposure...
11:40	——	——
12:00-1:40	*Lunch*	*Lunch*
1:40	**C. McIntyre** Movement of Juvenile Gyrfalcons...	**C. Briggs** Recruitment in Swainson's Hawks...
2:00	**D. Bittner** Golden Eagle Movements...	**R. Nelson** Turkey Vultures: Nesting, Productivity...
2:20	**T. Pitz** Estimating Natal Origins of Golden Eagles...	**S. Chiavacci** Reproductive Success of M. Kites...
2:40	**M. Saggese** Ospreys Migrating to South America...	**C. Haralson** Ecology of White-tailed Hawks...
3:00-3:30	*Coffee Break*	*Coffee Break*
3:30	**K. Smucker** Flammulated Owl Distribution...	**I. Caballero** Genetic Analysis Reveals...
3:50	**T. Booms** Raptor Detectability During Surveys...	**J. Deshler** Northern Pygmy-owl Breeding Season...
4:10	**J. Brown** Nest Survival Models...	**F. Gehlbach** Nesting Guilds of Five Small Owls...
4:30	**J. Dooley** Methods for Determining Diets...	**B. Strobel** Implications of Spatial Variation...
5:30-7:30	***POSTER SESSION IN THE ATRIUM***	

Friday	BALLROOM B	BALLROOM C
8:00-8:45	**Plenary: E. Greene** Raptors - From a Different Point of View (Ballrooms B & C)	
8:45-9:00	*Coffee Break*	*Coffee Break*
9:00	**W. Clark** What is Krider's Hawk...	**M. Gahbauer** Monitoring the Short-eared Owl...
9:20	**W. Clark** Characters of Adult Harlan's Hawks...	**L. Priestley** Status of Short-eared Owls in Alberta...
9:40	**J. Dwyer** Interactions of Crested Caracaras...	**D. Johnson** N. A. Raptor Monitoring Strategy...
10:00-10:20	*Coffee Break*	*Coffee Break*
10:20	**R. Seaton** Requirements of New Zealand Falcon...	**H. Valdez-Gomez** Winter Ecology of Short-eared...
10:40	**R. Tingay** Ecology of the Grey-headed Fish Eagle...	**P. Nye** Movements of Short-eared Owls...
11:00	**M. Ross-Boulianne** Impact of Wind Farms...	**G. Holroyd** N. A. Conservation Action Plan...
11:20	**E. Corvidae** Causes of Raptor Injury...	**R. Harness** Saker Falcon Electrocutions
11:40	**H. Timm** Is Road Construction Good for P. Falcons...	**J. Fontaine** Distribution of Great Grey Owls...
12:00-1:40	*Lunch*	*Lunch*
1:40	**J. Meshach** Cooper's Hawk Natural History...	**D. Bittner** Increased Barn Owl Abundance...
2:00	**K. Gray** Morphometrics to Determine Gender...	**C. Lenihan** Raptors and the Ground Squirrel...
2:20	**M. Seidensticker** Sex-Determination of Snowy...	**R. Mannan** Identifying Habitat Sinks...
2:40-3:45	*Coffee Break*	*Coffee Break*
3:45-5:00	***Business Meeting***	——

Saturday	BALLROOM C	BALLROOM D
8:10	Introduction	——
8:20	**L. Kiff** The Raptor Literature	**K. McVey** Introduction of Agriculture Alter ...
8:40	**W. Clark** Raptor Identification, Ageing, and Sexing I.	**K. Davis** Peregrine Falcons Capturing Stoneflies...
9:00	**W. Clark** Raptor Identification, Ageing, and Sexing II.	**J. Wiley** Diet of the Cuban Pygmy-Owl...
9:20	**J. Bednarz** Study Design, Data Management...	**D. Anderson** California Swainson's Hawk Inventory...
9:40	**D. Andersen** Survey Techniques.	**S. Slater** Effectiveness of Perch-deterrent Devices...
10:00-10:20	*Coffee Break*	*Coffee Break*
10:20	**J. Smith** Migration Counts and Monitoring	**J. Deshler** Habitat Selection by N. Pygmy-Owls...
10:40	**C. Marti** Food Habits.	**S. Hindmarch** Barn Owl Distribution and...
11:00	**L. Tapia** Habitat Sampling.	**B. Moser** Goshawk Home Ranges...
11:20	**J. Pagel** Accessing Nests.	**K. Munro** Habitat Suitability Model for Boreal Owls...
11:40	**P. Bloom** Capture Techniques.	**R. Estrella** Owls in the S. Desert of Baja California...
12:00-1:20	*Lunch*	*Lunch*
1:20	**D. Varland** and **J. Smallwood** Marking Techniques I.	**J. Slaght** Blakiston's Fish Owl Habitat Use...
1:40	**D. Varland** and **J. Smallwood** Marking Techniques II.	**G. Albrecht** Creative Staffing for the Summer...
2:00	**S. Walls** Radio Tracking.	**K. DuBois** Recovery of the Bald Eagle...
2:20	**C. Henny** Toxicology.	——
2:40	**R. Harness** Mitigation.	——
3:00-3:30	**D. Hancock** Video Wildlife CAMs for Research...	——
3:30-4:00	*Coffee Break*	*Coffee Break*
4:00-5:00	**Keynote: B. Woodbridge** Swainson's Hawks (Ballrooms B & C)	

Only the presenting author's names and shortened titles are provided for brevity. Please see the full schedule for complete information.

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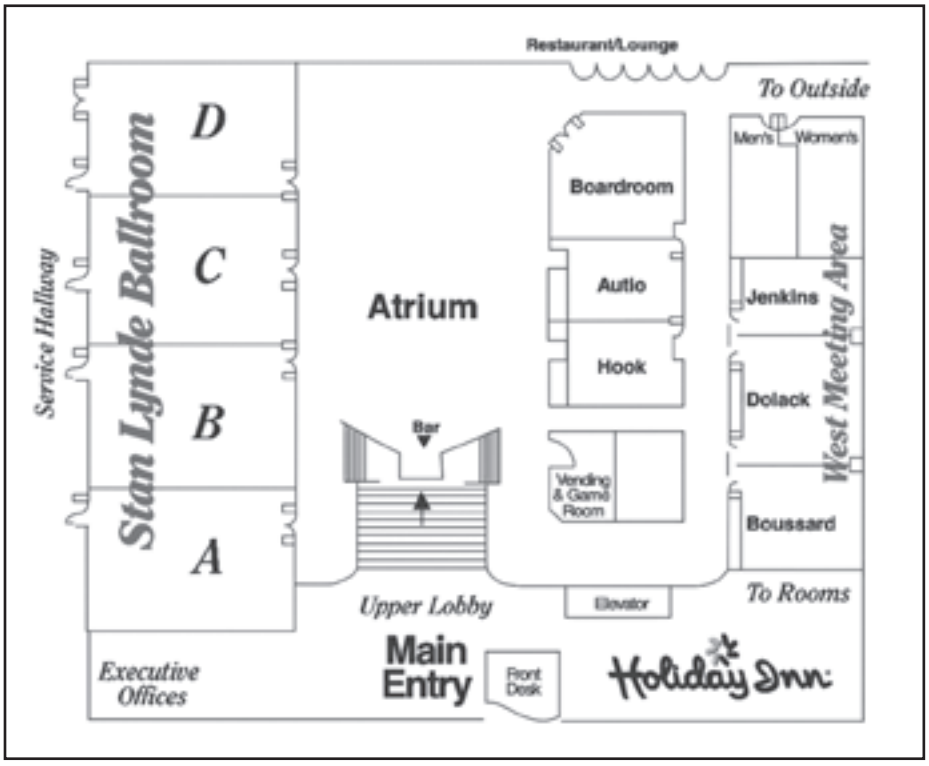

Raptor Research Foundation
Annual Meeting

The Craighead Legacy

September 24 - 28, 2008
Missoula, Montana

Hosted by Raptors of the Rockies

Co-hosted by The University of Montana
Division of Biological Sciences
Continuing Education, Technical Assistance and Training Center

We heartily thank our sponsors whose generosity has helped in planning, organizing, and holding this event:

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Program Book

Design: www.nancyseiler.com

Photos/Graphics:
Rob Palmer and Kate Davis

Production: Kate Davis

Printing: Fed Ex Office, Missoula
on recycled paper

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Our apologies if we failed to list anyone as a volunteer!

September 2, 2008

Welcome Raptor Research Foundation 2008 Conference participants!

On behalf of the citizens of Missoula, I welcome you to our city. It is a great honor for Missoula to host the annual Raptor Research Foundation Conference.

In Missoula you will find spectacular natural surroundings and a wide range of opportunities to experience the magnificence of western Montana. Dining and shopping opportunities abound, and Missoula's cultural offerings are varied and plentiful. I hope you have the opportunity to enjoy all that our city has to offer, as well as the great mountains and rivers of western Montana. I hope you will take the time to get to know Missoula as the special place it is.

Sincerely,

John Engen
Mayor

Raptor Research Foundation

Founded in 1966, RRF is a non-profit scientific society formed to accumulate and disseminate scientific information about raptors in order to inform the scientific and lay public about the role of raptors in nature and to promote their conservation. The RRF membership, which includes nearly 1000 individuals from some 50 countries, consists of academic researchers, government employees, and others interested in birds of prey. The *Journal of Raptor Research* is issued quarterly to members and contains the latest research results from raptor studies around the world.

Raptors of the Rockies

Executive Director Kate Davis began this educational program in 1988, and has since provided over 1100 presentations with live raptors to schools and the public in Montana and Idaho. The eighteen resident raptors are held in facilities at her acreage on the banks of the Bitterroot River, south of Missoula. These birds are the source of inspiration for her artwork, photography and writing. Her second book, *Falcons of North America* just his the stands. Kate is the Chair of the RRF Education Committee.

The University of Montana

Several branches from The University of Montana are co-sponsoring the RRF conference: The Division of Biological Sciences, The Wildlife Biology Program, and The Montana Wildlife Cooperative Research Unit are renowned for conducting world-class research on wildlife, ecology and conservation biology in Montana and around the world. Faculty members train both undergraduate and graduate students by teaching cutting-edge classes and providing laboratory and intellectual support for research.

Photo: Rob Palmer

John and Frank Craighead

by Sherry Devlin of the Missoulian

Most of us met John and Frank Craighead in the pages of *National Geographic* magazine.

Always, they were having some grand adventure. Climbing cliffs and trees to study and photograph eagles and hawks. Learning falconry and coursing cheetahs in India. Capturing grizzly sows and playing tag with their cubs in Yellowstone National Park.

Later came the television documentaries, and footage of a new generation of Craigheads at play in the shadow of the Tetons while their famous fathers documented the life histories of hundreds of grizzly bears.

"Much more than most people, the Craigheads were able to bring their science to the people," said Jack Hogg, a wildlife biologist and director of the Craighead Wildlife-Wildlands Institute in Missoula. "They made sure that people knew what they were doing and how it was relevant to the management of our public lands."

Over the years, the twin Craighead brothers exemplified the image of wildlife biologists at work, said John Weaver, a former student and wildlife biologist for the Wildlife Conservation Society. Frank passed away in 2001, and John just celebrated his 92nd birthday in August here in his hometown of Missoula.

Their journals document decades of field study and data collection. Their naturalist-scientist-conservationist credentials are unmatched. Their contributions to the understanding of humans and animals and their shared habitat are among the century's most significant.

The Craigheads began their studies as teenagers in Chevy

Chase, Md., during long afternoons at the Library of Congress perusing 15th-century treatises on falconry.

While still in college, they walked into the lobby of *National Geographic* magazine and asked to see the chairman. We have come, the twins told a startled secretary, with a story and photographs about our adventures studying and handling hawks. The chairman, himself a twin, was intrigued, so invited the boys into his office. He bought their story and photographs, and 20 others over the years.

During World War II, the Craigheads enlisted in the Navy, reconnoitered behind Japanese lines in the South Pacific and wrote the first and only survival guide for naval aviators stranded on land or sea.

Later, they took their wives and children aboard kayaks and canoes down the mightiest rivers in the West and declared that those waters should remain unbroken. Their writing provided much of the text of the National Wild and Scenic Rivers Act.

They were teachers, too. John was leader of the Montana Cooperative Wildlife Research Unit at the University of Montana for 25 years. Frank spent 10 years at the University of New York at Albany.

In 1959, the Craigheads were invited to Yellowstone to conduct the first modern investigation of grizzly bears. During the next 12 years, they studied the biology of big bears and pioneered the use of radiotelemetry to track their movement. (Later, they pioneered satellite telemetry.)

Most importantly, they made the connection between what they were seeing in the wild and conservation. When park officials decided to close the dumps where grizzlies had congregated each spring to feed, the Craigheads warned that bears would die – that the dumps had, in fact, become part of the grizzly's ecosystem.

The ensuing controversy cost them their research in Yellowstone. They were ordered out of the park.

But the Craigheads' work endured and continues, under the leadership now of their children.

Neither the bears nor the hundreds of students they brought with them into the field will ever be the same.

Wrote one former student: "Sometimes as a student you get lucky with teachers. John and Frank have always been very busy men, but they also took time to talk, to teach, to share their vast knowledge with the whole group of students around them at that time. We camped, fished, photographed, and spent long, hard hours working together.

"They shared their vision – their dream of how wild rivers and wildlands could fit into the modern American landscape mosaic – while teaching us about the stars and flowers, to live lightly on the land, and how vulnerable megacarnivores, wilderness and wild rivers are to man's expanding sphere of influence."

Photo: Rob Palmer

Explore Missoula

Missoula lies at the hub of five valleys, with wildlife and wilderness close at hand. Bald eagles and ospreys are a common sight on the Clark Fork River, flowing next to the conference hotel. All events (as well as fine birdwatching) are within walking distance, including a ***Birds and Art Show***, and a special showing of the Craighead film, ***"Life with an Indian Prince"***. Plan time for birding walks along the riverfront trails, in nearby Greenough Park on Rattlesnake Creek, or from the heights of the "M" trail of Mt. Sentinel above the University of Montana campus. September is a fine month for sunny days, cool mornings and migrating birds.

The Holiday Inn has an excellent restaurant for all meals and a menu with treats for any taste. Plus, vibrant downtown Missoula offers excellent and varied cuisine, including outdoor dining where you can combine eating with raptor viewing. Take time to explore the art museum, galleries, bookstores, shops and The Carousel. Cross over the Higgins Bridge for a visit to what's locally known as the "Hip Strip" for more dining and shopping opportunities.

The University of Montana is renowned for its research and education programs in ornithology, wildlife, and wilderness management, including the ***Avian Science Center, Avian Flight Lab, and USGS Montana Cooperative Wildlife Research Unit.*** The scenic campus is just across the Clark Fork River from the conference center.

Finally, what is it with all of these die-hard, rabid football fans? ***Montana Grizzly*** football games attract thousands to Missoula, proudly cheering their nationally winning team on to victory. The joke is that our population doubles when the Griz are in town, an exaggeration, but it might feel that way downtown on Friday and Saturday nights!

Photo: Kate Davis

Vendors

Tables with raptor-related items will be on display in the Atrium starting Thursday. Be sure to check out Kent Carnie's collection of back issues of *The Journal of Raptor Research*, which he is selling at very affordable prices. He will also have copies of the 1941 classic by John and Frank Craighead, *"Life with an Indian Prince."*

Notes for Presenters

Scientific Papers

Concurrent paper sessions will be held all three days, in Ballrooms B and C. The program schedule lists rooms and times for presentations. Papers must be in digital, PowerPoint format, and on memory sticks. Presenters should download papers to the computer the afternoon or evening before their presentation. Ballroom D behind the registration desk will be open Wednesday 3-6 pm, Thursday, and Friday, from 8 am until 6 pm for presentation uploads and reviews. We encourage presenters to run through all of the slides to ensure they are loaded correctly.

Poster Session and Reception

Please install your posters on Thursday in the atrium after 9 a.m. Poster reception will begin at 5:30 and continue until 8:30 p.m. Refreshments will be served.

Silent Auction Items

Please drop off your donations to the Silent Auction at the registration tables before Thursday. Kim Thomas, the Local Committee Chair, will handle the paperwork and placement of items in Ballroom D. The auction will take place in conjunction with the Saturday evening banquet. We feature cards, signed books, "hawk" wine, and a print donated by David Sibley, among other raptor-related items. And the auction helps to defray conference costs.

FIELD TRIPS

Sunday, September 28th

NEW! CHANGE! Jewel Basin!

Travel to a new hawk watch site in northwestern Montana. Dan Casey, Northern Rockies Bird Conservation Director for the American Bird Conservancy, has discovered an exciting new raptor migration site in the Swan Range, just south of Glacier National Park. A trip to the newly-discovered Jewel Basin Hawk Watch will be a shorter drive and an easier hike than the Bridger trip. Participants will observe more raptors and more species at closer range. Accipiters comprise 60-70% of the total flight, and buteos, eagles and falcons are plentiful. The scenery is spectacular, and resident mountain goats are entertaining! Late September is prime raptor migration season, with 200 or more migrant raptors likely on a good day. Steve Hoffman, founder of HawkWatch International, will lead the trip. Group size is limited to 12 participants. Meet in the hotel lobby at 6 AM -- we will carpool to the trailhead. The hike is 2.5 miles one-way, with a 1350 feet gain in elevation (1.5-hour hike). Assuming we have a strong flight, we will return to Missoula by 10 PM. The cost is $20 (lunch not included).

Golden Eagle trapping and banding on the Continental Divide

8:30 am - 4:30 pm

The Rocky Mountain Front (RMF), in west-central Montana boasts some of the greatest numbers of fall migrating Golden Eagles known in the world. From late September through mid October numbers of up to 200+ Golden Eagles may be counted on peak days. However, 30 to 50 individuals are more commonly observed. Visit our research station near Lincoln, Montana and take part in capturing and processing Golden Eagles, as well, as numerous other potential raptor species. The weather on the Front can be extreme, so please bring appropriate gear.

Raptor View Research Institute Director Rob Domenech
Cost: $35.00 includes transportation and box lunches.

Photo: Kate Davis

Mission Valley Tour – Montana Waterfowl Foundation, Ninepipe National Wildlife Refuge, National Bison Range

8:00 am - 5:30 pm

Head north to the Mission Valley, starting with a tour of the Montana Waterfowl Foundation near Ronan. A five-acre predator proof fence surrounds ponds, and additional aviaries hold native waterfowl, breeding Trumpeter Swans, and Sandhill Cranes. Ninepipe NWR is bordered by the scenic ten-thousand foot Mission Mountains and is a riparian paradise for waterfowl, shorebirds, and raptors such as Short-eared Owls. The last stop is at the Bison Range Visitor's Center and a guided three hour auto tour over Red Sleep Mountain. These grasslands hold herds of elk, pronghorns, mountain sheep and goats, and of course bison. Over 200 species of birds inhabit the prairie, forest, and wetlands, including Northern Harriers and Golden Eagles. Tours by John Grant, Ninepipe Wildlife Management Area and Pat Jamieson, National Bison Range.

Cost: $35.00 includes transportation and box lunches.

Bitterroot Valley Tour – Lee Metcalf National Wildlife Refuge, discussion Montana Peregrine Institute, Raptors of the Rockies

8:00 am - 3:00 pm

Explore the Bitterroot Valley south of Missoula, beginning with a bird walk at Lee Metcalf NWR, a riparian and grassland haven over 230 bird species. Jay Sumner, Director of the Montana Peregrine Institute will discuss his survey project in the amphitheatre, with the backdrop of Bitterroot Mountains. Eleven Peregrine pairs nested in the valley this year, eyries in nearly every drainage. Lastly is a tour of the Raptors of the Rockies facility and the 18 resident falcons, hawks, eagles, and owls and a wrap-up on the banks of the Bitterroot River.

Special Events

Wednesday, September 24th:

6:00 - 9:00 pm **Icebreaker Reception** (Atrium)
Refreshments and local beer, plus a cash bar.

8:00 - 9:00 pm **"Eagles of the World,"** by William Clark (Ballroom B)
An informative and interesting survey of eagles, in a brand new presentation from the author and researcher.

Thursday, September 25th:

8:30 - 9:30 am **Special Speaker, Ken Dial** (Ballrooms B & C)
"Raptors, Maniraptoran Dinosaurs, and the Evolution of Flight."

5:30 - 7:30 pm **Poster Session** (Atrium) Refreshments provided

8:00 - 9:00 pm **Film: "Life With An Indian Prince"** by John and Frank Craighead
(MCT Center for the Performing Arts) The historic film made by the brothers during nine months in 1940-41, exploring falconry and Indian culture with the royal family. Copies of book will be for sale at the theater. The film is free with registration.

Friday. September 26th:

8:00 - 8:45 am **Plenary Speaker - Dr. Erick Greene** (Ballrooms B & C)
"Raptors – From a Different Point of View."

3:45 - 5:00 pm **RRF Business Meeting (Ballroom A)**

5:00 - 6:00 pm **Photography Workshop - Rob Palmer** (Ballroom B)
See a presentation of shots from his new book, "Skyhunters: A Passion for Falconry" and digital photography tips from one of the best in the world.

5:00 – 7:00 pm **Artists Reception - "Birds And Art" Exhibition** (Monte Dolack Gallery)
Join us to meet many of the artists in this invitational showing of birds (especially raptors) depicted in all mediums. Twenty-two fine artists from around the region and country are guests of acclaimed painter and printmaker Monte Dolack. The show will be open all week and through October 11

7:00 - 9:00 pm **Picnic at the Parkside,** with Americana music by local faves, The Frederico Brothers
A real, old-fashioned western barbeque on the banks of the Clark Fork River (behind the Holiday Inn).

Saturday, September 27th:

8:10 am - 3:00 pm **Raptor Research and Management Techniques Symposium** (Ballroom B)
Most of the authors will present their chapters from the new Techniques manual, and a book-signing follows David Hancock's presentation.

3:00 - 3:30 pm **"The Use of Live Video Wildlife CAMS for Research and Education,"** by David Hancock
A presentation from Hancock Publishers owner and Bald Eagle expert. (Ballroom B)

4:00 - 5:00 pm **Keynote Speaker – Brian Woodbridge** and Chris Briggs (Ballrooms B & C)
"The Long View: Twenty-five Years of Swainson's Hawk Research and Still Going"
An overview of ground-breaking research begun in the early 1990s.

6:00 - 7:00 pm **Cocktails and Silent Auction** (Atrium) Peruse the items and bid them up!

