

2006 Annual Conference

**The Western Section of
The Wildlife Society**

Plenary Theme:

*Monitoring Wildlife Populations:
State of the Science*



Program and Abstracts

February 8-10, 2006
Doubletree Hotel
Sacramento, California

COMPLETE SCHEDULE AT A GLANCE
Day and Room Designations
Tuesday and Wednesday

Room	Tuesday Feb 7 Morning	Tuesday Feb 7 Afternoon	Wednesday Feb 8 Morning	Wednesday Feb 8 Afternoon
Main Lobby	Symposium and Conference Registration: 7-9 a.m.	Symposium and Conference Registration: 11:30 - 1	Symposium and Conference Registration: 7 - 9	Conference Registration: 11:30 – 1:30
Grand Salon A	Fisher and Marten Symposium: 8-5	Fisher and Marten Symposium: 8-5 Symposium Poster Session and Social: 6-9	Fisher and Marten Symposium: 8-11:50	Wildlife Research and Management Funding Workshop: 1 – 5 Welcome Reception 6 – 8:30
Grand Salon B	Fisher and Marten Symposium: 8-5	Fisher and Marten Symposium: 8-5 Symposium Poster Session and Social: 6-9	Fisher and Marten Symposium: 8-11:50	TWS Biologist Certification Workshop: 1-5 Welcome Reception 6 – 8:30
Grand Salon C		Symposium Breakout/Working Group Session: 6-8		Avian Issues Associated with Energy Facilities Workshop: 1 - 5
Grand Salon D	Posters Available for Viewing	Posters Available for Viewing	Posters Available for Viewing	Technologies for Assessing and Monitoring Wildlife Populations Workshop: 1 - 5
Terrace/Garden				
Bear River				San Joaquin Valley Chapter Meeting 7:30 – 9:30
Feather River				San Francisco Bay Chapter Meeting 7:30 – 9:30
American River				North Coast Chapter Meeting/CUAA Meeting 7:30 – 9:30
Rubicon River				Sac-Shasta Chapter Meeting 7:30 – 9:30
Yuba River	Speaker Practice	Speaker Practice	Speaker Practice	Speaker Practice
Sacramento Room				Exhibitor & Vendor Displays: 10:30-5

COMPLETE SCHEDULE AT A GLANCE
Day and Room Designations
Thursday and Friday

Room	Thursday Feb 9 Morning	Thursday Feb 9 Afternoon	Friday Feb 10 Morning	Friday Feb 10 Afternoon
Main Lobby	Conference Registration: 8-5	Conference Registration: 8-5	Conference Registration: 7-10 a.m.	Conference Registration: 7-10 a.m.
Grand Salon A	Plenary Session: 9-11:30	Concurrent Session: Forest Carnivores: 1-5:10	Concurrent Session: Desert Ecosystems: 8-11:30	Concurrent Session: Mitigation Banking: 1-3:10
Grand Salon B	Plenary Session: 9-11:30	Concurrent Session: Conservation Planning: 1-3:50 Concurrent Session: Oak Woodlands 3:50 – 4:30 Annual Business Meeting and Members Forum: 5:30-7	Concurrent Session: Riparian Ecosystems: 8-11:10	Concurrent Session: Raptors: 1-3:50
Grand Salon C		Concurrent Session: Invertebrates: 1-3:30 Reptiles and Amphibians: 3:30-5:30	Concurrent Session: Seabirds: 8-11:10	Concurrent Session: Bats: 1-3:50
Grand Salon D		Concurrent Session: Large Mammals: 1-4:10 Small Mammals: 4:10-5:10	Concurrent Session: Wildlife and Water: 8-10:30 Concurrent Session: Shorebirds: 10:50-11:30	Concurrent Session: Shorebirds (cont.): 1-2:30 Concurrent Session: Landbirds: 2:50-5:10
Terrace/Garden	Student/Professional Lunch: 10:30-1:30	Dedicated Poster Session: 5:30 -8	Posters Available for Viewing	Posters Available for Viewing
Grand Ballroom		Banquet, Awards Ceremony, Raffle, Entertainment: 7:15-11		
Bear River				
Feather River				
American River				
Rubicon River				
Yuba River	Speaker Practice	Speaker Practice	Speaker Practice	Speaker Practice
Sacramento Room	Exhibitor & Vendor Displays: 10:30-5	Exhibitor & Vendor Displays: 10:30-5	Exhibitor & Vendor Displays: 10:30-5	Western Section Board Meeting 4-6

2006 Annual Conference
**The Western Section of
The Wildlife Society**

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**The Western Section of the Wildlife Society
2006 Annual Conference
Schedule at a Glance**

Tuesday, February 7, 2006

7:00 a.m. to 9:00 a.m.	Fisher and Marten Symposium Registration (Main Lobby)
8:00 a.m. to 5:00 p.m.	Fisher and Marten Symposium (Salons A&B)
11:30 a.m. to 1:00 p.m.	Fisher and Marten Symposium Registration (Main Lobby)
6:00 p.m. to 9:00 p.m.	Symposium Poster Session and Social

Wednesday, February 8, 2006

7:00 a.m. to 9:00 a.m.	Conference Registration (Main Lobby)
8:00 a.m. to 11:50 a.m.	Fisher and Marten Symposium (Salons A&B)
11:30 a.m. to 1:30 p.m.	Conference Registration (Main Lobby)
1:00 p.m. to 4:50 p.m.	Workshop: Funding Wildlife Management and Research programs
1:00 pm to 5:00 pm.	Workshop: TWS Biologist Certification (Salon B)
1:00 pm to 5:00 pm.	Workshop: Avian Issues Associated with Energy Facilities and Infrastructure (Salon C)
1:00 pm to 5:00 pm.	Workshop: Technologies for Assessing and Monitoring Wildlife Populations (Salon D)
6:00 pm to 8:30 pm.	Welcome Reception w/Hors d' Oeuvres, No-Host Bar (Salons A and B)
7:30 pm to 9:30 pm.	Chapter Meetings (Bear River, Feather River, Yuba River, and American River Rooms, See Day and Room Designations for details)

Thursday, February 9, 2006

8:00 a.m. to 5:00 p.m.	Registration (Main Lobby)
9:00 a.m. to 11:30 a.m.	Plenary Session (Salons A&B)
10:30 a.m. to 5:00 p.m.	Exhibitor Setup (Sacramento Room)
10:30 a.m. to 1:30 p.m.	Student/Professional Lunch (free to students with ticket; Garden/Terrace)
11:30 a.m. to 1:00 p.m.	Lunch Break (lunch not provided)
1:00 p.m. to 5:10 p.m.	Concurrent Session: Forest Carnivores (Salon A)
1:00 p.m. to 3:50 p.m.	Concurrent Session: Conservation Planning (Salon B)
1:00 p.m. to 3:30 p.m.	Concurrent Session: Invertebrates (Salon C)
1:00 p.m. to 4:10 p.m.	Concurrent Session: Large Mammals (Salon D)
3:50 p.m. to 4:30 p.m.	Concurrent Session: Oak Woodlands (Salon B)
3:30 p.m. to 5:30 p.m.	Concurrent Session: Reptiles and Amphibians (Salon C)
4:10 p.m. to 5:10 p.m.	Concurrent Session: Small Mammals (Salon D)

Evening:

5:30 p.m. to 7:00 p.m.	Annual Business Meeting and Members Forum (Salon B)
5:30 p.m. to 8:00 p.m.	Dedicated Poster Session (Garden/Terrace)
7:15 p.m. to 11:00 p.m.	Banquet, Awards Ceremony, Raffle, Entertainment (Grand Ballroom)

Friday, February 10, 2006

7:00 a.m. to 10:00 a.m.	Registration (Main Lobby)
8:00 a.m. to 11:30 a.m.	Concurrent Session: Desert Ecosystems (Salon A)
8:00 a.m. to 11:10 a.m.	Concurrent Session: Riparian Ecosystems (Salon B)
8:00 a.m. to 11:10 a.m.	Concurrent Session: Seabirds (Salon C)
8:00 a.m. to 10:30 a.m.	Concurrent Session: Wildlife and Water (Salon D)
9:10 a.m. to 9:30 a.m.	Break (snacks provided)

10:50 a.m. to 11:30 a.m.

11:30 a.m. to 1:00 p.m.

1:00 p.m. to 3:10 p.m.

1:00 p.m. to 3:50 p.m.

1:00 p.m. to 3:50 p.m.

1:00 p.m. to 2:30 p.m.

2:30 p.m. to 2:50 a.m.

2:50 p.m. to 5:10 p.m.

4:00 p.m. to 6:00 p.m.

Concurrent Session: Shorebirds (Salon D)

Lunch Break (lunch not provided)

Concurrent Session: Mitigation Banking (Salon A)

Concurrent Session: Raptors (Salon B)

Concurrent Session: Bats (Salon C)

Concurrent Session: Shorebirds (cont. Salon D)

Break (snacks provided)

Concurrent Session: Landbirds (Salon D)

Western Section Board Meeting (Sacramento Room)

GENERAL INFORMATION

Registration Desk. Registration materials, general information, and Western Section membership applications can be picked up at the registration desk. Western Section and Chapter Merchandise are also available for purchase here. Members may receive a copy of the 2004 *Transactions* at the registration desk.

Refreshment and Lunch Breaks. Refreshments will be provided at the morning and afternoon breaks. Lunch will not be provided. For information on local restaurants and attractions, check the insert in your registration packet or inquire at the registration desk.

Practice Room. The Yuba River Room will be available throughout the meeting from Tuesday, February 7 at 8:00 a.m. through Friday February 10 at 3:00 for speakers to practice their presentations.

Exhibits and Vendor Displays. Exhibits will be displayed all day Thursday and Friday in the Sacramento Room.

Job Board. Job announcements can be posted and viewed at the job board in the common area near the technical session salons.

Messages and Announcements. Messages and announcements can be posted and viewed at the message board in the main foyer near the registration desk.

Plenary Session. The plenary session titled *Monitoring Wildlife Populations: State of the Science* will be held on Thursday, February 9, 2006, from 9:00 a.m. to 11:30 a.m. in Salons A & B. There will be no concurrent sessions during the plenary session.

Workshops. A series of workshops will be held concurrently on Wednesday, February 8 from 1:00 p.m. to 5:00 p.m. in Salons A through D. See the conference schedule for workshop topics.

Concurrent Sessions. Concurrent sessions will begin on Thursday, February 9 at 1:00 p.m. in Salons A through D and continue all day Friday, February 10.

Poster Session. Poster papers will be available for viewing throughout the symposium and conference. Symposium posters will be available for viewing beginning 9:00 a.m., Tuesday, February 7, until 7:00 p.m. Wednesday, February 8 in Salon D. Conference posters will be available for viewing from noon to 7:00 p.m. Wednesday, February 8 in Salon D. Both symposium and conference posters will be available for viewing from 9:00 a.m. Thursday, February 9 through 4:00 p.m. Friday, February 10 in the Garden/Terrace rooms. Authors will be available to answer questions about their posters on Thursday evening from 5:30 p.m. to 8:00 p.m. in the Garden/Terrace rooms

Receptions. A welcome reception will be held on Wednesday, February 8, from 6:00 p.m. to 8:30 p.m. in Salons A and B. **Tickets are required for entry to the reception.** Light *hors d'oeuvres* will be served and a no - host bar will be available.

Annual Members' Forum and Business Meeting. The Annual Members' Forum and Business Meeting will be held on Thursday, February 9, from 5:30 to 7:00 p.m. in Salon B. Elected officers and committee chairs of the Western Section will provide reports for membership information and discussion, and new officers and executive board members will be introduced. Section Board Members will describe proposed by-law changes, the 2006 Section Budget and other items of interest to the general membership. Attendance by all members is encouraged.

Awards Banquet. The annual awards banquet will be held on Thursday, February 9 from 7:15 to 11:00 p.m. in the Grand Ballroom. **Tickets are required.** Tickets are available for purchase at the registration desk. Awards will be presented for the "Raymond Dasmann Professional of the Year" and "Conservationist of the Year." The annual raffle/auction and dancing will follow.

Entertainment. The Fulton Street 3 Blues Band, led by Wildlifer Jeff Single, will get everybody dancing.

Raffle and Auction. The annual raffle and auction will be conducted during Thursday evening's banquet, after the awards ceremony. The raffle supports the Western Section's student incentive programs, including travel grants, awards for best papers, and student-mentor activities. We encourage everyone to purchase raffle tickets, which are available at the reception desk or from Western Section officers at Wednesday's welcome reception and Thursday's Members' Forum.

Student/Professional Lunch and Career Fair. The student/professional lunch and Career Fair will be held from 10:30 a.m. to 1:30 p.m. in the Garden and Terrace Room. This is an opportunity for students to meet prospective employers and discuss careers in the wildlife sciences. The lunch, served at noon, is free to students who have indicated they will attend on their registration form, but a ticket is required. Your ticket will be attached to your registration receipt.

Presentation and Poster Contest. Awards will be given to the best student presentation and poster.

Field trips. The Sacramento-Shasta Chapter has organized a series of field trips for Saturday, February 11. Watch the field trip message board near the main registration desk for trip participation information. Field trips are free and include all-day and morning-only outings.

"Fire Sale". The Section will be selling T-shirts, polo shirts, copies of past *Transactions*, and other items throughout the conference. Please visit the sale tables in the Capitol foyer

Special Meetings:

Tuesday, February 7, 2006

6 p.m. to 8 p.m. Marten and Fisher Breakout/Working Group will meet in **Salon C.**

Thursday, February 9, 2006

5:30 p.m. to 7:00 p.m. Annual Business meeting and Members Forum - **Salon B.**

Friday, February 10, 2006

4:00 p.m. to 6:00 p.m. Western Section Board Meeting – **Sacramento Room**

Professional Development. The number of contact hours for each workshop and contributed paper session is equal to the number of actual hours spent in a workshop or session and does not include time allotted for breaks or lunch. Information on the TWS professional development certificate is available on the TWS website by clicking on the link in the Western Section website at: www.tws-west.org.

SPONSORS

Sacramento-Shasta Chapter
The Wildlife Society

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2006 OFFICERS AND COMMITTEE CHAIRS

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Katie Moriarty, Secretary
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Arcata, CA

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California Department of Fish and Game
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US Marine Corps Air Ground Task Force
Training Command
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Denise Walker
California Department of Fish and Game
Eureka, CA

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University of California, Berkeley
Jepson Herbarium, Berkeley, CA

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California Department of Parks and Recreation
San Diego, CA

Mark Jordan, Student Affairs
Berkeley, CA

Conservation Affairs

Kevin Hunting
California Department of Fish and Game
Sacramento, CA

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US Forest Service, El Dorado National Forest
Pollock Pines, CA

Historian

James Yoakum
Western Wildlife
Verdi, NV

Webmaster

Bill Standley
Hawai'i Division of Forestry and Wildlife
Honolulu, HI

2006 ANNUAL MEETING PROGRAM COMMITTEE

Chair:

Kevin Hunting
California Department of Fish and Game
Sacramento, CA

Audio Visual Captain:

Don Yasuda, US Forest Service, El Dorado
National Forest

Career Fair/Student Lunch:

Karen Swaim, Swaim Biological Consulting

Entertainment:

Jeff Single, California Department of Fish and
Game

Raffle:

Craig Bailey, Wildlands Inc.
Kirsten Christopherson

Registration Administration:

Katie Moriarty, USFS Redwood Sciences Lab
Candace Renger, Western Section Assistant
Executive Board Members

Student Papers Judging/Awards:

Rhys Evans, US Marine Corps

Volunteer Coordinator:

Katie Moriarty, USFS Redwood Sciences Lab

Workshops:

Rhys Evans, US Marine Corp
Denise Walker, California Department of Fish
and Game
Kevin Hunting, California Department of Fish
and Game

Contributed Papers Session Chairs:

Amphibians and Reptiles:

Hartwell Welsh, USFS Redwood Science Lab

Bats:

Betsy Bolster, California Department of Fish and Game

Conservation Planning:

Gail Presley, California Department of Fish and Game

Desert Ecosystems:

Rhys Evans, US Marine Corp

Amy Fesnock, National Park Service

Forest Carnivores:

Keith Hamm, Green Diamond Industries

Invertebrates:

Sandy Shanks, California Department of Fish and Game and UC Davis

Landbirds:

Dan Airola, Airola Environmental Consulting

Large Mammals:

Steve Torres, California Department of Fish and Game

Mitigation Banking:

Tina Bartlett, California Department of Fish and Game

Oak Woodlands:

Barrett A. Garrison, California Department of Fish and Game

Seabirds:

Gerard McChesney, US Fish and Wildlife Service

Shorebirds:

Mark Colwell, Humboldt State University

Small Mammals:

John Harris, Mills College

Raptors:

Allen Fish, Golden Gate Raptor Observatory

Riparian Ecosystems:

Geoff Guepel, PRBO Conservation Science

Water and Wildlife:

Marti Kie, Department of Water Resources

Concurrent Technical Session Schedule:

Thursday, February 9, 2006 (Salon A)
Concurrent Session: Ecology and Management of Forest Carnivores

Chair: Keith Hamm, Green Diamond Resources Company

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *Evidence for Population Decline of Pacific Fisher (Martes pennanti) on the Hoopa Valley Reservation, California.* Sean M. Matthews, J. Mark Higley, Charles A. Goddard, Aaron J. Pole and Karrie T. Mellon
- 1:30 to 1:50 p.m. *Genetic State-wide Studies of Black Bears in California: Preliminary Findings.* Sarah K. Brown, Douglas Updike and Holly B. Ernest
- 1:50 to 2:10 p.m. *Serological and Pcr Evidence of Anaplasma phagocytophilum in Gray Foxes (Urocyon cinereoargenteus) in Northern Humboldt County, California.* Mourad W. Gabriel, Richard N. Brown, Janet E. Foley and Richard G. Botzler
- 2:10 to 2:30 p.m. *Using Camera Traps to Conduct a Population Survey of Fishers (Martes pennanti) in the Southern Sierra Nevada.* Mark J. Jordan, Reginald H. Barrett and Kathryn L. Purcell
- 2:30 to 2:50 p.m. Break**
- 2:50 to 3:10 p.m. *High Resolution DNA Marker Panel for Puma Ecology and Forensics.* Jennifer Kurushima, Julia Collins, Jay Well and Holly Ernest
- 3:10 to 3:30 p.m. *Pacific Fisher Distribution and Habitat in the Shasta Lake Region of Northern California.* Len Lindstrand III
- 3:30 to 3:50 p.m. *Pathogens Associated with Pacific Fishers (Martes pennanti) in Northwestern California: Implications for Trapping and Translocation.* Richard N. Brown, Mourad W. Gabriel, Sean Matthews, J. Mark Higley and Greta Wengert
- 3:50 to 4:10 p.m. Break**
- 4:10 to 4:30 p.m. *Genetic Structure among Lowland and Montane Red Fox Populations in California.* John D. Perrine, John Pollinger, Benjamin N. Sacks, Reginald H. Barrett and Robert K. Wayne
- 4:30 to 4:50 p.m. *Characteristics of Summer and Fall Home Ranges of American Martens in Coastal Northwestern California.* Keith M. Slauson and William J. Zielinski
- 4:50 to 5:10 p.m. *Overview of Symposium: Fisher and Marten in California "Moving Science and Management Forward."* Keith A. Hamm

