

Program and Abstracts  
Idaho Chapter of The Wildlife Society  
Northwest Section of The Wildlife Society  
Northwest Scientific Association  
Northwest Lichenologists  
Annual Meeting

March 6 - 8 2006  
The Grove Hotel • Boise, Idaho

## **Science, Natural Resource Management, and the Public Good**

The meeting is being organized jointly by the Idaho Chapter of The Wildlife Society, Northwest Section of The Wildlife Society, Northwest Scientific Association, and Northwest Lichenologists.

The conference theme is "Science, Natural Resource Management, and the Public Good: Toward a Democracy of Information and Management." The conference will feature a diverse scientific program with plenary lectures, organized symposia, contributed oral presentations, and poster session, as well as social activities and annual business meetings of each society. Pre-conference activities include two workshops and a Northwest Bat Cooperative Steering Committee Meeting.

The conference will take place 6-8 March 2006 in the Capitol City of Boise, Idaho. Members are encouraged to register in advance by going to the on-line, secure registration page at the meeting's Web site: <http://www.ictws.org/whatsnew.htm>. Alternatively, a registration form can be downloaded from the Web site for submission by mail or FAX. The current registration fee is \$85, which includes the banquet. A limited number of banquet tickets will be available at the meeting. In addition, a one day only registration of \$60 may be purchased at the registration table on each day of the conference.

### **Host City — Boise, Idaho**

The City of Boise is located at the western end of the Snake River Plain near the southwest edge of the Idaho Batholith. In a region dominated by a continental climate, temperatures are moderated by maritime patterns and the area owes its aridity to the rain shadow effect of the Cascades. Boise was platted in 1864 north of the Boise River which is now flanked by an extensive Greenbelt system and numerous parks. This attracts year-round outdoor enthusiasts as well as those who enjoy more casual encounters with nature. Well-preserved historic architecture, including the Idaho Statehouse, contributes to an upbeat and inviting downtown atmosphere.

*Birding in and around Boise.* Boise birders benefit from living at the edge of a migratory bird flyway. To the north, these feathered visitors use Idaho forests for food and cover on their arduous journeys. Numerous water bodies in the Treasure Valley support a wide variety of resident and migratory species. To the south, the Birds of Prey National Conservation Area hosts the densest populations of nesting raptors in North America within the 600-foot high walls of the Snake River Canyon. Between the Snake River and the forested mountains, birds of prey can be glimpsed at amazing heights as they ride thermal air currents above the sagebrush-steppe. Bald eagles winter along the Boise River and heron rookeries can also be spotted in the spring. Bring your binoculars!

Snake River Birds of Prey · <http://www.birdsofprey.blm.gov/index.html>

The World Center for Birds of Prey · <http://www.birdsofprey.blm.gov/worldctr.htm>

Idaho Bird Observatory · <http://www.boisestate.edu/biology/ibo/about.html>

Lake Lowell and Deer Flat National Wildlife Refuge · <http://www.fws.gov/deerflat/>

*Cultural attractions.* Boise offers many cultural attractions. Information is available online for the City of Boise · <http://www.cityofboise.org/>

Basque Museum and Cultural Center · 611 Grove Street · 343-2671

Boise Art Museum · 670 Julia Davis Dr. · 345-8330

Discovery Center of Idaho · 131 Myrtle St. · Boise · 343-9895

The Egyptian Theatre · 700 W. Main St. · 345-0454

The Flicks · cinema & café · 646 Fulton St. · 344-4222

The Idaho State Historical Museum · 610 Julia Davis Drive · 334-2120

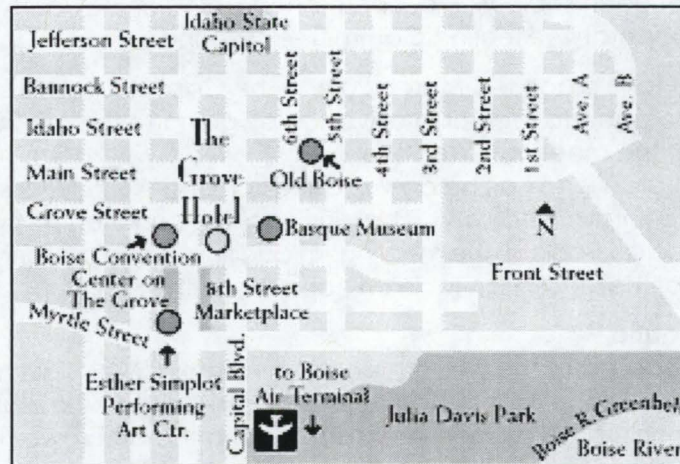
Morrison Knudsen Nature Center (IDFG) · 600 S. Walnut · 334-2225

Zoo Boise · 355 Julia Davis Drive · 384-4260

## Conference Venue

All conference activities will take place at The Grove Hotel, Boise, Idaho [www.grovehotelboise.com](http://www.grovehotelboise.com). Voted Boise's Best Area Hotel in 2005, The Grove Hotel is located in the heart of Boise and is Boise's only AAA Four Diamond rated hotel. Conference rooms are located on the 2<sup>nd</sup> and 3<sup>rd</sup> floors.