8:00 - 11:00 pm **Banquet and Social** (Ballrooms B & C)
With an exciting Craighead Legacy Presentation by Jay Sumner, Director of the Montana Peregrine Institute. Jay was on their field staff for over twenty-five years.

Thursday, September 25

8:00 - 8:30 am **Announcements and Introduction** **BALLROOM B & C**
Welcome to Missoula! *Missoula Mayor John Engen*

The Craighead Legacy *Joel Berger, University of Montana Craighead Chair*

8:30 - 9:30 am **Keynote: Raptors, Maniraptoran Dinosaurs, and the Evolution of Flight.** *Ken Dial*

9:30 - 10:00 am *Coffee Break*

CONCURRENT GENERAL SESSION I

CONSERVATION I **BALLROOM B**

Moderator: Dave Bittner

10:00 am ***Steven E. Alsup,** Michael N. Kochert, Marc J. Bechard, and Stephen Novak
Productivity and Habitat Features of Swainson's Hawks *(Buteo swansonii)* Nesting in Suburban and Agricultural Environments of Southwest Idaho.

10:20 am **Dave Bittner** and Jeffrey L. Lincer
Human Disturbance Issues Associated with Golden Eagle Nesting Success in the Western Mojave Desert.

10:40 am ***Matt D. Giovanni,** Clint W. Boal, and Heather A. Whitlaw
Ferruginous Hawk (*Buteo regalis*) Nest Survival in the Texas Panhandle: Addressing Observer-based Disturbance and Other Sources of Uncertainty.

11:00 am ***Erin H. Strasser** and Julie A. Heath
Reproductive Success in American Kestrels: The Roles of Individual Quality and Human Disturbance.

11:20 am **Erick Greene,** Ana Noson, Anicka Kratina-Hathaway, Amanda Ormisher, Matt Parker, Max Egenhoff, Rob Domenech, and Heiko Langner
Landscape Analysis of Baling Twine in Osprey *(Pandion haliaetus)* Nests.

11:40 am **Diana M. Whittington,** Laura Romin, Connie Young-Dubovsky, George T. Allen, and Jim Muck
Raptor Conservation Measures.

12:00 - 1:40 pm *Lunch*

CONCURRENT GENERAL SESSION III

MIGRATION MOVEMENT PATTERNS **BALLROOM B**

Moderator: Carol L. McIntyre

1:40 pm **Carol L. McIntyre,** David C. Douglas, and Layne G. Adams
Movement Patterns of Juvenile Gyrfalcons *(Falco rusticolus)* from Western and Interior Alaska.

2:00 pm **Dave Bittner,** James Hannan, Jeff Wells, Jeff Laws, and Leslie Nelson
Golden Eagle Movements Tracked by Patagial Tags, Satellite and VHF Transmitters.

2:20 pm **Tim Pitz,** Rob Domenech, Katherine Gray, and Melanie Smith
Estimating Natal Origins of Migratory Golden Eagles *(Aquila chrysaetos)* Using Stable Hydrogen Isotopes.

2:40 pm **Miguel D. Saggese,** Claudia F. Marano, and Ignacio Roesler
Ospreys *(Pandion haliaetus)* Migrating to Southern South America More Now than in the Past? Preliminary Evidence from Recent Argentine Records.

3:00-3:30 pm *Coffee Break*

CONCURRENT GENERAL SESSION V

TECHNIQUES **BALLROOM B**

Moderator: Kristina Smucker

3:30 pm **Kristina Smucker,** Beth Hahn, Amy Cilimburg, and Montana Audubon
Flammulated Owl *(Otus flammeolus)* Distribution in Montana and North Idaho: Results from Two Years of Surveys by Technicians and Citizen Scientists.

3:50 pm ***Travis Booms,** Phil Schempf, Brian McCaffery, and Mark Fuller
Raptor Detectability during Aerial Surveys on the Yukon Delta National Wildlife Refuge, Alaska.

4:10 pm **Jessi L. Brown** and Karen Steenhoff, Laura Bond, and Michael N. Kochert
Nest Survival Models: Do They Work for Raptors?

4:30 pm ***Jessica A. Dooley,** Brian L. Latta, Paul W. Collins, Gary W. Roemer, Collin A. Eagles-Smith, Peter B. Sharpe, David K. Garcelon, and Fritz Hertel
A Comparison of Methods for Determining Diets of Bald Eagles *(Haliaeetus leucocephalus),* Golden Eagles *(Aquila chrysaetos),* and Peregrine Falcons *(Falco peregrinus)* on the California Channel Islands.

CONCURRENT GENERAL SESSION II

ECOTOXICOLOGY **BALLROOM C**

Moderator: Robert Domenech

10:00 am **Bryan Bedrosian** and Derek Craighead
Blood Lead Levels of Bald and Golden Eagles Sampled during and after Large-Game Hunting Seasons in the Greater Yellowstone Ecosystem.

10:20 am **Robert Domenech**, Heiko Langner, and Tyler Veto
Blood-Lead levels of Fall Migrant Golden Eagles *(Aquila chrysaetos)* in West Central Montana.

10:40 am **Heiko Langner,** Robert Domenech, and Erick Greene
Mining-related Contaminants in Osprey along the Upper Clark Fork River.

11:00 am ***Laura B. Rivera-Rodrigues** and Ricardo Rodriguez-Estrella
Of Organochlorine Pesticides in Nestling Ospreys *(Pandion haliaetus)* from San Ignacio Lagoon, a Pristine Area of Baja California Sur, Mexico.

11:20 am ***Matthew J. Stuber,** Jim Belthoff, Katie McVey, Justin Welty, Mike Hooper, and Dale Russell
Ecotoxicological Risk and Exposure:
A Comparison of Burrowing Owls in Natural and Agricultural Habitat in Southern Idaho.

CONCURRENT GENERAL SESSION IV

BREEDING BIOLOGY I **BALLROOM C**

Moderator: Jim Bednarz

1:40 pm ***Christopher W. Briggs,** Brian Woodbridge, Michael W. Collopy
Correlates of Recruitment in Swainson's Hawks: Are All Fledglings Created Equal?

2:00 pm **R. Wayne Nelson,** Floyd Kunnas, Dave Moore, and Rick Morse
Turkey Vultures *(Cathartes aura)*: Nesting, Productivity, and Phenology in East-central Alberta.

2:20 pm ***Scott J. Chiavacci,** Sabine Scheafer, and James C. Bednarz
Reproductive Success and Causes of Nesting Failures of Mississippi Kites *(Ictinia mississippiensis)* in the White River National Wildlife Refuge, Arkansas.

2:40 pm ***Carey L. Haralson,** Clint W. Boal, and Craig Farquhar
Breeding Ecology of White-tailed Hawks on the Texas Barrier Islands.

3:00-3:30 pm *Coffee Break*

CONCURRENT GENERAL SESSION VI

BREEDING BIOLOGY II **BALLROOM C**

Moderator: Fred Gehlbach

3:30 pm ***Isabel C. Caballero,** Mary V. Ashley, John M. Bates, and Mary Hennen
Genetic Analysis Reveals Possible Extra-pair Paternity and Sex-biased Dispersal in an Urban Avian Predator *(Falco peregrinus).*

3:50 pm ***John F. Deshler** and Michael T. Murphy
An Exploration of the Northern Pygmy-owl Breeding Season from Egg Laying through Fledgling Independence.

4:10 pm **Fred Gehlbach**
The Ecosystem and Nesting Guilds of Five Small Owls in Canyon Riparian Forests of the U.S.-Mexican Borderlands.

4:30 pm ***Bradley N. Strobel** and Clint W. Boal
Implications of Regional Spatial Variation in Prey Use by breeding Red-shouldered Hawks *(Buteo lineatus).*

POSTER SESSION 5:30 - 7:30 pm **ATRIUM**

Bryan Bedrosian and Robert Domenech Band Size for Eagles: Is Size 9 Adequate for All Birds?

Jim Belthoff, Justin L. Welty, Katie McVey, and Matt Stuber
Costs and Benefits of Group Living in Burrowing Owls *(Athene cunicularia).*

David M. Bird, **Helen Garland,** Alejandro Del Peral, and Marc-Andre Fortin
High Frequency of American Kestrel Strikes at the Montreal-Trudeau International Airport: A Case Study.

***Travis Booms,** Brian McCaffery, and Phil Schempf
Molted Raptor Feather Persistence and Aging in a sub-Arctic Environment;
Implications for Non-invasive Genetic Sampling.

Clay Corbin
Tempo of Diversification in the Accipitridae under Different Phylogenetic Hypotheses.

***Stephanie A. DeMattee,** Curtis Reynolds, and Jennifer Gagliardi-Seeley
Changing Weather Patterns and the Rate of West Nile Virus Transmission in Raptors.

Laurie J. Goodrich and Margaret Brittingham
Roosting Habitat Selection of Migrating Sharp-shinned *(Accipiter striatus)* and
Cooper's Hawks *(A. cooperii)* in the Eastern Flyway: Implications for Conservation.

Bruce Haak Assessment of Merlin Populations Wintering in Southwest Idaho.

Joshua M. Hull, Holly B. Ernest, Amanda A. Irish, Bradley N. Strobel,
Clint W. Boal, Angus C. Hull, Allen M. Fish, and Cheryl R. Dykstra
Conservation, Taxonomic Status, and Genetic Differentiation among
Red-shouldered Hawk Subspecies *(Buteo lineatus).*

***Dylan Jones** and Jeremy E. Guinn
Importance of Grassland Habitat for Overwintering Rough-legged Hawks
(Buteo lagopus) on Standing Rock Reservation, South Dakota.

Lloyd Kiff Global Raptor Information Network.

***Elizabeth K. Mojica** and Bryan D. Watts
Coming Home to Roost: Active Bald Eagle *(Haliaeetus leucocephalus)*
Nests within Communal Roosts in the Chesapeake Bay, U.S.A.

Joan L. Morrison, Isabel G.W. Gottlieb, Frances M.L. Thomas, Conner Wells, and Kyle E. Pias
Ecology of an Urban Red-tailed Hawk *(Buteo jamaicensis)* Population.

Lisa T. Priestly, Chuck Priestly, Douglas M. Collister, Ross Dickson, Jared Clarke, and Richard Krikun
Northern Saw-whet Owl *(Aegolius acadicus)* Re-encounters from
Banding Stations in Alberta and Saskatchewan, Canada.

Steven J. Slater and Jeff P. Smith
Accipiter Nesting Use of Pinyon-juniper Habitats in Northwestern Colorado.

***Henning Stabins** Do Great Blue Heron (Ardea herodias) Nesting Colonies Benefit from
Osprey *(Pandion haliaetus)* Nest Defense Behavior?

Henry K. Timm and W.N. Johnson Raptor Monitoring in the Upper Tanana Valley, Alaska 1991-2007.

***Romeo Tinajero,** Ricardo Rodriguez-Estrella, and Felipe Chavez-Ramirez
Effect of Habitat Fragmentation on the Breeding Ecology and Body Condition of Raptors in the
Desert of Baja California Sur, México.

***Hector E. Valdez-Gomez,** Armando J. Contreras-Balderas, Geoffrey Holroyd, and Helen E. Trefry
Preliminary Notes on Clarion Burrowing Owl, a Forgotten Subspecies of the North American Continent.

Friday, September 26

8:00 - 8:45 am **Dr. Erick Greene** **BALLROOM B & C**
Plenary Speaker: Raptors – From a Different Point of View.

8:45 - 9:00 am *Coffee Break*

CONCURRENT GENERAL SESSION I

POTPOURRI I **BALLROOM B**

Moderator: William S. Clark

9:00 am **William S. Clark**
What is Krider's Hawk (taxon *krideri*)?

9:20 am **William S. Clark**
Characters of Migrant Adult Harlan's Hawks *(Buteo jamaicensis harlani)* in Alaska.

9:40 am ***James F. Dwyer,** James D. Fraser, and Joan L. Morrison
Interspecific and Intraspecific Social Interactions of Crested Caracaras *(Caracara cheriway)* in Florida.

10:00 - 10:20 am *Coffee Break*

CONCURRENT GENERAL SESSION II

CONSERVATION II **BALLROOM B**

Moderator: Ruth Tingay

10:20 am ***Richard Seaton**
The Ecological Requirements of New Zealand Falcon *(Falco novaeseelandiae)* in Plantation Forests.

10:40 am **Ruth Tingay,** D. Phil Whitfield, David R.A. Mcleod, Malcolm A.C. Nicoll, and Sun Visal
Ecology and Conservation of a Regionally Significant Grey-headed Fish Eagle Population in Cambodia.

11:00 am ***Michael Ross-Boulianne,** David M. Bird, and Charles Maisonneuve
Impact of Wind Farms on the Quebec South Shore on Migrating Raptors in Spring.

11:20 am **Elaine L. Corvidae**
Causes of Raptor Injury and Mortality in the Carolina Piedmont.

11:40 am **Hank Timm** and W.N. Johnson
Is Road Construction Good for Peregrine Falcons? Productivity of Peregrine Falcons Nesting on Quarried Cliffs and River Bluffs in the Upper Tanana Valley, Alaska.

12:00--1:40 pm *Lunch*

CONCURRENT GENERAL SESSION III

TECHNIQUES II **BALLROOM B**

Moderator: Mathew T. Seidensticker

1:40 pm **Jeffrey S. Meshach**
The Cooper's Hawk (*Accipiter cooperii*) Natural History and Alternative Trapping Method.

2:00 pm **Robert Domenech,** Kathy L. Gray, and Jim Lish
Using Morphometrics to Determine Gender in Golden Eagles (*Aquila chrysaetos*).

2:20 pm **Mathew T. Seidensticker,** Denver W. Holt, Jennifer Detienne, Sandra Talbot, and Kathy Gray
A Field Technique for Sex-Determination of Young Snowy Owls.

2:40-3:45 pm *Coffee Break*

3:45-5:00 pm **Business Meeting** **BALLROOM B**

SHORT-EARED OWL SYMPOSIUM I (CONCURRENT SESSION) **BALLROOM C**

Moderator: Geoff Holroyd

9:00 am **Marcel A. Gahbauer**
Monitoring the Distribution and Abundance of Short-eared Owl (*Asio flammeus*) in North America.

9:20 am **Lisa Priestley**
Status of the Eruptive Short-eared Owl in Alberta.

9:40 am **David Johnson** and Mark Fuller
North American Raptor Monitoring Strategy for the Short-eared Owl.

10:00-10:20 am *Coffee Break*

SHORT-EARED OWL SYMPOSIUM II (CONCURRENT SESSION) **BALLROOM C**

Moderator: Geoff Holroyd

10:20 am **Hector E. Valdez-Gomez,** Geoffrey L. Holroyd, Helen E. Trefry, and Armando J. Contreras-Balderas
The Winter Ecology of Short-eared Owl in Zapopan, Jalisco, Mexico.

10:40 am **Peter E. Nye**
Movements of Short-eared Owls *(Asio flammeus)* in North America from Satellite Transmitters.

11:00 am **Geoff Holroyd** and Helen Trefry
Towards a North American Conservation Action Plan for Short-eared Owls.

11:20 am **Philip F. Schempf,** Edward J. Mallek, and Mark R. Fuller
The Distribution and Abundance of Snowy Owls *(Bubo scandiacus)* on the Arctic Coastal Plain of Alaska.

11:40 am Charles Van Ripper III and **Joseph J. Fontaine**
On the Distribution of Great Gray Owls *(Strix nebulosa)* in Yosemite National Park.

12:00-1:40 pm *Lunch*

CONCURRENT GENERAL SESSION IV

ECOLOGY AND POPULATION BIOLOGY **BALLROOM C**

Moderator: R. William Mannan

1:40 pm **David Bittner** and Jeff Wells
Increased Barn Owl Abundance and Resulting Mortality.

2:00 pm **Colleen M. Lenihan,** Dirk H. Van Vuren, and Michael L. Johnson
The Association between Grassland Raptors and the California Ground Squirrel (*Spermophilus beecheyi).*

2:20 pm **R. William Mannan,** Robert J. Steidl, and Clint W. Boal
Identifying Habitat Sinks: A Case Study of Cooper's Hawks in an Urban Environment.

2:40-3:45 pm *Coffee Break*

3:45-5:00 *Business Meeting*

Saturday, September 27

RAPTOR RESEARCH TECHNIQUES SYMPOSIUM I

WORKSHOP I (CONCURRENT SESSION) **BALLROOM C**

Moderator: David Bird

8:10 am Introduction

8:20 am **Lloyd Kiff,** Rob G. Bjilsma, Lucia Liu Severinghaus, and Jevgeni Shergalin
The Raptor Literature.

8:40 am **William S. Clark**
Raptor Identification, Ageing, and Sexing - Part I.

9:00 am **William S. Clark**
Raptor Identification, Ageing, and Sexing - Part II: Sequence of flight feather molt in accipitrid raptors and its use in aging immatures.

9:20 am **James C. Bednarz**
Study Design, Data Management, Analysis, and Presentation of Raptor Research.

9:40 am **David E. Andersen**
Survey Techniques.

10:00-10:20 am Coffee Break

RAPTOR RESEARCH TECHNIQUES

SYMPOSIUM II (CONCURRENT SESSION) **BALLROOM C**

Moderator: Daniel E. Varland

10:20 am Keith L. Bildstein, **Jeff P. Smith**, and Reuven Yosef
Migration Counts and Monitoring.

10:40 am **Carl D. Marti,** Marc Bechard, and Fabian M. Jaksic
Food Habits.

11:00 am **Luis Tapia,** Patricia L. Kennedy, and R. William Mannan
Habitat Sampling.

11:20 am **Joel E. Pagel** and Russell K. Thorstrom
Accessing Nests.

11:40 am **Peter H. Bloom,** William S. Clark, and Jeff W. Kidd
Capture Techniques.

12:00-1:20 pm Lunch

RAPTOR RESEARCH TECHNIQUES

SYMPOSIUM III (CONCURRENT SESSION) **BALLROOM C**

Moderator: David M. Bird

1:20 pm **Daniel E. Varland, John A. Smallwood**, Leonard S. Young, and Michael N. Kochert
Marking Techniques I.

1:40 pm **Daniel E. Varland, John A. Smallwood**, Leonard S. Young, and Michael N. Kochert
Marking Techniques II.

2:00 pm **Sean S. Walls** and Robert E. Kenward
Radio Tracking.

2:20 pm **Charles J. Henny** and John E. Elliott
Toxicology.

2:40 pm **Richard E. Harness**
Mitigation.

3:00 - 3:30 pm **David Hancock**
Special Presentation: The Use of Live Video Wildlife CAMs for Research & Education

3:30 - 3:40 pm **Workshop wrap-up and book signing by authors**

3:40 - 4:00 pm *Coffee Break*

4:00 - 5:00 pm **Brian Woodbridge** and Chris Briggs **BALLROOM C & D**
Keynote Address:
The Long View: Twenty-five Years of Swainson's Hawk Research and Still Going.

CONCURRENT GENERAL SESSION I

POTPOURRI II **BALLROOM D**

Moderator: James W. Wiley

8:20 am ***Kathlyn McVey**
How Does Introduction of Agriculture Alter Ecosystem Dynamics?: Stable Isotopes Analysis of Trophic Relationships and Food Webs of Burrowing Owls *(Athene cunicularia)*.

8:40 am Jay Sumner and **Kate Davis**
Observations of Adult Peregrine Falcons *(Falco peregrines anatum)* Capturing Stoneflies.

9:00 am **James W. Wiley,** Arturo Kirkconnell, and Emilo Alfraro
Breeding Season Diet and Behavior of the Cuban Pygmy-Owl *(Glaucidium siju)*.

9:20 am **Dick Anderson,** Ron Schlorff, Julie Dinsdale, Kristi Fien, and Calvin Chun
California Statewide Swainson's Hawk Inventory.

9:40 am **Steven J. Slater** and Jeff P. Smith
Effectiveness of Perch-deterrent Devices in Reducing Raptor Perching on a Power Line in Southwestern Wyoming.

10:00 - 10:20 am *Coffee Break*

CONCURRENT GENERAL SESSION II

HABITAT RELATIONSHIPS **BALLROOM D**

Moderator: Brian W. Moser

10:20 am ***John F. Deshler** and Michael T. Murphy
Nest-site Habitat Selection by Northern Pygmy-Owls in a Mixed Forest in Northwestern Oregon.

10:40 am ***Sofi R. Hindmarch** and David J. Green
Habitat Transformed: How is Barn Owl *(Tyto alba)* Distribution and Breeding Success Influenced by Land Use in The Fraser Valley, British Colombia?

11:00 am **Brian W. Moser** and Edward O. Garton
Goshawk Home Ranges and Habitat Selection in Northern Idaho.

11:20 am ***Kathrin J. Munro,** Ian G. Warkentin, and Christine M. Doucet
Testing a Habitat Suitability Index Model for Boreal Owls *(Aegolius funereus)* in Western Newfoundland.

11:40 am ***Ricardo Rodriguez Estrella,** B. Granados, J.M. Lobato, R.C.R-Fernandez, R. Bolanos, and R. Tinajero
Owls in the Southern Desert of Baja California Peninsula: Preliminary Distribution Models.

12:00-1:20 pm *Lunch*

CONCURRENT GENERAL SESSION III

HABITAT, EDUCATION, AND MORE **BALLROOM D**

Moderator: Gretchen Albrecht

1:20 pm ***Jonathan Slaght**
Understanding Blakiston's Fish Owl Habitat Use in Russia: Preliminary Results from a Telemetry Project.

1:40 pm **Gretchen Albrecht**
Creative Staffing for the Summer Season or How to Influence the Next Generation.

2:00 pm **Kristi DuBois**
Recovery of the Bald Eagle (*Haliaeetus leucocephalus*) in Montana.

Raptor Research Foundation
Annual Meeting

The Craighead Legacy

September 24 - 28, 2008
Missoula, Montana

ABSTRACTS

Listed in alphabetical order by first author's last name and in following sections:

1. General Session Abstracts
2. Poster Session Abstracts
3. Raptor Research and Management Techniques Workshop Abstracts
4. Symposium: Status and Conservation of Short-eared Owls

Bold denotes Presenter, *denotes Student Award Candidate

GENERAL SESSION ABSTRACTS

Productivity and Habitat Features of Swainson's Hawks *(Buteo swansonii)* Nesting in Suburban and Agricultural Environments of Southwest Idaho.