Thursday, February 9, 2006 (Salon B)
Concurrent Session: Conservation Planning

Chair: Gail Presley, California Department of Fish and Game

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *The Lower Colorado River Multi-Species Conservation Program.* Lorri Gray
- 1:30 to 1:50 p.m. *Habitat Conservation Planning on a Private Timberland.* Sarah C. Billig
- 1:50 to 2:10 p.m. *A Comparison of Monitoring Measures in Habitat Conservation Plans Approved Before and After Changes in Federal and California Policies and Requirements.*
Jean K. Carr
- 2:10 to 2:30 p.m. Break**
- 2:30 to 2:50 p.m. *Developing a Conservation Strategy and an Adaptive Management and Monitoring Program for the Solano Habitat Conservation Plan.* Rebecca A. Doubledee, Steve Foreman, Greg Gallagher and Lori Banister
- 2:50 to 3:10 p.m. *Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP): a Practical Guide to Year One Implementation.* June Collins, Joe Monaco, Sarah Lozano, Megan Enright and Brock Ortega
- 3:10 to 3:30 p.m. *Monitoring Coastal California Gnatcatchers at a Regional Level.* Clark Winchell and Jeremy Groom
- 3:30 to 3:50 p.m. Break**

Concurrent Session: Ecology of Oak Woodlands

Chair: Barrett A. Garrison, California Department of Fish and Game

- 3:50 to 4:10 p.m. *Wildlife Habitat Changes in Mixed-Conifer Forests in the Central Sierra Nevada.*
Barrett A. Garrison and Stacy Hall
- 4:10 to 4:30 p.m. *A Deadly Tree Disease--Sudden Oak Death--Threatens Wildlife Habitat in Coastal California Woodlands.* Bill Tietje, Donald Winslow and Doug Tempel

Thursday, February 9, 2006 (Salon C)
Concurrent Session: Ecology and Management of Invertebrates

Chair: Sandy Shanks, U.C. Davis and California Department of Fish and Game

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *Insects: Should we Care?* Lynn Kimsey
- 1:30 to 1:50 p.m. *Observations on the Feeding Behavior of the Decollate Snail (Rumina decollata): Implications to an Endangered Mollusk in Central California.* Jeff Tupen and Jeremy Wiggins
- 1:50 to 2:10 p.m. *Monitoring Bumble Bee Populations to Detect Population Fluctuations and Declines.* Robbin Thorp
- 2:10 to 2:30 p.m. Break**
- 2:30 to 2:50 p.m. *Status and Trends of Mollusks under the Northwest Forest Plan's Survey and Manage Program.* Joseph Furnish
- 2:50 to 3:10 p.m. *Challenges in Monitoring the Kern Primrose Sphinx Moth.* Paul G. Johnson II and Peter Jump
- 3:10 to 3:30 p.m. Break**

Concurrent Session: Ecology and Management of Reptiles and Amphibians

Chair: Hartwell Welsh, U.S. Forest Service, Redwood Sciences Lab

- 3:30 to 3:50 p.m. *Evaluating the Influence of Water Quality and the Distribution of Aquatic Herpetofauna within the East Bay Regional Park District.* Steven Bobzien
- 3:50 to 4:10 p.m. *Sex and Habitat Effects on Home Ranges of Blunt-nosed Leopard Lizards.* David J. Germano
- 4:10 to 4:30 p.m. *Introduced Trout Affect Ecosystem Subsidy and a Threatened Frog.* Karen L. Pope, Sharon P. Lawler and Hartwell H. Welsh Jr.
- 4:30 to 4:50 p.m. Break**
- 4:50 to 5:10 p.m. *Spatial Ecology of a Population of the Aquatic Garter Snake, *Thamnophis atratus*, associated with a Montane, Cold-Stream Environment in Northwestern California.* Hartwell H. Welsh Jr., Amy J. Lind and Clara A. Wheeler
- 5:10 to 5:30 p.m. *Monitoring Arroyo Toad Populations within the Los Padres National Forest, California.* J.C. Uyehara, Valerie K. Hubbart and Sam Sweet

Thursday, February 9, 2006 (Salon D)
Concurrent Session: Ecology and Management of Large Mammals

Chair: Steve Torres, California Department of Fish and Game

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *The Irvine Wildlife Corridor Plan: Reconnecting the Coast to the Mountains.*
Melissa A. Busby and Tito A. Merchant
- 1:30 to 1:50 p.m. *The Landscape Genetics of Invasion: A Study of California Wild Pigs.* Elizabeth R. Heeg, Holly B. Ernest and Douglas Updike
- 1:50 to 2:10 p.m. *Efficacy of Feral Pig Removals at Hakalau Forest National Wildlife Refuge, Hawaii.*
Steven C. Hess, Jack Jeffrey, Donna L. Ball and Lev Babich
- 2:10 to 2:30 p.m. *Conservation Strategies for Cougars in Riverside County, California: from Models to Management.* Rick A. Hopkins, Brett G. Dickson, Brad H. McRae and Paul Beier
- 2:30 to 2:50 p.m. Break**
- 2:50 to 3:10 p.m. *Distribution and Trends of Mountain Lion Mortality in the Americas.* Christopher M. Papouchis
- 3:10 to 3:30 p.m. *Predator Behavior and Proximity affects Risk Assessment in Columbian Black-tailed Deer.* Theodore Stankowich and Richard G. Coss
- 3:30 to 3:50 p.m. *Cougar Management Guidelines.* Steve Torres
- 3:50 to 4:10 p.m. Break**

Concurrent Session: Ecology and Management of Small Mammals

Chair: John Harris, Mills College

- 4:10 to 4:30 p.m. *Perchlorate Concentrations in Upland Game from a Former Rocket Motor Assembly and Test Facility on the San Jacinto Wildlife Area, Riverside County, California and Implications for Future Game Management.* Robert C. Hosea, Brian J. Finlayson, J.R. Sanborn, R.K. Brodberg, A. Mekeberi, M. Vasquez, G. Blondina and D. Crane
- 4:30 to 4:50 p.m. *Habitat Associations of Northeastern Nevada Rodents.* Kent J. McAdoo, Mack R. Barrington and Mark A. Ports
- 4:50 to 5:10 p.m. *Assessing the Current Status of the American Badger (Taxidea taxus) in California.*
Jessica H. Quinn

Friday, February 10, 2006 (Salon A)
Concurrent Session: Ecology of Desert Ecosystems

Chairs: Rhys Evans, Marine Air Ground Task Force Training Command, and Amy Fesnock, Joshua Tree National Park.

- 8:00 to 8:10 a.m. Opening Remarks
- 8:10 to 8:30 a.m. *Reducing Raven Predation on Desert Tortoises.* William I. Boarman
- 8:30 to 8:50 a.m. *Declining Population of the Federally Threatened Desert Tortoise within Joshua Tree National Park.* Kurt T. Bacon and Amy L. Fesnock
- 8:50 to 9:10 a.m. *The Battle Graphic as an Ecological Tool.* Michael A. Recht and Gray A. Adest
- 9:10 to 9:30 a.m. *Urban Effects on Adjacent Populations of Wild Desert Tortoises: Dogs and Disease.* Kristen H. Berry, Andrea S. Demmon, Rachel L. Woodward and Rhys M. Evans
- 9:30 to 9:50 a.m. Break**
- 9:50 to 10:10 a.m. *Status and Behavior of the Pygmy Rabbit (Brachylagus idahoensis) in Nevada's Great Basin Desert.* Evelyn Sequin Larrucea and Peter Brussard
- 10:10 to 10:30 a.m. *California Tree Frogs: Assessment of Status, Threats, and Management Strategies within Joshua Tree National Park.* Kristen N. Lalumiere and Amy L. Fesnock
- 10:30 to 10:50 a.m. *Non-equilibrium Population Dynamics in the Coachella Valley Fringe-toed Lizard (Uma inornata).* Cameron W. Barrows
- 10:50 to 11:10 a.m. *Desert Bats and Management Issues.* Patricia E. Brown and Robert D. Berry
- 11:10 to 11:30 a.m. *Range Contractions and Current Status of the Flat-tailed Horned Lizard (Phrynosoma mcallii) in the Coachella Valley.* Cameron W. Barrows

Friday, February 10, 2006 (Salon B)
Concurrent Session: Ecology of Riparian Ecosystems

Chair: Geoff Guepel, PRBO Conservation Science

- 8:00 to 8:10 a.m. Opening Remarks
- 8:10 to 8:30 a.m. *Lower Mokelumne River Small Mammal Inventory.* Kent E. Reeves, James S. Jones and James R. Smith
- 8:30 to 8:50 a.m. *Low Nest Survivorship in a Coastal California Warbling Vireo Population.* Erica Lindgren and Francis X. Villablanca
- 8:50 to 9:10 a.m. *Trends in Abundance and Productivity of Riparian-Associated Breeding Birds in Central Coastal California.* Nellie Thorngate
- 9:10 to 9:30 a.m. *Shifting Populations of Yellow-billed Cuckoos on the Sacramento River: A 20-Year Perspective.* Murrelet Halterman and Lew Oring
- 9:30 to 9:50 a.m. Break**
- 9:50 to 10:10 a.m. *Habitat Relationships of Breeding Landbirds in Riparian Habitat along the San Joaquin River.* Renee Cormier, Julian Wood, Geoffery Guepel and Chrissy A. Howell
- 10:10 to 10:30 a.m. *Patterns of Songbird Nest Success on Restored and Remnant Riparian Habitat on the Cosumnes River Preserve, in Relation to Flooding and Weather.* Nadav Nur
- 10:30 to 10:50 a.m. *Indicators, Umbrellas, and Endangered Species: What is our Monitoring Goal?* Chrissy A. Howell
- 10:50 to 11:10 a.m. *Using Results of Bird Monitoring to set Biological Objectives in Riparian Habitat.* Geoffery Geupel, Thomas Gardali, Diana Stralberg and Gregory H. Golet

Friday, February 10, 2006 (Salon C)
Concurrent Session: Ecology and Management of Seabirds

Chair: Gerry McChesney, U.S. Fish and Wildlife Service

- 8:00 to 8:10 a.m. Opening Remarks
- 8:10 to 8:30 a.m. *Reproductive Success of Ashy Storm-petrels (Oceanodroma homochroa) at Santa Cruz Island, California.* William R. McIver, Harry R. Carter, Richard T. Golightly, Gerard J. McChesney and Daniel Welsh
- 8:30 to 8:50 a.m. *Space Use of Foraging Forster's Terns (Sterna forsteri) in South San Francisco Bay, California.* Jill Blusso, Mark Colwell and John Takekawa
- 8:50 to 9:10 a.m. *Population Status of Common Murres in Northern California, 1996-2004.* Phillip J. Capitolo, Gerard J. McChesney, Harry R. Carter, Michael W. Parker, James N. Hall, Richard J. Young and Richard T. Golightly
- 9:10 to 9:30 a.m. *Restoration of Common Murre Colonies in Central California.* Gerard J. McChesney, Michael W. Parker, Harry R. Carter, Steven W. Kress and Richard T. Golightly
- 9:30 to 9:50 a.m. Break**
- 9:50 to 10:10 a.m. *Beach COMBERS: Using Surveys of Beached Marine Birds to Monitor Natural and Human-related Mortality in the Monterey Bay National Marine Sanctuary, 1997 – 2005.* Hannah Nevins, Elizabeth Phillips, David Jessup, and Jim Harvey
- 10:10 to 10:30 a.m. *Use of an Inland Lake by Western Gulls.* Richard T. Golightly, Talitha F. Penland and Scott H. Newman
- 10:30 to 10:50 a.m. *Effects of Night Roost Loss on Brown Pelican Distribution in Southwest Washington.* Deborah Jaques
- 10:50 to 11:10 a.m. *Boardwalk use by Cassin's Auklets at Southeast Farallon Island.* Jesse Irwin and Joella Buffa

Friday, February 10, 2006 (Salon D)
Concurrent Session: Water and Wildlife

Chair: Martie Kie, Department of Water Resources

- 8:00 to 8:10 a.m. Opening Remarks
- 8:10 to 8:30 a.m. *Hetch Hetchy--To Drain or Not to Drain?* Dale K. Hoffman-Floerke
- 8:30 to 8:50 a.m. *Lower Colorado River Habitat Restoration for Neotropical Migratory Birds and Water Acquisitions and Uses.* Christopher S. Harris
- 8:50 to 9:10 a.m. *Salton Sea Restoration Program.* Jerry Boles
- 9:10 to 9:30 a.m. *Mitigation of Central Valley Evaporation Ponds - Does it Really Work?* Douglas A. Barnum
- 9:30 to 9:50 a.m. Break**
- 9:50 to 10:10 a.m. *Shorebird Management Rotating with Rice Production at the Yolo Wildlife Area.* David Feliz
- 10:10 to 10:30 a.m. *Wildlife and Hydropower Re-licensing in the Sierra Nevada: Issues and Answers.* Richard D. Williams
- 10:30 to 10:50 a.m. Break**

Concurrent Session: Ecology and Management of Shore Birds

Chair: Mark Colwell, Humboldt State University

- 10:50 to 11:10 a.m. *Population Ecology of Long-billed Curlews Breeding in Non-native Grasslands.* C. Alex Hartman and Lewis W. Oring
- 11:10 to 11:30 a.m. *Evidence for Conspecific Attraction in the Breeding Distribution of the Western Snowy Plover in Coastal Northern California.* Zach Nelson and Mark Colwell

Friday, February 10, 2006 (Salon A)
Concurrent Session: Mitigation Banking

Chair: Tina Bartlett, California Department of Fish and Game

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *Mitigation Banks – Promises and Pitfalls.* Craig Bailey
- 1:30 to 1:50 p.m. *Markets and Biodiversity: A Global Overview.* Ricardo Bayon
- 1:50 to 2:10 p.m. *Conservation Banking at the Landscape-Scale for the Red-cockaded Woodpecker.*
Douglas J. Bruggeman, M. Jones, F. Lupi and K. Scribner
- 2:10 to 2:30 p.m. Break.**
- 2:30 to 2:50 p.m. *The Experience of Species Conservation Banking in the United States.* Jessica Fox
- 2:50 to 3:10 p.m. *The Devil is in the Details: The Art and Science of Mitigation Bank Deals, Long
Term Stewardship Requirements, and Management Costs.* Sherry Teresa

Friday, February 10, 2006 (Salon B)
Concurrent Session: Ecology and Management of Raptors

Chair: Allen Fish, Golden Gate Raptor Observatory

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *Monitoring Golden Eagle Populations: The State of the Science.* J. David Bittner, John Oakley, Jim Hannan, Jeffrey Lincer and Leslie Nelson
- 1:30 to 1:50 p.m. *Raptor Management at Lake Sonoma, California.* Joseph J. Lishka, Wade L. Eakle, Monte N. Kirven and Robert E. Garcia
- 1:50 to 2:10 p.m. *West Nile Virus Antibody Prevalence in California Raptors.* Joshua Hull, Angus Hull, John Keane, William Reisen and Holly Ernest.
- 2:10 to 2:30 p.m. *Gender Determination in Red-tailed and Red-shouldered Hawks using Molecular Techniques and Morphological Characters.* Sarah Pitzer, Holly Ernest and Angus Hull
- 2:30 to 2:50 p.m. Break**
- 2:50 to 3:10 p.m. *Site Occupancy and Detection Probabilities of Cooper's and Sharp-shinned Hawks in the Southern Sierra Nevada: Design Considerations for Monitoring Accipiters.* Jennifer G. Carlson, John J. Keane, Douglas D. Piitro and Samantha J. Gill
- 3:10 to 3:30 p.m. *Assessment of Northern Goshawk Territories within the Lake Tahoe Basin.* Richard J. Young, Michael L. Morrison, Richard T. Golightly and J. Shane Romsos
- 3:30 to 3:50 p.m. *Developing and Evaluating Predictive Models of Habitat Use and the Distribution of the Great Gray Owl (Strix nebulosa) within the Sierra Nevada Range.* Chris J. Stermer, Carrie J. Sears and Kevin O'Connor

Friday, February 10, 2006 (Salon C)
Concurrent Session: Ecology and Management of Bats

Chair: Betsy Bolster, California Department of Fish and Game

- 1:00 to 1:10 p.m. Opening Remarks
- 1:10 to 1:30 p.m. *Acoustic Sampling of Bat Assemblages: Challenges of Spatial and Temporal Replication.* Elizabeth D. Pierson, William E. Rainey and Leslie S. Chow
- 1:30 to 1:50 p.m. *Do Wind Turbines Generate Ultrasound that May Attract Bats?* Joseph M. Szewczak and Ed Arnett
- 1:50 to 2:10 p.m. *Assessment and Management of Bats in Buildings.* Greg Tatarian
- 2:10 to 2:30 p.m. Break**
- 2:30 to 2:50 p.m. *Developing Successful Mitigations for Bridge-Roosting Bats.* Greg Tatarian
- 2:50 to 3:10 p.m. *Bats and Foraging Habitat – Critical Management Issues.* Patricia E. Brown and Robert D. Berry
- 3:10 to 3:30 p.m. *Winter Ecology of Pallid Bats in Central Coastal California.* David S. Johnston
- 3:30 to 3:50 p.m. *Water for Wildlife: Improving Access and Reducing Mortality for Bats and other Wildlife at Livestock Water Developments.* Daniel A.R. Taylor and Stuart R. Tuttle

Friday, February 10, 2006 (Salon D)
Concurrent Session: Ecology and Management of Shore Birds (con't. from AM)

- 1:00 to 1:10 p.m. **Opening Remarks**
- 1:10 to 1:30 p.m. *Survival and Natal Dispersal of Juvenile Snowy Plovers in Central California.* Lynn E. Stenzel, Gary W. Page, Jane C. Warriner, John S. Warriner, Douglas E. George, Carlton R. Eyster, Bernadette A. Ramer and Kristina K. Neuman
- 1:30 to 1:50 p.m. *Changes in Winter Shorebird and Waterfowl Abundance and Community Structure Over 34 Years in a Depositional Estuarine System.* Lynn E. Stenzel and Gary W. Page
- 1:50 to 2:10 p.m. *Diurnal and Nocturnal Roost Site-Fidelity of Wintering Dunlin (Calidris alpina pacifica).* Jesse R. Conklin and Mark Colwell
- 2:10 to 2:30 p.m. *Spring-time Site use by Migratory Pacific Flyway Shorebirds: Ecological and Management Considerations.* Nils Warnock, Mary Anne Bishop and John Y. Takekawa
- 2:30 to 2:50 p.m. Break**

Concurrent Session: Ecology and Management of Land Birds

Chair: Dan Airola, Airola Environmental Consulting

- 2:50 to 3:10 p.m. *West Nile Virus, Genetics, and the Yellow-billed Magpie.* Holly Ernest, Leslie Woods, Jay Well, Jennifer Kurushima, Ryan Carney and Vicki Kramer
- 3:10 to 3:30 p.m. *Yellow-billed Magpie in Sacramento: Declines at Roost Sites Following the 2005 West Nile Virus Outbreak.* Scott Crosbie
- 3:30 to 3:50 p.m. *Impact of West Nile Virus on Yellow-Billed Magpie and American Crow in the Sacramento Valley, California.* K. Shawn Smallwood and Brenda J. Nakamoto
- 3:50 to 4:10 p.m. Break**
- 4:10 to 4:30 p.m. *Use of Christmas Bird Counts to Evaluate Effects of West Nile Virus on Corvid Populations in the Lower Sacramento Valley.* Daniel A. Airola and Tim Manolis
- 4:30 to 4:50 p.m. *Bird Population Declines in the Four Southern California National Forests.* J.C. Uyehara, Sylvia Mori and Kathryn Purcell
- 4:50 to 5:10 p.m. *Birds on Golf Courses: Does Human Disturbance Influence Flight Behavior?* Eric M. Punkay

Thursday, February 9, 2006
9:00 to 11:30 a.m.
(Salons A&B)

PLENARY SESSION:
Monitoring Wildlife Populations: The State of the Science

9:00 to 9:10 a.m.