Navigation Note: Myrtle Street is one-way eastbound and Front Street is one-way westbound. Capitol Boulevard is one-way northbound and 9<sup>th</sup> Street is one-way southbound.



Directions to The Grove Hotel:

### From Interstate 84 & Airport:

- Take Vista/Airport Exit (exit #53).
- North on Vista, which becomes Capitol Boulevard near the Depot; go left down the hill.
- North on Capitol Boulevard approximately 1 mile.
- Located on left-hand side of Capitol Blvd. Just 3 blocks south of the Capitol Building.
- Corner of Front Street and Capitol Boulevard. See Parking information on page 8.

### From 184 (Nampa-Caldwell):

- Interstate 84 – 184 junction to City Center.
- 184 East to Myrtle Street.
- East on Myrtle approximately 1 mile.
- North on Capitol Boulevard.
- Located on left-hand side of Capitol Blvd. Just 3 blocks south of the Capitol Building.
- Corner of Front Street and Capitol Boulevard. See Parking information on page 8.

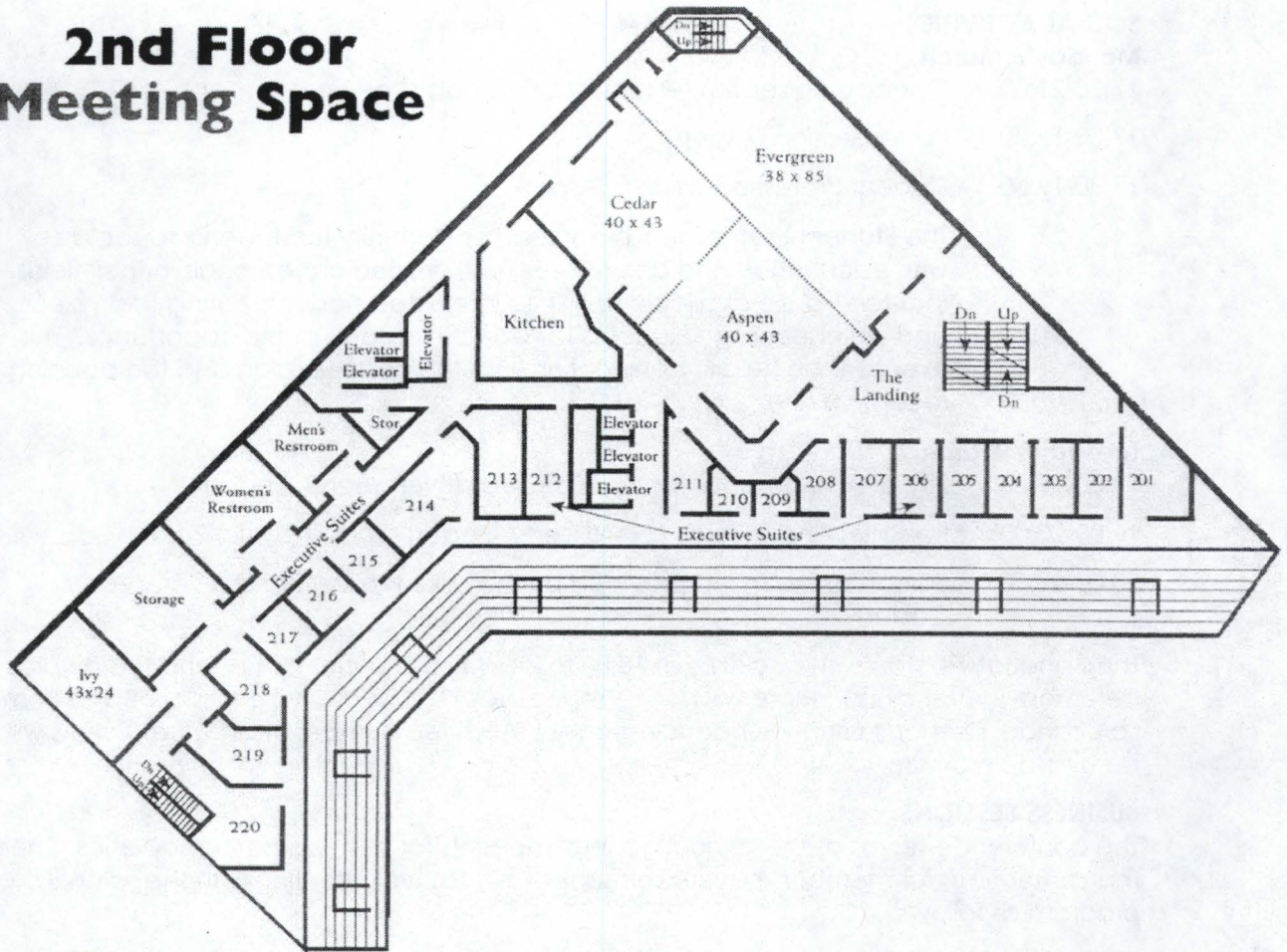
Emilio's, a full-service restaurant, is open for breakfast, lunch, and dinner, features cutting edge New American cuisine.