***STEVEN E. ALSUP** (stevealsup@gmail.com), Raptor Biology Program, Boise State University, Boise, ID U.S.A. MICHAEL N KOCHERT, U.S. Geological Survey, Forest and Rangeland Ecoscience Center, Snake River Field Station, Boise, ID U.S.A. MARC J.BECHARD and STEPHEN NOVAK, Department of Biology, Boise State University, Boise, ID U.S.A.

Urbanization is the process of human settlement that gradually transfers wildlands uninhabited by humans into lands containing some degree of permanent human presence. Rapid urbanization is a global phenomenon that can affect a diverse range of species. Species that depend on specific habitat types can not only be affected by urbanization, but can also be affected by other changes in land use (i.e. crop type). Many studies have looked at the effects of urbanization on raptor species. Several studies have shown that Swainson's Hawks can benefit from development in agricultural environments, but the level of human development that Swainson's Hawks can tolerate is unknown. Swainson's Hawks depend on alfalfa fields for foraging areas, and as these areas are reduced, reproductive constraints can be imposed. Nesting success and productivity have been shown to decrease as the distance to foraging areas increases. To assess how land use and increased development affect reproductive success of Swainson's Hawks breeding southwest Idaho, land use within nesting areas of 40 pairs of hawks was quantified using GIS and field techniques. Twenty of these nesting areas were located within a predominantly suburban environment and 20 were located within a predominantly agricultural environment. Productivity (number of fledgling per nesting attempt) did not differ significantly between the two study areas; however nesting success was significantly higher within the suburban study area. Differences in nesting success between the two study areas were influenced by an unusually high rate of complete nest failures within the agricultural study area. The number of fledglings per successful nesting attempt was higher for the agricultural study area than for the suburban area. These results suggest that while hawks nesting in suburban environments were able to nest successfully, the number of offspring they produced may have been reduced by increased distances to foraging areas.

California Statewide Swainson's Hawk Inventory.

DICK ANDERSON (Danderson@cal.net), University of California – Davis (UCD) Wildlife Health Center/Swainson's Hawk Technical Advisory Committee, Davis, CA U.S.A. RON SCHLORFF, California Department of Fish and Game, CA U.S.A. JULIE DINSDALE, UCD Wildlife Health Center/Swainson's Hawk Technical Advisory Committee, Davis, CA U.S.A. KRISTI FIEN, California Department of Fish and Game, CA U.S.A. CALVIN CHUN, California Department of Fish and Game, CA U.S.A.

In 2005 and 2006, California Department of Fish and Game in collaboration with the University of California Davis Wildlife Health Center and the Swainson's Hawk Technical Advisory Committee conducted a two year inventory to determine the number of Swainson's Hawk *(Buteo Swainsoni)* breeding pairs in California. The 2005 inventory covered the entire Swainson's Hawk range in California. The 2006 inventory was restricted to the majority of California's Swainson's Hawk population in California's Central Valley. Both inventories were based on a stratified random sample design. In 2005, 360 samples were completed, with 450 completed in 2006. Estimates for Swainson's hawk pairs were determined by county and for California. It is estimated that there are 2084 breeding pairs of Swainson's Hawks in California.

Blood Lead Levels of Bald and Golden Eagles Sampled During and After Large-Game Hunting Seasons in the Greater Yellowstone Ecosystem.

BRYAN BEDROSIAN (bryan@beringiaouth.org) and DEREK CRAIGHEAD, Craighead Beringia South, Kelly, WY U.S.A.

Following our recent discovery of lead ingestion in Common Ravens *(Corvus corax)* from the southern Greater Yellowstone Ecosystem, we investigated the incidence of lead ingestion in eagles of this region. Our evidence from Common Ravens implicated hunter-left offal as the likely point source for lead in this system. To test this theory for both Bald Eagles *(Haliaeetus leucocephalus)* and Golden Eagles *(Aquila chrysaetos),* we sampled the blood lead levels of both species during and after a large-scale hunt for two years. We found that 72% of the bald eagles tested during the hunting season exhibited elevated lead levels (>20ug/dL; *N* = 36 total) and only 20% during the non-hunt (*N* = 10 total). Although our golden eagle sample during the hunt is small (*N* = 3), we found 67% with elevated blood lead levels, while 46% exhibited elevated lead during the non-hunt. We were also able to collect data from a sample of nestling bald eagles for both comparison and to begin understanding baseline lead levels for this species. We found a median blood level of 0.25 ug/dL for 8 nestlings from 2006. We will discuss these data in more detail and the management implications therein.

Golden Eagle *(Aguila chrysaetos)* Movements Tracked by Patagial Tags, Satellite and VHF Transmitters.

DAVE BITTNER (dbittner@wildlife-research.org) and JAMES HANNAN, Wildlife Research Institute, Ramona, CA U.S.A. JEFF WELLS, US Forest Service, Ramona, CA U.SA. JEFF LAWS and LESLIE NELSON, San Diego Gas and Electric, San Diego, CA U.S.A.

Over the last 16 years we have banded 324 Golden Eagles. Two hundred and eighty six of these had patagial tags applied and 46 of those have also had VHF transmitters attached. Since 2006, we have placed satellite telemetry on 10 Golden Eagles; three adults and seven juveniles. These Golden Eagles have moved as far south as San Miguel El Alto, Mexico (1938 km below the US border) and as far north as Alaska (2827 km north of their winter range). One Golden Eagle migrated north for 18 days at an average rate of 156 km per day. Additional local and long range migration information will be presented as well as significant results learned from these banding and tracking efforts.

Golden Eagle *(Aquila chrysaetos)* Human Disturbance Issues Associated with Golden Eagle Nesting Success in the Western Mojave Desert.

DAVE BITTNER, (dbittner@wildlife-research.org) and JEFFREY L. LINCER, Wildlife Research Institute, Ramona, CA U.S.A.

In 2003 and again in 2008 we surveyed the Western Mojave Desert for raptors concentrating on Golden Eagles and Prairie Falcons. During these desert surveys numerous human activities including construction of new housing, off road vehicle use, shooting and rock climbing were being conducted within disturbance distances, some as close as 20 feet, that appeared to cause nest abandonment and incubation failure resulting in a low reproductive rate. Only one young was fledged out of twenty nine (29) pairs of Golden Eagles in 2003 and only one young was fledged from twenty one (21) pairs of Golden Eagles surveyed in 2007. In 2007, extensive ground surveys combined with helicopter surveys indicated that at least sixteen (16) pairs of Golden Eagles were on territory in January and February. In March, five (5) pairs were confirmed to be incubating and by May two (2) pairs had one young each at four (4) weeks of age. One of the two eaglets disappeared from the nest at six weeks of age and only one fledged out of 15 active pairs. Of the fifteen (15) pairs of active Golden Eagles in 2007, five (5) built nests or nested on Electric Transmission Towers and both eaglets were hatched on transmission towers. All five (5) Golden Eagles using transmission towers also had nearby cliff nests.

Increased Barn Owl *(Strix alba)* Abundance and Resulting Mortality.

DAVE BITTNER (dbittner@wildlife-research.org) and JEFF WELLS, Wildlife Research Institute, Ramona, CA U.S.A.

During 31 survey trips of 368 km each, a total of 1093 Barn Owls were recorded killed by automobile collisions. Sixty one other raptors of at least five other species were also recorded killed during this same survey period. These surveys were conducted randomly over the period 1991 to 2007 along the I-5 corridor in the San Joaquin Valley of central California. The surveys took place through the center of the San Joaquin Valley which was historically open grassland and marsh with only an occasional nest hollow along riparian habitat. The highest mortality occurred in December 2006 when 147 Barn Owls were found dead during one survey. This is one dead owl per 2.5 km. The overall average for all 31 surveys was one dead Barn Owls per 10.4 km of highway surveyed. The fall months, especially November and December are when the highest highway mortality occurs. The habitat today is intensive agriculture consisting of orchards, grapes, cotton and many other extensive monoculture crops that farmers deem threatened by rodents. Artificial owl boxes have been erected by the thousands to control rodent populations and the observed mortality reflects the success of the nesting use of these boxes. The success of this artificial population explosion has implications for management in other parts of the country where Barn Owls have declined significantly due to farming and agriculture changes.

Photo: Kate Davis

Raptor Detectability during Aerial Surveys on the Yukon Delta National Wildlife Refuge, Alaska.

***TRAVIS BOOMS** (travisbooms@hotmail.com), University of Alaska Fairbanks, Biology and Wildlife Department and Institute of Arctic Biology, Fairbanks, AK U.S.A. PHIL SCHEMPF, U.S. Fish and Wildlife Service, Migratory Bird Management, Raptor Management Office, Juneau, AK U.S.A. BRIAN MCCAFFERY, U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Bethel, AK U.S.A. MARK FULLER, USGS Forest and Rangeland Ecosystem Science Center, Boise, ID U.S.A.

Many raptor surveys do not incorporate measures of detectability and are therefore simple counts used as indices of population size. Accounting for detectability in surveys, however, allows one to directly estimate population parameters and is generally accepted as a more robust technique for monitoring populations. We conducted replicated fixed-wing and helicopter aerial surveys on the Yukon Delta National Wildlife Refuge to estimate cliff-nesting raptor detectability. Preliminary analyses using program PRESENCE 2.0 in a maximum likelihood estimation framework indicated that Golden Eagle *(Aquila chrysaetos)* detectability in fixed-wing and helicopter replicates was 0.56 and 0.68, respectively; Gyrfalcon *(Falco rusticolus)* detectability was 0.78 and 0.80, respectively. Detectability in fixed-wing and helicopter replicates was more variable for Rough-legged Hawks *(Buteo lagopus)* at 0.42 and 0.10, respectively, and Common Ravens *(Corvus corax)* at 0.85 and 0.45, respectively, though survey timing was not optimal for these species. Given our results, future aerial surveys that include one replicate should be sufficient to generate robust detectability and occupancy estimates with small standard errors for most cliff-nesting raptors on the Yukon Delta National Wildlife Refuge.

Correlates of Recruitment in Swainson's Hawks: Are all fledglings created equal?

***CHRISTOPHER W. BRIGGS** (chriswbriggs@yahoo.com), Program in Ecology, Evolution and Conservation Biology, University of Nevada-Reno, Reno, NV U.S.A. BRIAN WOODBRIDGE, U.S. Fish and Wildlife Service, Yreka, CA U.S.A. and MICHAEL W. COLLOPY, Academy for the Environment, University of Nevada-Reno, Reno, NV U.S.A.

We examined correlates of recruitment in a population of Swainson's Hawks *(Buteo swainsoni)* in northern California using a 27-year mark-recapture dataset. While previous analyses have demonstrated that reproduction is a reasonable predictor of recruitment at the population scale, it was unclear what factors might affect recruitment of any particular individual. We used mixed model logistic regression analysis to correlate parental attributes and factors around the nest site with future recruitment into the local breeding population. There was no apparent relationship with maternal breeding experience, tree density around the nest site, or proximity to or amount of agricultural foraging areas. However, the probability of offspring recruitment increased with paternal breeding experience. Increases in probability of recruitment generally lasted until the individual was approximately 10 years old, after which probability of offspring recruitment declined precipitously. Additionally, recruitment probability was highest for individuals from nests that fledged either one or four offspring. The probability of recruitment was significantly lower for individuals from nests that fledged two or three offspring. These results provide evidence that conditions at the nest site may influence future survival.

Genetic Analysis Reveals Possible Extra-Pair Paternity and Sex-Biased Dispersal in an Urban Avian Predator *(Falco peregrinus).*

***ISABEL C. CABALLERO** (icabal2@uic.edu), University of Illinois at Chicago, Chicago, IL and Field Museum of Natural History, Division of Birds, Chicago, IL U.S.A. MARY V. ASHLEY, University of Illinois at Chicago, Chicago, IL U.S.A. JOHN M. BATES and MARY HENNEN, Field Museum of Natural History, Division of Birds, Chicago, IL U.S.A.

North American Peregrines Falcon populations were devastated by the pesticide DDT in the 1950s and have rebounded following methods such as captive breeding and hacking programs. We are investigating genetic mating system and dispersal in urban dwelling Midwestern Peregrine Falcons using molecular tools. Ten microsatellite DNA markers, developed for the species, were analyzed resulting in 70 alleles and mean levels of gene diversity of 0.74 ± 0.12 for the population considered. Familial structure was inferred by testing hypotheses of pedigree relationships (full sibs vs. unrelated and parent-offspring vs. unrelated), based on multilocus genotypes, between all pairs of individuals, using KINGROUP. A maximum of 10 breeding seasons were included in the analysis. High nest site fidelity was demonstrated through analysis of 200 chicks in the Chicago area from 10 nest sites with males preferring to breed close to their natal sites. Microsatellites were used to test for events of extra-pair paternity in nests where one or both of the parents were genetically sampled. Although rare, we discuss what the genetic data and nest-site monitoring suggest for extra-pair paternity in our study.

Reproductive Success and Causes of Nesting Failures of Mississippi Kites *(Ictinia mississippiensis)* in the White River National Wildlife Refuge, Arkansas.

***SCOTT J. CHIAVACCI** (scott.chiavacci@smail.astate.edu), SABINE SCHEAFER, and JAMES C. BEDNARZ, Department of Biological Sciences, Arkansas State University, Jonesboro, AR U.S.A.

Few studies have investigated the nesting ecology of Mississippi Kites within the Mississippi Alluvial Valley. Results of those studies have reported unusually low nest success rates in comparison to the Mississippi Kites residing in the Great Plains region. In order to determine what factors may be contributing to the low reproductive success of kites nesting within the Mississippi Alluvial Valley, we located and monitored nests during the 2006 and 2007 breeding seasons to document nest fate and causes of nest failures. We located a total of 32 Mississippi Kite nests, 11 of which successfully fledged one young each (34.4%). We used infrared time-lapsed video recording systems to continuously monitor at least six Mississippi Kite nests per season. We documented four predation events that resulted in nest failures; three depredations by Barred Owls *(Strix varia)* and one black rat snake *(Elaphe obsolete).* Our results are similar to those found in a study conducted during 2004 and 2005 by Bader (2007) in which he located 39 Mississippi Kite nests and found a nest success rate of 28.2%. Bader also documented nest failures caused by both Barred Owls (N = 1) and black rat snakes (N = 3). Our results, in addition to those of Bader suggest that the Mississippi Kite population within the White River National Wildlife Refuge exhibits an extremely low nest success rate in comparison to other populations across the U.S. These studies suggest that the Mississippi Kite population in the Mississippi Alluvial Valley is of definite conservation concern and appropriate actions should be taken to further investigate limiting factors and causes of the low reproductive rate.

Characters of Migrant Adult Harlan's Hawks *(Buteo (jamaicensis) harlani)* in Alaska.

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Harlan's Hawks *[Buteo (jamaicensis) harlani]* differ from other adult Red-tailed Hawks in many plumage characters. I took photographs of 394 different adults at Gunsight Mt. in Alaska (170 km ENE of Anchorage) in April 2008. Using these, I determine the relative frequency of the following traits in which they differ: color morph, breast markings, wingtip markings, secondary markings, throat color, and undertail color and markings. Harlan's Hawk plumage is cold black, and that of other Red-tails is dark brown. The upper tails of adult Harlan's can show rufous. Almost all Harlan's adults seen had black plumage, and many showed rufous on their upper tails. Light-morph adults were more frequent than expected at 9%. Light-morph adults varied little, mainly on the amount of dark markings on the undersides More than 60% of dark-morph adults showed white breast streaks, sometimes as a white necklace or a distinct white patch. Twenty percent had few or no white breast markings. Surprisingly, 10% had buff-rufous breasts, 12% had dark brown breasts, and 3% showed a brown cast on their heads, breasts, and underwing coverts. Barred wingtips: 68% had them and 32% had dark tips. White throats: 63% had white or whitish throats, with only 37% having dark throats. Secondaries: 44% had mottled or unbarred secondaries, and 56% were regularly barred. All adults showed whitish undertails, with 30% showing no sub-terminal band, 33% showing a narrow dusky sub-terminal band, and 29% showing a wide dusky sub-terminal band. One showed a pale rufous band on the tip, and 5% showed narrow crisp black sub-terminal band, and 3% showed a wider black sub-terminal band. I saw no hawks that had characters of other Red-tailed Hawks.

What is Krider's Hawk (taxon *krideri*)?

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Hoopes described Krider's Hawk in 1873 as a new subspecies of the Red-tailed Hawk *(Buteo jamaicensis krideri)* based on two juvenile specimens collected in Iowa, now in the Philadelphia Academy of Natural Sciences. They are similar to juvenile *B. j. borealis,* Eastern Red-tailed Hawk but have whitish heads, white tails with narrow brown bands, white uppertail coverts, and heavy white mottling on the upperparts. White underparts are lightly marked with small dark spots. AOU Check-lists treated *krideri* as a subspecies of Red-tailed Hawk, beginning with the first in 1886 until the fifth in 1973, when subspecies were not listed. Its breeding range was given vaguely as "northern Great Plains." There are no type specimens of adults. Illustrations of this form in various handbooks and field guides vary. Most literature references to this taxon were actually reports of other taxa, especially Harlan's Hawk *(B. (jamaincensis) harlani),* but also Ferruginous Hawk *(B. regalis).* I found no valid breeding records from anywhere. Many raptor researchers on the Great Plains had never encountered breeding Krider's Hawks. Nevertheless, the Birds of North America account shows a discrete breeding range there, although the authors (Preston and Beane) doubt that it is a valid species. Most, but not all, museum specimens labeled as Krider's were mis-identified and were actually other forms of Red-tails or light-morph Harlan's Hawk. I present some numbers of re-identified specimens in several museums. Clark and Wheeler (2001) treated it as a color morph of the Eastern Red-tail. In summary, there are no breeding records of this enigmatic form and few museum specimens. What then, is it? One possibility that I will explore is that they are the pale extreme of light-morph Harlan's Hawks.

Causes of Raptor Injury and Mortality in the Carolina Piedmont.

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Between February 1980 and April 2008, Carolina Raptor Center has received 7,060 dead or injured raptors (not including nestlings) where the cause of injury is known. Collisions with vehicles were the most common cause of injury or death, representing 58.8% of all birds, followed by gunshot (8.7%) and window collisions (6.5%). Electrocution, a well-studied cause of mortality in raptors, was responsible for only 1.5% of cases. Causes of injury for the four most commonly recovered species (Barred Owl *(Strix varia)*, Red-tailed Hawk *(Buteo jamaicensis)*, Great Horned Owl *(Bubo virginianus)*, and Eastern Screech Owl *(Otus asio)*) and Bald Eagles *(Haliaeetus leucocephalus)* were also analyzed. In all cases except for Bald Eagles, vehicular strikes represented the most common cause of injury, accounting for 78.1% of Barred Owls, 58.8% of Red-tailed Hawks, 50.4% of Great Horned Owls, and 86.2% of Eastern Screech Owls. Bald Eagles were the exception, with gunshot injuries being the primary cause of injury at 35.9%. Given these numbers, it appears that vehicular collisions may be a significant factor affecting raptor populations in the Carolina Piedmont, and that any conservation plan must take development and extent of roadways into account if it is to be successful.

An Exploration of the Northern Pygmy-owl Breeding Season from Egg Laying through Fledgling Independence.

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The Northern Pygmy-owl *(Glaucidium gnoma)* is a small, enigmatic forest owl with a sparse distribution and inconspicuous breeding habits. In this presentation, we review the day-to-day activities of the adults during the egg-laying, incubation and nestling periods, and highlight instances of mate loss, nest depredation and predation of fledglings. We follow the plight of fledglings and show video footage of early hunts as young birds gain independence. During the spring and summer of 2007 and 2008, we located 15 pygmy-owl nest-sites in a 2145 ha forested park within the city limits of Portland, Oregon. Nest-site activity was documented using videotape, photographs, audio recordings and ethological data sheets. We discuss the function of calls used near the nest-site, and provide audio examples of at least four types of calls. We review data on diet, clutch size, nest success, laying dates, hatching dates and fledging dates, and explore the issues of hatching and fledging synchrony in this species. In 2008, mean clutch size was greater than six (6.33, $N = 6$) and 89% of nests ($N = 9$) fledged at least five young. Nest success for the combined seasons was 93.3% ($N = 15$). In addition, we provide the first ever direct evidence of nest-site fidelity within this species.

Nest-Site Habitat Selection by Northern Pygmy-Owls in a Mixed Forest in Northwestern Oregon.

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Northern Pygmy-Owls *(Glaucidium gnoma)* are sometimes considered habitat generalists, and only a single study has yielded clues about their habitat use and home range size. In contrast, a multitude of unsupported, secondary sources persistently avow that Northern Pygmy-Owls avoid unbroken, dense forest and may indeed benefit from logging. We investigate whether Northern Pygmy-Owls select nest-site habitat non-randomly, and discuss preliminary findings on more than thirty nest-site characteristics. In the spring of 2007 and 2008, 15 pygmy-owl nests were located in a 2145 ha park within the city limits of Portland, Oregon. In 2008, nests for all 10 breeding pairs within the study area were found. Nest cavities occurred in five tree species: Western Redcedar *(Thuja plicata)*, Douglas Fir *(Pseudotsuga menziesii)*, Red Alder *(Alnus rubra)*, Big-leaf Maple *(Acer macrophyllum)* and Western Hemlock *(Tsuga heterophylla)* at heights ranging from <1 m to 40 m. In both seasons, an individual female nested in stumps. Nest cavity reuse did not occur, though nest-site fidelity did occur. We examine geographic distribution including nearest neighbor, and distance to edge, trail and stream, and find that nest-sites did not occur near forest edges, and nearest neighbors ranged from 400 m to 1500 m. We discuss cavity type, and preliminary data on percent canopy cover, canopy height, percent slope, shrub density, shrub richness, tree diameters, tree species richness, tree density, and percent ground cover following a modified protocol based on James and Shugart (1970).

Raptors, Maniraptoran Dinosaurs, and the Evolution of Flight.

SPECIAL SPEAKER: KENNETH P. DIAL, Division of Biological Sciences, University of Montana, Missoula, MT U.S.A.