Welcome and Introductory Remarks
Kevin Hunting, President-Elect, California Department of Fish and Game

9:10 to 9:25 a.m.

The Wildlife Society Executive Director's Message
TWS: Where do we go from here?
Michael Hutchins, Executive Director, The Wildlife Society

9:25 to 9:45 a.m.

Keynote Address
Are we Clearing the way to Future Understanding through Monitoring?
Dr. Judd Howell, Director, Patuxent Wildlife Research Center, U.S. Geological Service, Biological Resource Division, Laurel, Maryland

9:45 to 10:05 a.m.

Forest Service Perspective
Adaptive Management within the Sierra Nevada Ecoregion: Can it be done?
Dr. Peter Stine, Director, Sierra Nevada Research Center, Pacific Southwest Research Station, U.S. Forest Service

10:05 to 10:25 a.m.

Planning Perspective
Designing Science-Based Monitoring Programs for Regional Multiple Species Conservation Plans
Dr. Brenda Johnson, Conservation Planning Program, California Department of Fish and Game, Sacramento, CA

10:25 to 10:40 a.m. Break

10:40 to 11:00 a.m.

Southern California Perspective
The complexities of developing and implementing monitoring for conservation plans
Dr. Robert Fisher, Zoologist and Research Professor of Biology, U.S. Geological Survey, Biological Resource Division, San Diego, CA

11:00 to 11:30 a.m.

Panel Discussion
All Plenary Session Speakers

DEDICATED POSTER SESSION
THURSDAY, FEBRUARY 9, 2006
5:30 TO 8:00 P.M. (Garden/Terrace Rooms)

Response of California Red-Legged Frogs (Rana draytonii) to Large-Scale Silt and Vegetation Removal from Aquatic Habitat. Jeffrey A. Alvarez and Mary A. Shea

Space Use of American Avocets in South San Francisco Bay. Scott Demers, Mark Colwell, John Takekawa, and Josh Ackerman.

Controlling the Spread of New Zealand Mud Snails on Wading Gear. Robert C. Hosea and Brian J. Finlayson.

An Improved Technique to Capture Bats using Macro or Stacked Nets. David S. Johnston

Home Range, Habitat Use, and Mercury Concentrations in California Black Rails (Laterallus jamaicensis coturniculus), in Petaluma River Tidal Marshes, California. Danika Tsao Melcer and John Takekawa.

Developing Predictive Models for Bat Species Activity at Crater Lake National Park Using Ordinary Point Kriging. Dana Ostfeld and Andrew Duff

Impact of Flooding on a Burrowing Owl Colony in the Sacramento-San Joaquin Delta. Kent Reeves and James E. Jones

Assigning Forest Wildlife Value for Terrestrial Wildlife at the Landscape Scale in Rural King County, Washington, Using GIS. Jennifer Vanderhoof, Gino Lucchetti and Kollin Higgins

Using Chin Spot Patterns to Identify Individual Mountain Yellow-Legged Frogs. Greta M. Wengart and Benjamin B. Littlefield

ABSTRACTS:

Use of Christmas bird counts to evaluate effects of West Nile virus on corvid populations in the lower Sacramento Valley.

Daniel A. Airola, Airola Environmental Consulting, 2700 6th Ave., Sacramento, CA 95818, (916) 454-3073, Email: d.airola@sbcglobal.net, and Tim Manolis, 808 Encino Way, Sacramento, CA 95864, Email: ylightfoot@aol.com.

Abstract: The prevalence of West Nile virus (WNV) in the lower Sacramento Valley (LSV) in 2005 raised concerns regarding its effects on corvids (Corvidae). The annual Christmas Bird Counts (CBCs) provide one of few data sources for evaluating pre- and post-WNV population changes. We summarized abundances of the yellow-billed magpie (*Pica nuttalli*), western scrub-jay (*Aphelocoma coerulescens*), and American crow (*Corvus brachyrhynchos*) for 7 CBCs in the LSV over a 25-year baseline period (1980-2004) for comparison with abundances in 2005-2006. Before 2005, regional populations varied annually but without any consistent trend, despite trends within some individual count areas (likely due to increased residential development). We will present the comparison of 2005-2006 counts to the baseline to determine if any population changes are evident following the WNV outbreak. We also discuss the effectiveness of CBC data in evaluating species with a wintering population component and the appropriateness of different abundance measures (total individuals and number of birds/party hour) in evaluating species that roost communally in groups of different sizes. Despite their limitations, our analysis suggests that CBC data provide a useful information source to contribute to the broader evaluation of short- and long-term effects of WNV on corvids and other birds.

Response of California red-legged frogs (Rana draytonii) to large-scale silt and vegetation removal from aquatic habitat.

Jeffrey A. Alvarez, The Wildlife Project, P.O. Box 579805, Modesto, CA 95357, (209) 815-5660, Email: azoologist@sbcglobal.net, and Mary A. Shea, Contra Costa Water District, 100 Walnut Blvd., Brentwood, CA 94513, (925) 240-2372, Email: mshea@ccwater.com.

Abstract: As part of mitigation for the construction of the Los Vaqueros Reservoir in the upper Kellogg Creek Watershed, the Contra Costa Water District periodically removed built-up silt loads and excess emergent vegetation from stock ponds and mitigation wetlands that were managed on the watershed. Heavy equipment was used to mechanically remove silt and emergent vegetation (*Typha* and *Scirpus* spp.) from 12 ponds over a six-year period from 1998 to 2004. Monitoring was conducted for special status amphibians preceding and following silt and vegetation removal. Thirty-eight percent of the ponds had California red-legged frog (*Rana draytonii*) egg masses 1 year prior to dredging. By the first year after dredging, 75% of the same ponds had California red-legged frog (CRLF) egg masses, with 100% of those ponds showing egg masses by the second year after dredging. During the same period, the averaged number of observed CRLF egg masses per pond increased 300%. Large-scale silt and vegetation

removal had a positive effect on the observability of CRLF egg masses and may also improve habitat conditions for this species.

Declining population of the federally threatened desert tortoise within Joshua Tree National Park.

Kurt T. Bacon and Amy L. Fesnock, Joshua Tree National Park, 74485 National Park Blvd., Twentynine Palms, CA 92277, (760) 367-5568 (Bacon), (916) 414-6731 (Fesnock), Email: kurt_bacon@nps.gov, amy_fesnock@fws.gov.

Abstract: Weekly spring surveys for the federally threatened desert tortoise were conducted in 2004 and 2005 at a long-term study plot in the Pinto Basin of Joshua Tree National Park, California. Survey methods used in 2004 consisted of surveyors covering the entire 2.56 km² study plot twice over an eleven-week period. A total of 65 tortoises, including 17 recaptures, were found. Using the Peterson-Lincoln index, an estimate of 15 adult tortoises/km² was determined. A similar study conducted from 1991-1996 obtained population estimates of 42 tortoises per km². Improved survey methods used in 2005 consisted of surveyors covering a 1 x 1.6 km portion of the study site four times. A total of 49 tortoises, including 14 recaptures, were found. Preliminary analysis of the data suggests that a lower population density was determined compared to previous surveys. The desert tortoise population in the Pinto Basin has been protected since the establishment of the national monument in 1936. A substantial decline in the desert tortoise population is occurring not because of off-road vehicles, military activities, mining, or development. Disease and predation vectors associated with anthropogenic activities are also absent. Additional studies will be necessary to better identify population trends.

Mitigation banks: Promises and pitfalls.

Craig Bailey, Wildlands, Inc., 208 W. Main Street, Suite U-2, Visalia, CA 93291, (559) 625-7077, Fax: (559) 625-7078, E-mail: cbailey@wildlandsinc.com

Abstract: Mitigation and conservation banks have been operating in California since the early 1990s. These tools have restored and protected thousands of acres of habitat. As the industry has matured, valuable lessons have been learned. This presentation will provide an overview of the advantages and successes of mitigation and conservation banking, as well as the industry's mistakes and shortcomings. Possible solutions will be discussed. Subjects will include land acquisition and property encumbrances.

Mitigation of Central Valley evaporation ponds - does it really work?

Douglas A. Barnum, U.S. Geological Survey, Salton Sea Science Office, 78401 Hwy 111, Suite R. La Quinta, CA 92253. (760) 777-1564, Fax: (760) 564-5288, Email: doug_barnum@usgs.gov.

Abstract: In 1994, a 124-ha (307-acre) wetland was constructed by the Tulare Lake Drainage District to provide foraging and nesting habitat for American avocets (*Recurvirostra americana*) and black-necked stilts (*Himantopus mexicanus*). The wetland is seasonally operated to compensate for evaporation basins in which shorebirds and other wildlife are exposed to elevated selenium concentrations, nest flooding, high nest predation rates, and impacts from routine maintenance. American avocet and black-necked stilt nest construction at the wetland was 16.6 nests/ha (6.7 nests/acre). From 1995 through 2004, annual nesting attempts by American avocets and black-necked stilts at the wetland averaged 2,896 per year in addition to nesting by other avian species. Nest success averaged 82% for American avocets, and 75% for black-necked stilts. Geometric mean selenium concentration in American avocet eggs at the wetland was 2.9 µg/g (dry weight), and 3.0 µg/g for stilts, which is substantially below the egg selenium threshold for reproductive impairment and embryo toxicity of 12-13 µg/g (Adams *et al.* 2003), and 12.8 µg/g (Ohlendorf 2003) reported for stilts, avocets, and waterfowl. No deformed or abnormal avocet ($n = 70$) or stilt ($n = 67$) embryos have been observed. The managed wetland appears to be effective in attracting and providing suitable nesting habitat for large numbers of avocets and stilts.

Non-equilibrium population dynamics in the Coachella Valley fringe-toed lizard, (Uma inornata).

Cameron W. Barrows, University of California, Riverside / CNLM, 53298 Avenida Montezuma, La Quinta, CA 92253, (760) 343-1234, Email: cbarrows@cnlm.org.

Abstract: Previous paradigms of population dynamics included the concept of a population in equilibrium at a carrying capacity for a given habitat. If we could measure that carrying capacity, then significant population declines would signal a population out of equilibrium that had breached a threshold for management intervention. The current paradigm for populations has embraced non-equilibrium dynamics. Resources are ever-changing and while populations attempt to track those resources, there is no long-term equilibrium. Without a carrying capacity, how do we establish thresholds for when to apply management strategies in order to prevent the loss of biological diversity? Using a 20-year data set, I was able to demonstrate that the population dynamics of the federally threatened and State endangered Coachella Valley fringe-toed lizard (*Uma inornata*) are consistent with the non-equilibrium paradigm. The fringe-toed lizard populations generally track annual precipitation, which mediates food resources. Identifying rainfall as the primary driver of the lizard's population allows us to then identify deviations from that pattern as potential thresholds for management intervention. The 2005 population explosion of the exotic Saharan mustard (*Brassica tournefortii*) within the fringe-toed lizards habitat provides a demonstration of how management thresholds can be identified.

Range contractions and current status of the flat-tailed horned lizard (Phrynosoma mcallii) in the Coachella Valley.

Cameron W. Barrows, University of California at Riverside / CNLM, 53298 Avenida Montezuma, La Quinta, CA 92253, (760) 343-1234, Email: cbarrows@cnlm.org.

Abstract: The flat-tailed horned lizard (*Phrynosoma mcallii*) reaches its northwestern-most distribution in the Coachella Valley, within southern California's Colorado Desert. Recent records for this lizard indicate a distribution coincident, or nearly so, with the original sand dune expanse that previously covered roughly 26,000 ha of the Coachella Valley floor. Today 95% of that aeolian sand landscape has been fragmented by roads and converted to a suburban landscape. While four separate sand dune habitat reserves have been created, only one currently includes this lizard species. Research aimed at understanding the nature of edge effects on the aeolian sand habitat endemic species occurring within this preserve has identified that flat-tailed horned lizards are largely absent from those edges. As a result of predation from American kestrels (*Falco sparverius*) and loggerhead shrikes (*Lanius ludovicianus*) a 100-150 m edge effect was measured for the horned lizards. The flat-tailed horned lizard population dynamics away from those edges appears to be tied to the abundance of harvester ants (*Pogonomyrmex* spp.). In recent years the harvester ant populations have crashed, and so too have the horned lizards. Identifying drivers of flat-tailed horned lizard population dynamics will be key to insuring their persistence in this portion of their range.

Markets and biodiversity: A global overview.

Ricardo Bayon, Ecosystem Marketplace, Managing Editor, 8 Morning Sun Ave., Mill Valley, CA 94941, (415) 462-5869, Fax: (206) 984-4681, E-mail: rbayon@ecosystemmarketplace.com

Abstract: Ever since the U.S. launched the first large-scale market in an environmental commodity—sulfur dioxide—markets have been revolutionizing the way governments approach environmental policy. Given the burgeoning interest in environmental markets worldwide, it is not surprising that there should now be an emerging discussion on how market-based approaches can be used to conserve forests, species, and biodiversity. But what works for CO₂ doesn't necessarily work for biodiversity. Markets for biodiversity, however, have a variety of added complications that don't arise in standard pollution trading. Likewise, there are a number of market-like mechanisms emerging at the international level that could provide an added value to biodiversity. The most interesting of these is the “biodiversity offset”, a process whereby an individual or company decides voluntarily to offset the damage they are causing to biodiversity.

The presentation will look at the various “environmental markets” emerging around the world, consider what these may mean for global biodiversity, and explore the potential of conservation banks and voluntary biodiversity offsets to serve as mechanisms for “internalizing” the economic value of biodiversity into the global economy.

Urban effects on adjacent populations of wild desert tortoises: dogs and disease.

Kristin H. Berry¹, Andrea S. Demmon¹, Rachel Woodard², and Rhys M. Evans³. ¹U.S. Geological Survey, 22835 Calle San Juan de Los Lagos, Moreno Valley, CA 92553, (951) 697-5361, Fax: (951) 697-5299, Email: kristin_berry@usgs.gov; ²Ridgecrest, CA, 93555; ³Marine Air Ground Task Force Training Command, Twentynine Palms, CA 92277.

Abstract: Desert tortoise populations living at or near the interface between urbanized and rural lands and the adjacent desert face more threats to their well-being and survival than populations remote from human contact. We are studying two threat variables, domestic dogs and upper respiratory tract disease (URTD) caused by pathogenic bacteria in the genus *Mycoplasma*, at several Mojave Desert study sites. Our objectives are to develop risk models for desert tortoise populations occurring in close proximity to urban and rural lands. Our preliminary studies indicate that dog attacks on tortoises are more common near urban developments than in remote parts of the desert. Likewise, URTD is more common in captive tortoises living in urban settings and near the urban/desert interface than in remote areas. We address the topics of risks or threats to the tortoises as a function of distance from urbanized lands and small settlements, as well as potential management solutions.

Habitat conservation planning on a private timberland.

Sarah C. Billig, Mendocino Redwood Company, P.O. Box 996, Ukiah CA, 95482, (707) 463-5125, Email: sbillig@mendoco.com.

Abstract: Current processes for protecting threatened and endangered species involve assessment on a project-by-project basis to minimize the likelihood of take. This approach often provides short-term protections for a single or pair of animals in a given area. In an effort to more effectively and efficiently protect threatened and endangered species on its ownership while also maintaining regulatory certainty, Mendocino Redwood Company (MRC) entered discussions regarding a Habitat Conservation Plan (HCP) with federal agencies. While the HCP dealt with federal statutes, MRC also sought to engage state agencies with a Natural Communities Conservation Plan (NCCP). Together, these plans provide conservation measures for 3 fish, 3 amphibian, 1 mammal, and 2 bird species; as well as 42 rare plant species and 6 natural communities. As a result, habitat and distribution of covered species should improve while natural communities will be conserved. Our understanding of distribution and population trends of covered species will also improve as the plans require continual monitoring of these species. Overall, we believe these plans provide the best potential for this ownership to contribute to the recovery of threatened and endangered species as well as maintaining an economically sustainable business.

Monitoring golden eagle populations: The state of the science.

J. David Bittner, Wildlife Research International, Inc., 18030 Highland Valley Road, Ramona, CA 92065, (760) 789-3992, Email: dbittner@wildlife-research.org; John Oakley, Wildlife Research International, Inc., 18030 Highland Valley Road, Ramona, CA 92065; Jim Hannan, Wildlife Research International, Inc., 18030 Highland Valley Road, Ramona, CA 92065; Jeffrey L. Lincer, Wildlife Research International, Inc., 18030 Highland Valley Road, Ramona, CA 92065; and Leslie Nelson, Wildlife Research International, Inc., 18030 Highland Valley Road, Ramona, CA 92065, Email: lnelson@wildlife-research.org.

Abstract: In 1867, egg collectors first documented golden eagles in San Diego County. Egg-collecting was practiced extensively there into the 1940s, inadvertently starting the longest continuous monitoring of a golden eagle population in the western hemisphere. A series of researchers continued studying and documenting golden eagle populations from the days of egg collecting to the present. Historically, 104 golden eagle territories have been documented in San Diego County with 50 active pairs remaining today. Helicopter surveys of southern California allow monitoring of 123 known active territories. Wildlife Research Institute, Inc. researchers are currently utilizing various means including helicopters, satellite telemetry, patagial markers, bands, and volunteer crews to expand this study and obtain a more comprehensive view of the southern California golden eagle population. To expand our knowledge of the overall status of golden eagles in North America, WRI initiated a long-term project to trap, color mark, and attach satellite transmitters to eagles migrating south from Canada and Alaska each winter. Data will provide insight into winter mortality rates and causes as well as eagle migration patterns. This kind of comprehensive approach is expected to ultimately produce a clearer picture of the status, trends, and management needs for this species.

Space use of foraging Forster's terns (Sterna forsteri) in south San Francisco Bay, California.

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Abstract: Forster's tern (*Sterna forsteri*) is a Species of Special Concern in California and, in the San Francisco Bay, nests primarily on island or levee habitats provided by artificial salt evaporation ponds. In 2005, we captured and radio-marked 31 pre-breeding Forster's terns on 4 colony sites within Don Edwards San Francisco Bay National Wildlife Refuge (DESFBNWR) in the South San Francisco Bay, California. Foraging Forster's terns were tracked aerially and using truck-mounted telemetry systems throughout the San Francisco Bay region to estimate home-range and core-area sizes, defined as the areas encompassing 95% and 50% of the probability distribution, respectively. Foraging terns averaged a home-range size of $5,843 \pm 1,016$ ha and a core-area size of 864 ± 206 ha. All core-areas encompassed artificial salt evaporation ponds within DESFBNWR, indicating the importance of salt pond habitat for foraging terns. Forster's terns are potentially faced with vast habitat alterations as restoration efforts in the South San Francisco Bay aim to convert artificial salt pond habitat to tidal marsh. Effective management of Forster's terns in the South San Francisco Bay will need to conserve or create colony sites and take into account the foraging movements of terns within the bay and salt pond systems.

Reducing raven predation on desert tortoises.