The Bar in the lobby features signature beverages, including award-winning martinis. Enjoy live music Tuesday through Saturday.

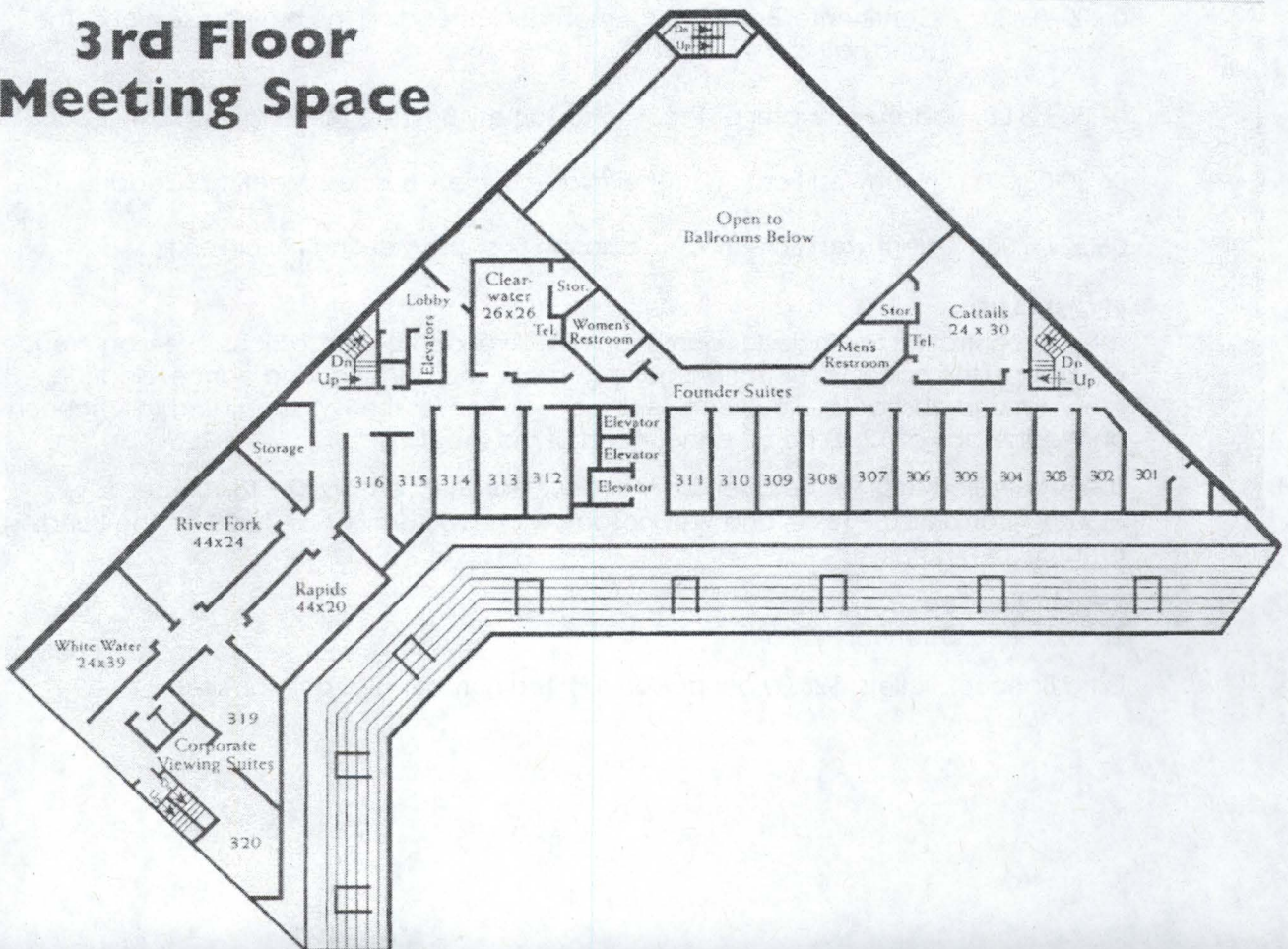
## Conference Contact

Rita Dixon, e-mail [rdixon@idfg.idaho.gov](mailto:rdixon@idfg.idaho.gov), telephone: 208-287-2735, cell: 208-761-4958, postal mail: P.O. Box 25, 600 S. Walnut Ave., Boise, ID 83707.

## 2nd Floor Meeting Space



## 3rd Floor Meeting Space



## **SOCIAL ACTIVITIES**

### **Monday 6 March**

- 17:30-21:00 Opening Reception—No-host bar & hors d'oeuvres (Aspen)  
17:30-19:30 Poster Session (Aspen)  
17:30-19:30 Student-Professional Mixer (Aspen)

The Student-Professional mixer is an opportunity for students to socialize with each other, and also to meet with invited professionals in their fields. Mentors will be available to talk to interested students during the mixer and we encourage students to take advantage of this opportunity. This event will be held in conjunction with the poster session and the opening reception.

### **Tuesday 7 March**

- 18:00-19:00 Social—No-host bar & hors d'oeuvres (Evergreen / Cedar)  
19:00-20:00 Banquet and awards (Evergreen / Cedar)  
20:00-23:00 Dance to live music provided by the Mike Mallory Band (Evergreen / Cedar)

The Banquet will start with cocktails at 18:00 followed by a buffet dinner and the awards ceremony. After dinner, there will be live music provided by the Mike Mallory Band from La Grande, Oregon. Bring your dancing shoes! A limited number of banquet tickets will be available on site.

## **BUSINESS SESSIONS**

The conference serves as the annual general meeting for all 4 sponsoring societies. Their major meetings for members have been scheduled to avoid conflict with the scientific program as follows:

### **Wednesday 8 March**

- 06:00–06:30 Continental Breakfast for members attending the business sessions (The Landing)  
06:30–08:00 Idaho Chapter of The Wildlife Society Business Meeting (Rapids)  