Over the past decade there have been significant advancements toward a better understanding of the evolution of birds and the origin of flight. A rich new fossil collection of proto-birds coupled with novel experiments on the locomotor development of extant forms allows us to address a major conundrum in the biological sciences, “What use is half a wing” in the evolution of birds? A new ontogenetic transitional wing hypothesis permits us to move beyond the historical cursorial -arboreal origins debate. We show how living birds use their incipient wings to reach elevated refuges to evade predation. We provide a survey of locomotor behavior among diverse groups of living birds to show that wing-assisted incline running is common and important to the survival of young and adult birds. Finally, we encourage young scientists to participate in an integrative approach to studying historical questions in the ecology and evolution of birds.

Using Morphometrics to Determine Gender in Golden Eagles *(Aquila chrysaetos).*

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Determining gender in Golden Eagles is not as easy as one may think and often requires a blood test to determine definitely. Previous methods have been used to predict Golden Eagle sex based on morphological characteristics. Previous regression equations have been used to predict gender based on morphological characteristics such as, footpad length, mass, hallux claw length, and culmen length. Because these regression equations were based on dead Golden Eagles, we wanted to test the accuracy of these models on live captured Golden Eagles. We sampled 41 Golden Eagles captured on migration, where gender was determined through blood analysis to validate these models. The existing regression equations had misclassification rates ranging from 5–22%. It was shown that models developed using dead birds and a footpad length as a variable did not discriminate between sexes accurately. Existing models utilizing just mass, or culmen and hallux length combined performed well. Through a random forest predictor, it was shown that hallux length, footpad length, and mass were the three most important morphological characteristics for predicting sex on Golden Eagle. The random forest predictor was used to create a model based on these live eagles. The out-of-bag error rate using random forests was 2.44%. Further sampling analyses will be preformed to compare models on additional data collected in the future.

Photo: Rob Palmer

Blood-Lead Levels of Fall Migrant Golden Eagles *(Aquila chrysaetos)* in West-Central Montana.

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Lead has long been documented as a serious environmental hazard to eagles and other predatory, opportunistic and scavenging avian species. Due to lead poisoning in the Bald Eagle *(Haliaeetus leucocephalus)* the use of lead shot for waterfowl hunting on federal and state lands was banned in 1991. More recently, lead poisoning from spent ammunition has been identified as the leading cause of death in California Condors *(Gymnogyps californianus)*, prompting the recent ban of lead ammunition within the "California Condor Recovery Zone." Another study on Common Ravens *(Corvus corax)* in Wyoming has shown a direct correlation between elevated blood-lead levels and the on-set of rifle hunting season. Indeed, there is overwhelming evidence showing that lead is still prevalent in the environment and mounting data points to lead based rifle bullets as the primary source. We sampled blood from 42 Golden Eagles captured on migration during the fall of 2006 and 2007 to quantify a suite of possible heavy metal contaminants, with an emphasis on lead. Lead was measured in micrograms per deciliter (ug/dl) and ranged from 0 – 481 ug/dl. The blood-lead levels were broken in four exposure stages and our results were as follows: eagles with 0 – 10 ug/dl (*N* = 18) were considered background, 10 – 60 ug/dl (*N* = 19) sub-clinically exposed, 60 – 100 ug/dl (*N* = 2) clinically exposed and any eagle with >100 ug/dl (*N* = 3) were considered acutely exposed. In all, we found that 58% of the 42 Golden Eagles sampled had elevated blood-lead levels.

A Comparison of Methods for Determining Diets of Bald Eagles *(Haliaeetus leucocephalus),* Golden Eagles *(Aquila chrysaetos),* and Peregrine Falcons *(Falco peregrinus)* on the California Channel Islands.

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Bald Eagles and Peregrine Falcons have been reintroduced to the California Channel Islands. Diet preference for these two species is important because DDT contamination is still a persistent problem. Golden Eagles established themselves in the absence of Bald Eagles and are considered a novel predator of island endemics. We examined the diets of all three species using a combination of methods including direct observations, nest excavations, examining nest remains, and stable isotope analysis. Based on nest deliveries data, Bald Eagle diets consisted of 86% fish, 10% seabirds, 3% marine mammals, and 1% other, whereas nest excavation data indicated historical Bald Eagle diets consisted of 61% birds, 19% fish, 14% invertebrates, 5% mammals, and 1% other. Direct observations indicated juvenile and sub-adult Bald Eagles derived a large portion of their diet from scavenging on non-native ungulates and marine mammals. Based on nest excavations, Peregrine Falcon diets consisted of 72% seabirds, 7% shorebirds, and 21% land birds, and Golden Eagle diets consisted of 59.5% terrestrial mammals, 21% seabirds, 19% land birds, and <1% reptiles. Isotope values ($\delta^{13}C$ and $\delta^{15}N$) of recaptured sub-adult Bald Eagles suggest their diets consisted of approximately 50% marine and 50% terrestrial sources. Nestling Bald Eagles had isotope values that were consistent with observations of nest deliveries. Historical Bald Eagle feather isotope values showed these eagles had a strong preference for marine sources. Isotope values from Peregrine Falcons indicated these raptors showed a stronger preference for land birds than for seabirds and isotope values from Golden Eagles indicated their diet was derived from terrestrial sources with minimal input from marine sources. All three species showed spatial and temporal variations in diet. Reasons for the apparent differences among different methods of diet determination will be discussed in the context of contaminants, reintroductions, and conservation issues on the California Channel Islands.

Recovery of the Bald Eagle *(Haliaeetus leucocephalus)* in Montana.

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Bald Eagle populations have been increasing in Montana and throughout most of the US since 1980, leading to delisting in 2007. Montana Fish, Wildlife and Parks (FWP) and the Montana Bald Eagle Working Group have tracked Bald Eagle nesting success and production since 1980. The Bald Eagle population recovered from an estimated 12 nesting pairs in 1978 to over 400 nesting pairs in 2007. The Montana population continues to expand, and shows no sign of leveling off. Productivity remains high, with several pairs documented to have fledged 4 young in recent years. Montana FWP maintains a database to track Bald Eagle nest locations and productivity, with assistance from other agency biologists, landowners, tribes, and volunteers. The Montana Bald Eagle Working Group will revise the 1994 Montana Bald Eagle Management Plan, once the take permitting process under the Bald and Golden Eagle Act has been finalized. Management of nesting Bald Eagles will be critical to the species continued success, since most nesting areas are under intense development pressure.

Interspecific and Intraspecific Social Interactions of Crested Caracaras *(Caracara cheriway)* in Florida.

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A threatened population of Crested Caracaras (hereafter caracara) in Florida may be declining due to loss of nesting habitat. Habitat loss also may impact non-breeding caracaras by escalating competition in remaining habitat with breeding adults and other avian scavengers. We hypothesized that non-breeding caracaras would be subordinate to breeding caracaras and other carrion feeding birds larger than themselves, and that within groups of non-breeding caracaras, older birds would be dominant. To test this, we used 20 aggressive behaviors, to identify social hierarchies. Dominance behaviors ranged from supplanting a peer without physical contact to pinning a peer to the ground while biting and standing on it. Audible dominance and subordinate signals were identified as rattles and screams, respectively. Visual dominance signals were head-back displays, and rapid changes of face color from dark to light. Visual subordinate displays were changes of face color from light to dark. We distinguished three age classes in caracaras, and all were dominant over American Crows *(Corvus brachyrhynchos)* (N = 24 interactions) which tended to avoid aggression by not approaching caracaras, and subordinate to Bald Eagles *(Haliaeetus leucocephalus)* (N = 40 interactions) which usually avoided caracara habitat. No age class of caracaras was consistently dominant or subordinate to Black or Turkey vultures *(Coragyps atratus, Cathartes aura)*, but caracaras tended to discover and consume local carrion prior to the formation of thermals and arrival of vultures. Thus, the effects of habitat loss do not appear exacerbated by interspecific competition. We observed >2000 aggressive interactions involving pairs of caracaras. Adult caracaras won 58% of these, subadult caracaras won 18%, and 24% were won by juveniles. Adult caracaras appear capable of defending territories from non-breeders. Thus, non-breeders may feel the effect of habitat loss particularly acutely if they are unable to find undefended areas where they may avoid competition.

The Ecosystem and Nesting Guilds of Five Small Owls in Canyon Riparian Forests of the U. S.-Mexican Borderlands.

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Whiskered *(Megascops trichopsis)* and Western *(M. kennicottii)* Screech-Owls, Flammulated Owls *(Otus flammeolus)*, Elf Owls *(Micrathene whitneyi)*, and Northern Pygmy-Owls *(Glaucidium gnoma)* coexist and nest more often and more successfully in clusters than singly, some species only 0.5 m apart in the same tree and similarly close to diurnal cavity nesters. Rank-order of mean densities is Whiskered (densest)-Elf-Pygmy-Western Screech-Flammulated at 1500-1750 m elevation. This study focuses on size-structure ecological assembly of 2–5 species small owl guilds in the riparian forest ecosystem of the Chiricahua and Huachuca mountains, southeastern Arizona, with supplementary data from elsewhere in the Southwest plus Mexico and Belize. Nesting owls are mostly insectivorous and polyterritorial, arrayed among large natural-damage cavities used mostly by screech owls and woodpecker holes used by smaller species. Most Flammulateds use Northern Flicker *(Colaptes auratus)* holes, while Elfs and Pygmys use the smaller Acorn Woodpecker *(Melanerpes formicivorus)* holes. Arizona Sycamore *(Platanus wrightii)* is the keystone tree within its range, enhancing guild and all cavity-nester richness regardless of elevation. Elfs and Western Screeches prefer open-canopies, Flammulateds closed-canopies, whereas Whiskereds and Pygmys are generalists. Interacting natural ecosystem components in temporal sequence are El Niño-Southern Oscillations (yr 1), monsoon rain (yr 2), primary productivity, insect biomass, owl density and fledgling productivity (yr 3), guild stability (yr 4), but human development is a negative impact except where mitigated by conservation and education programs as at the Ramsey Canyon Nature Preserve.

Raptors from a Different Point of View.

PLENERY: ERICK GREENE (erick.greene@mso.umt.edu), Division of Biological Sciences and Wildlife Biology Program, University of Montana. Missoula, MT USA.

Predation is ubiquitous in nature, and raptors can be the major source of mortality for many other animals. The interactions between predators and prey have been a powerful force with important behavioral, ecological, and evolutionary consequences. Most research presented at this conference will focus on the ecology of raptors. In this talk I will give a different perspective of raptors – from the prey's-eye view living in a dangerous world. The risk of predation influences habitat selection, foraging behavior, life history, and communication behavior in a wide range of species. Recent studies focusing on the behavioral ecology of alarm signaling reveal previously unsuspected levels of sophistication in how prey species assess potential threats about raptors and communicate information to each other.

Landscape Analysis of Baling Twine in Osprey *(Pandion haliaetus)* Nests.

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Baling twine is polypropylene rope used by farmers to tie together bales of hay. After the hay is used to feed livestock, loose strands of baling twine are sometimes left in fields. Ospreys *(Pandion haliaetus)* have a propensity to collect baling twine and use it to line their nests. For example, an Osprey nest near Missoula, Montana contained over 4000 m of baling twine. Chicks and adults can easily become entangled in baling twine causing significant mortality: some studies estimate that over 10% of Osprey chicks become so tangled that they die in their nests before fledging. Our goal was to describe the general extent of this problem. We sampled over 150 Osprey nests in Montana, Wyoming, Idaho and Washington. To test what landscape features are associated with the amount of baling twine in Osprey nests we used GIS analyses to describe land use around nests. Osprey nests in wilderness areas farther than 5 km from human agricultural activities contained no baling twine. However, 75% of all other nests contained baling twine. These analyses suggest that Ospreys travel considerable distance to collect baling twine, and that fairly distant point sources of baling twine (e.g., a single, small dirty field) can be important. We are currently working with ranchers and farmers, and this public education campaign has been extremely encouraging.

Ferruginous Hawk *(Buteo regalis)* Nest Survival in the Texas Panhandle: Addressing Observer-based Disturbance and Other Sources of Uncertainty.

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Ferruginous Hawks are an iconic western North American grassland and shrubsteppe species. Researchers provided demographic information on populations in Canada and the western parts of the breeding range, but minimal information exists for southern populations. Apparent nest success (ANS, nest successes/nest attempts) is a commonly estimated demographic parameter, and, although more suitable for upper-trophic level species with relatively high nest survival and detectability, also carries much uncertainty. Mayfield estimators and subsequent modifications have facilitated maximizing precision in nest survival estimation, and more recent developments such as logistic exposure-based survival (LES) help assess the effects of ecological variables. We present ANS and LES estimates for a Ferruginous Hawk population in the Texas panhandle from 2001-2006, and discuss the uncertainty and strengths associated with the estimation methods. Annual ANS estimates for 2001-2006 varied dramatically depending on how much estimate uncertainty was tolerated. LES estimates for 2001-2006 were 0.26 (±0.02 SE, *N* = 12 nests), 0.70 (±0.02, *N* = 15), 0.40 (±0.01, *N* = 27), 0.34 (±0.01, *N* = 28), 0.53 (±0.01, *N* = 26), and 0.50 (±0.01, *N* = 26) respectively. We directly visited a subsample of nests two to three times per week in 2003 (*N* = 6) and 2004 (*N* = 9) for video-monitoring maintenance, and adults responded with strong agitation and aggression. The remaining nests in 2003 (*N* = 21) and 2004 (*N* = 19) were monitored from a distance with spotting scopes, which elicited minimal to no response. AICc-based model selection indicated no effect of researcher-based disturbance (ΔAICc = 1.85, model weight = 0.28) relative to the constant model (ΔAICc = 0, model weight = 0.72). In addition, apparent nest success at video-monitored (i.e., frequently disturbed) nests was, counter to our expectations, higher than at undisturbed nests (0.89 ± 0.11 versus 0.57 ± 0.20). We also discuss the effects of age, ordinal day, weather, nest site structure, and prey-provisioning rates.

The Use of Live Video Wildlife CAMs for Research & Education.

DAVID HANCOCK, Hancock Wildlife Research Center, Surrey, BC Canada.

In 2006 the Hancock Wildlife Research Center initiated broadcast on the web of live streaming images of a nesting Bald Eagle *(Haliaeetus leucocephalus).* Over 500,000,000 hits were recorded. This presentation shows some of the technology, science, news and educational impacts resulting from use and broadcast of various wildlife cams.

Breeding Ecology of White-tailed Hawks on the Texas Barrier Islands.

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We observed the density and productivity of breeding White-tailed Hawk (*Buteo albicaudatus;* WTHA) pairs on Matagorda, Mustang, and North Padre Islands, Texas, in 2006 and 2007. The proportion of nesting pairs on each island was compared between islands. We used nonparametric Mann-Whitney U tests to determine differences between nestling and fledgling production on Matagorda and Mustang Islands. North Padre Island was not used in this comparison due to a small sample size. The mean earliest clutch initiation for all islands was March 3 (± 3.2). Observed nest success on North Padre Island (2 of 9; 22.2%) was markedly lower than Matagorda (25 of 44; 56.8%) and Mustang (7 of 12; 58.3%) Islands. Summarized across the study area, the Mayfield nest success estimate was 41.6%. There was a difference in the frequency distribution of nestling and fledgling production between the high human disturbance (HHD) nests and low human disturbance (LHD) nests. The HHD area has nests which produce more nestlings despite having a higher level of human disturbance. This may be a result of WTHAs adapting to human disturbance and breeding pairs having larger territories; whereas in the LHD area pairs may be influenced by density-dependence factors where WTHAs may be at population saturation.

Habitat Transformed: How is Barn Owl *(Tyto alba)* Distribution and Breeding Success Influenced by Land Use in The Fraser Valley, British Columbia?

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Barn Owls, like many farmland birds are showing long term declines worldwide. Although these declines have been linked to changes in land use practices generally, the specific landscape attributes, or impacts on birds are not well understood. In British Columbia, the Fraser Valley is a key area for agriculture and is the northern edge of the breeding range for Barn Owls. Land use in the Fraser Valley has changed dramatically over the last 50 yr due to increased urbanization, road expansion and changes in agricultural practices. We compared the current distribution of Barn Owls with that from the early 1990's and quantified the habitat features influencing presence/absence of Barn Owls and roosting and breeding sites (*N* = 139). We found a reduction in both Barn Owl occupancy and productivity in the Valley, declines linked with the loss of potential nest sites. In addition we will discuss how habitat features within the territories of breeding pairs influenced the growth and survival of nestlings.

Mining-Related Contaminants in Osprey along the Upper Clark Fork River.

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Osprey *(Pandion haliaetus)* are widely recognized as environmental sentinels of the health of aquatic ecosystems. Until the time of fledging, nestlings feed exclusively on fish caught within a few kilometers of the nest. Therefore, tissues of these young birds reflect the level of contamination of local fish and more generally, the aquatic ecosystems they inhabit. Ospreys are nesting along the Upper Clark Fork River corridor, which is the largest site on the U.S. Environmental Protection Agency's National Priorities (Superfund) List for cleanup. Small blood samples can be easily obtained from the chicks, making them ideal subjects for assessing the success of remediation projects that are currently underway. We have been monitoring the levels of priority pollutants (arsenic, cadmium, lead, copper, zinc, mercury and selenium) in Osprey chicks along a 250 km section of the Clark Fork River for three years. Objectives are to establish current contaminant status, pinpoint pollution hotspots, and assess the success of restoration efforts. Our results suggest mercury to be of highest concern with blood levels of up to 0.5 mg/L (reference dose for human health is 0.0058). Interestingly, we found mercury levels increased in downstream direction, in contrast to concentrations of other pollutants. Reasons may be different sources of mercury such as historic placer mines and the presence of contaminated wetlands where mercury can be transformed into more bioavailable methylmercury. Blood levels of selenium are also elevated throughout the Upper Clark Fork River drainage. We discuss the implications for restoration and remediation of the Clark Fork River.

The Association between Grassland Raptors and the California Ground Squirrel *(Spermophilus beecheyi).*

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Raptor ecology and behavior is strongly influenced by prey availability. Raptors forage where capture probabilities are highest and as a result, prey availability reliably predicts raptor density and habitat selection. In grasslands, potential prey species may exist at high density but are not necessarily available when vegetation is dense. Through foraging and burrowing activities, the California ground squirrel acts as an ecosystem engineer creating areas of open ground and lower vegetation that may be conducive to prey capture by raptors. Because ground squirrels create structural complexity on colonies, we expected that the composition of the bird community would differ between colony sites with squirrels and off-colony sites without squirrels; in particular, we predicted a strong association between squirrels and individual bird species that utilize squirrels as prey or use their burrows for shelter and nesting. We examined avian assemblages at paired colony and off-colony sites within the Livermore Valley, California. Analyses revealed a pattern of higher avian species richness, diversity, and significantly higher abundance of birds on colony sites. Specifically, the presence of raptors distinctly separated colony from off-colony sites. Raptor frequency was four times higher on colony compared to off-colony sites, and in all seasons, Burrowing Owls were recorded only at colony sites. Our results indicate that colonies are highly attractive year-round for raptors that hunt both squirrels and smaller prey. Within grasslands, California ground squirrels act not only as prey but also as an ecosystem engineer providing resources that support a high abundance of grassland birds, invertebrates and burrow dependent organisms on colonies that in turn attract a rich predator community. Generally considered a rangeland pest, we review the ecological role of the squirrel as prey and ecosystem engineer, and recommend that a more contemporary approach towards the management of this squirrel may benefit grassland conservation.

Identifying Habitat Sinks: A Case Study of Cooper's Hawks in an Urban Environment.

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We studied a population of Cooper's Hawks *(Accipiter cooperii)* in Tucson, Arizona from 1994 to 2005. High rates of mortality of nestlings from an urban-related disease prompted speculation that the area represented an ecological trap and habitat sink for Cooper's Hawks. In this paper, we used estimates of survival and productivity from 11 years of monitoring to develop an estimate of the rate of population change, λ, for Cooper's Hawks in the area. We used a Cormack-Jolly-Seber approach to estimate survival of breeding hawks, and a stochastic, stage-based matrix to estimate λ. Despite the urban-related disease, the estimate of λ indicated that the area does not function as a habitat sink for Cooper's Hawks

($\lambda = 1.11 \pm 0.047$; $P = 0.0073$ for the null of $\lambda \leq 1$). Because data required to reliably identify habitat sinks are extensive and difficult to acquire, we suggest that the concept of habitat sinks be applied cautiously until substantiated with reliable empirical evidence.

Movement Patterns of Juvenile Gyrfalcons *(Falco rusticolus)* from Western and Interior Alaska.

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Juvenile raptors often travel thousands of kilometers from the time they leave their natal areas to the time they enter a breeding population. Documenting movements and identifying areas used by raptors before they enter a breeding population is important for understanding the factors that influence their survival. In North America, juvenile Gyrfalcons are routinely observed outside the species' breeding range during the non-breeding season; however, the natal origins of these juveniles are rarely known. We used satellite telemetry to track movements of juvenile Gyrfalcons during their first months of independence. We instrumented nestlings with lightweight satellite transmitters within 10 d of estimated fledging dates on the Seward Peninsula in western Alaska and in Denali National Park in interior Alaska. We tracked 15 individuals for an average of 70.5 ± 28.1 d post-departure. Gyrfalcons moved an average of 1792 ± 1160 km during the entire tracking period. During the post-departure period, Gyrfalcons moved away from their natal areas and did not establish temporary winter ranges within the tracking period. We recognized several movement patterns including unidirectional long-distance movements out of the breeding range, long-distance movements within the breeding range, and shorter movements within a local region. Seward Peninsula Gyrfalcons remained in western Alaska or flew to eastern Russia with no movements into interior Alaska. Several Seward Peninsula Gyrfalcons made round-trip flights between Alaska and eastern Asia. In contrast, Denali Gyrfalcons remained in interior Alaska, flew to northern and western Alaska, or flew to northern Alberta. Gyrfalcons from both study areas tended to move to coastal, riparian, and wetland areas during autumn and early winter. Because juvenile Gyrfalcons dispersed over a large geographic area and across three international boundaries, conservation efforts must focus on both regional and international scales.