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Abstract: Common raven populations have increased in the California deserts in the past half-century. Because they are a subsidized predator, they have come into conflict with threatened desert tortoise populations. Since 1991, several collaborators and I have studied raven ecology in the Mojave Desert to learn more about how we can reduce ravens' impacts on tortoise populations. Radio tracking, nest monitoring, abundance surveys, scat analyses, and attacks rates on tortoise models yield insights into the dynamics of raven ecology and behavior. Ravens clearly take advantage of humans for roosting, nesting, and foraging. Fledgling and juvenile survivorship are enhanced by proximity to anthropogenic sources of food - natural desert habitat seems to be detrimental to reproductive success. Ravens move about the desert freely, using human structures as stepping-stones to aid their dispersal through more inhospitable portions of desert. Predation risk to tortoises is highest near major sources of food, but is also high near active raven nests. These studies are informing development of a multi-agency plan to manage ravens. We still do not know the extent of raven impacts on tortoise populations, and this gap is likely to be the greatest impediment to effective implementation of raven management actions.

Evaluating the influence of water quality and the distribution of aquatic herpetofauna within in the East Bay Regional Park District.

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Abstract: The East Bay Regional Park District (District) currently manages 65 parks, recreation areas, wilderness lands, shorelines, preserves, and land bank areas which encompass over 96,000 acres in Alameda and Contra Costa Counties. Approximately 80 percent of District lands are protected as natural parklands. The District contains 271 fresh water ponds, 12 larger lakes, and hundreds of miles of streams. Several water quality variables are often identified as the probable cause for deleterious effects on aquatic biota. However, the effect of water quality on various aquatic herpetofauna is not well understood. To assess water quality in lentic water bodies, we evaluated the influence of water temperature, pH, dissolved oxygen, nitrogen, and turbidity with the distribution of California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), and other aquatic herpetofauna throughout the District. Overall, our preliminary results and data suggest that most taxa have relatively broad tolerance to these variables.

Salton Sea restoration program.

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Abstract: The current Salton Sea has existed since 1905, when flooding breached an irrigation canal allowing water from the Colorado River to flow into the Salton Sink. The salinity of the Sea rapidly increased due to dissolution of salts from ancient seabed soils,

discharge of agricultural drainage water, and a high evaporation rate. With salinity similar to that of ocean water, marine fish species were introduced and soon developed into an excellent fishery. In addition, hundreds of bird species use the various habitats at the Sea. However, increasing salinity threatens the ability of the Salton Sea ecosystem to continue to support these species. In addition, an agreement concerning allocation of water from the Colorado River will reduce inflows to the Sea. As part of the allocation agreement, the Resources Agency is developing an ecosystem restoration plan. The restoration plan must address infrastructure, restoration of fish and wildlife habitat, and air and water quality. Several primary infrastructure alternatives have been identified. Methods to mitigate air quality impacts and improve water quality are being explored, and habitat needs for fish and wildlife species dependent on the Salton Sea ecosystem are being assessed.

Bats and foraging habitat---critical management issues.

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Abstract: Knowledge of roosting and foraging requirements is necessary in managing for viable bat populations. The advances in transmitter technology now allow small bats to be tracked to roosts. Delineating foraging habitat and home range is a bigger challenge. Bats are very mobile, active at night and can cover areas not accessible by roads. For some species that don't travel far from the roost, ground tracking has been used to determine foraging habitat. For example, *Macrotus* in the California desert has been tracked from the ground while foraging in desert washes. *Corynorhinus* on Santa Cruz Island commuted from the roost at the coast to forage in native oak and ironwood forests on the mountains. Nocturnal aerial tracking from a light aircraft has been successful in determining foraging habitat and extending the distance traveled for three species of bats (*Macrotus*, *Euderma*, and *Idionycteris*). *Idionycteris* in Arizona traveled approximately 80 km roundtrip nightly between the roost in creosote bush scrub at 1000 meters and the foraging areas in mesquite grassland and pinyon/juniper woodland (1500 - 2000 meters) in the next mountain range to the east. Protecting habitat for foraging near the roost would not have been appropriate for this species.

Desert bats and management issues.

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Abstract: At least 17 bat species are found in the deserts of California and Nevada, and several more species occur sporadically. Many species are colonial, and a single impact can remove large numbers. Most bats have only one baby a year, and populations recover slowly. Roosting habitat (mines, rock crevices, trees, etc) may be over 30 km from foraging habitat. Human activities influence bat distribution and may threaten their survival. Mines provide primary shelter for several species, principally the California leaf-nosed and Townsend's big-eared bats, that are threatened by mine closure for hazard abatement and renewed mining, and by recreational entry into mines. OHV activity

impacts foraging habitat and increases access to mines and caves; recreational rock-climbing can disturb crevice-roosting species. Agricultural conversion and pesticides kill insect prey and may poison bats. Urbanization destroys foraging and roosting habitat. Channelizing desert washes removes riparian foraging habitat. Dams along the Lower Colorado River have altered bat diversity. Exotic vegetation (tamarisk) replaces native desert riparian and can change the prey base. Removal and burning of palm skirts can endanger roosting bats. Wind turbines can kill bats, especially during migration. Some of these impacts can be mitigated, such as by installing bat gates on mines, while others can only be acknowledged.

Pathogens associated with Pacific fishers (Martes pennanti) in northwestern California: Implications for trapping and translocation.

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Abstract: Western populations of fisher, *Martes pennanti*, were recently designated by the USFWS to be a distinct population segment (DPS) meriting listing under the Endangered Species Act. Disease was noted as a potential issue in this DPS, and this study provides preliminary information on exposures of a population in northwestern California that appears to have declined during recent years. Of 31 fishers sampled during Winter, 2005, one (3%) had been exposed previously to canine distemper virus, 13 (41.9%) had been exposed to a feline parvovirus-like virus, and 30 (96.8%) had been exposed to *Anaplasma phagocytophilum*, the cause of granulocytic anaplasmosis. Although little is known about disease in fishers, both viruses cause mortality of susceptible mustelids. In addition, anaplasmosis causes debilitating immunosuppression in susceptible species; the seroprevalence of fishers for exposure to *A. phagocytophilum* is unprecedented for areas other than Hoopa. While these data are preliminary, they illustrate the importance of (1) disinfecting traps and handling equipment between captures to minimize risks of spreading viruses throughout a population, and (2) consideration of disease issues prior to translocation of wildlife that could succumb to diseases cycling at a release site or into areas with existing communities that might be adversely affected by disease.

Genetic state-wide studies of black bears in California: Preliminary findings.

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Abstract: Black bears (*Ursus americanus*) are estimated to number about 30,000 in California and are distributed in habitats generally greater than 914 m in elevation. This species has experienced much range expansion in the past 20 years, doubling in estimated population size and expanding into habitats previously inhabited by the California Grizzly bear (CDFG 1998). To provide information on genetic diversity and population structure, we began sample collection and DNA analyses in 2003 for a state-wide population genetic analysis of black bears in California. Over 2500 samples from bears killed during the 2002-2005 hunt season, in addition to blood and tissue samples from depredation and public safety incidents have been collected.

We are using nuclear microsatellite markers to investigate the genetic diversity and gene flow between the habitat ranges of black bears. We will present preliminary findings with respect to usefulness of up to 17 loci for black bears in California and variation within and among California bioregions (Klamath, Modoc, Sierra, Mojave, South Coast and Central Coast). Information gained from this project will aid in our understanding of the biology and ultimately, the management of California black bears.

Conservation banking at the landscape-scale for the red-cockaded woodpecker

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Abstract: A tradable credit system is described that facilitates banking at the landscape-scale while recognizing the uncertainty associated with predicting a species' response to habitat fragmentation. Landscape Equivalency Analysis (LEA) is proposed as a method to integrate economic, ecological, and evolutionary theory providing a market-based approach for exchanging habitat within a landscape without compromising long-term population persistence. Under LEA, price of credits represents the in-kind replacement value of three ecological services emanating from endangered species habitat: 1) abundance; 2) average genetic variance within a local population, and 3) average genetic divergence among local populations. These ecological services are estimated at a regional scale which allows the exchange of credits to include tradeoffs between habitat area and connectivity to be made at local scales. Including genetic services minimizes risks of extinction from inbreeding and outbreeding depression while preventing the loss of genetic variance required for adaptation to changing environmental conditions. However, we are uncertain how a species will respond to changing habitat spatial associations. A spatially-explicit simulation model for the red-cockaded woodpecker is used to illustrate the range of ecological services that may result from a banking decision given our knowledge of the species' natural history. When a species requires migration among groups, LEA incorporates the influence of decisions at the local scale on the regional persistence of an endangered population.

The Irvine Wildlife Corridor Plan: Reconnecting the coast to the mountains.

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Abstract: Wildlife corridors are areas of natural open space that allow wildlife movement between natural habitats, promoting proliferation of indigenous species. In southern California, where natural areas are often scarce and wildlife reserves are continually being encroached upon and surrounded by development, connectivity between these habitats is perhaps one of the best feasible options for preventing localized extinction and enhancing biodiversity. A primary purpose of the Irvine Wildlife Corridor Plan is to connect, through habitat creation, two significant open space reserves – the Limestone-Whiting Wilderness Park to the north and the Laguna Coast Wilderness Park and Crystal Cove State Park to the south. Careful analysis of potential target species for this corridor and the existing conditions of the site resulted in the selection of 4 animals to guide corridor design and restoration. While sections of this corridor will provide habitat for a number of other species, the focus is primarily on two mammalian species – bobcat and coyote – and two avian federally listed species – least Bell’s vireo and California gnatcatcher. The two predators will also likely help regulate the population of mesopredators (i.e., small and medium-sized predatory mammals), which in turn will benefit bird and small mammal populations and help to restore ecological balance within the corridor and surrounding areas. The Plan seeks to integrate the habitat needs of target species so that movement between open space areas can be achieved with the many constraints and challenges of transforming a former military base into a wildlife corridor.

Population status of common murrelets in northern California, 1996-2004.

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Abstract: In 1996-2004, population size and trends of common murrelets (*Uria aalge*) in northern California (Del Norte, Humboldt, Mendocino, and Sonoma Counties) were examined using annual aerial surveys of breeding colonies. Whole-colony counts from photographs were determined for all colonies in 1997, 1999, 2001, 2003, and 2004, while sample colonies were counted in all years. The highest northern California total count (211,400) occurred in 2004 and reflected about 176,500 breeding pairs. Since 1989, most colonies in Del Norte and Humboldt Counties were stable or increased, including the four largest colonies (Castle Rock, 2004 count >80,000; False Klamath, Green, and Flatiron Rocks, 2004 counts >20,000). Redding Rock declined from human disturbance and other factors. Numbers of murrelets in Mendocino County (<10% of the northern California

total) increased steadily since 1989 with formations of five new colonies. No colonies occur in Sonoma County.

Site occupancy and detection probabilities of Cooper's and sharp-shinned hawks in the southern Sierra Nevada: Design considerations for monitoring Accipiters.

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Abstract: Biologists have recently made increased efforts to inventory and monitor forest raptors on a landscape level. Long-term monitoring programs that may detect population trends over time are useful for managers interested in determining thresholds of conservation concern. Such long-term monitoring programs have been conducted on the northern goshawk, although not on the more elusive Cooper's and sharp-shinned hawks. Using a model developed by MacKenzie et al. (2002), we conducted a pilot study at Mountain Home Demonstration State Forest to estimate the parameters of site occupancy and detection probability for each species. We surveyed 34 sampling units four times each throughout the breeding season, using the broadcast vocalization method. The model estimated that the proportion of area occupied for Cooper's and sharp-shinned hawks were 0.25 (SE=0.079), and 0.40 (SE=0.098), respectively. The probability of detecting Cooper's and sharp-shinned hawks at any given site was 0.56 (SE=0.098) and 0.47 (SE= 0.086), respectively. We also made estimates of survey effort and costs associated with conducting a long-term accipiter monitoring program.

A comparison of monitoring measures in habitat conservation plans approved before and after changes in federal and California policies and requirements.

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Abstract: This presentation 1) summarizes the evolution of monitoring policies and requirements under the federal Endangered Species Act and California Fish and Game Code from the late 1980s to present; 2) compares the monitoring provisions of select regional and large project-level conservation plans approved during that period, with an emphasis on plans in California; and 3) discusses the implications for completing and implementing conservation plans in 2006 and beyond.

Western Riverside County multiple species habitat conservation plan (MSHCP): A practical guide to year one implementation.

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Abstract: The Western Riverside County MSHCP is a joint Natural Communities Conservation Plan (NCCP)/Habitat Conservation Plan (HCP) for a 1.26 million acre Plan Area in Western Riverside County, California. The Plan provides for a 500,000 acre habitat reserve, assembled and managed for the benefit of 146 Covered Species including 83 animal species and 63 plant species. State and federal permits for the Plan were issued in August 2004 and Permittees include the County of Riverside, 14 cities within the Plan Area and a variety of other entities. A joint powers authority, the Western Riverside County Regional Conservation Authority (RCA), has been established to coordinate the efforts of the Permittees, including reserve assembly, funding, project consistency review and reserve management and monitoring. Plan preparation and permitting was an intense 5-year effort and the first year of implementation is even more challenging, in many respects. Key factors in implementing such a complex, comprehensive program will be emphasized along with a practical case study example, focusing on wildlife issues.

Diurnal and nocturnal roost site-fidelity of wintering dunlin (Calidris alpina pacifica).

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Abstract: Roosts represent an important, yet poorly understood, aspect of the ecology of non-breeding shorebirds, especially in coastal habitats where tides predictably inundate foraging areas. Roosts are often considered traditional based on predictable occupancy by large numbers of birds over long time intervals. However, little is known of the day-to-day fidelity of individuals to particular roosts, especially on a spatial scale of individual home range. Consequently, we studied fidelity of dunlin (*Calidris alpina pacifica*) to high-tide roosts during the day and night using radio-tagged birds wintering on Humboldt Bay in northern California. Individuals had significantly higher fidelity to fewer roosts and higher use of terrestrial habitat (vs. marine habitat) at night than during the day. Precipitation and predation danger appear to be the factors most influencing roost choice. We suggest that the notion of tradition is scale-dependent. At the scale of individual home range, fidelity to roosts was lower than reported by others working over larger spatial and longer temporal scales. These findings have implications for the notion of habitat limitation, especially under the influence of natural and anthropogenic disturbance.

Habitat relationships of breeding landbirds in riparian habitats along the San Joaquin River.

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Abstract: Riparian habitat and water flows in the San Joaquin Valley have been seriously diminished resulting in changes to the landbird community. Region-specific information on the habitat associations of multiple bird species is needed by land managers to make informed decisions regarding restoration design. Predictive bird-habitat association models for species presence, abundance, species diversity and species richness were built using bird and vegetation collected from 175 unique point count stations in the San Joaquin Valley from 2003 to 2005. Both individual species and the overall breeding songbird community were influenced by a number of different habitat features; some related to specific plant species and others to vegetation structure and density. The value of these is an important step toward improving riparian habitat for a diverse bird community despite our limited understanding of the demographic parameters that directly influence songbird fitness and the processes that may limit these parameters (e.g., fecundity and survival). Increased collaboration between researchers and managers, and reevaluation of our results over time is needed to insure the cost effective and successful management of riparian habitat in the San Joaquin Valley.

Yellow-billed magpie in Sacramento: Declines at roost sites following the 2005 West Nile virus outbreak.

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Abstract: The 2005 outbreak of West Nile virus (WNV) in the Sacramento region created concern for the yellow-billed magpie (*Pica nuttalli*), a California endemic. During 2003 and 2004, prior to WNV detection, I initiated monitoring for yellow-billed Magpies at 3 major roost sites in the Sacramento area. Several of these roosts supported up to 1,000 individuals. In fall 2005, following the WNV outbreak in Sacramento, monitoring showed that no birds were present at two roost sites while the third declined by 20%. Long-term historical use of these sites prior to 2005 suggests that the decline in numbers at roosts may represent a dramatic local population decline, rather than a shifting of use pattern. This decline also coincides with the detection of large numbers of dead magpies in the Sacramento region, and high incidence of WNV in tested birds. These results indicate that the yellow-billed Magpie is particularly susceptible to WNV infection and that WNV has likely caused a substantial local population decline. Increased monitoring effort is warranted to evaluate current and long-term effects of WNV on magpie populations in Sacramento and throughout its range.

Space use of American avocets in south San Francisco Bay.

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Abstract: Wetland conservation of endemic waterbirds may be improved with greater knowledge of their space use patterns. Life-history patterns are often not considered in the analysis of home range, core use areas, and spatial movements. From March through July 2005, we radio-marked 50 American Avocets (*Recurvirostra americana*) in the South San Francisco Bay and monitored 5 individuals from pre-breeding through post-breeding. Our results indicated that American Avocet space use did vary with life-history stage. Pre-breeding home ranges (960 ha) and core use areas (133 ha) were greater than during the incubation stage (151 and 23 ha, respectively). Post-breeding home ranges (5,389 ha) and core use areas (1014 ha) were, in turn, greater than during pre-breeding and incubation stages. Pre-breeding and incubation stage core use areas often overlapped, indicating that avocets were prospecting in potential nesting locations prior to egg-laying. As expected, core use areas during the incubation stage centered on nest locations. Large post-breeding home ranges suggested that American Avocets used a wider range of foraging areas when not restricted by reproductive activities. During each stage, American Avocets used a wide variety of habitats, including non-tidal and tidal salt ponds, tidal sloughs, mud flats, and water treatment ponds.

Developing a conservation strategy and an adaptive management and monitoring program for the Solano Habitat Conservation Plan.

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Abstract: We developed a Conservation Strategy and Adaptive Management and Monitoring Program for the Solano Habitat Conservation Plan (HCP). The plan was developed from a natural community perspective and incorporates an adaptive approach to conservation planning. Conceptual models for each covered species and natural community were developed and used to guide and facilitate the review of the conservation planning process. From the conceptual models, key conservation elements or potential indicators of ecosystem health, such as disturbance levels or species richness, were identified for each natural community throughout the Plan Area. These key elements were then used in a landscape level analysis to identify areas of high conservation value. The landscape level conservation analysis was combined with a county-wide risk analysis to develop a reserve design vision for the Solano HCP. Finally, the conceptual models were used to develop the Adaptive Management and Monitoring Program. Major pressures affecting each covered species and natural community, and the major uncertainties, assumption and data gaps associated with our current knowledge of

the system, were identified throughout the Plan Area. From these, appropriate monitoring variables and targeted studies were chosen to guide the first two phases of the Adaptive Management and Monitoring Program.

West Nile virus, genetics, and the yellow-billed magpie.

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Abstract: The yellow-billed magpie (YBMA) is an endemic California corvid with a range limited primarily to the Great Central Valley and sections of the Central Coast Range. The species has experienced reduction in numbers and contraction of its historical range due to past bounty hunting and loss of habitat. Beginning summer 2004, the first YBMA death due to West Nile Virus (WNV) was documented by the California Department of Health Services WNV Dead Bird Surveillance Program. Approximately 75% of the YBMA submitted to the Surveillance Program in 2004 and 2005 tested positive to WNV. As part of our studies to evaluate the impacts of WNV on raptor and corvid population viability, ecology, and health, we examined organ pathology associated with WNV and developed polymorphic nuclear DNA markers to test whether WNV is causing alterations in genetic diversity and population structure. Necropsy findings for 25 WNV-positive YBMA indicated severe and acute necrosis (cell death) in multiple organs. Preliminary results will be presented on genetic marker development and population data for 100 pre-WNV YBMA. We will relate the significance of dead bird surveillance, pathology, and genetic findings to health and viability of the species, and present plans for future work.

Shorebird Management rotating with rice production at the Yolo Wildlife Area.