06:30-08:00 Northwest Section of The Wildlife Society Business Meeting (Cedar)  
06:30-08:00 Northwest Scientific Association Business Meeting (River Fork)

## **REGISTRATION**

The full registration fee includes admission to all oral and poster sessions, pre-conference workshops, the opening reception, coffee breaks, the banquet and dance, and the program and abstracts. Additional fees are required for the TWS membership luncheon on Wednesday at 12:10 (to be announced at the meeting).

The registration desk will be open on Monday, March 6 from 08:00 – 18:00, Tuesday, March 7 from 08:00 – 18:00, and Wednesday, March 8 from 08:00 – 12:00 on The Landing of The Grove Hotel.

Registration Fee:

\$85.00 after 30 January 2006

Extra Banquet Tickets: \$25.00 per person (Limited number available on site)

### Organizing Committee

**Harriet Allen**, Washington Department of Fish and Wildlife  
**Jon Beals**, Idaho Department of Fish and Game  
**Diane Evans Mack**, Idaho Department of Fish and Game  
**Rita Dixon**, Idaho Department of Fish and Game, Idaho Conservation Data Center  
**Michael Goldstein**, USDA Forest Service  
**David Musil**, Idaho Department of Fish and Game  
**Steve Rust**, Idaho Department of Fish and Game, Idaho Conservation Data Center  
**Gregg Servheen**, Idaho Department of Fish and Game

The Committee would like to thank Cyndi Coulter for assistance with the program; Jeff Gould for the invasive species centerpieces; Leslie Carpenter, Marcie Carter, Sylvia Copeland, Jon Dudley, Chris Forristal, Diane Huckabay, Katie Miller, Brian Moser, Pam O'Hearn, and Scott Story for assistance with audio-visual equipment, and all of our dedicated volunteers for making the meeting a success!

Note: The Local Organizing Committee has made a special effort to reduce the ecological impact of such a large meeting by using reusable plates, utensils, and cups for the breaks and banquet, providing bins for recycling, and purchasing local and/or sustainable food to the extent possible.