How Does Introduction of Agriculture Alter Food Web Dynamics?: Stable Isotopes Analysis of Trophic Relationships and Food Webs of Burrowing Owls *(Athene cunicularia).*

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Agriculture changes natural landscapes and affects many species of plants and animals. Unlike most species of native wildlife that appear to be displaced by agriculture, Burrowing Owls frequently nest in higher densities in agricultural landscapes. Prey diversity and availability appear to drive greater Burrowing Owl abundance in agricultural areas in southern Idaho. Our objective was to characterize trophic relationships and food web dynamics that involve Burrowing Owls, their prey, and other raptors within natural and agricultural settings in the Snake River Birds of Prey National Conservation Area (Idaho, USA) using stable isotopes analyses of carbon and nitrogen. We collected tissue samples from owls and other raptors, their prey, their predators, and plants throughout the 2007-08 breeding seasons, subjected them to stable isotopes analysis, and calculated a trophic level index for each species. Analysis of $\delta^{13}C$ revealed that energy pathway in both agricultural and natural habitats is based primarily on C_3 plants. Burrowing Owl $\delta^{15}N$ levels were 9.7‰ and 10.2‰ for owls in agricultural and natural settings respectively, which indicates that trophic position was similar between habitats. We used cluster analysis of vertebrate predator trophic level to investigate associations of predators and compare results to previously reported relationships that were based largely on regurgitated pellet analysis. Top predators, e.g., coyotes *(Canis latrans)* and badgers *(Taxidea taxus)*, clustered in both traditional food habits analysis and stable isotopes analyses, as did Burrowing Owls, American Kestrels *(Falco sparverius)* and Common Ravens *(Corvus corvax)*. Our study yields important information about effects of introduction of agriculture on the trophic ecology of wildlife.

The Cooper's Hawk *(Accipiter cooperii)* Natural History and Alternative Trapping Method.

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Probably the most common accipiter in the United States, the Cooper's Hawk seems to be becoming even more common as it adapts to and thrives in close proximity to humans. My paper will focus on the natural history of the Cooper's Hawk, with special attention to its nesting habits, and other work I have done with this species. My paper will also describe a new and exciting trapping method, developed by a raptor bander and falconer from Maryland. The technique is derived from the head-set, which was originally used by Native Americans to capture eagles and other birds of prey. This alternative trapping method also gets you closer to the action of trapping a hawk than anyone has ever imagined.

Goshawk Home Ranges and Habitat Selection in Northern Idaho.

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We estimated Northern Goshawk *(Accipiter gentilis)* home ranges and habitat selection in northern Idaho during 2004-2005 using satellite telemetry. We calculated home ranges using 95% fixed kernels. Male breeding-season home ranges were 5146 ± 826 ha. Female breeding-season home ranges were 3859 ± 815 ha, and nonbreeding-season home ranges were 9251 ± 1745 ha. Home range sizes were a function of nest success and habitat within the home range. Male goshawks selected home ranges with smaller patches of forest with 30-69% canopy closure, and more edge associated with openings. Female goshawks selected home ranges with smaller patches of openings, and more edge associated with forests with >30% canopy closure. Nest buffers similar in size to goshawk home ranges suggested different patterns of habitat selection than the actual home ranges. At a finer scale, male Goshawks selected for habitats near streams, away from ridgetops, and near forests with >30% canopy closure. Female goshawks selected habitats near streams and away from openings.

Testing a Habitat Suitability Index Model for Boreal Owls *(Aegolius funereus)* in Western Newfoundland.

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A habitat suitability index model based on scientific literature and expert opinion was developed for the Boreal Owl in western Newfoundland, Canada. This model was part of a suite of tools developed for the Western Newfoundland Model Forest (a consortium of industry, governmental and non-governmental agencies) as the foundation to formulate recommendations on forest harvesting strategies that maintain regional biodiversity. The Boreal Owl was chosen due to its perceived susceptibility to the changes brought about through forest harvesting. The model compares the outcomes of four different management scenarios that differ primarily in the spatial distribution of clearcut harvest blocks and proportion of forest harvested in the surrounding landscape: (1) aggregation of large cutblocks, (2) incorporation of Newfoundland Marten habitat needs, (3) fragmentation with many small cutblocks, and (4) continuation of current management practices. Preliminary analyses conducted on the model suggested outputs were most sensitive to home range size, foraging radius, and density of living and dead stems in nesting areas. Over a 2-year period, data were collected on nine Boreal Owl home ranges and habitat use using radio telemetry. This information was used to empirically test model assumptions. Model outputs were compared to spatial distribution data collected during large-scale censuses to identify discrepancies between predicted and actual habitat use. The model was also used to make forward projections over a 200-year period regarding which forest management scenario most effectively provided for Boreal Owl habitat needs. In addition, this modeling process will be used in conjunction with those for other critical taxa to examine how harvesting practices might influence regional forest biodiversity in the future.

Turkey Vultures *(Cathartes aura)*: Nesting, Productivity, and Phenology in East-central Alberta.

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At the very northern edge of the breeding range, in east central Alberta, Turkey Vultures regularly nest in attics, lofts, and mangers of abandoned farm buildings. Arising mostly from public reports, our study population rose from nine known pairs in 2003 to 19 known pairs in 2007. From whitewash evidence, each year provided 1–3 first-time uses of buildings. These, and more frequent observations, suggest an expanding population. This population produced 1.78 near-flying nestlings per successful nesting pair. We know little about nest failures during the incubation and nestling phases. 2005 and 2007 had more broods of 1 vs. 2 and more vacancies/failures, apparently related to spring weather. Some sites with vacancies/failures remained vacant for many yr but others were reoccupied after 1-2 vacant yr. The season's phenology was calculated by backdating from nest visits with nestlings aged from known-age photos, and assuming 40 d incubation for each egg and asynchronous hatching. Vultures usually arrive back from migration in early-mid April, mean clutch initiation was 5 May (range 24 April – 27 May), mean hatching of E1 occurred 14 June (range 3 June – 6 July), and mean estimated fledging of the second nestling at 60 d old was 15 August (range 4 August – 7 September). The earliest that nestlings first flew was at about 60 d old; some probably were 70+ d old before they were able to exit through high windows. Featheration of broodmates almost always showed one nestling was approx. 2 d older than the other. At least some broods still used their home attic as a night roost 3 wk after first flying. Data for 2008 will be added. Patagial tagging of nestlings in this population began in 2008.

Estimating Natal Origins of Migratory Golden Eagles *(Aquila chrysaetos)* Using Stable Hydrogen Isotopes.

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We used stable hydrogen isotope analysis to estimate the natal origins of fall migrant Golden Eagles captured in west-central Montana. We collected hatch-year feather samples from Sept – Oct, 2004 – 2008 (*N* = 65). Feathers were analyzed for their ratio of deuterium (δDf) and described in parts per thousand [‰].We used a regression model to compare the relationship between stable-hydrogen isotope ratios collected from eagles on migration, and reference feathers collected from known origin raptors throughout North America. Our calibrated values were then used to estimate the latitudinal origins of Golden Eagles using a raptor specific isotope reference map. Our analysis suggests that we captured individuals ranging from natal areas as far away as Alaska, as well as individuals as close as northern Montana, southern British Columbia, and Alberta. We observed no temporal patterns such as "chain" or "leap-frog" migration when comparing passage date and latitudinal origins, as well as no patterns between gender and latitudinal origins. By using the reference map we estimated that individuals with δDf values more negative than -140 (*N* = 37, 57% of our samples), had natal latitudinal origins between the Yukon and Northwest Territories. The information generated with this technique on remote northern populations of eagles which are otherwise difficult to monitor may one day allow us to interpret regional population trends from ongoing migration count data collected at count and trapping sites.

On the Distribution of Great Gray Owls (*Strix nebulosa*) in Yosemite National Park.

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The extent to which the use of wild areas for human recreation influences animal behaviors, species distribution, and community structure and function is a growing issue in conservation biology. Understanding the mechanisms by which human recreation influences the distribution of species is imperative for successful management of remaining wild areas. We studied the distribution of Great Gray Owls *(Strix nebulos)* in Yosemite National Park in relationship to nest sites, food availability and human use and development. Although owl distribution was closely associated with the abundance of pocket gophers and snags across the landscape, human recreation limited the distribution of this species in the park. Despite the strong relationship between development and human recreation, development alone did not explain the shift in distribution. If anything, owls appear to prefer developed areas, presumably because of increased food availability. That these areas also have the highest human activity presents a paradox, both for individual owls, and for the future conservation and management of this species.

Presence of Organochlorine Pesticides in Nestling Ospreys *(Pandion haliaetus)* from San Ignacio Lagoon, a Pristine Area of Baja California Sur, Mexico.

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We identified and quantified organochlorine pesticide residues in 28 Osprey nestlings from a dense population located in San Ignacio lagoon, a pristine area of Baja California Sur, Mexico, during the 2001 breeding season. Sixteen organochlorine (OC) pesticide compounds were identified and quantified. α, β -, δ - and γ -HCH, heptaclor, heptachlor epoxide, endosulfan I and II, endosulfan sulfate, p,p'-DDE, p,p'-DDD, aldrin, dieldrin, endrin, endrin aldehyde and endrin ketone were the pesticides found in the plasma of nestlings. No differences were found in the concentration of pesticides between sexes ($p > 0.05$). In this work, the concentrations detected in the plasma are lower than those reported to be a threat for the species and that affect the survival and reproduction of birds. The presence of OC pesticides in the San Ignacio lagoon Osprey population is remarkable despite its isolation. It seems that OCs are traveling long distances from the sources to the study area. A significant relationship between hemoglobin and mean corpuscular hemoglobin concentrations and OCs concentration was found suggesting that a potential effect on health condition of chicks may exist in this Osprey population as a result of, for example anemia problems. We propose to continue monitoring OCs in the area to determine the sub-lethal effects produced by low concentrations of pesticides on Ospreys because this type of effects affect body condition, and it has been suggested they also affect competitive interactions and population status in the long term in vertebrate species. Finally this results and new organochlorine pesticides quantification technique could be used as reference to monitoring Ospreys population health from contaminated areas.

Owls in the Southern Desert of Baja California Peninsula: Preliminary Distribution Models.

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Great Horned Owls *(Bubo virginianus),* Western Screech Owls *(Megascops kennicotti),* Elf Owls *(Micrathene whitneyi),* Burrowing Owls *(Athene cunicularia)* and Barn Owls *(Tyto alba)* are resident owl species in the southern desert of Baja California peninsula. To locate owls, we used specific tape-recorded broadcasts of calls and then listened for a response. Presence/absence data were obtained from more than 100 sampling points. Environmental variables were obtained from the sampling points in order to evaluate the habitat characteristics more relevant to all species (we excluded from analyses burrowing owls). These data were used to develop GLM models for each owl species. We found differences in environmental variables explaining presence/absence for each owl species at the local and landscape scales. Human-related variables (agriculture, urban environments) significantly explain the absence of owl species through the peninsular desert. We discuss our results and the conservation implications of the patterns we found.

Impact of Wind Farms on the Quebec South Shore on Migrating Raptors in Spring.

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Despite their environmental benefits in generating electricity by avoiding air pollution associated with fossil fuels, wind farms have attracted some controversy with regard to their impacts on birds, especially raptors. These impacts include collision risks, direct and indirect habitat loss, and barrier effects. The main objectives of this study are to find if the Baie-des-Sables wind farm, located on the south shore of the St-Lawrence River in Quebec have an impact on the spring migration of raptors. Emphasis was placed on observing differences between behavioural and abundance criteria for areas with and without wind turbines. Behavioural aspects observed were differences in altitude, flight direction and flight type. Preliminary results indicate that most species of raptors migrating are not affected by the presence of the wind farm, although Broad-winged Hawks *(Buteo platypterus)* and Red-tailed Hawks *(B. jamaicensis)* increase their altitude in the presence of the wind farm. No changes in direction or flight type were observed for any species. A second season of data collected in the spring of 2008 is undergoing analysis.

Habitat Selection of Barred Owls *(Strix varia)* Across Multiple Spatial Scales in Boreal Alberta.

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Old boreal forest is declining in Alberta due to recent efficiencies in industrial forestry. Current management strategies for old forest associates focus primarily on the retention of standing dead trees and minimum retention standards within cutblocks. However, no strategies have been implemented to manage for habitat supply at larger scales on the landscape. Barred Owls are an old boreal forest associate within Alberta, have large territories, require large diameter tree cavities for nesting and are non-migratory residents. Therefore, if the habitat requirements of Barred Owls are robust, they may be useful in managing for other species' habitat requirements within the old-forest dependant species assemblage. I studied Barred Owl habitat selection across multiple scales in forest patches in an agricultural landscape in north-central Alberta. A habitat model was developed based on the selection of resources by Barred Owls within their territories. The owls selected for microsites with larger diameter trees, more white spruce, more large snags and more open understories. Within their territory, they selected for mixedwood stands that were large, had less edge, and were closer to old-growth forest and father from open fields. I used the resource selection function derived from within-territory data to explain territory selection from available habitat on the landscape and patterns of pair occupancy of territories over three years. This model provides a tangible approach to Barred Owl habitat management in Alberta and a tool to measure habitat supply on the landscape. The median value of preferred habitat in territories selected by Barred Owls (as defined by the area-adjusted frequency of resource selection function quantile bins during model validation) was 39%. Priority areas for Barred Owl habitat management should exceed the average territory size of a Barred Owl (562 ha) and contain at least 39% preferred habitat.

Photo: Kate Davis

Ospreys *(Pandion haliaetus)* Migrating to Southern South America More Now Than in the Past? Preliminary Evidence from Recent Argentine Records.

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The Osprey is a North American breeding species that winters mainly in Central and northern South America, north of the equator. Although recorded as far south as Chile and Argentina, scarce information exists about Ospreys migrating and wintering in Southern South America. In a previous study, 38 visual records of Ospreys were reported for Argentina over a 73 year period (1916–1993). Since 1994, the number of visual sightings of Ospreys in this country has apparently increased, although only a small number of these sightings have been published in the ornithological literature. In this presentation we summarize new information about Ospreys in Argentina based on our own sightings as well on those obtained through a recent survey conducted among ornithologists and qualified bird watchers. Until 10 June 2008, more than 100 visual sightings of Ospreys were made during the period 1994-2008. While the number of observers may have been increased since 1994, Ospreys have also been observed wintering in well studied areas such as Iguazu National Park, El Palmar National Park, Rio Hondo and the Parana River, where there were little or no reports of the species before 1994. The combination of increased numbers of bird watchers in Argentina as well as more Ospreys migrating southward and wintering in this country may explain this larger number of sightings in recent years. The ultimate causes of these southern movements are not known. Our data confirm previous suggestions that wintering Osprey make use of the main rivers system of northern Argentina such as the Iguazu, Paraguay, Uruguay, and Parana rivers. Censuses along these rivers may provide more accurate estimates about how many migrating Ospreys wintering in Argentina as well supply information about the migration ecology of this bird in this country and why they migrate to these latitudes.

The Distribution and Abundance of Snowy Owls *(Bubo scandiacus)* on the Arctic Coastal Plain of Alaska.

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An aerial survey of the Arctic Coastal Plain (ACP) of Alaska, an area of 61,645 km^2, was initiated in 1986 and has been conducted annually since then covering slightly more than 2% of the total survey area. The ACP survey was combined with a coastal eider survey beginning in 2007 so this report will only cover the 21 years from 1986 through 2006 when the same area was surveyed each year. While the immediate purpose of the survey was to track waterfowl populations nesting on the ACP, Snowy Owls encountered on survey transects were also recorded and an annual population index was calculated. The following are preliminary results. The average index of owls on the ACP from 1986-2006 was 1220 individuals with a high of 6574 individuals in 1995 and a low of 0 in 1986 and 2004. The majority of observations occur within 50 km of the Arctic Ocean and, particularly in recent years, in the western portion of the survey area from Harrison Bay to Icy Cape.

The Ecological Requirements of New Zealand Falcon *(Falco novaeseelandiae)* in Plantation Forests.

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Commercial pine plantations made up of exotic tree species are increasingly recognized as habitats that can contribute significantly to the conservation of indigenous biodiversity in New Zealand. Encouraging this biodiversity by employing sympathetic forestry management techniques not only offers benefits for indigenous flora and fauna but can also be economically advantageous for the forestry industry. The New Zealand Falcon is a threatened species endemic to the islands of New Zealand, that has recently been discovered breeding in pine plantations. This research determines the ecological requirements of New Zealand Falcons in this habitat, enabling recommendations for sympathetic forestry management to be made. Plantation forests that create a mosaic of pine stand ages across a plantation, offer suitable habitat for breeding New Zealand Falcons by providing abundant nest sites, promoting high abundances of avian prey and creating favorable conditions for hunting. The diet of falcons within pine forests consisted primarily of birds, the majority of which were small exotic passerines. Prey abundances were highest along pine stand edges. Both sexes preferentially hunted along pine stand edges between stands less than four years old and stands more than 20 years old. Pairs also preferentially nested along these borders, particularly within and along the edges of pine stands less than two years old. Introduced predators and some forestry operations negatively affected breeding success. Nevertheless, productivity was higher than recorded for other habitats and female falcons were recorded successfully breeding in their first year for the first time. This research establishes that if commercial pine plantations are suitably managed, they can support extremely high falcon densities. Plantation forests therefore have a significant role to play in the future conservation of this species.

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A Field Technique for Sex-determination of Young Snowy Owls.

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We predicted sex of 140 Snowy Owl *(Bubo scandiacus)* chicks out of 34 nests at our Barrow, Alaska study area to develop a technique for sexing these owls in the field. We sexed young owls (38-44 d of age) by quantifying plumage markings and collecting blood samples to verify our predictions in the field. Molecular data indicated that we correctly sexed 139 of the 140 (99%) chicks. We applied a variety of multivariate statistical methods to analyze the data, including exploratory analysis, classification trees, random forests, and discriminant analysis. Confidence intervals for the exploratory analysis showed significant differences in numbers of markings between males and females for all of the feathers sampled except: Left Primary-P8, Right Primary-P9, and Right Primary-P8. Misclassification rate for predicting sex using the random forests method was 4.29%. The most important variable for predicting sex using this model was shown to be the number of markings on the Left Secondary-S4 feather. We used cross validation techniques to arrive at the "best" tree for the classification tree method. The misclassification rate using this tree was estimated to be 3.6%. We used a stepwise approach to select variables for the discriminant model. The cross-validation error rate using discriminant analysis was 2.9%. For all methods the number of markings on the secondary feathers appears to be most important in determining sex of young Snowy Owls, as was the case with our descriptive method. However, our field method differentiated three different plumage markings (two "types" of bars – marking that touch the rachis; spots – markings that do not touch the rachis) and performed better at classifying sex than any of the statistical models. This study will allow researchers working on Snowy Owls to gather information about sex-ratios and sex-related variation in behavior and growth.

Understanding Blakiston's Fish Owl Habitat Use in Russia: Preliminary Results from a Telemetry Project.

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Probably the largest owl in the world, Blakiston's Fish Owl *(Ketupa blakistoni)* is endemic to northeast Asia with most of the estimated global population of 5000 birds found in the Russian Far East. These massive birds have rigid habitat requirements that tether the species to areas also utilized by the Russian logging industry; they are dependent on large, natural cavities of old-growth tree species such as Japanese poplar *(Populus maximowiczii)* and elm *(Ulmus spp.)* for nesting, and they also require access to fish-rich stretches of river that resist freezing in winter. Until recently, fish owls in the remote Russian Far East have been naturally shielded from human threats, but increased interest in resource extraction in the region has resulted in direct conflicts between the needs of fish owls and the logging industry, which represents the backbone of the local economy. Although several local logging groups have expressed interest in fish owl conservation, the species is so poorly studied that only a rudimentary understanding of habitat requirements presently exists, and subsequently there are no habitat management plans for this owl. The purpose of my study, initiated in 2006, is to collect habitat use data that will be used to develop a sustainable forest management plan that meets the needs of both fish owls and the logging industry. At present this project is still in the data collection stage; I have captured eight fish owls and recorded habitat use data for 16 mo using VHF transmitters and GPS dataloggers. Here, I present what is known about fish owls from the literature and my own observations, describe my capture methodology, and present initial movement data gleaned from telemetry.

Effectiveness of Perch-deterrent Devices in Reducing Raptor Perching on a Power Line in Southwestern Wyoming.

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In open, sagebrush-steppe habitats, electrical distribution and transmission lines (i.e., "power" lines) can provide perches for raptors and Common Ravens *(Corvus corax)* in areas where few natural perches of similar height previously existed. These manmade perches may indirectly impact nearby prey species, such as the Greater Sage-grouse *(Centrocercus europhasianus)*. Between September 2006 and August 2007, we assessed the ability of perch-deterrent devices to minimize raptor and raven activity on a recently constructed power line in southwestern Wyoming. We sighted 42 raptors and ravens on primary support structures of the deterrent line versus 551 on the control line during 192 driving surveys of each line. We also documented much off-line, alternate perch use and flights near both survey lines, but fewer birds were seen off-line near the deterrent line. There was a pronounced winter peak in on-line perch use and off-line activity near both survey lines, but the effect was more dramatic on the control line. We also recorded 31 raptor and raven activities on the deterrent line versus 124 on the control line during 192 hours of stationary behavioral-observation surveys of each line. We found 17 single prey items and 65 grouped items (i.e., pellets or bone clusters) near deterrent-line poles, compared to 398 single prey items and 493 grouped items near control-line poles during 576 prey-remains surveys of each line. Very few Greater Sage-grouse were observed during the study, but we did document a likely raptor-caused mortality event and a wire-collision mortality. When determining the appropriateness of deterrent devices as a tool to manage raptor and raven perching over entire power-line segments, we suggest managers consider what level of reduction in perching activity is deemed worth the cost, as well as the availability of alternate perches in the surrounding landscape.

Flammulated Owl *(Otus flammeolus)* Distribution in Montana and North Idaho: Results from Two Years of Surveys by Technicians and Citizen Scientists.

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Flammulated Owl populations in the Intermountain West may be declining due to habitat alterations, yet their secretive nature and scattered distribution have made monitoring difficult. In 2005, the Avian Science Center (ASC) and the Northern Region of the U.S. Forest Service (USFS) initiated the first-ever Region-wide survey for Flammulated Owls in lower elevation, dry forest types of Montana and northern Idaho. Sampling methods using GIS modeling proved effective, and we now have a clearer understanding of Flammulated Owl distributions both east and west of the divide. In 2008, we re-visited many of these surveys and established new survey areas to gain a better understanding of Flammulated Owl habitat associations. However, a long-term monitoring program using an established protocol is needed to understand habitat associations and population trends. A citizen-science approach has the potential to provide a cost-effective means of collecting population data across a large area over time, and Flammulated Owl surveys are particularly appropriate for citizen monitoring because identification is straight forward, equipment is simple and inexpensive, and the public has a keen interest in both hearing owls and contributing to valuable science. In 2007, we initiated a successful pilot project with the help of volunteers from local Audubon groups who "adopted" survey routes. In 2008 we continued these surveys and expanded the program to the Helena area. I will highlight the successes and challenges of the citizen science approach and discuss how our future surveys will attempt to draw on the strengths of this approach together with a program using paid USFS technicians. Ultimately our goal is to better assess the habitat association of these owls, particularly in the wildland urban interface.