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Abstract: The Yolo Wildlife Area manages wetland habitat for a variety of species. It endeavors to incorporate agricultural practices into the management of the Wildlife Area and has pioneered a rotation of summer shorebird habitat followed by rice production in the same field the following year. The Wildlife Area benefits by having shallow water shorebird habitat in mid summer when shorebirds are migrating south and by receiving income during the rice production phase. The farmer receives the benefits of weed

control and increased yields. The Wildlife Area currently is managing approximately 500 acres in this fashion

The experience of species conservation banking in the United States.

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Abstract: The ability to receive financial gains for protecting habitat on private property may provide the incentive necessary to proactively protect endangered species in the United States. The practice of species conservation banking (the selling of 'credits' that represent biodiversity values on private land) is nearly a decade old. However, this is the first comprehensive report detailing the biological, financial, and political experience of conservation banking in the United States. We compiled comprehensive accounts of the experiences of current bank owners. While there are 76 properties identified as 'conservation banks' in the United States, only 35 of these are established under a conservation banking agreement. These official conservation banks cover 39,488 acres for over 22 endangered species.

Financial motives drove the foundation of 91% of banks. With credit prices ranging from \$3000 to \$125,000, banks offer financial incentives that compete with building golf courses and homes, and provide a business-based argument for conserving habitat. While the bureaucracy of establishing an agreement with the Service was burdensome, 63% of bank owners reported that they would set up another. Increasing information sharing, decreasing the time to establish agreements (averaging 2.18 years), and reducing bureaucratic challenges can further increase the property committed to banking.

Status and trends of mollusks under the Northwest Forest Plan's Survey and Manage program.

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Abstract: The Survey and Manage Standards and Guidelines adopted in the 1994 ROD for the Northwest Forest Plan were designed to increase protection for species that were at risk because of inadequate habitat protections under Alternative 9, the preferred alternative that was originally developed during FEMAT. Eventually about 400 old-growth associated Survey and Manage species were selected, including about 200 species of fungi, 46 aquatic and terrestrial snails, a variety of vascular and non-vascular plants, a few vertebrates and four guilds of arthropods. There were four primary mitigation measures: 1) manage known sites of certain species; 2) conduct surveys prior to ground-disturbing activities; 3) conduct extensive surveys to find high priority sites for hard-to-find species; and 4) conduct general regional surveys to gain information about poorly known species. In 2001 the Survey and Manage protocols were amended with the intention of making surveys more efficient and less costly. In 2004, the Survey and Manage provisions were removed and replaced with protections afforded under the federal land management agencies' sensitive species programs. Using mollusks as a

representative group, an assessment of the current status of native species and a summary of knowledge gained over 10 years of surveys will be presented.

Serological and PCR evidence of Anaplasma phagocytophilum in gray foxes (Urocyon cinereoargenteus) in northern Humboldt County, California.

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Abstract: Granulocytic anaplasmosis (GA) is an emerging tick-borne disease in North America caused by *Anaplasma phagocytophilum*, an obligate, intracellular bacteria. Since first reported in 1994, over 1300 human cases have been documented in the U.S. Although GA has been documented in numerous wildlife species, gray foxes (*Urocyon cinereoargenteus*) have not been evaluated previously for exposure to this agent. Traps were set for 1522 trap-nights during a 16-month period in 2003-2004 within the Hoopa Valley Indian Reservation, Humboldt County, California. A total of 54 individual gray foxes were sampled and 16 individual foxes were recaptured. Twenty-eight (52%) of these gray foxes were *A. phagocytophilum* seropositive. Foxes trapped in areas outside tribe-established human residential boundaries were more likely to be seropositive (16 of 23) than foxes trapped within the human residential boundary (12 of 31). There was a significant decreasing trend in seroprevalence from summer to winter. Six (9%) of the 70 total captures were infected at the time of capture as determined by PCR amplification of DNA with sequences matching *A. phagocytophilum*. We suggest that gray foxes may serve as competent wildlife sentinels of *A. phagocytophilum*. The clinical implications of anaplasmosis in gray foxes are not known but deserve further investigation.

Wildlife habitat changes in mixed-conifer forests in the central Sierra Nevada.

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Abstract: In the early 1930s, the U.S. Forest Service developed the Vegetation Type Map (VTM) for the forests, woodlands, shrublands, and grasslands of California. In forests, detailed information on tree species composition, diameters, and heights and ground cover were collected on rectangular 0.2-acre plots to support the map. These plots were collected at the time when active fire suppression as well as large-scale industrial logging was just beginning in California so these data represent baseline pre-fire suppression habitat conditions. Comparisons of VTM data with current measurements from the same locations can yield important information on changes in wildlife habitats. To determine if changes have occurred to mixed-conifer habitat, we re-measured vegetation at 74 relocated VTM points in central Sierra Nevada in 2002 and 2003 using a cluster of three 0.2-acre plots. Points were randomly selected from more than 2,500 original VTM plots measured between 2000-6000 ft elevation. We found that stem densities and basal areas

were significantly greater and tree diameters significantly smaller in 2002-03 than in the 1930s. These differences indicate that substantial changes in wildlife habitat have occurred in the past 70 years, which has implications for forest and wildlife management in this region.

Sex and habitat effects on home ranges of blunt-nosed leopard lizards (Gambelia sila).

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Abstract: I radio-tracked 33 male and 27 female blunt-nosed leopard lizards (*Gambelia sila*) from 2002-2004 in the southern San Joaquin Valley of California. From May to July each year (to August in 2004), I tracked leopard lizards 2-4 times per week and recorded GPS locations. Mean home range size of females was 5.51 ha using 95% MCP and 7.79 ha using 95% Kernel Method, which was not significantly different from mean home range size of males of 5.69 ha (95% MCP) and 8.42 ha (95% Kernel Method) based on ANOVA (MCP, $F_{0.05, 1, 58} = 0.01$, $P = 0.923$; Kernel, $F_{0.05, 1, 58} = 0.09$, $P = 0.765$). However, 3 female home range estimates (1 female each year) were 2-3 times larger than other female estimates. When these estimates were removed, standard error estimates were similar between males and females and there were significant differences in mean home range sizes (MCP, $F_{0.05, 1, 54} = 16.06$, $P = 0.0002$; Kernel, $F_{0.05, 1, 55} = 13.54$, $P = 0.001$). In 2004, comparisons were made of home range size in open areas and areas covered by saltbush (*Atriplex* sp.). No differences in sizes of home ranges were found for males (MCP, $F_{0.05, 1, 15} = 0.177$, $P = 0.680$; Kernel, $F_{0.05, 1, 15} = 0.331$, $P = 0.573$) or females (MCP, $F_{0.05, 1, 12} = 0.004$, $P = 0.949$; Kernel, $F_{0.05, 1, 12} = 0.41$, $P = 0.843$) between open areas and areas with shrubs.

Winter use of an inland lake by western gulls.

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Abstract: Western gulls were found to be abundant (as many as 8,000 individuals) at an inland lake in southern California, 70 km from the coast. We surveyed Castaic Lake for gulls every 10-18 days for extended periods between 2002-2005. Gulls were few in summer and fall, but dramatically increased in November. Gull numbers were variable between November and March, after which most individuals returned to the marine environment (presumably to the breeding colonies). Based on DNA samples of captured gulls ($n=25$), this population was 84% female. We radio-marked 12 of these gulls. Although count surveys showed western gulls to be numerous throughout winter, these individuals regularly used the marine environment, and fewer than 20% of the radio-marked gulls were present at the lake at any one point in time. Thus the total number of gulls using the lake was much greater than indicated by ground counts on any one day. Most western gulls at the lake appeared to be associated with the breeding colony at Anacapa Island. We found correlations between abundance, movements, and

low pressure weather systems, and speculate that Castaic Lake provided sheltered and safe roosting with available food during and following storm events.

Using results from bird monitoring to set biological objectives in riparian habitat.

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Abstract: The conservation and restoration of riparian systems is a high priority in California. To maximize the cost-effectiveness of the millions of dollars currently spent on riparian restoration; these efforts need to be guided by sound biological objectives. Quantifiable biological objectives can be used to prioritize and evaluate projects and guide conservation actions and management activities. We used bird species richness and diversity, abundance and population trends, and demographic parameters derived from long-term riparian monitoring programs to set biological objectives. Examples include calculating population targets of focal species across Central Valley basins, evaluation of specific restoration projects and programs, and providing measurable indicators for agencies involved in restorations projects. We demonstrate the utility of long-term bird monitoring programs and the need for their continuation.

The Lower Colorado River Multi-Species Conservation Program.

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Abstract: In 1995, U.S. Department of Interior agencies, water, power and wildlife resource agencies from Arizona, California, and Nevada, Native American tribes, and other interested parties formed a partnership to develop a long-term endangered species compliance program for the historical floodplain of the Lower Colorado River from the lower Grand Canyon to the Southerly International Boundary with Mexico. The resultant Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a fifty-year program to conserve habitat and work toward the recovery of threatened and endangered species, as well as reduce the likelihood of additional species being listed, while accommodating present and future water and power needs. The Bureau of Reclamation, as lead Federal agency for the LCR MSCP, began implementation of the Habitat Conservation Plan (HCP) with the signing of the Record of Decision on April 4, 2005. The HCP calls for the creation of over 8,100 acres of riparian, marsh, and backwater habitat for 26 covered species, in addition to the maintenance of existing habitat. Native fish populations will be augmented to insure sufficient numbers for reintroduction into suitable habitat. Research and monitoring programs will provide data to effectively and efficiently implement the HCP, utilizing an adaptive management approach.

Shifting populations of yellow-billed cuckoos on the Sacramento River: A 20-year perspective.

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Abstract: We conducted surveys for yellow-billed Cuckoos on a 160-km stretch of the Sacramento River in 1977, 1987-90, 1999, and 2000. We observed shifts in site use both during consecutive years, and every decade. The greatest shift in site use occurred during the period between the 1987-90 and 1999 surveys. Only 30% of the sites were used during both the 1999 and 1987-1990 survey periods. In contrast, over 50% of patches were used in both 1999 and 2000. The total population of cuckoos was similar during the periods compared. There was little human-mediated alteration of riparian habitat between 1987 and 2000. One possible reason for this shift in use may be varying prey populations. These results have important implications for management, since decisions based on single-year surveys may underestimate the value of some habitat patches. We recommend a minimum of three years of surveys to determine the significance of any given section of riparian to yellow-billed cuckoos. Further management implications will be discussed.

Lower Colorado River habitat restoration for Neotropical migratory birds and water acquisitions and uses.

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Abstract: In order to provide approximately 9.0 million acre-feet of Colorado River water annually to the States of Arizona, California, and Nevada, as well as the Republic of Mexico, the Lower Colorado River was dammed, channelized, and flood-control levees were constructed. The consequences of nearly 100-years of water resources development includes: (1) a significant reduction in the frequency of over-bank flooding; (2) decoupling of the river from the adjacent floodplain; and (3) a conversion of the native riparian plant community to one dominated by exotic salt cedar (*Tamarix, spp.*). In 2005, after ten years of development, the states of Arizona, California, and Nevada and the Department of the Interior began to implement the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The LCR MSCP will restore and maintain over 8,100 acres of native wetland and riparian habitats over a fifty-year period. A critical component of the LCR MSCP is the acquisition and utilization of mainstream water supplies for habitat restoration and maintenance activities. Currently Lower Colorado River water supplies are fully apportioned and developed. Obtaining water supplies for habitat restoration purposes will likely be controversial with attendant water rights administration and policy ramifications.

Population ecology of long-billed curlews breeding in non-native grasslands.

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Abstract: The long-billed curlew is one of the most threatened shorebirds in North America. Habitat loss and degradation has led to a severe contraction of the long-billed curlew's historic breeding range and a significant reduction in global population size. In portions of the western United States, however, curlew numbers have increased in association with the development of non-native grasslands such as hayfields and irrigated cattle pastures. We studied the population ecology of long-billed curlews breeding in hayfields and adjacent rangeland habitat in northern Nevada during the springs and summers of 2003-2005. Absolute nest success was consistently low among years and averaged 25 percent. A high propensity for re-nesting, however, resulted in a per female nest success rate of 41 percent. Chick survival varied among years, with the greatest fledging success recorded during the wet year of 2005. On average, females fledged 0.16 female chicks per year, which coupled with high juvenile and adult annual survival rates, corresponds to a slightly declining to stable population. Long-billed curlew productivity appears to be limited during the nesting phase as nest predation rates were quite high. Additionally, egg inviability reduced the number of young hatched from successful clutches.

The landscape genetics of invasion: A study of California wild pigs.

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Abstract: Questions of research and management are particularly applicable to California wild pigs because of the potential impacts on native species. California wild pigs originated from free-range domestic pigs introduced by into early Spanish settlements in the coastal region in the 1700s and Eurasian wild boars subsequently introduced into Monterey County in 1925 and in the 1950s. Estimates suggest that this hybrid population could contain anywhere from 64,000 to 100,000 wild pigs statewide. Investigations into the effect of spatial pattern on invasion are needed to determine the prospects of land management programs to control invasive species, especially since the structure of the landscape affects the spread of invasion in multiple ways. We are analyzing the population genetic structure of wild pigs in the Central Coast region of California using neutral markers (microsatellites), and will present our findings to date on the genetic relatedness and landscape genetics of sampled pigs from counties including Monterey, San Luis Obispo, Santa Clara, and others.

Efficacy of feral pig removals at Hakalau Forest National Wildlife Refuge, Hawaii.

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Abstract: We compiled and analyzed data from 1987–2004 on feral pig (*Sus scrofa*) management at Hakalau Forest National Wildlife Refuge, a tropical montane rainforest on the island of Hawaii. These data included annual sign surveys, the number of pigs removed from fenced management units, and age and reproductive status from necropsies. We found an essentially even sex ratio within the population and within age classes, although males lived to 60 months while females lived to only 48 months. Pregnancy occurred throughout the annual cycle, but lactation peaked in April–June. Reproductive rates also increased with age, peaking at 2–4 years in females. We reconstructed the standing population within a 5,000 acre closed unit to examine demographic processes. We estimated that annual removal in excess of approximately 41–43% of the population was necessary to affect a decline. Annual sign surveys showed a strong and sustained decline in pig activity after 1997 relative to unmanaged areas. We related the standing population to annual sign surveys to build a predictive model of feral pig density, and then applied this model to other management units. We evaluated control methods and found snaring to be more efficient than staff or public hunting

Hetch-Hetchy – To drain or not to drain.

Dale Hoffman-Floerke, California Department of Water Resources, 1416 Ninth Street, Rm. 1148, Sacramento, CA 95814, (916) 651-7052, E-mail: dalehf@water.ca.gov.

Abstract: In December of 2004, the Resources Agency, by request from the Governor's Office directed the Department of Water Resources and the Department of Parks and Recreation to evaluate the most recent studies on restoring Hetch Hetchy Valley. Further, the Resources Agency Secretary requested that DWR and DPR provide a balanced analysis on what information and further work would be needed for decision makers to decide whether or not such a process should be undertaken to restore Hetch Hetchy Valley. This presentation will provide an overview of the State's work, conclusions of the study, and potential next steps, as outlined in the State's Report, released in late Fall, 2005.

Conservation strategies for cougars in Riverside County, California: From models to management.

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Protection Agency, Western Ecology Division, Corvallis, OR 97333, brad.mcrae@nau.edu; Paul Beier, School of Forestry and Merriam-Powell Center for Environmental Research, Northern Arizona University, Flagstaff, AZ 86011.

Abstract: The conservation of wide-ranging carnivores depends critically on planning efforts that consider the habitat requirements of a species at multiple spatial scales. To maximize their utility, these efforts should rely on models constructed and validated using empirical data collected at scales relevant to animal behavior. In southern California, cougar (*Puma concolor*) populations persist in areas increasingly dominated by human influence. Often, these populations are only tenuously connected by habitat features, and man-made barriers to movement are common. To model suitable habitats, core areas, and landscape connectivity for cougars in this region, we applied data from field studies to a 35,000 km² landscape that included all of Riverside County. Results from these studies included information on cougar response to vegetation, topography, and roads at three spatial scales. Although our models identified sizable amounts of suitable habitat, many of these areas provided few key resources, were highly fragmented, and were separated by features that inhibited cougar movement. Circuit-theoretic models of connectivity identified multiple pathways where landscape resistance was minimized by the preservation of important core areas. Our results suggest that regional efforts to conserve and manage cougars should reflect the scale-dependent patterns of selection exhibited by this species.

Controlling the spread of New Zealand mud snails on wading gear.

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Abstract: The New Zealand mud snail is a new invasive species in California. First discovered in 1999 in the Owens River, mud snails are now found in three rivers and Putah Creek on the west side of the Sierra Nevada Mountains as well as being well established in the Owens River drainage. Mud snails have been found in concentrations in excess of 100,000 snails per square meter of streambed. This study focused on a phased approach to identify chemicals and cleaning methods that can easily be used in the field to effectively remove snails from wading gear with minimal corrosiveness to the gear. Solutions of copper sulfate, benzathonium chloride and Formula 409 Disinfectant were found to be the most efficacious. Three different methods of applying the solutions to waders and boots were tested during the study. Use of full immersion, and shaking in a dry sack were efficacious for all three solutions. Applications using a spray bottle worked well for copper sulfate however snails survived when treated with the Formula 409 Disinfectant solution. The spray bottle application method was not tested for benzathonium chloride.

Perchlorate concentrations in upland game from a former rocket motor assembly and test facility on the San Jacinto Wildlife Area, Riverside County, California and implications for future game management.

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Abstract: The California Department of Fish and Game (DFG) is considering allowing public access to the Potrero Canyon Unit of the San Jacinto Wildlife Area for hunting mourning dove, California quail, jack rabbit, and cottontail rabbit. The Potrero Canyon unit encompasses a former rocket motor assembly and test burn facility. Recent testing indicates high levels of perchlorate contamination. DFG collected samples of the target game species and analyzed their muscle tissue for perchlorate residues using High Performance Liquid Chromatography-Mass Spectrometry. The average perchlorate concentrations in local upland game species were: mourning dove, 2.35 ng/g; California quail, 3.34 ng/g; jack rabbit, 11.97 ng/g; and cottontail rabbit, 1.01 ng/g, based on fresh or wet tissue weight. The Office of Environmental Health Hazard Assessment estimated seasonal and annual consumption of these species from published reports, data on weights of edible muscle in the collected samples, and DFG estimates of meal sizes, and calculated corresponding perchlorate exposures for hunters and their families consuming game from this area. The potential for mobilization of contaminants and possible human exposure through consumption of game species needs to be considered as a component of habitat restoration and land use planning in areas with a history of prior use for industrial or agricultural activities.

Indicators, umbrellas, and endangered species: What is our monitoring goal?

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Abstract: Riparian habitats are among the rarest and most degraded in North America; in California's Central Valley over 95% of the riparian habitat has been lost in the past 150 years. As part of an unprecedented effort to restore riparian habitat and wildlife populations in the region, PRBO Conservation Science has been conducting intensive monitoring of riparian bird populations at restored and intact remnant riparian sites within the Central Valley to evaluate the success of restoration projects. Restoration monitoring of birds has occurred since 1993 at multiple riparian sites along the Sacramento River, San Joaquin River, and the Cosumnes River. Using these data, I compare monitoring results from multi-species, focal species, and endangered species approaches in order to investigate the inferences we obtain from different avian monitoring strategies in riparian systems.

West Nile virus antibody prevalence in California raptors.