### Plenary Speakers

**Dr. Michael Hutchins**, Executive Director/CEO, The Wildlife Society  
Michael Hutchins, is currently an Adjunct Associate Professor at the University of Maryland's Graduate Program in Sustainable Development and Conservation Biology, Senior Fellow at the Georgia Institute of Technology's Center for Behavior and Conservation and Executive Director of ZooThink, Inc., a Maryland-based consulting company that assists zoos, aquariums, conservation organizations and natural history museums in finding solutions to complex problems. He received his Ph.D. from the University of Washington in 1984 where he studied the behavioral ecology of free ranging, introduced population of Rocky Mountain goats in Olympic National Park. He was also an Acting Assistant Professor at the University of Washington, where he taught undergraduate and graduate courses in animal behavior, sociobiology and behavioral ecology. Dr. Hutchins has traveled to over 33 countries worldwide to pursue his interest in wildlife and nature conservation. Included among his many treasured experiences are: trapping mountain goats in the Olympic Mountains, SCUBA diving with Manta rays on Australia's Great Barrier Reef, tracking jaguars in the Brazilian Pantanal, holding a pangolin in Taiwan, avoiding fer de lances in Costa Rica, observing tribal ceremonies in Papua New Guinea and climbing Volcan Darwin in the Galapagos Islands, Ecuador.

**James L. Caswell**, Administrator, Idaho Governor's Office of Species Conservation  
Jim Caswell is currently the Administrator for the Office of Species Conservation, under an appointment by Governor Kempthorne. Previously Jim had been with the Forest Service for 33 years with his last position as a Supervisor of the Clearwater National Forest until December 2, 2000 when he retired and took on the new role of administrator for the Office Species Conservation. Jim graduated from Michigan State University with a B.S. in Forest Management. He is a member of the Society of American Foresters and Rotary. Other than a three-year stint in the army where he served as an American Advisor to Vietnamese combat troops, Jim has spent his entire career working in natural resource management. He has worked for three federal agencies, six national forests within three

Forest Service regions, and for two Forest Service regional offices. Jim began his career as a temporary employee on the Umatilla National Forest. From there, he moved on to the Bureau of Land Management and Bonneville Power Administration before returning to the Forest Service in 1974. During those early years, Jim held various positions including District Ranger on the Willamette National Forest and the Regional Appeals and Litigation Coordinator in Portland. In 1986, he was promoted to Deputy Forest Supervisor on the Boise National Forest, and in 1989 assumed the Forest Supervisor position on the Targhee National Forest. Jim became supervisor of the 1.8 million acre Clearwater National Forest in September 1993. Jim believes strongly in multiple use management and in ecosystem management. His love of hunting, fishing and river running keeps him outdoors in much of his free time.

**Christopher Servheen**, Grizzly Bear Recovery Coordinator, U. S. Fish and Wildlife Service and Adjunct Associate Professor in the College of Forestry and Conservation, University of Montana

Dr. Servheen has been the Grizzly Bear Recovery Coordinator for the USFWS for 25 years. As such, he is responsible for coordinating all the research and management on grizzly bears in the lower 48 states and working with biologists in Alberta and British Columbia. He was the EIS Team Leader for the Bitterroot Grizzly Bear Reintroduction EIS. Much of his current work involves the impacts of highways and human developments on habitat fragmentation for bears and other large carnivores in the Rocky Mountains. He leads projects involving the application of Global Positioning Systems (GPS) collars on grizzly bears and black bears to learn more about their detailed movements in relationship to human activity, particularly highways. He leads the interagency wildlife linkage taskforces working on highways, private lands, and public lands to maintain movement opportunities for wildlife across the landscape in the Northern Rockies. Dr. Servheen works with state and federal highway departments to develop better ways to get animals across highways to improve the safety of the traveling public and reduce wildlife road kills. In addition, Dr. Servheen teaches a class at UM on international wildlife conservation. He has worked in many countries in Asia and in Europe on bears and bear conservation, and was a Fulbright Scholar in Greece in 1994. He co-chairs the Bear Trade Expert Team for the IUCN Species Survival Commission. He is interested in the trade of bear parts for use in traditional medicine in Asia and the impact of this trade on Asian bear conservation. Through his international work he maintains close cooperative relationships with IUCN, WWF, and other international conservation organizations. He has authored or co-authored 78 publications and supervised 17 Masters Students and Ph.D. students at UM.