Nest Survival Models: Do They Work for Raptors?

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Evaluations of reproductive output are important components of studies that assess the status of raptor populations. One common measure of reproductive success, the ratio of pairs that successfully fledge young to the total number of pairs found, or "apparent nest success," produces estimates of nest success that are biased high. Alternative methods to assess nest success that may be more robust and flexible, such as the Mayfield estimate and the logistic-exposure or "Shaffer" model of daily nest survival, have not been widely applied to raptors. Studies of breeding raptor populations tend to have different monitoring protocols than those of passerines and waterfowl, and it is unclear how methods developed for such studies will perform for raptors. We analyzed data from long-term studies of three raptor species: Golden Eagles *(Aquila chrysaetos)*, Prairie Falcons *(Falco mexicanus)*, and American Kestrels *(Falco sparverius)* in southwestern Idaho. Monitoring protocols differed by species, and represented approaches used to monitor raptors. Preliminary results indicate that for all species apparent nest success estimates for all nests with known fates were higher than Mayfield and logistic-exposure model estimates; the estimates with 95% CI did not overlap. Apparent nest success estimates excluding nests found during brood-rearing were lower, but still different from the other estimates. Mayfield and logistic-exposure model estimates from a model without covariates were nearly identical. The most obvious advantage of logistic-exposure models is that they can simultaneously assess the influences of categorical and continuous covariates. Mayfield estimates can be calculated by category only.

Reproductive Success in American Kestrels: The Roles of Individual Quality and Human Disturbance.

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Avian reproductive success and, consequently, fitness can be affected by a number of variables. These variables include quality of nesting habitat, individual quality, level of anthropogenic disturbance, or a combination of these factors. American Kestrels *(Falco sparverius)* utilizing nest boxes in Southwest Idaho show variation in reproductive success depending upon nesting location. Birds that nest near interstates and homes have lower reproductive success compared to birds that nest along secondary roads near agriculture or shrub-steppe habitat. We examined two non-mutually exclusive hypotheses to explain variation in reproductive success, particularly the pattern of low success in kestrels. We hypothesized that kestrels nesting near interstates and homes may be of lower quality (e.g., younger) and therefore have lower reproductive success compared to birds nesting in other areas. Alternatively, kestrels nesting near roads and homes may be in areas of high disturbance and behavioral and physiological responses to disturbance may cause decreased reproductive success. To evaluate these hypotheses we measured growth rates, reproductive success and number of young fledged per pair and compared these to measures of individual quality and human disturbance. We also used a standardized chronic stress protocol (CSP) to compare the corticosterone stress response in nestlings located in relatively "high" and "low" disturbance areas. Results from this study may be used to identify factors and physiological mechanisms that negatively affect kestrel reproductive success.

Implications of Regional Spatial Variation in Prey Use by Breeding Red-shouldered Hawks *(Buteo lineatus).*

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Patterns in resource use by animals provide important information regarding species ecology, conservation and management. We explored the prey use by breeding Red-shouldered Hawks to identify regional patterns in resource use and potential implications for species conservation. We conducted a meta-analysis of region specific data from research on nestling provisioning by adult Red-shouldered Hawks. We summarized data from nine unique study sites resulting in the analysis of over 3200 prey items. Using a cluster analysis of Morisita's similarity index we identified significant differences in Red-shouldered Hawk prey throughout their breeding range. Furthermore, patterns in prey use coincide with latitudinal differences among study sites. Red-shouldered Hawks breeding in the northern portions of their range used mammalian prey more frequently and herptilian prey less frequently than their counterparts breeding in southerly portions of the species range. Our study summarizes the dietary flexibility of breeding Red-shouldered Hawks and suggests regional variations in prey availability as an additional factor influencing reproductive success and survival of Red-shouldered Hawks in North America.

Ecotoxicological Risk and Exposure: A Comparison of Burrowing Owls in Natural and Agricultural Habitat in Southern Idaho.

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Burrowing Owls *(Athene cunicularia)* nest in higher densities in irrigated agricultural habitat when compared to natural, arid habitat. In fact, they are the only species of raptor to show increased association with irrigated agriculture during the breeding season in s. Idaho. Previous research suggests that owls may associate with agricultural areas because of more reliable and abundant prey, particularly invertebrates. One potential cost of this association for Burrowing Owls, however, is an increased risk of exposure to pesticides that are applied to agricultural fields. We used plasma cholinesterase as a biomarker to investigate in vivo organophosphate and carbamate exposure, feather and footwash samples to investigate general external exposure, and whole egg contents to investigate organochlorine (p,p^1-DDE) exposure in females. In addition to exposure, we investigated eggshell thinning in agricultural habitat compared natural habitat. Cholinesterase levels and eggshell thickness in agricultural habitat were not different than in natural habitat. Additionally, there were no pesticide residues detected in footwash samples. Thus, initial results indicate that owls nesting in agricultural habitat in our study area are not exposed to detectable levels of pesticides on their breeding grounds and, as such, may benefit, as suggested by previous studies, from association with agriculture. Conversely, p,p^1-DDE, a metabolite of DDT, was detected in 10 of 30 eggs and was present in egg contents irrespective of proximity to agricultural lands. Thus, Burrowing Owls are at risk of exposure to DDT and it's metabolites. Exposure to DDT is more likely to occur on wintering grounds than on breeding grounds. Our paper discusses the implication of these results for a migratory population of Burrowing Owls and in comparison to those that nest in more intensively farmed areas elsewhere.

Observations of Adult Peregrine Falcons *(Falco peregrinus anatum)* Capturing Stoneflies.

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We observed adult Peregrine Falcons capturing giant California Stoneflies (commonly known as Salmonflies, *Pteronarcys californica*) along the Blackfoot River in Missoula County, Montana in June 2004 and 2007. In 2004, two feeding bouts were timed and insect captures counted. In 2007, numerous feeding bouts over three days and at two different eyries were observed, timed, and capture numbers recorded. Both sexes engaged in hunting salmonflies at each eyrie and two capture strategies were employed. Also in June 2007, an adult female Peregrine Falcon was observed feeding on salmonflies over the Gallatin River near Bozeman, Montana. American Kestrels, Red-tailed Hawks, and Common Ravens were also observed feeding on the insects in aerial hunts. Findings were summarized in a table of rates of capture of stoneflies and estimated caloric intake during eight adult Peregrine Falcon foraging flights (2004, 2007). Peregrines have been observed hunting insects, however we found no accounts in the literature of Peregrines feeding on insects from the order Plecoptera (stoneflies). Numerous photographs were taken, documenting the hunting strategies.

Raptor monitoring in the Upper Tanana Valley, Alaska 1991-2007.

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Tetlin National Wildlife Refuge has collected annual occupancy and productivity data for nesting Bald Eagle *(Haliaeetus leucocephalus)*, Osprey *(Pandion haliaetus)* and American Peregrine Falcon *(Falco peregrinus anatum)* in the Upper Tanana Valley since 1991. Methodology, trends and comparisons with other North America studies are presented. Annual mean occupancy, nest success, productivity and brood size for Bald Eagles over 17 years was 66.34%, 51.78%, 0.64 young per occupied nest, and 1.24 young per successful nest respectively. Annual means for Osprey was 75.75%, 59.32%, 1.10, and 1.85, and for Peregrine Falcons was 88.69%, 87.47%, 2.32, and 2.62 respectively. Our study documented higher productivity and mean brood size of falcons than four other multi-year studies in eastern interior Alaska and the number of known falcon territories has increased from three to 20 in 17 years. Mean dates were estimated for peregrine falcons for egg laying (15 May), hatching (17 June) and fledging (27 July). Breeding parameters of all 3 species appear to be relatively stable. Tetlin Refuge will continue monitoring efforts with no further management actions.

Ecology and Conservation of a Regionally Significant Grey-headed Fish-Eagle population in Cambodia.

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The poorly-studied Grey-headed Fish-Eagle *(Ichthyophaga ichthyaetus)* is in apparent population decline throughout its Indo-Malayan range, and is currently considered as globally near-threatened. Populations in Southeast Asia are of particular conservation concern, as surveys in Myanmar, Thailand, Laos, Vietnam and Malaysia suggest numbers have become severely diminished in recent years. Despite its widespread distribution, virtually nothing is known about the ecology of the Grey-headed Fish-Eagle, nor the reasons for its apparent decline. Since 2005, we have studied a previously unknown high density breeding population in the swamp forest at Tonle Sap Lake, northern Cambodia. The Tonle Sap is Southeast Asia's largest freshwater lake, and is subject to annual flooding from the Mekong River, coinciding with the fish-eagle's breeding season. We present the first quantified data on the ecological requirements of the Grey-headed Fish-Eagle, as a basis for future conservation management. We analyzed features associated with nest site trees, the spatial distribution of nest sites in relation to permanent vs. temporary floodwater, diet and food availability, and an index of human disturbance/influence. Our results indicate that the Grey-headed Fish-Eagle is sensitive to fluctuating water levels, human disturbance, and prey (water snake) availability. We suggest that this is a regionally significant fish-eagle population that is potentially threatened by the effects of upstream Chinese hydropower dams on the Mekong River (predicted to cause significant changes to the seasonal flood regime) and by the unsustainable human over-exploitation of food resources (an estimated 6.9 million water snakes are removed from the lake per annum, predicted to have a catastrophic effect on water snake population stability).

Preliminary Notes on Clarion Burrowing Owl, a Forgotten Subspecies of the North American Continent.

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Clarion Burrowing Owl *(Athene cunicularia rostrata)* (Townsend, 1890) is an endemic, endangered subspecies from Clarion Island, Archipelago of Revillagigedo (MX). This volcanic island 8.53 km long by 3.48 km wide is located 700 km SW Baja. We conducted fieldwork in the island from May 20 to April 7. Nine Active burrows were described, 7 of them constructed by introduced rabbits and 2 were part of natural cavities conformed by lava as a result of the volcanic activity. Pellets were scarce in presence of high densities of rabbits, however our results confirmed the diet was largely represented by invertebrates. Beetles constituted the highest frequency (65%) followed by orthoptera (26%). Clarion Cricket, not yet assigned a scientific name, is one of the biggest insects available. The rest of the items are integrated by spiders and caterpillars. Only one case of a small mammal gray-pellet was provided by a female owl containing a juvenile rabbit partially consumed. During our stay we described the habitat attributes as well as vegetation structure associated to the roosts. Censuses were conducted in either low lands as well as the upland we estimated the population as "uncommon" respectively to the rest of the birds present. During our visit we observed couples sharing the same roost mainly at the upland where soil is softer, deeper, and pastures surrounded. This study has been conceived as long term project designed to answer a number of questions associated the ecology and evolution of the owl, its continuity will depend on funding sources available.

Breeding Season Diet and Behavior of the Cuban Pygmy-Owl *(Glaucidium siju).*

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We studied the behavior and ecology of the endemic Cuban Pygmy-Owl in the palm savanna and adjacent semideciduous woodlands at Soplillar, Ciénaga de Zapata, Cuba in April and May 2007 and 2008. Of 18 nests examined, 15 were in cavities created in palms by West Indian Woodpeckers *(Melanerpes superciliaris)*, whereas three were in natural cavities in hardwoods. We made intensive observations of seven nesting pairs from blinds for a total of 371.7 hr. The pygmy-owl is diurnal, with prey-capture peaks in early morning (0800–0900 H) and late afternoon (1630-1700 H). Prey delivered to nests (*N* = 219) included lizards (82.7%; mainly *Anolis*, but also *Ameiva,* and *Leiocephalus*), insects (8.7%; orthopterans), frogs (1%; *Eleutherodactylus, Osteopilus*), and unidentified items (7.2%). In contrast to the high proportion of lizards delivered to chicks and incubating females, adult pygmy-owls fed on more insects (mainly orthopterans, but also beetles, dragonflies, and caterpillars; 59.4%) than lizards (25.0%) (*N* = 32). Females alone incubated and brooded chicks. Male visits to nests were limited to prey transfers to females at the nest entrance, with only occasional entry to transfer prey to chicks in the late reproductive period while females were foraging. Male pygmy-owls delivered most prey items to the nests (78.0%) throughout the breeding period. Females contributed an overall 22.0% of the items delivered to nests, mainly in the late nestling period. Prey delivery rates averaged 0.58 ± 0.31 (*N* = 219; r = 0.1-1.3) prey per hour. Nest attendance rates (female) were highest during incubation (females on nest 90.4 ± 10.3% of observation time; *N* = 6 d/39.1 hr of observation) and early through mid-nestling (65.0 ± 29.3%; *N* = 17 d/146.1 hr) periods. Thereafter, females took a more active role in provisioning chicks, when they were away from the nest an average of 96.7 ± 6.0% of the day (*N* = 12 d/117.9 hr).

The Long View: Twenty-five Years of Swainson's Hawk Research and Still Going

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In this presentation we summarize our research of the ecology and population status of Swainson's Hawks *(Buteo swainsoni)* in northern California over a 25 year period. Through evaluation and comparison of information collected at multiple spatial scales – ranging from selection of prey and foraging habitat by individuals to species-wide effects occurring in overwintering areas – we have been able to identify important processes and resources affecting this population. Mid-scale processes such as territory distribution and home-range habitat showed little evidence of habitat preferences and changed through time. At fine scales, however, daily movements and foraging success were consistently and strongly influenced by agricultural practices that determine prey availability. The long temporal scale of this research also allowed us to examine trends in demographic rates. Preliminary results obtained in the early 1990s indicated specific years with high overwinter mortality of adult hawks; leading to satellite telemetry research and investigations in Argentina. Subsequent demographic monitoring revealed a significant effect of habitat on reproductive success, whereas adult survival was correlated with agricultural practices and conservation actions occurring in Argentina. Detection of these patterns would be unlikely at shorter temporal scales. Long-term research has enabled us to describe the dynamic nature of this population in response to shifting agricultural practices, subsidy and tariff programs, and commodity markets. We believe that the benefits of long-term ecological studies far outweigh the difficulty of funding and staffing them.

Photo: Rob Palmer

POSTER SESSION ABSTRACTS

Molted Raptor Feather Persistence and Aging in a sub-Arctic Environment: Implications for Non-invasive Genetic Sampling.

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The use of molted feathers as non-invasive genetic samples is increasing and some analytical applications of these samples require temporal assumptions. However, the age of feathers used in such studies has rarely been addressed. We investigated molted feather persistence and aging in a sub-Arctic environment in western Alaska. We placed individual falcon flight and body feathers below historical Gyrfalcon *(Falco rusticolus)* nest sites and on perches; we returned a year later to collect and inspect remaining feathers. After one year, 14% of the deployed feathers remained and were collected during primary search efforts. Mean length of recovered feathers was significantly longer than that of deployed feathers. Small and body feathers were significantly less likely to persist than large or flight feathers. All recovered feathers exhibited at least one sign of aging not present when deployed: matted and separated barbs, fungi on the rachis, and/or algal growth on the feather vane. Hence, in our study area in western Alaska, few molted feathers persisted for one year and those that did remain were visually distinguishable from fresh feathers. These results hold important implications for the appropriate use, application, and interpretation of data from molted feathers as non-invasive genetic samples.

Tempo of Diversification in the Accipitridae under Different Phylogenetic Hypotheses.

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The extent to which phylogenetic affinity affects diversification (morphological and/or species richness) is not universal across clades nor is it conserved among traits. The Accipitridae is a large clade (~ 239 species) within the Falconiformes. Hence, it is a good group in which to address questions of clade-specific diversification. Using ellipse analysis on trait metrics and lineage through time (LTT) plots, I assessed the relative amounts of clade-specific phylogenetic conservation and diversification since their origins. Two important results of this study are: (1) Towards the tips of the tree, certain cranial traits (overall width, bill tip shape) seem to have reduced phylogenetic signal while others (overall cranial shape, orbital shape) to morphological diversification within the family, (2) LTT plots reveal some clade specific speciation, yet the majority of speciation throughout the history of accipiters is not outside predicted boundaries based upon bootstrapped values for birth and death. Furthermore, the specific phylogenetic hypothesis used has ramifications for resulting metrics of LTT and ellipse patterns of diversification.

Changing Weather Patterns and the Rate of West Nile Virus Transmission in Raptors.

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West Nile Virus (WNV) is a pathogen carried and transmitted by mosquitoes, which then infects avian species as well as other animals. The virus was first detected in the United States in 1999 which spread rapidly from the east to the west coast. In 2002 confirmed cases of WNV were found in Colorado and since have been infecting and killing the avian populations in the state. WNV cases from 2002-2007 were collected from a raptor rescue and compared to average monthly and annual temperatures and precipitation. We hypothesize that WNV cases would be positively correlated to temperature and precipitation, because the mosquito vector requires a warm and wet environment to thrive. Our results supported a positive correlation between the number of WNV infected birds and average monthly temperature; however, there was no correlation between the number of WNV infected birds and average annual temperature, annual precipitation, nor monthly precipitation.

Band Size for Eagles: Is Size 9 Adequate for all Birds.

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During our banding studies on Bald Eagles *(Haliaeetus leucocephalus)* and Golden Eagles *(Aquila chrysaetos),* we noticed that the recommended size 9 U.S. Geological Survey bands did not fit properly on all birds. We found that the size 9 bands were too large for some male Bald Eagles and too small for some female Golden Eagles. By using minimum tarsus width measurements for a variety of species, we were able to model correct band sizes for individual eagles based on minimum tarsus width size. Using those models and observed band fit on wild-caught eagles, we conclude that a variety of band sizes should be used on North American eagles.

High Frequency of American Kestrel Strikes at the Montreal-Trudeau International Airport: A Case Study.

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The American Kestrel *(Falco sparverius)* has been ranked tenth out of all wildlife that causes major damage to aircraft in the United States. Since 1990 there have been 4545 reported raptor strikes in the U.S., and American Kestrels represented 33.7% of those strikes. Of kestrel strikes, 16 were reported to have caused damage to the aircraft, representing a total of $1 268 813 USD. Comprehensive data on bird strikes have been collected at Montreal-Trudeau International Airport (YUL) for the past 10 yr. Since data collection started in 1997, the American Kestrel tops the list of birds most struck by aircraft. At YUL there is a significant correlation between time of year and number of kestrels struck, with peaks appearing in July and August. This time of year coincides with the fledging dates and post-fledging social behaviour of young American Kestrels. These young birds often form foraging groups of unrelated juveniles, and groups of up to nine American Kestrels have been spotted foraging on airport grounds. The open fields of YUL provide ideal habitat for this species, with an abundance of prey and perching surfaces. In a given year, as many as four pairs have bred on airport land as well. Preliminary stomach content analyses of struck birds revealed grasshoppers to have formed a large portion of their diet. We recommend grass height management (tall grass programs), elimination of perching surfaces, identification and elimination of potential nest sites and grasshopper control as possible techniques to reduce American Kestrel strikes at airports.

Photo:Kate Davis

Roosting Habitat Selection of Migrating Sharp-shinned *(Accipiter striatus)* and Cooper's hawks *(A. cooperii)* in the Eastern Flyway and Implications for Conservation.

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The central Appalachian Mountains are a key corridor for migrating raptors within the eastern North America flyway. As habitat alteration continues along this and other raptor migration corridors, it is critical to better understand the habitat requirements of migrants during passage. In autumn 2003 and 2004, we radio-tagged 44 migrating Sharp-shinned and Cooper's hawks and followed them during their migration through the central Appalachian region. Roost sites used by the migrants were mapped and compared to habitat available at three landscape scales, near scale (less than 0.5 km), distant scale (10 km) and a regional scale (across areas used by all hawks) and distance from the flyway. The best predictors of habitat selection were evaluated using logistic regression. Both accipiters selected significantly larger forest patches and less open and suburban or urban areas than were available to them in the landscape. One of the strongest predictors of Sharp-shin roost locations was forest patch size. Cooper's Hawk roosts were highly influenced by the roost proximity to the migration flyway. At a near scale, all accipiters showed a strong negative association with non-forest habitats. At a large scale, adult sharp-shin roosts were significantly associated with conifer forest and adult coopers and sharpshins roosted significantly closer to the flyway than immature birds. Although, migration habitat selection was similar to nesting habitat reported for the Sharp-shinned Hawk, Cooper's Hawks appeared to be more selective during migration than during the breeding season, selecting larger and less developed forested areas than were available. And, although Cooper's Hawks are often seen in suburban or urban habitats during nesting and wintering, they may avoid such areas during migration. Both species selected roosts nearer the corridor than expected at random suggesting that conservation of large areas of natural habitats near migration corridors may be especially important for migrating raptors.

Assessment of Merlin Populations Wintering in Southwest Idaho.

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In Idaho the Merlin *(Falco columbarius)* is ranked as a state Species of Greatest Conservation Need due to a lack of population trend information. Merlins are a rare breeding bird in Idaho, but regularly winter in low-elevation valleys. However little is known about their habit preferences or the distribution of subspecies in winter. Between 27 December 2006 and 3 March 2008, 58 Merlins were observed during road surveys throughout the Treasure Valley in southwest Idaho. Based on plumage characteristics, 57% (33) were identified as Western Taiga Merlins *(F. c. columbarius),* 33% (19) were Black Merlins *(F .c. suckleyi)* and 10% (5) were Richardson's Merlins *(F. c. richardsonii)*. Of this sample, 55% (32) were first observed in rural areas while 45% (26) were found in urban areas. Twenty-four Merlins were trapped and photographed to confirm subspecies identification, age and sex. Of the 15 females captured, 11 were in juvenile plumage. In contrast, only one of the nine males captured was in juvenile plumage. Western Taiga Merlins breed north through Canada and Alaska; Black Merlins breed along the coastal belt of western Washington to southeast Alaska; and Richardson's Merlins generally breed in the northern Great Plains. While a relatively large proportion of Western Taiga Merlins and small proportion of Richardson's Merlins would be expected on wintering grounds in southwest Idaho, the percentage of Black Merlins noted in this study is unexpectedly high. The skewing of age and sex data may be the result of low sample size. This information adds to the overall knowledge of Merlins in Idaho and suggests that urbanization has created core wintering habitat for Merlins in the high desert. Based on the number of Black Merlins noted in this study, the wintering range of this subspecies is dissimilar to breeding habitat and should be reevaluated.