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Abstract: West Nile virus (WNV) arrived in North America in 1999 and rapidly spread across the continent, and has now been detected in all 48 contiguous states. During its westward spread WNV has been documented as a source of significant avian mortality, particularly among raptors and corvids, which appear to be particularly susceptible to WNV-induced mortality. To assess the extent of WNV exposure in California raptors we began testing of six species for antibodies against WNV in the summer of 2004. These included red-tailed, red-shouldered, and Cooper's hawks, northern goshawks, spotted and great gray owls. We will present preliminary results from this serosurvey along with factors that may result in variation in antibody prevalence among species and across habitats.

Boardwalk use by Cassin's auklets at Southeast Farallon Island.

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Abstract: Cassin's and rhinoceros auklets dig burrows across the marine terrace of Southeast Farallon Island. These burrows collapse when trampled by field biologists. To help prevent collapsed burrows, wooden boardwalks were built in the early 1970s to allow passage through burrow areas. In September 2000 these were replaced with recycled lumber boardwalks, consisting of 18 sections totaling 812 feet. Boardwalks were installed with every 4th plank missing to allow burrowing seabirds access to habitat, except 3 of the boardwalks do not have planks missing to allow for research activities. Monitoring began in 2001 to: 1) document colonization of newly created habitat; 2) survey burrow utilization by auklets; and 3) compare density of auklet burrows in the "influence" zone. The first survey in August 2001 identified 52 burrows. The number of burrows increased steadily from 2001 to 2004, reaching a peak of 138 in June 2004. Of these, 67.4% had nesting activity (88 Cassin's auklets, one rhinoceros auklet, and six undetermined). Only 60 burrows were found in June 2005 due to an overall reduction in nest attempts. Burrow density is much higher in the boardwalk zone of influence compared to "natural" areas; however, the occupancy rate is comparable to monitored natural areas.

Effects of night roost loss on brown pelican distribution in southwest Washington.

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Abstract: An underwater jetty was installed at the mouth of Willapa Bay, Washington in 1998, as part of a project to reduce shoreline erosion. According to some predictions, the jetty was expected to redirect wave and current energy to a sand island that was a key traditional night roost for thousands of non-breeding brown pelicans. Willapa Bay was one of the most important locations for migratory pelicans in the Pacific Northwest at the time. We monitored pelican response to habitat changes at Willapa Bay in 1998-2005. We also monitored use of the two major estuaries immediately north and south of the project site, the Columbia River estuary and Grays Harbor. Erosion of the traditional night roost in Willapa resulted in a shift in use to a lower quality island within the bay in 1999, but when that island also eroded in 2001, there was no suitable alternate night roost site. Loss of night roost habitat coincided with a dramatic decline in use of the bay for foraging and diurnal roosting, as well as increased use of the surrounding estuaries. Pelicans began a return to Willapa Bay in 2004 when a new sandbar accreted naturally and became a suitable night roost.

Challenges in monitoring the Kern primrose sphinx moth.

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Abstract: The Kern primrose sphinx moth (*Euproserpinus euterpe*) is the only federally listed threatened or endangered moth in the continental U.S. The moth was originally described in 1888 from "San Diego," and was later presumed extinct because none could be found. In 1974, a population was discovered in Kern County, putting into question the validity of the original type locality. By 1982 this population was feared extinct, purportedly due to overcollecting and the unsuitability of an invasive introduced *Erodium* as a larval food plant. Fortunately, this is not the case; the Kern County population is extant, populations have recently been discovered in several new localities, research is being conducted on its ecology, and a monitoring program has been initiated.

Winter ecology of pallid bats in central coastal California.

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Abstract: Although pallid bats have been studied extensively during summer months, few studies provide information on the winter ecology of this species. In late October and early November of 2001, temperature-sensitive radio tags were attached to three males and two females. Males and females typically roosted together in a primary winter roost, the attic of a building located near a stream, but other nearby roosts were used intermittently. Bats exited their primary roost intermittently throughout the winter. Day

roosts comprised the attic of a building; trees, including a *Quercus lobata*, (diameter at breast height [dbh] = 52 cm), several *Quercus agrifolia* (dbh = 10 - 39 cm), *Umbellularia californica* (dbh 45 cm), and ground roosts. Winter roosts were located in shaded areas along the edges of a riparian oak woodland forest all within 100 M of a perennial stream, where temperatures remained consistently cool. Females began roosting at a maternity roost (approximately 2 KM from the winter roost and stream) in mid-March while males continued to roost at and in the vicinity of the primary winter roost. Additional results from attaching temperature-sensitive radio tags on ten additional pallid bats from the same population during the 2005/2006 winter will be presented.

An improved technique to capture bats using macro or stacked nets.

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Abstract: The use of Macro mist nets (6 m or 9 m high x 30 m long) enables investigators to increase the height and surface area of smaller, more conventional mist nets. However, when using macro mist nets, the horizontal tension on shelf cords is difficult to maintain without losing the ability to easily lower or raise net shelves. Most designs are either effective but expensive and cumbersome (e.g., sailboat masts and track with runners), or do not easily maintain proper shelf cord tension and maneuverability (pole with continuous rope and shower curtain rings). This design with materials costs under \$300 U.S. is 1.5 m long, weighs 24.5 kg, and has been tested since 1996 in California, Costa Rica, Belize, and Panama. Mean installation time = 52 min., and mean dismantling time = 50 min. (n = 5 for each). Some bats (e.g., *Molossus ater* in Lamanai, Belize and *Micronycteris schmidtoroum* in Costa Rica) were caught in the macro net but not caught in smaller (3 m x 18 m and 2 m x 6 m) mist nets. The macro net caught more bats per hour per area under tall closed canopies, but not along open roads, paths, or in meadows. The combined use of macro and smaller-sized nets maximized the number of species and individuals caught.

Using camera traps to conduct a population survey of fishers (Martes pennanti) in the southern Sierra Nevada

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Abstract: In California fishers (*Martes pennanti*) have experienced a significant range reduction over the past century that has isolated populations in the southern Sierra Nevada mountains. From 2002 - 2004, we used camera traps to estimate the abundance of a subpopulation occupying a 317 km² area in the Sierra National Forest. Animals were marked with ear tags by live trapping, then resighted using remotely-triggered cameras at baited stations. Density estimates of fishers ranged from 10-13 animals per 100 km². Fishers in this region occur in low densities compared to other parts of their

range, prompting concern for their persistence. These results show that camera resight can be used to monitor populations of this elusive animal.

Insects: Should we care?

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Abstract: There are perhaps 20 million species of insects and other terrestrial arthropods worldwide. In California alone there are probably 100,000 species. Yet even in California we know relatively little about the natural history, distributions, seasonality, and in some cases, taxonomy of these creatures. Insects play many critical roles in terrestrial environments. They are food for many animals, irreplaceable pollinators, important nutrient recyclers, and some are parasites or transmit pathogens to plants and animals. Except for a very few listed species, we do not now monitor insect populations. However, insects can be valuable indicators of environmental health or change, and using them as bioindicators would be far less costly and raise fewer public concerns than many of the vertebrates we study. Increased emphasis needs to be placed on this poorly-known part of our fauna.

High resolution DNA marker panel for puma ecology and forensics.

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Abstract: Mountain lions, or pumas, are a management and conservation concern in California not only because of their declining habitat but also due to their interactions with humans, livestock, and other wildlife species of concern such as bighorn sheep. Development of a suite of robust microsatellite markers will benefit several puma studies in California. Once developed, these tools will allow ascertainment of at least first order (parentage and full sibs) kinship relationships, and perhaps second order (half sibs, aunts/uncles, etc). Such information is a vital addition to puma ecological studies that incorporate telemetry and demographic information. In addition, a panel of tetrameric microsatellites will aid in the forensic identification of specific pumas that come into contact with humans, domestic species, and endangered bighorn sheep. We developed mountain lion specific microsatellite primers and are testing these markers for variation and population differentiation. We will present the results of these preliminary microsatellite panels as they are tested on California mountain lion populations.

California treefrogs: Assessment of status, threats, and management strategies within Joshua Tree National Park.

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Abstract: California treefrog (*Hyla cadaverina*, CTF) populations within Joshua Tree National Park (JOTR) have declined since the mid 1960s. At that time they were observed in 7 different drainages, but as of 2000 CTF could only be located in 3 drainages. Although cause for the decline is unknown, factors such as human disturbance, lack of water, habitat loss and alteration have been implicated. At the current rate of decline, CTF are at serious risk of disappearing from JOTR within the next few decades. Our 2-year-old project focused on the 3 known areas where CTF are still found. 2004 yielded: 2516 tadpoles, 51 metamorphs, and 104 adults. 2005 yielded: 2593 tadpoles, 5 metamorphs and 58 adults. CTF life history characteristics of an 8-week metamorph period appear to be related to the population decline. Observations from this past season indicate that flooding and stream geomorphology due to summer thunderstorms may have significant impacts on tadpole and metamorph survival. In assessing the population sizes, locations, threats and habitat conditions, it is unclear if management actions will prevent further decline of the CTF or whether environmental conditions have changed to the point where this species can no longer persist in this area.

Status and behavior of the pygmy rabbit (Brachylagus idahoensis) in Nevada's Great Basin desert

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Abstract: This project is part of an ongoing study to determine the current distribution, status, and natural behavior of the pygmy rabbit (*Brachylagus idahoensis*) in Nevada and California. Surveys across the historic range were conducted by placing Trailmaster active infrared-triggered camera systems into areas with appropriate habitat. To date, we have found 198 new positive sites. In addition, 101 historical pygmy rabbit records from Nevada were obtained from the published literature, museum collections, and agency files. We visited and assessed 86 of these sites and found that 51% still have pygmy rabbits. While the overall distribution remains similar to that demonstrated by historic records, new active colonies are being located in valley bottoms, while historic sites were found in higher upland canyons. Available habitat may be shifting due to a combination of pressures from wildfires, grazing, and juniper encroachment. Camera data were used to explore temporal activity patterns and to compare behavior among different populations. Four populations were studied, two in Northern Nevada and two at the southern extent of the range in Central Nevada and Eastern California. Rabbits were captured with Havahart box traps and were uniquely marked for mark-recapture analysis. Population sizes were also estimated using transect surveys. Differences were found in the level and timing of activity; however pygmy rabbits in all populations exhibited a bi-modal activity pattern with peaks at dawn and dusk.

Low nest survivorship in a coastal California warbling vireo population.

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Abstract: Local extirpations or declines in western warbling vireo (*Vireo gilvus swainsonii*) populations have been detected at various locations throughout California. Evidence has suggested that poor reproductive success may be contributing to this decline. In 2003 and 2004, we located and monitored 32 warbling vireo nests at a riparian cottonwood forest on the Carmel River in California. Twenty-eight of 32 (87.5%) nests failed; 89% of these nests failed during the incubation stage. Vireo pairs commonly re-nested; cumulatively 72% of nests were re-nesting attempts. Despite the high number of re-nesting attempts, yearly pair success was also low. Only 25% of the vireo pairs successfully fledged an average of 2.5 young per nest each year. Overall, we detected low annual productivity for a western warbling vireo population on the Carmel River. These data may help elucidate which stage of the vireos' annual cycle may be the most compromised and thus contributing towards western warbling vireo declines or local extirpations in California.

Pacific fisher distribution and habitat in the Shasta Lake region of northern California.

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Abstract: As part of a suite of field investigations related to the proposed raising of Shasta Dam and expansion of Shasta Lake, North State Resources, Inc. performed forest carnivore surveys to determine the presence of fisher. The survey effort was initiated during a pilot study in 2003, followed by two large-scale surveys in 2004 and 2005. Eighty-five baited remote camera stations were utilized across a 53-sample unit survey grid, covering an approximately 200 square-mile area. Fishers were detected at 13 locations, including four at the eastern portion of the lake. Our survey information shows fishers generally occur all around the region surrounding Shasta Lake.

Our survey information also shows fisher occur in areas not generally considered to represent suitable habitat; including open second-growth conifer, hardwood-conifer, and hardwood habitats, often with extensive chaparral components. Three detection sites occur in locations that were barren or semi-barren as recently as 50-60 years ago due to vegetation damage caused by copper smelting. Additional interesting results include detections near residential and other development areas. These survey results provide valuable information for the impact analysis of the proposed Shasta Dam enlargement project, and also provide many insights into the habitat-use and distribution of fisher in northern California.

Raptor management at Lake Sonoma, California.

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Abstract: Warm Springs Dam and Lake Sonoma, 11.5 miles northwest of Healdsburg, Sonoma County, California, were proposed in 1958 and authorized by Congress in the Flood Control Act of 1962 for flood control, water supply, and recreation. Dam construction at the confluence of Warm Springs Creek and Dry Creek by the US Army Corps of Engineers (USACE) began in 1978. In 1977 the US Fish & Wildlife Service (USFWS) finalized the designation of critical habitat for the endangered American peregrine falcon, including portions of Dry Creek, which partially overlapped lands designated primarily for wildlife management. After consulting with the USFWS, in accordance with the Endangered Species Act (ESA) of 1973, the USACE established a peregrine falcon monitoring program in 1979, which continued through 1989. With the removal of the peregrine falcon from the USFWS List of Threatened and Endangered Species of Plants and Wildlife in August 1999, and from protection under the ESA, raptor management at Lake Sonoma has shifted to the population of nesting ospreys, and more recently to a newly discovered pair of nesting bald eagles. Herein, we describe the diurnal and nocturnal raptors of Lake Sonoma, and the USACE's management activities for birds of prey, including special status species.

Evidence for population decline of Pacific fisher (Martes pennanti) on the Hoopa Valley Reservation, California.

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Abstract: The distinct population segment of the Pacific fisher (*Martes pennanti*) is currently listed as a candidate for federal protection under the Endangered Species Act. The fisher is also culturally significant to the Hupa people and has occurred in relatively large numbers on the reservation. Field work is currently underway to describe fisher rest site and den characteristics in order to maintain or enhance these critical habitat components while implementing the tribe's forest management plan. In efforts to capture and radio-collar adult female fisher during the winter of 2004-5, we documented a 45.6% decline in capture success compared to trapping efforts conducted over the same area of the reservation during the winter of 1997-8. Baited, remote camera stations and the Bowden estimator were used to conduct a mark-sight population estimate during the

winter of 2005. A preliminary population estimate of 0.16 fishers/km² with a 95% confidence interval of 0.16-0.17 was calculated. This estimate was significantly smaller than previous estimates (and 95% confidence intervals) of 0.45 (0.35-0.58), 0.37 (0.29-0.46), and 0.29 (0.21-0.38) fishers/km² collected during winter 1997, spring 1998, and winter 1998-9, respectively. Possible explanations for the decline include increased predation pressure and/or disease. Investigations of disease in the population is currently underway.

Habitat associations of northeastern Nevada rodents.

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Abstract: Relatively little information is available on the ecological interactions of rodents in the sagebrush ecosystem. Rodents are important stabilizing and sustaining agents and thus are essential to the maintenance of healthy ecosystems. Three years of baseline data for rodent populations were collected by live-trapping a study area in northeastern Nevada, approximately 80 km north of Elko. Objectives were to determine species composition and relative abundance of rodents in various plant communities. Deer mice (*Peromyscus maniculatus*), Great Basin pocket mice (*Perognathus parvus*), and least chipmunks (*Neotamias minimus*) were the most abundant and widely distributed species. The species composition and abundance of rodents was variable among habitats and over time. For most species, relative abundance indices and densities were similar to those reported in other multi-year studies in similar habitats. Although some species (e.g., deer mice) were more generalistic in habitat requirements, others (especially microtine species) had more specific habitat needs. The habitat requirements of diverse rodent species in the sagebrush ecosystem should be taken into consideration when planning vegetation management for biological diversity on a landscape scale. Researchers evaluating rodent population responses to livestock grazing management strategies or other habitat treatments should consider natural population fluctuations and differences among similar habitats.

Restoration of common murre colonies in central California.

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Abstract: In 1996, a social attraction project was initiated on Devil's Slide Rock in central California to restore a breeding colony of common murres (*Uria aalge*). This colony held nearly 1,500 pairs in the early 1980s but was extirpated in 1986. Twelve plots of murre decoys, including adults, eggs, and chicks, along with mirrors and sound systems broadcasting murre calls, were placed on the rock at varying densities to attract potential breeders and assess responses to plot treatments. Small numbers of murres quickly recolonized the rock and six pairs produced three chicks in 1996. Social attraction efforts have continued each year since 1996. The 10-year goal of 100 breeding pairs was reached in 2000 (year 5) and has exceeded this each year since, reaching a high of 190 pairs in 2004. In 2000, we began reducing the numbers of decoys, and in 2002 plot treatments were abandoned to adaptively manage for increased numbers of murres in established nesting areas. Chicks per pair averaged 0.65 (range 0.32-0.77) from 1996-2005, similar to other colonies in central California. This is the first successful restoration of murres using social attraction. Oil spills and disturbance from boats and aircraft are ongoing threats to continued success.

Reproductive success of ashy storm-petrels (Oceanodroma homochroa) at Santa Cruz Island, California.

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Abstract: In 1995-98, we monitored nests of ashy storm-petrels (*Oceanodroma homochroa*) at five locations (four sea caves and one offshore rock) at Santa Cruz Island, California, to determine reproductive success. Breeding success was relatively low with failures mainly during incubation. Success varied by location, partly because of differences in human recreational activities, predation by barn owls (*Tyto alba*), and pollutants, but success did not appear to be negatively affected by El Niño conditions in 1997-98. Kayakers were noted at two sea caves and may have unknowingly affected nests. Many carcasses of owl-predated adults were found at one sea cave. Eggshell thinning was detected in a sample of collected eggs. Little or no effect was found from predation by deer mice (*Peromyscus maniculatus*) which did not occur at two sea caves but occurred in small numbers at other locations. Long-term annual monitoring from 1995-2005 also is measuring population trends at Santa Cruz Island.

Home range, habitat use, and mercury concentrations in California black rails (Laterallus jamaicensis coturniculus) in Petaluma River tidal marshes, California.

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Abstract: California black rails (*Laterallus jamaicensis coturniculus*) were captured at three independent sites along the Petaluma River, CA, in spring and summer 2005. Captured birds were radio-marked in the spring, and blood and feather samples collected for mercury analyses in both seasons. Home ranges differed among sites, and males (0.29 ha) had larger home ranges than females (0.18 ha). In spring, black rails preferred wet areas dominated by tall *Salicornia virginica* (25.8 - 35.0 cm mean height.) situated near upland habitat or other taller vegetation at all sites, where nests would be less likely to be flooded during high tide events. In summer, black rails were often found in areas of lower vegetation structure than in spring. Mercury concentrations in tissues differed significantly among sites. Females had lower (not significantly) mercury concentrations than males, possibly due to depuration of mercury into eggs. Understanding the spatial relationships of habitat use and mercury concentrations of threatened species such as the California black rail will aid in the design and management of tidal marsh restoration, a major concern in the San Francisco Bay area.

Evidence for conspecific attraction in the breeding distribution of the western snowy plover in coastal northern California.

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Abstract: Physical features of habitat are often examined to explain species distributions, but individuals may also use conspecifics to assess habitat. We examined whether conspecific attraction influenced settlement and distribution of a marked breeding population of the snowy plover (*Charadrius alexandrinus nivosus*). Over 5 years in northern California, distribution and abundance of plovers varied among 18 occupied sites; other historical breeding locations remained unoccupied. At these 18 sites, first-time local breeders (e.g., philopatric yearlings, immigrants yearlings and unmarked immigrant adults) were more likely to settle at sites with more resident breeders. Plovers also appeared to nest near conspecifics. At one site with 19-27 breeding plovers over the 5 years, nests were spatially clumped; however, location of these aggregations varied among years. Some individuals initiated nests nearer established nests than would be expected by chance; in other cases, however, this was not the case. These findings suggest that conspecific attraction influenced decisions of individual plovers seeking a breeding location. Individuals settling for the first time may use the presence of conspecifics, especially those incubating clutches or tending chicks, to gauge habitat quality. We discuss our findings in light of commonly used management activities (e.g., predator exclosures) to increase reproductive success of shorebirds.