**Gloria Flora**, Executive Director, Sustainable Obtainable Solutions

In her 22-year career with the U. S. Forest Service, culminating in supervising the largest national forest in the lower 48 states, Gloria Flora became nationally known both for her leadership in ecosystem management and for her courageous principled stands. Today Flora is the Director of Sustainable Obtainable Solutions, a nonprofit dedicated to the sustainability of public lands and of the plants, animals and communities that depend on them. She works on western lands issues through education and activism and speaks on ecosystem stewardship, sustainability, people's relationships to landscapes and on the critical role of leadership that strives to make a difference. For her outstanding stewardship of public lands, she has received many regional and national awards, including being recognized as one of the outstanding environmental leaders of 2004 by *Vanity Fair Magazine*.

### **Idaho Chapter of The Wildlife Society Awards**

The **Special Recognition Award** is intended to honor any person or group who has made an outstanding contribution within the state of Idaho to wildlife conservation, management, science, conservation education, the wildlife profession or to an area of endeavor species, community, ecosystem or region. Any person or group who has made such a contribution in the last 3 years is eligible for this award.

The **Professional Wildlifer Award** honors professionals in wildlife management. It is given to demonstrate outstanding contributions to Idaho's wildlife resources as appreciated by one's peers. The award is meant to recognize outstanding professional contribution and promote public understanding of significant wildlife management accomplishments in Idaho.

### **Northwest Section of The Wildlife Society Awards**

The **Arthur S. Einarsen Award** was established in 1966 to recognize outstanding service to the wildlife profession by individuals residing in the area encompassed by the Northwest Section of The Wildlife Society.

The **Wildlife Administrator Award** was designed to recognize and reward excellence in the areas of wildlife program development and administration.

### **Speaker Preparation**

Contributed talks are 20 minutes long. Respect other speakers and your audience by staying within your scheduled time. A brief (5 minute) period post-presentation should be left so members of the audience can ask a few questions. Take the time to practice so your delivery fits into the scheduled interval. Check with your session chair well in advance of the start of your session to make sure that you know where the tools are that you need for your talk (e.g., slide advance monitor, laser pointer) and how to use them. This is also the time to check and see if your PowerPoint presentation runs properly on the projector and projection computer.

### **Posters: Set Up and Removal**

Posters may be set up any time after 17:00 on Monday 6 March in the Aspen Room and MUST be removed no later than 17:00 on Wednesday 8 March. Presenters should be available to discuss their posters between 17:30 and 19:30. Tables will be set up against the wall and posters may be leaned against the wall. Posters may also be attached to the wall with heavy double-sided carpenters' tape (which we will provide). In addition, easels will be available.

### **Messages, job postings, and volunteer opportunities**

We will set up a message and job board next to the registration desk.

### **Parking**

There will be a charge of \$4.95 for The Grove Hotel guest's overnight self-parking, and an hourly charge for members of the group who are not staying at the hotel; free for the first hour, \$1.50 for each hour thereafter and a maximum charge of \$12.00 per day. Valet parking is available for \$12.95 per day (Parking fees and charges are subject to change). For groups arriving simultaneously via ground transportation, there is a portage fee of \$4.50 per person, round trip. Arrival/departure times of ground transportation must be confirmed seven days prior to arrival.

In addition to parking at The Grove Hotel, there is a parking lot located at the corner of Capitol Blvd. and Front St. (immediately opposite The Grove; enter off Broad just past Myrtle). This is a self-pay parking lot and costs \$4.00/day. You will need the exact amount in cash to put in the coin box. There is a possibility that the rate may increase by March 6, so please be prepared to pay more.



### **Recycling**

We have made special arrangements with The Grove Hotel to provide recycling bins at the meeting and we encourage everyone to use them.

### **Lost And Found/Security**

Please bring lost and found items to the Registration Desk.

### **Sponsors**

US Geological Survey  
Potlatch Corporation  
Idaho State University, Department of Biological Sciences  
Idaho Department of Fish and Game  
SM Stoller Corporation  
USDA Forest Service, Region 4  
USDI Bureau of Land Management  
USDI Fish and Wildlife Service  
Idaho Governor's Office of Species Conservation  
Idaho Power  
CH2M HILL  
Idaho Wildlife Federation  
Lava Lake Land & Livestock  
Power Engineers  
Washington Department of Fish and Wildlife