Conservation, Taxonomic Status, and Genetic Differentiation among Red-shouldered Hawk Subspecies *(Buteo lineatus).*

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Traditional subspecies classifications among avian taxa may suggest phylogenetic relationships that are discordant with evolutionary history misleading evolutionary information among avian taxa. To more accurately describe evolutionary relationships and inform conservation efforts, we investigated the genetic relationships and demographic histories of Red-shouldered Hawk subspecies in eastern and western North America using 21 microsatellite loci and 375 base pairs of mitochondrial control region sequence. Frequency based analyses of mitochondrial sequence data support a significant population distinction between eastern *(B. l. lineatus/alleni/texanus)* and western *(B. l. elegans)* subspecies of Red-shouldered Hawks. This distinction was further supported by frequency and Bayesian analyses of the microsatellite data. Within the eastern range, Bayesian clustering analysis suggested that *B. l. texanus* may be distinct from *B. l. lineatus/alleni;* further sampling and analysis is required to more completely resolve this relationship. In addition to evidence of population distinction, we found evidence of differing demographic histories between regions. Among eastern sites, mitochondrial data suggested that a rapid population expansion occurred following the end of the last glacial maximum, with the *B. l. texanus* population expansion preceding that of *B. l. lineatus/alleni.* No evidence of post-glacial population expansion was detected among *B. l. elegans.* Rather, microsatellite data suggest that *B. l. elegans* has experienced a relatively recent bottleneck, presumably associated with extensive anthropogenic habitat loss during the 19th and 20th centuries. Our data indicate that eastern and western populations of Red-shouldered Hawks are genetically distinct and have experienced very different demographic histories.

Importance of Grassland Habitat for Overwintering Rough-legged Hawks *(Buteo lagopus)* on Standing Rock Reservation, South Dakota.

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We conducted roadside surveys for raptors during February and March 2006 along 185 km routes in Corson County, South Dakota on the Standing Rock Reservation. GPS locations were plotted using ArcMap (9.2) GIS software to align field data on 1 m-resolution digital orthophotoquads for habitat analyses. During 88.50 total hours and 1915 total miles, we observed 231 raptors and owls from 11 different species. Clear identification was impossible for 41 of the observed raptors; these sightings were removed from our data set for analyses. Rough-legged Hawks (*N* = 117) accounted for more than half of our observations. Rough-legged Hawks were observed significantly (χ^2 = 202.62; *P* < 0.0001) more often in open, treeless grassland habitat, rather than in shelterbelts or wooded areas. Telephone poles were used as perches significantly (χ^2 = 79.66; *P* < 0.0001) more frequently than fence posts, trees, or the ground by Rough-legged Hawks. Recounts of the same individuals very likely occurred; however, the prevalence of Rough-legged Hawks during this time period is substantial. The commonness of wintering Rough-legged Hawks in this area has not be reported, although the species is on South Dakota's checklist and is known to winter and migrate through this area. Extensive, open grassland areas of Standing Rock Reservation may offer an important wintering area for tundra-breeding species, as efforts to increase windbreaks and augment tree populations in this region may degrade Rough-legged Hawk habitat. Further study of this area will investigate seasonal raptor use of the Standing Rock Reservation and establish a long-term monitoring program.

Global Raptor Information Network.

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The Global Raptor Information Network ("GRIN") is a web-based project designed to provide information on diurnal raptors and to facilitate communication between raptor researchers and organizations interested in the conservation of these species. GRIN is designed to: (1) Provide an extensive database containing basic biological information on the diurnal raptors of the world, (2) help identify priority species for conservation actions and species in need of further study, (3) provide access to the technical literature for researchers and students in remote locations, (4) establish a global network of raptor researchers and conservationists, and (5) post information on new research findings and raptor conservation issues. The main features of GRIN include a species-level database with distributional and conservation status information on 331 species of raptors for 260 countries or major island group, a searchable bibliography containing over 38 000 citations on diurnal raptors, species accounts with information on distribution, taxonomy, movements, habitat, breeding biology, conservation issues, important references, current research projects, and photo galleries, homepages of over 200 raptor researchers representing 61 countries with links to the species account, full abstracts from past raptor meetings, links to over 500 raptor organizations, observatories, raptor-related databases, and important journals, and a bulletin board with notices of upcoming raptor meetings, recent raptor news, and requests for assistance. It should be emphasized that GRIN is a dynamic database, and no portions will ever be "complete." Additional information from both older and current literature sources and bibliographic records are being added daily. The ultimate goal is to spread the responsibility for maintaining the GRIN database and species accounts among raptor specialists throughout the world.

Coming Home to Roost: Active Bald Eagle *(Haliaeetus leucocephalus)* Nests Within Communal Roosts in the Chesapeake Bay, U.S.A.

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The Chesapeake Bay is an area of convergence for Bald Eagle populations along the Atlantic coast. The tidal-reaches of the Bay support approximately 1200 breeding pairs and 8000 resident subadults. This non-migratory resident population is unique because it shares foraging and roosting habitat with migrant populations throughout the year, including the breeding season (December-June). We documented at least 12 active nests within communal roosts in Maryland and Virginia. Using historic survey data (1975-present), we confirmed that most of the nests were built years after communal roosts were established. The resident breeding population is in a period of exponential growth and breeding habitat is not currently limited. Nests within permanent communal roosts challenge our assumptions on the size of the defendable breeding territory and tolerance of other adults in close proximity to an active nest.

Ecology of an Urban Red-tailed Hawk *(Buteo jamaicensis)* Population.

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Although common throughout North America, Red-tailed Hawks have been rarely studied in urban environments. We are studying an urban Red-tailed Hawk population in Hartford, CT. Breeding pairs are year-round residents, and home ranges estimated using VHF telemetry differ between breeding and non-breeding seasons. We investigated the potential influence of several environmental factors on productivity and home range size, including area of green space, housing density, road density, level of human activity, and density of squirrels, one of the hawks' primary prey species. Preliminary results suggest breeding pairs living in large green spaces (i.e., city parks) have smaller home ranges than pairs inhabiting high density urban development (i.e., residential and commercial), and pairs living in urban parks rarely leave the parks. Breeding hawks in our study area produce 1–3 young each year, which, similar to other studies of urban populations of this hawk suggests that this species is adapting well to urban environments.

Northern Saw-whet Owl *(Aegolius acadicus)* Re-encounters from Banding Stations in Alberta and Saskatchewan, Canada.

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The movements of banded Northern Saw-whet Owls have been monitored extensively during spring and autumn migration in eastern North America, however only limited studies have been conducted in northern and western parts of their range. Ten Northern Saw-whet Owl migration monitoring stations have been established since 2002 in Alberta and Saskatchewan, Canada. There have been 60 band re-encounters between stations, from locations away from stations, and at the same stations the owls were banded in subsequent years. The longest distance of a Northern Saw-whet Owl band re-encounter was 2315 km, Last Mountain Lake, SK to Hebron, PA. The longest within season re-encounter was 1411 km from North Saskatoon, SK to Littleton, CO. Almost half of the re-encounters were in a southeast direction. Of the 19 within season re-encounters, hatch year females travelled farther than second year females. The average speed of travel was 3.4 km/night-hour or 45 km/night, however the average speed of eastern movements was 141 km/night. There were four instances of banded Northern Saw-whet Owls showing evidence if overwintering. The Northern Saw-whet Owls in Alberta and Saskatchewan may employ more than one strategy or may be nomadic to some degree. Investigations using stable isotope studies may help clarify the movement patterns of Northern Saw-whet Owls from western Canada.

Seasonal Diet of the Burrowing Owl *(Athene cunicularia)* in El Vizcaíno Desert, Baja California Sur, México.

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The seasonal diet of Burrowing Owl has been little studied throughout its wide distribution. In the Vizcaíno desert, Baja California Sur, México populations are located in pristine conditions with no human disturbance. The diet of this owl was determined analyzing 624 pellets in the spring and winter 1996-1997 seasons. We determined 41 different taxa with a total of 3384 items. In winter, arthropods were the main prey consumed (91.2%), followed by mammals (5.7%), reptiles (2.1%), and birds (0.8%). The main biomass was given by mammals (32.26%), reptiles (31.5%), arthropods (23.3%), and birds (12.8%). In spring, the most important prey was also arthropods (95.95%). A smaller frequency of mammals (2.5%), reptiles (1.06%) and birds (0.45%) was found in this season. Main biomass was given by arthropods (35.38%) followed by reptiles (33.44%), mammals (20.69%), and birds (10.47%). Seasonal trophic differences are discussed.

Photo: Kate Davis

Accipiter Nesting Use of Pinyon-juniper Habitats in Northwestern Colorado.

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While substantial research has been directed at understanding accipiter nesting habitat relationships, little attention has been paid to pinyon–juniper (*Pinus edulis* or *monophylla–Juniperus spp.*) habitats of the western U.S. Surveys conducted by the Bureau of Land Management (BLM) in northwestern Colorado suggested that accipiter nesting use of these habitats may be more common than previously acknowledged, leading to a study of this phenomenon by HawkWatch International and the BLM. Broadcast surveys and nest searches suggested that there were a minimum of 0–2 Sharp-shinned Hawk *(Accipiter striatus),* 13–29 Cooper's Hawk *(A. cooperii),* and 3–6 Northern Goshawk *(A. gentilis)* nests active in the surveyed portion of the Piceance Basin study area in 2007. Spacing of active nests located between 2005 and 2007 suggested that all three accipiters were found at low densities in the area relative to other habitats. Vegetation surveys suggested that Sharp-shinned Hawks (*N* = 3) nested in smaller trees, and in areas with predominantly smaller trees and a greater density of trees. In contrast, Cooper's Hawks (*N* = 10) and Northern Goshawks (*N* = 10) appeared to nest in more open pinyon–juniper patches containing larger trees. All surveyed accipiter nests were found on northwestern through eastern aspects, and no nests were found in pinyon–juniper patches less than 4.8 ha in size. Based on our results and other available records, we do not believe that accipiter nesting use of pinyon–juniper habitats is restricted to northwestern Colorado. Federal lands contain 65% of current pinyon-juniper habitats and we recommend federal land managers consider the potential of these habitats to support nesting accipiters during land management planning. We have identified the BLM and U.S. Forest Service field and district offices with the greatest pinyon–juniper coverage and provide general recommendations for survey of these habitats.

Do Great Blue Heron *(Ardea herodias)* Nesting Colonies Benefit from Osprey *(Pandion haliaetus)* Nest Defense Behavior?

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Anecdotal observations of six active Great Blue Heron nesting colonies in northwest Montana found that all were within 150 m of active Osprey nests. Ospreys are vigilant defenders of their nesting sites from potential predators such as Bald Eagles *(Haliaeetus leucocephalus).* Bald Eagles are a common resident in the region and are a predator of Great Blue Heron eggs and nestlings at colony sites. I present a hypothesis that Great Blue Herons are selecting nest sites in proximity to active Osprey nests to benefit from Osprey nest defense behavior. I request additional observations and data from other biologists and observers to gain further insight into this possible relationship.

Productivity of Peregrine Falcons Nesting on Quarried Cliffs and River Bluffs in the Upper Tanana Valley, Alaska: Is Road Construction Good for Peregrine Falcons?

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The number of known Peregrine Falcon *(Falco Pereginus anatum)* territories in Alaska Game Management Unit 12 in the Upper Tanana Valley has increased from three to 20 in 17 yr (1991-2007). During this same period, mean nesting success (87.47% ± 6.50 95%C.I.) and productivity (2.32 ± 0.33 young per occupied nest) were higher than five other eastern Interior Alaska studies with available data (Timm and Johnson 2008). Beginning in 1995, five pairs have nested on non-natural cliffs in altered habitats (three on well-trafficked road-cuts and two in rock quarries; one periodically used as a shooting range) along the Alaska Highway between Tok and the Canada Border. hese five roadside territories have consistently shown higher productivity (2.86 ± 0.30, 2003-2007 mean ± 95% C.I.) than those six to nine nesting territories in bluffs along the Tanana River (1.81 ± 0.37). We hypothesize that the energetic costs of frequent human disturbances at roadside territories may be offset by abundant prey nearby and the ability of the birds to habituate to highway traffic. The Tetlin-Northway flats are a complex of ponds and wetlands in close proximity to the roadside territories and the high densities of prey (waterfowl, waterbirds and shorebirds) found there may contribute to higher productivity. Research possibilities exist looking at the interrelationships of nest cliffs, food habits and wetlands, conducting a spatial analysis and comparing prey usage with prey availability. Interested students should contact the authors.

Effects of Habitat Fragmentation on the Breeding Ecology and Body Condition of Raptors in the Desert of Baja California Sur, México.

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We are studying the effects of habitat fragmentation on the breeding ecology and body health of raptors in the desert of Baja California Sur, México. Baseline information on the nesting ecology of Harris's Hawks *(Parabuteo unicinctus)* and Crested Caracaras *(Caracara cheriway)* is obtained from the Valle de Santo Domingo region. From December 2007 to July 2008 road surveys were conducted in transects throughout both fragmented and natural areas. We mainly recorded and compared the number of birds per land use practices and for natural vegetation. areas, 14 species were observed in fragmented areas and seven in natural areas, however the diversity (H´) was similar in both areas. *Elanus leucurus, Circus cyaneus, Buteo swainsoni, Aquila chrysaetos,* and *Falco columbarius* were recorded only in fragmented areas. Open habitats in fragmented areas of the desert may provide more heterogeneous habitat, and may increase foraging success for more opportunistic raptors. Clearing of desert may benefit Crested Caracaras in the short time as preliminary results indicate that a higher density of Crested Caracara occurs in fragmented areas than in natural vegetation. However, nesting sites are fewer and nest success decreases in fragmented areas. We are studying the effects of habitat fragmentation on territory size of both the Crested Caracara and the Harris's Hawk using radiotelemetry and we expect to determine both body condition and immune response through blood chemistry and limpha analyses and load of parasites and virus and the stress they produce on raptors in both fragmented and natural vegetation.

Preliminary Notes on Clarion Burrowing Owl, a Forgotten Subspecies of the North American Continent.

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Clarion Burrowing Owl *Athene cunicularia rostrata* (Townsend, 1890) is an endemic, endangered subspecies from Clarion Island, Archipelago of Revillagigedo (MX). This volcanic island 8.53 km long by 3.48 km wide is located 700 km SW Baja. We conducted fieldwork in the island from 20 May to 7 April. Nine Active burrows were described; seven of them constructed by introduced rabbits and two were part of natural cavities conformed by lava as a result of the volcanic activity. Pellets were scarce in presence of high densities of rabbits, however our results confirmed the diet was largely represented by invertebrates. Beetles constituted the highest frequency (65%) followed by orthoptera (26%). Clarion Cricket, not yet assigned a scientific name, is one of the biggest insects available. The rest of the items are integrated by spiders and caterpillars. Only one case of a small mammal gray-pellet was provided by a female owl containing a juvenile rabbit partially consumed. During our stay we described the habitat attributes as well as vegetation structure associated to the roosts. Censuses were conducted in either low lands as well as the upland we estimated the population as "uncommon" respectively to the rest of the birds present. During our visit we observed couples sharing the same roost mainly at the upland where soil is softer, deeper, and pastures surrounded. This study has been conceived as long term project designed to answer a number of questions associated the ecology and evolution of the owl, its continuity will depend on funding sources available.

Costs and Benefits of Group Living in Burrowing Owls *(Athene cunicularia).*

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There are a variety of benefits, costs, and effects associated with group or solitary living. Potential benefits of grouping include group defense, early detection of predators, and increased productivity through decreased predation and information or foraging advantages. Costs of grouping include increased parasite transmission, detection by predators, and competition for resources. Potential effects of grouping include increases in adult and egg yolk androgens resulting from increased conspecific aggression and increases in extrapair paternity (EPP). Burrowing Owl nesting distributions range from solitary to semi-colonial. During 2006 and 2007 we examined relationships between grouping and depredation in dummy and actual nests, nest defense behavior, ectoparasite (flea) abundance, egg yolk androgens, and EPP in Burrowing Owls nesting within the Snake River Birds of Prey National Conservation area in s. Idaho. While grouped and solitary dummy nests were depredated at similar frequencies, fewer actual nests suffered predation as neighbor density increased. Predator trials with a stuffed American Badger *(Taxidea taxus)* documented the potential benefit of group defense and early warning in semi-colonial owls and may help explain why few semi-colonial nests were depredated. Ectoparsites (fleas) increased as density increased, but removing fleas did not significantly improve nestling body condition. Egg androgens did not significantly rise with increasing nest density, but a within-clutch increase (potentially to compensate for partial asynchronous hatching) was detected. DNA parentage analyses to determine relationships with nest density are underway. Finally, productivity increased as neighbor density increased. While burrowing owls may incur costs of increased parasites, the benefits of decreased predation and increased productivity may be among the reasons why burrowing owls frequently nest in close association with conspecifics.

RAPTOR RESEARCH AND MANAGEMENT TECHNIQUES SYMPOSIUM ABSTRACTS

Survey Techniques.

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Compared with most other groups of birds, raptors often are widely dispersed, and many of their populations exist at relatively low densities across the landscapes in which they occur. Raptors can be difficult to survey, and surveys often require a substantial commitment of resources, but can yield information about population size, nest location and distribution, reproduction, population status and distribution, and behavior. How raptor surveys are planned and conducted depends on survey objectives, which need to be explicit. Furthermore, surveys need to be designed and implemented to provide reliable results. I reviewed published literature regarding surveys for raptors and summarized survey objectives, design considerations, and application of wildlife survey methods to raptors. Survey objectives included determining raptor distribution and abundance, and locating raptors to study population dynamics or other aspects of raptor ecology. Important design considerations included factors that influence raptor detection (e.g., behavior of individual raptors, prevailing environmental conditions) and factors related to sampling and inference (e.g., identifying and sampling from the appropriate statistical population). Surveys for raptors can be categorized broadly as those where (1) the observer traverses sample units from the ground or water, (2) the observer traverses sample units from the air, (3) the observer is stationary at fixed sample units, or (4) sample units are assessed remotely. Surveys for raptors are part of almost all raptor research and monitoring efforts, and by clearly identifying survey objectives and incorporating survey techniques that appropriately address survey objectives, results of surveys are more likely to provide reliable results that can be extended beyond single efforts and compared spatially and temporally. Finally, recent statistical advances can be used to improve surveys for raptors, and information resulting from well-designed surveys can be used confidently, both to understand raptor ecology and to guide effective raptor management and conservation.

Study Design, Data Management, Analysis, and Presentation of Raptor Research.

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A single source providing general guidance on how to conduct basic or applied ecological research is not readily available to new students of raptor science. Here, I provide a brief set of guidelines on how to conduct a raptor research project with emphasis on research design, data management, analysis, and the presentation of the results. I submit that the two most important elements necessary to complete successful research on raptors are (1) a significant or innovative research idea, approach, or both and (2) an adequate and meaningful sample size. To be most effective, raptor researchers should adopt the hypothetico-deductive method and design studies to test hypotheses of current interest. Researchers should be aware that the collection of key field data on raptors are limited to critical *"magic windows"* of data collection and must maximize their efficiency during these periods. Writing complete field notes and use of pre-printed data forms are devices that allow the collection of accurate and complete data. Publication of results in peer-reviewed journals by writing organized, well-illustrated, clear, concise, and, if possible, eloquent scientific manuscripts should be the primary objective of all researchers. Producing publications that expand our knowledge and benefit raptor populations are the ultimate rewards of participating in the science enterprise.

Migration Counts and Monitoring.

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In this chapter, we detail the rationale and methods involved in sampling visible raptor migrations for purposes of long-term population monitoring. Because they are cost-effective and relatively easy to implement, migration counts are one of the most commonly used methods in raptor migration science. Although not without limitations and needs for further improvement, properly collected and analyzed data can provide valuable information regarding fluctuations in raptor populations at multiple geographic scales. We review guidelines for identifying appropriate study objectives and protocols for selecting watchsites, conducting counts, recording count data and essential ancillary information, and storing data electronically for later analysis. We discuss migration counts within the perspective of long-term monitoring, presenting and exploring the use of such counts as indexes of regional population trends. We offer an operational definition of environmental monitoring and outline a procedure for designing long-term monitoring efforts at migration watchsites. Finally, we discuss how resulting status and trends data can be communicated to the scientific community, supplementing information presented in the book chapter with an update on the Raptor Population Index (RPI) Project—an on-going collaborative effort that seeks to advance the science of and institutionalize a program for long-term, continental-scale monitoring of raptor migrations in North America.

Capture Techniques.

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Many raptor studies require that birds be captured for examination, marking, or both. This chapter describes a large variety of field-tested techniques for capturing birds of prey. We discuss many capture techniques, covering their success and application. Our presentation will include, but not be limited to: audio lures, bal-chatri traps, Bartos traps, bow nets, box traps, cannon nets, cast lures and hand nets, Dho-gaza nets, mist nets, hand capture and spot lighting, use of helicopters and four-wheel drive vehicles, ground-burrow traps, nest traps, net guns, noose carpets, noosed fish, a variety of harnessed lures, noose poles, Phai traps, padded leg-hold traps, pit traps, verbail traps, power snares and walk-in traps. When selecting a capture technique, one should keep in mind that some raptors are more easily captured on migration, whereas others are more easily captured when nesting. The age of the bird may also be a factor; many juveniles are more easily captured than adults. Therefore knowing which trap to use, when to use it and what kind of lure to place in it requires familiarity with the target species' ecology and behavior. No matter what trap type(s) you use, we strongly recommend the use of motion-detector transmitters and scanning receivers to monitor traps from a distance. This new technology has greatly advanced raptor trapping success and the ease at which traps are monitored. Trap monitors are also important in reducing potential injuries and mortality because one learns of trap disturbance immediately and can respond accordingly. Selecting the proper trap and lure for any given situation can be challenging, particularly to the novice, however, this chapter should provide the pertinent information to be successful in capturing raptors.

Raptor Identification, Ageing, and Sexing.