Beach COMBERS: Using surveys of beached marine birds to monitor natural and human-related mortality in the Monterey Bay National Marine Sanctuary, 1997 – 2005.

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Abstract: Since 1997, trained COMBER volunteers have conducted monthly beached bird and mammal surveys in the Monterey Bay National Marine Sanctuary. Using standardized survey methods, we have obtained baseline rates of deposition (birds km⁻¹ mo.⁻¹) of beached birds and identified unusual mortality events related to human activities (e.g. fishery bycatch, oil spills) and natural phenomena (e.g. starvation events). We maintain a network of scientists, researchers and resource managers to enable early detection and investigation of mortality events. During 1997 to 2004, we examined trends in mortality of resident species, including common murre (*Uria aalge*) and Brandt's cormorant (*Phalacrocorax penicillatus*); and migratory species, including sooty shearwater (*Puffinus griseus*), northern fulmar (*Fulmarus glacialis*), loons (*Gavia* spp.), grebes (*Aechmophorus* spp.), and gulls (*Larus* spp.). We also report on a recent multi-species die-off documented during the summer of 2005 which affected mainly cormorants and other resident breeding species.

Population trends and patterns of songbird nest success on restored and remnant riparian habitat on the Cosumnes River Preserve.

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Abstract: The San Joaquin and its tributaries are highly managed, and not necessarily to the benefit of wildlife or plant life. There is a need by land managers for information on the effects of different hydrologic regimes on avian and plant communities. Restoration of riparian habitat on the lower Cosumnes River is aided by the hydrologic connection between the river, whose flows are unmanaged, and its floodplain. To study the effects of process-based restoration on the avian community, PRBO Conservation Science has collected 11 years of data on trends in avian abundance and patterns of reproductive success, for 20 species in restored and remnant habitat. Species-specific population trends have been positive for some and negative for others; these trends cannot always be explained by observed habitat change. For six species, trends differed for remnant and riparian habitat. Our long-term datasets provide invaluable tools demonstrating the links between hydrologic conditions and nest success on varying spatial and temporal scales. We found nest success correlated with timing and extent of flooding, and large scale weather patterns (such as the El Niño Southern Oscillation Index). Low nesting songbirds have decreased nest success during years with late spring floods and prolonged water cover.

Developing predictive models for bat species activity at Crater Lake National Park using ordinary point kriging.

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Abstract: The ability to accurately predict the activity of bat species of management concern is useful for wildlife managers, particularly in high elevation parks where mist netting can be difficult. During the summers of 2004-2005, we used Anabat II detectors (Titely Electronics, Ballina Australia) to monitor activity (80 sample nights) at 19 locations in Crater Lake National Park (CRLA) in southern Oregon. For each species or species group, we created an activity index that represented the average number of passes (group of ≥ 2 consecutive calls in an Anabat sequence file) per hour for the first 2.5 hours of the night. We used Ordinary Point Kriging to model activity patterns. Trend analysis was used to account for any fixed global trends, and spatial autocorrelation was modeled to resolve random short-range variation. We produced prediction maps, evaluated standard errors, and identified areas of over or under-estimation in our predictions. Areas of highest activity for all bats combined were predicted in the south-central portion of CRLA, while areas of highest big-brown bat (*Eptesicus fuscus*) activity were in the northwest. Predicting bat activity is valuable to conservation efforts because it provides spatial data important for evaluating the effects of management activities on bat distributions.

Distribution and trends of mountain lion mortality in the American west.

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Abstract: Mountain lions (*Puma concolor*) remain the only large carnivore with viable populations throughout most of the American West, and play an important role in maintaining the integrity and diversity of a variety of ecosystems. Conserving populations of mountain lions at ecologically effective sizes offers significant benefit to the conservation of the natural landscape. The management of mountain lions by state wildlife agencies is undertaken primarily through the regulation of mortality. In recent decades there has been a rapid escalation in human-caused mortality of mountain lions throughout the western states, as a result of growing interest in mountain lions as a trophy game species and increasing conflicts between mountain lions and livestock, pets and humans. Researchers have found the number of mountain lions killed by humans in recent years has reached levels exceeding those observed in the bounty years in nearly all western states. Efforts to conserve mountain lion populations throughout their range would benefit from a detailed understanding of distribution and trends in kills. I compiled and analyzed data on human-caused mountain lion mortality provided by state wildlife agencies and identify distribution and trends of kills in 11 western states. Finally, I offer several recommendations based on these findings.

Genetic structure among lowland and montane red fox in California.

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Abstract: California has two kinds of red fox; native red foxes (*Vulpes vulpes necator*) historically inhabited the Sierra Nevada and Cascades mountains, and exotic red foxes (*V. vulpes* ssp.) inhabited the Central Valley and southern coasts. The exotic lowland foxes have dramatically expanded their range since 1950, raising concerns about displacement of the native, State Threatened mountain foxes. To determine the current population structure, we analyzed mtDNA from 63 red foxes from 3 pre-1950 sub-populations (2 montane, 1 lowland) and 4 post-1950 sub-populations (1 montane, 3 lowland) in California. Analysis of molecular variance (AMOVA) indicated no structure among the 3 montane sub-populations (all pairwise F_{st} values ≤ 0.06), but significant structure between each montane sub-population and each lowland sub-population (F_{st} range: 0.32 – 0.76). There was no structure between San Francisco Bay and Los Angeles (F_{st} = 0.15), but there was structure between these areas and the Sacramento Valley (F_{st} = 0.44, 0.65). Genetically, the mountain red foxes were most similar to mountain red foxes from Washington. These results must be interpreted with caution due to the small sample sizes and the biases of mtDNA, but they indicate that native mountain red foxes persist, at least in northern California. Analyses are ongoing and updated results will be presented as appropriate.

Acoustic sampling of bat assemblages: Challenges of spatial and temporal replication.

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Abstract: A significant challenge in using acoustic methods to sample bat communities is dealing with the large temporal and spatial variation in bat activity. Night to night variation in activity at a single site can be extreme, and small distances between sampling stations can yield dramatically different results. Thus characterizing the bat community and drawing statistically meaningful conclusions regarding trends in bat activity requires extended sampling at multiple sites. Recent improvements in acoustic detector systems now make them suitable for long-term deployment. These modified units are relatively inexpensive, store data on compact flash cards, and can operate unattended for months at a time. Long-term monitoring with multiple units in Yosemite, Sequoia, and Kings Canyon National Parks has provided new distribution information for species of concern (e.g., western red bat and spotted bat) and elucidated seasonal activity and movement

patterns for others (e.g., western mastiff bat). Using already existing data sets and strategically designed new sampling efforts in several Sierran national parks, we are initiating a project to develop a cost-effective sampling protocol for statistically sound long-term monitoring of bat communities.

Gender determination in red-tailed and red-shouldered hawks using molecular techniques and morphological characters.

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Abstract: Gender determination is an important aspect of raptor biology studies and monitoring projects. However, many raptor species have monomorphic plumage, making gender determination in the field difficult. No practical field method for determining gender exists for red-tailed or red-shouldered hawks. Morphological characters may be useful since female raptors are usually larger than males -- a phenomenon called reverse sexual size dimorphism. At the Golden Gate Raptor Observatory in Marin County, California, researchers measure seven morphological characters and collect samples for DNA as part of their hawk banding process. We have extracted DNA from these samples and run a PCR-based genetic test (validated on known-sex individuals) to distinguish males from females. We will present the preliminary results of our discriminant analysis of these morphological measurements, and a flowchart to assist field biologists in determining gender of red-tailed and red-shouldered hawks.

Introduced trout affect ecosystem subsidy and a threatened frog.

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Abstract: Increasingly, ecologists are assessing the importance of flows of resources between ecosystems (ecosystem subsidies). Introduced predators could affect subsidies if they deplete prey that cross ecosystem boundaries. We are testing effects of introduced trout on the flow of insect and amphibian prey from lakes to predators in uplands. We are studying 4 historically fishless 'reference' basins, and 12 'treatment' basins under three management schemes: trout stocking, suspended stocking, and fish removals. Lakes are at elevations over 1,920 m in the Trinity Alps of California. In summer 2003, we collected biweekly pre-treatment data at all basins, and in fall we initiated treatments.

Sites are being re-sampled in summers 2004-6. We are surveying amphibians, snakes, aquatic insects, bats, and birds. The aquatic fauna did not differ among the three treatments before fish removal, but Cascades frogs, garter snakes and large-bodied insects were more numerous in reference lakes. In 2004 and 2005, recruitment of Cascades frogs, Pacific treefrogs and large aquatic insects improved dramatically in fish removal lakes and also improved in suspend-stocking lakes relative to stocked lakes. Results confirm that subsidy vectors respond to introduced predators. Preliminary results will be presented on recovery of subsidy recipients including bats, birds and snakes.

Birds on golf courses: Does human disturbance influence flight behavior

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Abstract: Golf courses are islands of heterogeneous habitat in urban or suburban landscapes that may support wildlife biodiversity comparable to that of nearby nature reserves, and provide habitat for endangered species. Although biodiversity may be equivalent, human disturbance may cause behavioral changes that could affect survival, such as flight response to perceived threats. Animals that experience frequent human disturbance may become either habituated or sensitized to the disturbance. Habituation allows animals to exploit human-altered environments, whereas sensitization may cause an excess expenditure of energy, reduce survival, and preclude the use of the habitat by a species. I examined if human disturbance alters the flight behavior of birds on a golf course in Sacramento, California, by comparing the flight response of birds on the course and in a nearby regional park that has little human disturbance. I tested the flight response of five species: western meadowlark, Brewer's blackbird, black phoebe, white-crowned sparrow, and western scrub-jay. All five species allowed the observer to approach closer before taking flight on the golf course than in the park. These five species are probably habituated to frequent human presence on the golf course, allowing them to successfully exploit this habitat.

Assessing the current status of the American badger (Taxidea taxus) in California.

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Abstract: Due to a significant range contraction throughout the state, American badgers were listed as a California Species of Special Concern in 1986. No further monitoring has been conducted since the time of listing; however, recent research in California and elsewhere suggests that badgers may be exceptionally sensitive to habitat fragmentation and human disturbance. As part of the U. C. Davis Wildlife Health Center/California Department of Fish and Game Resource Assessment Program (RAP), I compared the relative abundance of badger activity in fragmented and contiguous areas in two regions of the state. I also collected sighting reports statewide to better determine the current extent of the badger's range, and to investigate potential causes of decline between current and past (1986, 1927) range maps. Badger activity indices were higher in contiguous than fragmented sites, and were slightly lower in the Sierra foothills than in

other parts of the state. Sighting reports suggest that the range for badgers may be more extensive than previously thought; however, populations may also be becoming progressively more isolated from each other. Increasing road densities and conversion of land for agriculture or development may further threaten badger populations statewide.

The battle graphic as an ecological tool.

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Abstract: A new technique is proposed for reducing unwanted vehicular excursions into sensitive areas on military training ranges. The designation of sensitive areas with off-limits postings on the battle graphic and vehicular displays combined with simultaneous GPS-DFIRST position reporting should result in better traffic control reducing unwanted vehicular movements. Reduction of these unwanted vehicular movements reduces damage to existing vegetation; this stabilizes soils, reduces soil erosion and decreases habitat degradation. Reduced habitat degradation would diminish the training signature on the land, enhance vegetation recovery, improve its potential for camouflage, and maintain ecological integrity.

Impact of flooding on a burrowing owl colony in the Sacramento-San Joaquin Delta.

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Abstract: Burrowing owls were monitored along a segment of the Mokelumne Aqueduct in the Sacramento-San Joaquin Delta from 2003-2005. Monitoring of nesting burrowing owls was part of a mitigation plan for pipeline maintenance that consisted of seismic upgrades and recoating for two of the three aqueducts. Surveys were conducted following protocol established by the Burrowing Owl Consortium. The population peaked in 2004 with 28 nest burrows. Chick numbers ranged from two-six per nest with an average of 4.3 and an overall estimate of 121 chicks in 2004. The entire population was inundated when a levee was breached on the Upper Jones Tract in June 2004. Burrowing owls returned to the site and nested in 2005. Chick numbers were two and six for the two nests. Four chicks fledged. A total of seven adults and four young were observed in September 2005. This poster will also discuss plans for continued monitoring of this burrowing owl population and management of the population relative to aqueduct maintenance.

Lower Mokelumne river small mammal inventory.

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Abstract: Small mammal populations were inventoried along the lower Mokelumne River (LMR) from Camanche Dam to tidewater from April 2002 to July 2004 using small mammal traps, track plates, coverboard arrays and drift fence arrays with pit traps. Potentially 43 small mammal species occur along the LMR in San Joaquin and Sacramento counties. The inventory identified 1,136 individuals of 14 species during the survey period. For all inventory methods, species diversity was highest in summer and lowest in winter. California voles were the most commonly observed species, followed by black rats and raccoons. The small mammal trap inventory resulted in the greatest species diversity observed in spring with the lowest in fall. Western harvest mice were the most commonly observed species, followed by house mice, deer mice and black rats. Track plate surveys resulted in the highest species diversity observed in fall with the lowest in winter. Raccoons were the most commonly observed species, followed by black rats and opossums. The coverboards and pit traps resulted in the highest species diversity observed in fall with the lowest in spring. California voles were the most commonly observed species, followed by western harvest mice. Recommendations for future monitoring will be discussed.

Characteristics of summer and fall home ranges of American martens in coastal northwestern California.

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Abstract: During summer/fall of 2001-02 we radio-collared and relocated 13 American martens (*Martes americana*; 8M, 7 adults:1 juvenile and 5F, 2 adults:3 juveniles) using both walk-ins and remote triangulation on the Six Rivers National Forest. Each animal was monitored for an average of 3.4 months (range 1-6) and relocated an average of 21.3 times (range 5 to 39). We estimated seasonal home range size using 100% MCP for individuals with ≥ 15 locations ($n = 10$). Seasonal home range sizes were an average of 534.9 ha (SE = 291.2) for adult males ($n = 5$; range 122.6 to 1691.4 ha), 183.3 ha for a single juvenile male, 127.5 ha for a single adult female with one kit, and a mean of 603.3 ha (SE = 322, range 57.6 to 1204.1) for juvenile females ($n = 3$). We determined the developmental stages of the stands for each of 285 relocations with low-triangulation error; 174 relocations occurred in non-serpentine habitats, 77.0% were in old-growth, 8.6% in early-mature with dominants, while 111 relocations occurred in serpentine habitats, 30.6% were in late-mature, 20.7% in pole and 17.1% in old-growth. Stands in the oldest developmental stages are most frequently used within home ranges of coastal martens.

Impact of West Nile virus on the yellow-billed magpie and American crow in the Sacramento Valley, California

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Abstract: West Nile virus (WNV) arrived in the Sacramento Valley, California during 2004, and by summer 2005 many dead yellow-billed magpies (*Pica nuttallii*) and American crows (*Corvus brachyrhynchos*) were reported in cities and towns throughout the Valley. Concern has grown regarding WNV's impact on yellow-billed magpie populations, especially during and following the 2005 breeding season. Ten years prior to the epidemic we performed weekly to monthly surveys for corvids and other large birds over a 4-year period along 128 miles of road transect in the Sacramento Valley. We recorded about 50,000 bird observations, including 2,045 of yellow-billed magpies and 8,250 of American crows, for which we also recorded social group size, flight and perch behavior, and associations with crops and other vegetation cover types. We are repeating surveys of yellow-billed magpies and American crows during the fall and winter of 2005-2006 to compare numbers, distribution, group sizes, behaviors, and landscape associations following the first year of the WNV epidemic. Our results should shed light on the initial impact of WNV on local corvid populations, and they may help epidemiologists understand how changes in the spatial distribution and abundance of these reservoir species populations relate to human infection rates.

Improving biological effects analyses for Regional Conservation Plans

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Abstract: Analyzing effects on target species is a critical component of any HCP or NCCP, yet conservation and take analyses remain weak and scientifically indefensible for many regional conservation plans. HCP and NCCP guidelines require a plan to assess its net effects on populations of covered species, i.e., will the plan increase, decrease, or have no measurable effect on a species' population size, sustainability, or recovery? Many conservation plans do little to actually estimate these effects. Most simply count species observation points or putative habitat acreages inside and outside of preserve boundaries (often using vegetation type as a proxy for habitat), with little attempt to tie these measures to actual population effects. Estimating plan effects on populations requires considering ecological processes that influence habitat quality and population dynamics. I propose a framework to improve the scientific validity of conservation and take analyses for NCCPs and HCPs that takes advantage of diverse analytical tools, from quantitative population viability models to qualitative net-effects assessments. Although this rudimentary framework is far from perfect, it is better than current practices. This approach can be improved by developing more explicit and defensible analytical techniques in future conservation plans.

Predator behavior and proximity affects risk assessment in Columbian blacktailed deer.

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Abstract: Previous studies indicate that predator proximity and likelihood of attack influence risk perception by prey and their decision to flee. We examined the flight decisions of Columbian blacktailed deer (*Odocoileus hemionus columbianus*) using an approaching human that varied in speed, directness of approach, directness of gaze, and simulated gun carrying. Deer fled at greater distances when approached more quickly and directly, and there was a concave-down quadratic trend in the relationship between starting distance and alert distance, indicating that deer have a zone of awareness beyond which there is a delay in detecting an approaching predator. Assessment time was positively related with alert distance and was shorter during faster approaches. Deer already alert to the predator at the initiation of approach fled at longer distances and had shorter assessment times. Males had qualitatively different flight responses than females when approached with a simulated gun or with averted gaze. These sex differences in risk assessment might reflect male motivation during the mating season as well as exposure to human hunting. We suggest that flight decisions are affected by the distance at which predator is detected, the state of awareness of the prey, and the predator's behavior.

Survival and natal dispersal of juvenile snowy plovers in central California.

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Abstract: Juvenile survival and dispersal rates are important demographic parameters for population viability analysis, but estimates are seldom available because mortality is usually confounded with permanent natal dispersal in analyses of live encounter data. We used the Barker model for captures, recoveries, and survival intervals resightings, to estimate juvenile survival for snowy plover (*Charadrius alexandrinus*) fledglings on the central coast of California from an 18-year period, 1984-2001. By using a large body of year-round sighting data from throughout the species' Pacific coast range, we attempted to estimate true survival and quantify natal dispersal rates and distances. Juvenile survival was estimated at 0.463 overall and varied annually between 0.283 (\pm 0.028 SE) and 0.575 (\pm 0.061); it paralleled higher adult survival in our most parsimonious models. Males were more likely to disperse from Monterey Bay for winter and females more likely to disperse to breed. Dispersal distances to breeding sites usually were within 10 km of natal sites (64%) and seldom beyond 50 km (16%). Studies of local winter residents, focused on predator pressure and weather conditions, could advance our understanding of factors causing variation in snowy plover survival.

Developing and evaluating predictive models of habitat use and the distribution of the great gray owl within Sierra Nevada Range.