### **SCIENTIFIC PROGRAM**

**MONDAY 6 MARCH, 08:30–11:30**

#### **Workshop: Idaho Partners in Amphibian and Reptile Conservation**

Chair: Chuck Peterson

Location: Cedar

**Chuck Peterson** (ISU, IMNH): National and Regional PARC Updates

**Rita Dixon** (IDFG): Amphibian and Reptile Aspects of the Idaho Comprehensive Wildlife Conservation Strategy

**Suzin Romin** (IDFG): Incorporating Negative Herpetological Survey Data into the Idaho CDC Database

**Scott Farnsworth** (ISU, IDFG): Designing a Herpetological Inventory Plan for Southeastern Idaho

**Chris Jenkins** (WCS, ISU): The Idaho National Laboratory Conservation Plan

**Chuck Peterson** (ISU, IMNH): Important Herpetological Areas in Idaho: Introduction and Open Discussion

**Charlie Justus** (IDFG): Herpetological Enforcement Issues

**General Discussion:** All meeting attendees are encouraged to contribute their information during this time.

- Research
- Inventory and Monitoring
- Management
- Policy
- Education

**MONDAY 6 MARCH, 12:00-13:00**

**Northwest Bat Cooperative Steering Committee Meeting (Catered luncheon, Cattails)**

**MONDAY 6 MARCH, 13:30-17:00**

**Workshop:** Idaho Bat Working Group

Co-chairs: Chuck Harris and Rita Dixon

Location: Cedar

13:30 Greetings and Salutations

13:35 2005 Bat Research Year in Review

- **Jenny Taylor:** Oregon Bat Grid in North Idaho
- **Kate Lambert:** Bat Activity Levels at Taylor Ranch
- **Brian Moser:** Forest Bats With UK and Pottlatch
- **Lauri Hanauska-Brown:** South Fork Snake River Survey
- **Jason Beck:** Bats And Bugs on Big Creek
- **Katie Miller:** Townsend's Genetics
- Discuss Other Bat Research Conducted

14:45 2006 Upcoming Bat Research

- **Martha Wackenhut and Katie Miller:** The Hunt for Townsend's Maternity Colonies
- **Beth Waterbury and Lauri Hanauska-Brown:** Bats and Mines Surveys
- **Jason Beck:** Bat Locomotion
- **Jenny Taylor:** North Idaho Bat Surveys
- **Rita Dixon:** Statewide BLM Abandoned Mines Surveys
- Discuss any other upcoming bat work

15:30 Break: Townsend's big-eared bat DVD by the **Idaho Cave Survey**

15:45 Idaho Bat Conservation Plan

- Discuss the Top 10 Priorities from the Plan to Focus on
- Idaho Comprehensive Wildlife Conservation Strategy: Implementation
- The Importance of Negative Data: Using Bat Surveys as a Pilot Project
- Wrap-Up

**MONDAY 6 MARCH, 17:30-19:30 (Aspen)**  
**Contributed Posters**

Breeding Biology of Flammulated Owls in Idaho. **BARNES, KEITH P., and James R. Belthoff.**

Nesting Habitat Typification: Red-Tailed Tropicbird *Phaethon rubricauda* on Midway Atoll. **BOYD, AMANDA.**

Germination and Water Status of Grass Seeds on Lichen-Dominated Biological Soil Crusts. **DEINES, LYNELL, Tara Barks, Marcia Wicklow-Howard, Roger Rosentreter, and Marcelo Serpe.**

Progress in the Development of Native Forbs for Great Basin Restoration. **DEBOLT, ANN M., and Nancy L. Shaw.**

The Use of Remote Cameras to Monitor Spatial and Temporal Activity of Humans and Wildlife in the Livingstone River Area of Southwestern Alberta. **DUKE, DANAH.**

Upper Columbia Basin Network Natural Resource Inventory and Monitoring Program. **GARRETT, LISA, Leona K. Svancara, and Tom Rodhouse.**

Development of a Molecular Sex Identification Marker for Non-Invasively Collected Feathers. **GEBHARDT, KARA, Justin Doble, and Lisette Waits.**

A Survey of Lungworm Infestation in Dall Sheep (*Ovis dalli*) and Moose (*Alces alces*) in Alaska. **HOLCOMB, DARCE, and Kimberlee Beckmen.**

Ten Years of Wolf Recovery—A Conservation Success. **HOLYAN, JIM, Isaac Babcock, and Curt Mack.**

Greater Sage-Grouse Use of Rehabilitated Areas in South-Central Idaho. **LOWE, BRAD S., and David J. Delehanty.**

Effects of Periodic Substrate Scouring on Benthic Scrapper-Algae Interactions in a Small Idaho Stream. **MCCAULEY, LUANA M., and Peter Koetsier.**