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The first requirement for successful completion of raptor research projects is correct identification of the raptors studied, whether field studies or museum studies. This chapter is oriented toward diurnal raptors more than nocturnal raptors, as the latter are easier to identify. Nowadays first-rate optical equipment - binoculars, scopes, and cameras - are available at reasonable cost and will facilitate more accurate identification. Field marks are the heart of any identification system and will be described. The availability and usefulness of field guides and handbooks will be discussed. Variations in field conditions, such as lighting and distance from the subject, will be covered. Molt of the remiges is especially useful in ageing immatures of accipitrid raptors that take more than one year to attain adult plumage and will be described. Unusual plumages usually make identification difficult. The limitations of range maps will be touched on. Many studies require identification in the hand; useful references will be listed. Ageing and sexing owls will be mentioned. The session will close with short discussions of sound recordings and their usefulness and the availability of on-line resources.

Mitigation.

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Throughout history, divergence between human interests and raptors has led to impacts upon birds of prey. Direct impacts include deliberate persecution (e.g., shooting, trapping, poisoning), illegal trade, and collection. Although there are cases where persecution has had an adverse impact on raptor populations, raptors typically rebound once direct impacts are reduced. In contrast, indirect impacts are human activities that may have an unintentional negative impact on raptors. Adverse impacts are often the result of technological advancements, such as urbanization and pesticide use. Indirect impacts are numerous, diverse, and often negative. These impacts can be either lethal or sub-lethal. Sub-lethal impacts may affect raptors in a variety of ways that can be hard to detect (e.g., decreased reproductive rate, eggshell thinning). Additionally, once indirect impacts are detected, they can be difficult to reverse. Unlike direct impacts, raptors cannot learn to recognize many indirect impacts in order to avoid or habituate to them. As new research on birds of prey continues, additional impacts and mitigating measures will come to light. In the future, conservationists will face many new and difficult challenges. Increasingly, raptor biologists will be confronted with not only determining the source and scope of these impacts, but will have to define ecological and political processes in order to reverse them, often involving interactions with powerful interest groups. These factors will necessitate the need for rigorous science and good communication among those trying to protect raptors. This presentation presents an overview of a number of human activities affecting raptors, and identifies mitigating measures historically used to counter negative impacts. Sometimes several activities collectively create an impact requiring several mitigating techniques. The topics include some of the most documented examples of human impacts.

Toxicology.

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This chapter discusses contaminants that have adversely affected raptors, especially during the last 20 years. These contaminants were divided into several classes. We describe each class of contaminant, their chemical make-up, where and how they are used, how mobile they are in the environment, what their basic mode(s) of action are, what residue concentrations and biochemical response in which tissues should be investigated, and specific techniques for studying field exposure and effects. Classes of contaminants discussed include organochlorine pesticides (DDT, dieldrin, heptachlor, etc.); polychlorinated biphenyls, dioxins, furans; lead; mercury; organophosphorus and carbamate insecticides; vertebrate control chemicals; rotenone and other piscicides; emerging contaminants (polybrominated diphenyl ethers, perfluorooctane sulfonates, diclofenac, etc.). Selected field studies will be discussed that address some of these contaminant issues, along with a review of real-life practical complications associated with conducting meaningful contaminant studies with birds of prey. Raptor biologists provide many of the meaningful leads to serious contaminant issues; therefore, continued vigilance and reporting of observations to contaminant specialists remain important steps.

The Raptor Literature.

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This presentation provides an overview of the types of scientific literature of interest to raptor biologists and a comparison of current options for accessing that literature. The business of scholarly publishing is presently in a dynamic transition from print to electronic mode. Most of the important technical journals for biologists in general and raptor specialists in particular are already available in electronic form, or soon will be. Even so, not all of the useful literature necessary for the production of an acceptable contribution to the primary literature is available online. Full texts of Master's theses or Ph.D. dissertations can also be downloaded from the worldwide web for free. Even so, not all of the useful literature necessary for the production of an acceptable contribution to the primary literature may be available online. Most books, back issues of minor journals, a myriad of useful reports and monographs, and publications in foreign languages, other than those used most widely in Western Europe and North America, are still unavailable in electronic form. Despite ambitious proposals by Google and certain non-profit or governmental entities to convert all substantive printed materials to electronic form and make them available on the web, this goal will not be reached soon, judging from the current pace of conversion. In addition, access to the most important databases of electronic literature is still prohibitively expensive for all but the employees or associates of large universities, governmental agencies, or the largest non-government organizations. The sheer amount of information already available in web-based databases can be overwhelming, and some pundits have suggested that we are descending from the Information Age into a world of Information Chaos. A brief overview of the most important online databases with useful raptor literature will be presented in hopes of providing a few shortcuts for workshop participants not already well acquainted with these resources. Despite their present limitations, electronic techniques are already invaluable for information transfer and efficient data storage, especially for individuals lacking access to the resources of a large library, but the maintenance of print libraries is still essential for archival purposes.

Food Habits.

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We present methods of analyzing and interpreting raptor diets and discuss related precautions, pros and cons, and biases. We present analytical techniques for the collection of prey in raptor diets including pellet analysis, stomach content analysis, examination of uneaten prey in nests, direct and photographic observation of prey delivered to nests, and confinement of nestling raptors in order to prolong data collection intervals. Procedures for identifying prey and interpreting and characterizing raptor diets through dietary diversity, rarefaction, prey weight, dietary overlap, and stable isotope techniques are demonstrated as well as guidelines for assessing adequate sample sizes.

Accessing Nests.

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Research on raptors nesting in trees or on cliffs and human-made structures sometimes requires that biologists with specialized skills to gain access to obtain scientific information. Entries to band young and obtain blood or other physiological indices, or to collect prey remains, addled eggs and eggshell fragments, make nest measurements, trap adults, switch eggs, foster young, or set up audio and visual recording devices should be accomplished only by those biologists who have received sufficient training and who have developed experience to safely accomplish the task. High angle work on cliffs and in trees should be conducted in a pre-planned, sequenced approach promoting expedience, while preventing injury to the study species, climber, and the substrate upon which the bird nests. Free-climbing trees and cliffs to enter nests is a plausible method in some instances, however equipment, safety accessories and techniques gleaned from arborists and rock climbers are often preferred. Review of safe nest entry practices and an outline of necessary skills and mental clarity presented here will be used to remind biologists of the need to obtain considerable training to develop and hone their skills. When done safely, nest entries can be one of the most enjoyable and enlightening aspects of studying raptors. When done poorly, accidents can lead to loss of your banding permits, injury or mortality to your study species, and potentially your untimely, albeit accidental, death.

Photo: Kate Davis

Habitat Sampling.

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We review the scope and objectives of habitat studies in raptors, as well as methods for quantifying raptor habitats. Factors that explain ecological processes are usually scale-dependent and animal populations are influenced by how habitat is distributed across the landscape in both space and time. Biologists often measure many characteristics of the environment that are associated with the presence/absence or abundance of raptors and infer that these characteristics or some features to which they are related are important. Studies of habitat preference and selection often necessitate designs and sampling schemes that assess available habitat, habitat not used, or the extent and manner of use by a species. Presumably, species should reproduce or survive better in habitats they prefer. This approach assumes that such preferences relate to fitness and hence to population growth rates. Traditionally, measures of presence/absence and abundance have been considered appropriate surrogate measures for fitness in the study of habitat requirements of raptors. Habitats of high quality for a given species presumably have the resources required to sustain relatively high rates of survival and reproduction. Perhaps the best indicators for assessing habitat quality for a given species are estimates of productivity and survival, or combinations of both. Investigations of habitat associated with nesting activities that occur at larger spatial scales, such foraging areas and areas used during natal dispersal, are less common. Analytical techniques that enable examination of complex associations may be desirable over methods that assume simple linear relationships. Interpretations based on complex models and inadequate samples can be misleading.

Marking Techniques.

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We will describe techniques for marking raptors for visual identification, beginning with a discussion of considerations involved in designing and conducting a marking program We will identify and describe permanent markers that can be used safely and effectively on raptors, including conventional leg bands, colored leg bands, leg markers and wing markers. We will also discuss temporary marking techniques, including use of paints, dyes, and feather imping.

Photo: Rob Palmer

Radio Tracking.

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Radio-tracking has proved to be an essential tool for raptor studies because it allows recording of individual behavior systematically throughout the year. This aids collection of objective movement data (not just when the animal is visible in its expected habitat), survival rates, causes of death (not just anthropogenic causes) and breeding success (with a more realistic assessment of those that are not breeding). Nevertheless, there are now satellite and GPS systems that have distinct advantages, so the relative merits of when each technique is most appropriate will be explored. Like tracking systems, there is no single tracking regime that is suitable for all project aims. Learning about home ranges and habitat use requires very different sampling compared to studies of dispersal and survival. Each will be discussed, together with the need for an appropriate sample size for analysis. Often a pilot study is needed if data are to be obtained efficiently. Collecting sufficient ancillary data can greatly enhance studies because it can relate individual's movements and choices to their origins and current conditions. This can lead to a deeper understanding of motivation and limitations that influence behavior and ultimately can be useful for wildlife management. Having reviewed the benefits of systematic radio-tracking data, VHF tracking equipment will be examined. Choosing receiving equipment and tags can be daunting with so many decisions to make, but crucial for success. There is a tradeoff between the distance over which you can hear tags and the time they can last, and both are limited by the size of tag. Also attachments vary according to species and project aims.

SYMPOSIUM: STATUS AND CONSERVATION OF SHORT-EARED OWLS

Monitoring the Distribution and Abundance of Short-eared Owl *(Asio flammeus)* in North America.

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In the absence of species-specific research efforts, much knowledge about the movements and population trends of birds is inferred from banding recoveries and annual monitoring programs such as the Breeding Bird Survey and Christmas Bird Count. We reviewed these databases for Short-eared Owl *(Asio flammeus)* across North America. As of November 2006, 50 recoveries of banded Short-eared Owls have been reported, ranging in date from 1923 to 1997. Most (66%) individuals were recovered in the same state or province as they were banded, including 30% recovered within the same 10-minute block. However, eight individuals were recovered more than 1000 km away. From 1957 through 2006, Christmas Bird Count sightings have been reported for Short-eared Owl for all provinces and states. However, 61% of records have come from just two provinces and eight states. These are concentrated in four areas: Pacific coast (British Columbia, Washington, Oregon, California), Midwest (Illinois, Ohio), Northeast (Ontario, New York, New Jersey), and South (Texas). Even within these areas, owls were concentrated locally, for example in Ontario records exist for 48 count circles, but 57% of individuals were counted at just five of these. Across North America, the mean number of owls observed per hour declined at a mean annual rate of 4.7% (total 73%) between 1957 and 1982, but has since stabilized at a low level. BBS data for 1966 to 2006 cover a more limited range, comprising eight provinces, two territories, and 22 states. Five of these (Alberta, Montana, Idaho, North Dakota, and Utah) account for 58% of all BBS records. Therefore, while the Short-eared Owl is generally widespread in North America, monitoring and conservation efforts may be most effectively focused on areas known to consistently support substantial local populations.

Towards North American Conservation Action Plan for the Short-eared Owl.

GEOFF HOLROYD (geoffrey.holroyd@ec.gc.ca) and HELEN TREFRY, Canadian Wildlife Service, Room 200, 4999-98 Ave, Edmonton, AB Canada.

The status of the Short-eared Owl (Asio flammeus) in North America is difficult to monitor and is uncertain at best. Between 1966 and 2004, the 9% annual decline in Canada was significant, but the 3% decline in the US was not significant. In Canada, the Committee on the Status of Endangered Wildlife has the species listed as “Special Concern.” A management plan for this species will be drafted as required by the federal Species at Risk Act. The results of three workshops that were held in Winnipeg in November 2006, at RRF in Pennsylvania in September 2007, and at the World Owl Conference in Netherlands in November 2007 will be reviewed. Seven overall management objectives were developed at these workshops and will be presented in this talk. Audience feedback will be solicited to determine how to modify these objectives and how to get more collaboration between wildlife agencies and individuals in Mexico, US and Canada to conserve this nomadic and ephemeral species. The results of these workshops will be included in the Canadian Management Plan.

Photo: Kate Davis

North American Raptor Monitoring Strategy for the Short-eared Owl *(Asio flammeus).*

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We offer preliminary results relative to the draft Short-eared Owl *(Asio flammeus)* species account from the North American Raptor Monitoring Strategy (NARMS). We request your consideration of this material and comments regarding the best techniques for surveys and long-term monitoring of this species in North America. A goal of NARMS is to ensure a minimum ability to detect a 50% reduction in population size over a 25-year period with alpha = 0.10 and beta = 0.20. The species accounts include details about natural history that help us develop methods for monitoring in various geographic areas, and seasons. The Short-eared Owl is an open country, ground-nesting species that inhabits marshes, grasslands, and tundra throughout much of North America and Eurasia. It is regarded as a nomadic species that tends to congregate where vole populations are high. The population status of this species is difficult to assess because they are nomadic and prone to annual fluctuations in numbers. We propose a sampling design centered on yearly surveying of 1000, 1 by 1 km plots. Importantly, Northern Harriers *(Circus cyaneus)* would be simultaneously surveyed on the same plots. The following recommendations are made concerning field protocols for a survey of breeding Short-eared Owls (Calladine 2008): 1. Sample areas of owl nesting habitat (minimum 1000 ha in size; ideally contiguous); 2. Conduct surveys from 15 April to 15 July; 3. Undertake visual surveys from vantage points 750–1500 m distant from one another that provide an adequate field of view, within an arc not exceeding 180°, such that all areas to be viewed are within 750 m of a vantage point. Based on an "ideal" 1 km by 1 km square of contiguous suitable habitat, this usually would require two vantage points. More vantages points will be required if obstructing topography/vegetation is present; 4. Undertake cumulative totals of 2 hours of watching from each vantage point within each of the following time periods: (i) mid-April to mid-May within the last 2 hr before dark; (ii) in June within 2 hr before dark; and (iii) in July, within the last 2 hr before dark. We anticipate the need for pilot studies that will refine aspects of these occupancy surveys, specifically estimating probability of detection and obtaining detection rates by time of day, and assessing choice of plot size and numbers of plots. We also solicit information for synthesizing small mammal data associated with Short-eared Owl nesting data. There is evidence that the cyclic nature of some small mammals is spatially-temporally correlated (e.g., demographic traveling waves). These small mammal cycles are fundamental factors affecting Short-eared Owls and several other owl and raptor species. Thus, they are important for designing and interpreting survey and monitoring data.

Movements of Short-eared Owls *(Asio flammeus)* in North America from Satellite Transmitters.

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Little is known about the movements of Short-eared Owls in North America from banding records and seasonal observations, some movements appear to be typical migrations; other movements appear to be nomadic. The miniaturization of satellite transmitters has recently allowed them to be placed on Short-eared Owls. These small back-pack transmitters are solar powered and designed to last for several years. To date, seven Short-eared Owls have been tracked with 12 g (5) and 9.5 gm (2) satellite transmitters placed on them. Five transmitters (or owls) lasted less than 6 months. Three of these owls were tracked from traditional wintering areas in New York and moved about 1700 km north to Labrador; one is not known to have left the wintering area, another owl started in Saskatchewan and moved about 1500 km SE to Iowa (USA), and the sixth moved 600 km from Alberta to Saskatchewan. The seventh transmitter is still operating. The owl, a female, was captured in early February 2008, at a winter roost site in southern Ontario. She spent February and most of March in southern Ontario, followed by a few weeks in Michigan (USA) in April. She then moved north ~1300 km from her wintering grounds to breeding grounds on the Ungava Peninsula of northern Quebec, on the eastern shore of Hudson's Bay. We will review our experiences with these transmitters, causes for failure, attachment methods and the future for this technology.

Status of the Eruptive Short-eared Owl *(Asio flammeus)* in Alberta.

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The Short-eared Owl breeds in all provinces and territories in Canada and are described as most common in Alberta, Saskatchewan, and Manitoba, and along the arctic coast in a recent national status review. This species occurs throughout most of the non-mountainous regions of Alberta. Large numbers of owls may roost together in areas where food is abundant. In 1991, the Short-eared Owl was on Alberta's "Green List" signifying that it was a species not believed to be at risk in the province, but was moved to the "Blue List" in 1996 because it was felt that the species may be at risk. In 2001, this species was provincially designated "May Be At Risk," due to declines in all prairie provinces and other parts of the North American range. Causes of population declines are unknown, and the irruptive nature of the population makes trend assessments extremely difficult. It continues to be "May Be At Risk" in 2006. The Committee on the Status of Endangered Wildlife in Canada confirmed the national status of Short-eared Owl as 'special concern' in 2008. Over the past few decades a few eruptions of Short- eared Owls have been documented in Alberta. In the winter of 2005-06 over 190 Short-eared Owls wintered on the dry lake bed of Beaverhill Lake. In the winter of 1988-1989, over 30 owls wintered on an uncut hay field within the city limits of Edmonton. Farley reported an invasion of short-eared owls central Alberta in 1931. Relatively few nesting records exist for Alberta Short-eared Owls, and two invasions have been reported from southeastern Alberta and from Beaverhill Lake. We will discuss the weather and habitat conditions that were related to these eruptions, and the problems with determining its status.

The Winter Ecology of Short-eared Owl in Zapopan, Jalisco, Mexico.

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We trapped and radio-tagged two Short-eared Owls in mid winter 2002-03 while conducting a study about the winter ecology of Burrowing Owls in Zapopan Airbase situated NW Guadalajara City. We described habitat structure associated four roosts as well as six foraging areas defined in 258 ha and 124 ha consecutively as the Minimum Convex Polygon for each owl. Roosts were associated with grassland habitat whereas foraging areas were defined by scarce vegetation such as harvested fields and secondary roads. A total of 1037 prey was present in 354 pellets analyzed (± SD) (2.93 ± 1.67). Dietary preferences were defined by small mammals (64.7%) where northern pigmy mouse constitutes the bulk of the consumption. Invertebrates (21.7%) tend to increase its frequency by the end of the winter, while birds (13.6%) offered the highest diversity of prey with 21 species. 93% of the total biomass reported was provided by small mammals where Norway rat affords 66% of it. Our study area that encompasses more than 1200 ha of mixed grassland is a low activity military airport with restricted public access. Since 2001, we have confirmed the presence of Short-eared Owls redefining the concept of nomadic wintering habits for northern latitudes. This is the first diet report for the species in Mexico and the southern-most over its distribution range at North America scale.

Photo: Kate Davis

Creative Staffing for the Summer Season, or How to Influence the Next Generation.

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The Woodland Park Zoo (WPZ) raptor keepers tapped into an existing zoo teen program (ZooCorp) to not only get extra help during the busy summer season but, more importantly, to give younger people the opportunity to learn raptor husbandry, handling, natural history and program development. The WPZ Raptor Center houses 14 birds of prey, all of which are trained for use in educational programs. The number of programs presented increases considerably during the summer months; however, staffing levels remain the same. As is common for facilities of this type, the Raptor Center relies heavily on volunteer help, but the zoo's animal unit volunteer program has a minimum age requirement of 18 yr old. This excludes younger people from having potentially life-changing experiences. The ZooCorp (ZC) program focuses on teens that mainly work with and educate zoo visitors; they typically spend very little time working behind the scenes in the animal areas. Since the Raptor Center's focus is education, it seemed natural to involve the ZC teens. This involvement first began during the summer of 2003 when keepers were looking for help to man a spotting scope at a wild Bald Eagle (Haliaeetus leucocephalus) nest (conveniently located on zoo grounds adjacent to the raptor center). After a quick course in Bald Eagle natural history a group of ZC teens took turns at the scope, interpreting for WPZ guests and reporting their own observations back to keepers. This evolved into bringing a select few of the teens into the raptor unit to work alongside the keepers. It has been evident by their quick learning and enthusiasm that they are taking away unique experiences and learning life skills beyond just raptor care.

Using Iconic Species to Teach Conservation.

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Media coverage and educational efforts focused on an iconic species like the Peregrine Falcon (Falco peregrinus) can be particularly useful for introducing students and members of the public to conservation of nature. We report on an outreach program that highlights the accomplishments of conservation biologists at the Santa Cruz Predatory Bird Research Group with a special focus on the Peregrine Falcon population recovery in California. The program has four elements: public presentations delivered by an experienced field biologist who is accompanied by a tame Peregrine Falcon, Peregrine Falcon nest cameras that are accessible to the public at our web site www.scpbrg.org, a nest camera discussion forum moderated and informed by an experienced biologist, and training for those who wish to monitor nest sites and work at peregrine falcon hack sites. We find that the web cameras attract public interest while teaching natural history. Members of the public and students soon shift from being web camera watchers to being binocular owners who actively search outdoors for raptors and other birds. Some attend our training class to learn our protocol for falcon nest observation and dedicate time and effort to provide usable data for our annual Peregrine Falcon population survey. Selected students and members of the public who complete our training course staff hack sites where young Peregrine Falcons are released after being salvaged from nests with a history of poor success at fledging.

Raptor Conservation Measures.

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Based upon and expanding the Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck 2002), the Raptor Conservation Measures (RCMs) provide an advisory framework for consistent and effective raptor management on a project-specific, landscape, and regional basis. The document provides measures to (1) minimize the risk of 'take' under various bird protection statutes, (2) avoid or minimize impacts to sensitive raptor species, and (3) contribute to improvement in the status of raptor species which have been determined to be experiencing population declines or to be otherwise at risk. The RCMs include recommendations specific to planning such as: coordinating at the earliest stage of project planning; identifying species and distribution of raptors occurring within the project or planning area; prioritizing raptor species of concern; determining location and distribution of important raptor habitat, nests, roost sites, and migration corridors; establishing a disturbance baseline; avoiding long-term habitat degradation, minimizing the loss and providing compensatory mitigation for unavoidable losses of habitat; planning and scheduling activities to avoid raptor nesting and roosting areas, particularly during crucial breeding and wintering periods; monitoring and documenting the status of raptor populations post project completion; evaluating mitigation efforts; and documenting data and evaluations in a format which can be readily shared and incorporated into wildlife databases. The document is also intended to provide guidance to U.S. Fish and Wildlife Service (USFWS) staff engaging in land management activities and providing project review and assistance to others. The USFWS Regions 1, 2, 6, 7, and 8 are covered by the RCMs, including the states as follows: (R1), Idaho, Oregon, and Washington, (R2) Arizona, New Mexico, Oklahoma, and Texas, (R6) Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming, (R7) Alaska and R8) California and Nevada.

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