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Abstract: The great gray owl was listed as endangered in California in 1980. Estimated at 100-200 individuals, 80% of the known breeding population is limited to Yosemite National Park and surrounding National Forests. Most California great gray owl studies have been conducted in this core range. While there have been incidental observations outside the core range, there has never been a concerted effort to study this species throughout California, resulting in data gaps toward developing a comprehensive conservation strategy for the species. Because great gray owl habitat is associated with meadows surrounded by substantial forest including large diameter trees and snags, the species is significantly affected by grazing practices, forestry, fire suppression, and development. In 2003, the California Department of Fish and Game, U.C. Davis, U.S. Forest Service, and the National Park Service initiated a study to address critical information needs for great grey owl conservation in the state. Our objectives are to: (1) assess state distribution through extensive surveys outside the core range; (2) assess habitat and prey-base quality within the core range; (3) develop a habitat model covering the extent of their range; and (4) determine if habitat and prey qualities differ within occupied and predicted habitat.

Do wind turbines generate ultrasound that may attract bats?

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Abstract: Although audible acoustic emissions from wind turbines have been extensively measured (i.e., frequencies up to 20 kHz), the ultrasound emissions remain uncharacterized for most wind turbines. We performed a basic characterization of ultrasound emissions from a variety of wind turbines, including the 2.5 MW Clipper Liberty and the 1.5 MW NEG Micon wind turbines, to determine whether ultrasound emissions may contribute to attracting bats toward wind turbines with consequential fatalities from rotor strikes. We were particularly interested in characterizing ultrasound emissions from the 1.5 MW NEG Micon turbines because of the documented bat mortality from these turbines operating at the Mountaineer wind farm in West Virginia. This and six other types of turbines measured generated only minor ultrasound above ambient sound levels. The majority of acoustic energy was emitted at audible frequencies, and trailed off rapidly above audible frequencies with a similar profile to that of ambient wind noise. Measured from ground level, 34 m directly below the 1.5 MW NEG Micon wind turbine rotors, these turbines emitted approximately 15, 10, and 5 dB above ambient at 20, 30, and 40 kHz respectively. Above 50 kHz there was no significant difference from ambient sound levels. We conclude that ultrasound emissions from these wind turbines do not play a significant role in attracting bats.

Assessment and management of bats in buildings.

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Abstract: The management of impacts to bats and bat roosts has received increased attention by biologists and agency personnel in the past decade. Though none of California's 24 recognized bat species are either Threatened or Endangered, 10 are California Special Concern species. Additionally, impacts to common species are receiving increased attention when large maternal colonies are involved. Buildings provide significant roost habitat for many of California's bat species. The accurate assessment of buildings planned for demolition or renovation, and the application of appropriate mitigation measures is essential to reducing or eliminating impacts to roosting bats. This presentation will examine critical roost characteristics, which of California's species use building roosts, and how to properly assess and manage building-roosting bats.

Developing successful mitigations for bridge-roosting bats.

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Abstract: Bridges, culverts and other transportation-related structures provide a large, critical network of roosting opportunities for many of California's 24 recognized bat species. Bridge roosts can house thousands of bats for decades, but when renovation, replacement, or seismic retrofitting is required, roosting bats must be safely removed from the structure, and suitable replacement habitat provided. Over the past decade, Caltrans has taken a proactive approach to mitigation of impacts to bats roosting in transportation structures and recently contracted with three bat biologists, including the author, to conduct a research project that included monitoring of existing projects and creation of case studies of current mitigation measures. Such measures include off and on-structure artificial roosts, design of bat-friendly replacement bridge structures, and other creative approaches. After reviewing current mitigation designs, several show great potential to replace lost bat roosting habitat. This presentation will discuss some of the challenges associated with accommodating bats in transportation structures, and detail some successful designs.

Improving access and reducing mortality for bats and other wildlife at livestock water developments.

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Abstract: Free water is vital to wildlife survival in the arid west. Livestock water developments are often one of the few sources of water available to wildlife. Bats are especially vulnerable to water shortages, sometimes losing 50% of their body weight in evaporative water loss in an afternoon. Drinking rates of more than one bat per second have been recorded at livestock waters. Without proper escape ramps and maintenance, significant mortality to bats and other wildlife can occur. Recent evidence suggests thousands of birds and mammals are drowned annually. Obstacles such as fencing or bracing can impede access to bats, greatly increasing the energy needed to drink. Although escape ramps are mandatory for troughs on most federal rangelands, <10 percent of the 300 troughs we inspected had escape ramps, and 30 percent were obstructed by fencing, bracing, or other obstacles. Fortunately, escape ramps can be inexpensively built and installed in most types of water troughs, and alternative fencing and bracing methods can facilitate bat access. Bat Conservation International and the USDI-Natural Resources Conservation Service are collaborating to raise awareness about the importance of livestock waters to wildlife, and are publishing a comprehensive manual on wildlife-friendly livestock water developments.

The devil is in the details: The art and science of mitigation bank deals, long term stewardship requirements, and management costs.

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Abstract: The process of creating and implementing mitigation banking programs is an art form. Too often deals are crafted with little forethought to the long-term stewardship of protecting and preserving these lands in perpetuity. A critical element in the success of banking programs is determining the long-term maintenance tasks and costs. This presentation will argue that the most important way to take conservation seriously is to plan in detail for long-term stewardship. By planning for the tasks required to protect, monitor, and maintain the natural resource over the long term, we can accomplish goals essential to habitat and species conservation programs.

The Center has developed the Property Analysis Record (PAR) to assist in this process. The PAR has been used nationally as a tool to accurately identify and determine the stewardship tasks and costs. Mitigation banking implementation is further complicated by project phasing, financing and cash flows, conditions of title and agency requirements and permit conditions. All of these items must be concisely and thoroughly addressed prior to closing any deal. Contingencies must be allowed for changing laws and adaptive management scenarios. This presentation will address these issues and give examples using the 14 mitigation banks that the Center currently manages.

A deadly tree disease--sudden oak death--threatens wildlife habitat in coastal California woodlands.

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Abstract: In 1995, the Sudden Oak Death (SOD) disease (*Phytophthora ramorum*) was discovered in coastal oak woodlands of the San Francisco Bay area, California. Since then, SOD has spread up and down the California coast killing tens of thousands of oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) trees. SOD, moved in nursery stock to the eastern U.S., also threatens eastern hardwood forests. The USFS Pacific Southwest Research Station, the California Department of Forestry and Fire Protection, and the University of California, Berkeley, collaborate on SOD research, monitoring, and outreach. This talk will discuss the biology, monitoring, control of the disease, and what has been learned about its effects on wildlife habitat structure and wildlife populations in California.

Trends in abundance and productivity of riparian associated birds in central coastal California.

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Abstract: Avian monitoring programs are essential for tracking the health of bird populations and the habitats they use throughout their annual cycle, and for developing effective conservation strategies. I examined demographic trends of selected riparian breeding birds using data collected from mist net captures at two sites in central coastal California between 1999 and 2005. Study sites were located at the mouths of the Big Sur and Carmel Rivers in Monterey County, CA. I evaluated annual productivity, and population and survivorship trends for seven Partners in Flight Riparian Focal Species by age class and sex. I detected significant declines in populations of warbling vireos (*Vireo gilvus*) ($p = 0.05$) and common yellowthroats (*Geothlypis trichas*) ($p = 0.07$) in Big Sur, and declining trends in black-headed grosbeaks (*Pheucticus melanocephalus*) and song sparrows (*Melospiza melodia*) at the Carmel River mouth. Warbling vireos exhibited declines in both age classes, while common yellowthroat, black-headed grosbeak and song sparrow declines reflected decreasing numbers of adults. The results of this study support the need for increased restoration and conservation of habitat throughout the annual ranges of riparian-associated birds in order to halt and reverse population declines at local, landscape and continental scales.

Monitoring bumble bee populations to detect population fluctuations and declines.

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Abstract: A monitoring program was initiated in 1998 to determine relative abundance and population trends of a narrowly endemic bumble bee, *Bombus franklini*. One goal was to determine whether there was need to apply for federal protection for this species. It was considered a Candidate Species, due to inadequate knowledge of its biology and habitat requirements. Initially, robust populations were found, but over time these

declined precipitously. Similar declines have been found in closely related species of the subgenus *Bombus*. The role of exotic disease as the primary cause of these declines will be discussed.

Cougar management guidelines.

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Abstract: At the Sixth Mountain Lion Workshop in San Antonio, Texas in 2000 there was substantial discussion that the body of cougar management and research literature had grown to the point that agencies and stakeholders alike were having difficulty keeping up with current knowledge. The Cougar Management Guidelines were the result of an effort that was initiated at a follow-up meeting in Boise, Idaho in October, 2002. The participants shared a common desire to benefit cougar conservation through developing guidelines that would integrate the history, most current research and methodologies, policies, and approaches to cougar conservation. The contributors to these guidelines included scientists from both academia and wildlife management agencies who have numerous publications and decades of experience in cougar conservation. They volunteered their time for this initial effort, and they view these guidelines as a living document that will be maintained, updated, and rewritten as new information dictates. These guidelines are intended to serve as a framework to help management agencies develop regional approaches toward the conservation of cougars and their habitat. Their intended target audience is agency wildlife managers in Canada, the western United States, and Mexico. The presentation will cover the development, goals, and content of the guidelines, and discuss the potential for this document to help management programs for this and other species. We will also discuss the feedback that the guidelines have received.

Observations on the feeding behavior of the decollate snail (Rumina decollata): implications to an endangered mollusk in central California.

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Abstract: Predatory decollate snails (*Rumina decollata*) were introduced to southern California sometime in the late 1950s or early 1960s to control non-native brown garden snails (*Helix aspersa*). Since that time, the distribution of decollate snails has expanded steadily in California, mostly due to passive rather than active dispersal mechanisms. In 1991, a feral colony of decollate snails was observed at a coastal power plant site in San Luis Obispo County. The Los Osos/Morro Bay region of coastal San Luis Obispo County (about 8 km north of the power plant site) harbors the only federally endangered land snail within California, the Morro shoulderband snail (*Helminthoglypta walkeriana*).

Observations of the feeding habits of decollate snails suggest that native pulmonates may be at greater risk of predation than are brown garden snails when both are sympatric with *Rumina*. This conclusion has management implications for the continued persistence of *H. walkeriana*.

Monitoring arroyo toad populations within the Los Padres National Forest, California.

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Abstract: Within the Los Padres National Forest of southern California, the federally endangered arroyo toad (*Bufo californicus*) inhabits sediment-filled, montane floodplains within four watersheds: Sisquoc River/Santa Maria, Upper Santa Ynez, and in two subwatersheds of Santa Clara River, (Upper Sespe and Piru creeks). The microhabitat use by the toads made them susceptible to low recruitment and adult mortality due to anthropogenic activities in the 1980s. Starting in the 1990s, changes in riparian management were instituted and populations monitored. Population estimates were calculated from visual surveys or clutch observations of eggs and tadpoles. The Sisquoc River population remained a small breeding population of four-six adults when surveyed between 1999-2002. The estimated populations of arroyo toads between 2002 and 2005 were comparable to estimates from a decade earlier for the Upper Santa Ynez (100+ adults) and Upper Sespe (50+ adults), although the breeding pool distribution had changed in the intervening years. Lower Piru Creek has wide fluctuations in breeding success, necessitating several years of surveys in order to obtain reliable population estimates. Upper Piru Creek appears to have comparable number of adults, although the breeding distribution has increased. The arroyo toad populations across the forest appear to have stabilized.

Bird population declines in the four southern California national forests.

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Abstract: We monitored birds within four southern California national forests (Forests) at 205 riparian stations using point-counts. Over 11 survey-years (1988-1997 and 2003), we observed 145 species, with an annual mean of 104 species. Stations near larger streams, closer to the coastline, and with lower precipitation had higher richness. Species richness declined over the study period. We used Poisson regression to examine population trends for 47 species with mean abundances of >0.1 bird/station. Of the 47

species examined, 42 showed a declining tendency, of which 10 showed widespread, significant declines. Declining species shared some common life history features. Species that nested in conifers and on the ground, seedeaters, ground gleaners, and residents tended to decline more than other species. Based on classification-tree analysis, species with the largest declines were those nesting in conifers, followed by species that nest on the ground and, to a lesser extent, in snags. Comparison of our results with statewide BBS trends for 1988 to 2003 showed that trends agreed for 72% of the species examined. Landscape-level analyses of population trends may show associations with changing land-use.

Assigning forest wildlife value for terrestrial wildlife at the landscape scale in rural King County, Washington, using GIS.

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Abstract: Growing populations and land conversion are common challenges to wildlife habitat surrounding urban centers all over the country. In 2004, King County, Washington, passed its Critical Areas Ordinance (CAO), which establishes standard clearing limits with options for flexibility on parcels in rural-zoned King County. Management tools to help guide the location and amount of clearing became essential. The County needed a quick method for determining terrestrial wildlife value for properties subject to clearing. The County developed a decision tool that incorporates GIS analysis and assigns forest wildlife value at the landscape scale based upon the size of the forest patch (including its external forested buffer) and the presence of corridors between patches. Wildlife value for forest patches were defined as high = ≥ 40 hectares + 91 meter buffer; moderate = ≥ 4 and < 40 hectares + 91 meter buffer; and low = all remaining forest areas. Forested corridors of at least 91 meters width that connect forest patches were assigned value based upon the highest wildlife value of the connecting patches. All patches and corridors were compiled into a county-wide map. Future work will include monitoring forest patches to test assumptions used to assign value.

Spring-time site use by migratory Pacific Flyway shorebirds: Ecological and management considerations.

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Abstract: Since Frederick Lincoln first proposed the general flyway concept for migratory birds in North America in 1938, much progress has been made in describing migratory pathways of waterbirds, especially for larger game birds like ducks and geese. Using radiotelemetry to track individuals over the past 14 years, the Pacific Flyway

Shorebird Migration Program has begun to develop a clearer picture of shorebirds including western sandpipers (*Calidris mauri*), dunlin (*C. alpina*), and long- and short-billed dowitchers (*Limnodromus scolopaceus*, *L. griseus*) which migrate from Mexico north to their breeding grounds in Alaska. During this period we have tracked over 400 birds, many over distances spanning much of their spring migration route. Here we will report on results of these studies. We have shown that while individual birds can travel over 3,000 km in a single flight, the majority use a system of stopover sites within 100s of km of each other. Use of these sites is influenced by sex of birds, date, origin of migration, and age. In 2004 we measured triglyceride levels of migrating western sandpipers from Mexico to Alaska as an index of fattening rate, and we found that birds were fattening more rapidly as they moved further north and got closer to the breeding grounds. Understanding the site requirements of these far-ranging species will help us better manage their resources.

*Spatial ecology of a population of the aquatic garter snake, *Thamnophis atratus*, associated with a montane, cold-stream environment in northwestern California.*

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Abstract: We studied the movements, spacing patterns, and stream habitat use of the aquatic garter snake, *Thamnophis atratus*, at Hurdygurdy Creek in the Smith River National Recreation Area, from 1986 to 2001, using mark-recapture techniques. We captured and marked 1730 snakes and recorded 519 recaptures. Here we examine movements and hierarchical spatial patterns of this population of snakes by gender and age class at the: (1) macro-scale, the distribution of captures along the 4.7 km study reach, (2) meso-scale, reflected in the relative use of stream meso-habitats (i.e. riffles, runs, pools), and (3) micro-scale, evidenced by the use of differentiated sub-components of particular meso-habitat units, for example, the shallow stream margins or small back water pools adjacent to a riffle. This population of snakes exhibited differences in movement patterns, and in the use of stream meso- and micro-habitats, relative to both gender and age class. Our results are interpreted relative to age class differences in the foraging strategies employed by these snakes to capture a wide range of aquatic and riparian prey species. We suggest several non-exclusive hypotheses to explain these differences based on sexual selection, optimum foraging, and prey selection related to ontogenetic shifts associated with snake growth and development.

Using chin spot patterns to identify individual mountain yellow-legged frogs.

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Abstract: The study of animals in the field often requires the ability to identify individuals. Numerous techniques at marking individual animals have been developed that require extensive handling and sometimes invasive measures, like ear tags, elastomer injections, and PIT tags. An alternative to physical alteration of study animals is the use of natural markings for identification. Mammals that have unique pelage and skin patterns, such as some felids, pinnipeds, juvenile cervids, and whales, are readily identified using these markings. Some of these identification techniques have been extended to amphibians when individual identification is necessary. In our study of mountain yellow-legged frog (*Rana muscosa*) movements, we photographed the chin spot patterns of all captured frogs at the time of radio attachment and three months later at recapture in order to test the effectiveness of identifying individual frogs using these natural markings. Throughout the first three months, observers were able to identify individual frogs based on chin spot patterns all but one time. Further field tests and photo comparison trials were conducted with similar results, though definite changes in certain aspects of spot patterns were apparent. Although this method of individual identification requires animal handling, it is a reliable alternative to other animal-marking techniques.

Wildlife and hydropower relicensing in the Sierra Nevada: Issues and answers

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Abstracts: There are 116 hydropower projects in California subject to periodic re-licensing by the Federal Energy Regulatory Commission (FERC). Impact assessments for recent hydro project re-licensings in the Sierra Nevada focus on key “issues” as determined by the resource/project nexus, potential for impact, and opportunities for mitigation. The “hydro” in hydropower re-licensing generally translates to a greater emphasis on aquatic issues than on terrestrial wildlife issues. Wildlife issues associated with continued operation and maintenance of a project commonly fall into one or more of the following categories: 1) effects on special-status species (e.g., bald eagle); 2) effects on species that utilize project facilities for nesting or roosting (e.g., bats); 3) effects on species with a lacustrine, riverine, or other aquatic habitat requirement (e.g., waterfowl); 4) effects of ancillary water conveyances (e.g., canals, flumes) on wildlife; and 5) effects of project-related electric power lines on birds (e.g. electrocution, collision). This presentation will examine processes used to assess impacts to terrestrial species during hydro re-licensing, including an overview of actual studies performed on recent projects and the results of these studies.

Monitoring coastal California gnatcatchers at a regional level.

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Abstract: Coastal California gnatcatchers serve as both the flagship species and umbrella species for several HCPs in southern California. Estimating their populations at a regional level is a critical element of these plans if they are to be managed to maximize conservation goals. Optimally, managers want these estimates to be relevant both within and across HCPs. Additionally, the utility of any estimate is enhanced as accuracy and precision increases. We designed our study to estimate the number of coastal California gnatcatchers across the preserve lands of Orange and San Diego Counties, and determine key habitat elements that can be used for future conservation planning.

Assessment of northern goshawk territories within the Lake Tahoe basin.

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Abstract: We examined territory occupancy and reproduction relative to anthropogenic activity within northern goshawk territories in Lake Tahoe. The extent of roads/trails and the amount of human activity within 800 m of the most recent nest within historical goshawk territories were measured. The mean extent of roads/trails within each non-disturbance zone was $3859\text{m} \pm 3264\text{ SD}$. There was a positive relationship between number of years since territories were last used for nesting and the extent of roads/trails. The extent of roads/trails was twice as great within territories not used within the last 10 years, as compared to recently used territories, suggesting that road and trail construction contributed to abandonment of some territories. Paved USFS roads were the most frequently used type of road/trail. Human activity was greater within non-occupied than occupied territories, and nearly twice as great within non-nesting territories as compared to nesting territories. There were 21 breeding territories during the study. Breeding success was 24% higher in 2004 than 2005, probably due to the cold wet spring in 2005. The relationship between number of fledglings and human activity and extent of road/trails was weak. Anthropogenic disturbance may play a bigger role in nest site selection than reproductive success.

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