Characteristics of the Biological Soil Crust in Utah juniper (*Juniperus osteosperma*) and Pinyon-Juniper (*Pinus monophylla*-*J. osteosperma*) Habitat in South-central Idaho. **MILLER, JENNIFER J., and Steven K. Rust.**

Ecological Correlates of Genetic Structure in Townsend's Big-eared Bats in Southeast Idaho. **MILLER, KATIE ERIN G.**

Density and Seed Bank of *Verbesina encelioides* on Midway Atoll National Wildlife Refuge. **MORGAN, HOLLY.**

Yellowstone Cutthroat Trout Population Assessment: Teton Riverheadwaters. **NIELSON, JORDAN.**

Estimating the Amount of Suitable Spotted Owl Habitat on Non-federal Lands in Washington. **PIERCE, D. JOHN, Joseph B. Buchanan, Brian L. Cosentino, and Shelly Snyder.**

Old Nest Material Affects Burrow Reuse by Burrowing Owls. **RIDING, COREY S., and James R. Belthoff.**

Bald Eagle Nesting in North Idaho. **ROBINSON, SCOTT R.**

Bald eagles of Wolf Lodge Bay. **ROBINSON, SCOTT R.**

Fire Effects on Micronutrient Capital in Forest Soils of Chelan Mountains, WA. **SCHERER, GEORGE, and Dave Peterson.**

Embryo Growth and Germination in *Lomatium dissectum* Seeds. **SCHOLTEN, MELISSA, Nancy L. Shaw, and Marcelo Serpe.**

Cautions About Using Satellite Telemetry to Assess Habitat Associations of Raptors. **STEENHOF, KAREN, and Michael Kochert.**

University of Alaska Fairbanks Student Chapter of The Wildlife Society. **Student Chapter of The Wildlife Society, University of Alaska Fairbanks [JEFFREY WELLS presenter].**

Taking IT to the Field. **SVANCARA, LEONA K., Lisa Garrett, and Tom Rodhouse.**

Wildfire Effects on Stream Ecosystem Properties Following Debris Flows, 10 Years Post Fire. **TUCKETT, QUENTON, and Peter Koetsier.**

Comparing GPS Collar Error: Evaluation of Televilt POSREC Collars and a Method for Outlier Identification. **VILLEPIQUE, JEFFREY T., Vernon C. Bleich, and R. Terry Bowyer.**

Functional Asymmetry in Chukar Reproduction. **WARWICK, JOSEPH N., and David J. Delehanty.**

In Search of Simple Characters to Distinguish *Myotis lucifugus* and *Myotis yumanensis* in the Field. **WELLER, THEODORE J., Shonene A Scott, THOMAS J. RODHOUSE, Patricia C. Ormsbee, and Jan M. Zinck.**

Effects of the 1994 Rabbit Creek Fire On Stream Fish Diets: 11 Years Later. **WHITE, JOSHUA, Quenton Tuckett, and Peter Koetsier.**

Web-Based Bibliographies for Raptors and Great Basin Ecology. **Zarriello, Thomas, KAREN STEENHOF, Sean Finn, and Susan Toussaint.**

**TUESDAY 7 MARCH, 08:00-12:00**

**Plenary Session: Science, Natural Resource Management, and the Public Good: Toward a Democracy of Information and Management.**

Chair: Michael Goldstein

Location: Evergreen

- 08:00 Welcome: **Gregg Servheen**, President, ICTWS
- 08:10 Plenary Introduction: **Dr. Michael Goldstein**, President Northwest Section of the Wildlife Society
- 08:15 **Dr. Michael Hutchins**, Executive Director, The Wildlife Society
- 09:00 **James L. Caswell**, Administrator, Idaho Governor's Office of Species Conservation
- 09:30 Break
- 10:00 **Dr. Chris Servheen**, USFWS Grizzly Bear Recovery Coordinator *adaptive management*  
① conceptual & quantitative models ② rigorous monitoring plans ③ rapid feedback
- 10:30 **Gloria Flora**, Executive Director, Sustainable Obtainable Solutions
- 11:15 Panel Question and Answer
- 11:45 Wrap-up *he sounds like Jimmy Durante*
- 12:00 Lunch (on your own)

**SYMPOSIA AND CONTRIBUTED PAPERS SESSIONS**

**TUESDAY 7 MARCH 13:20-16:50**

**Symposium: Plant Ecology and General Botany**

Chair: Steve Novak

Location: Rapids

- 13:20 Vegetation Dynamics Following Conifer Encroachment in a Dry, Montane Meadow of the Western Cascade Range. **HAUGO, RYAN D., and Charles B. Halpern.**
- 13:40 Vertical Distribution of Vascular Plants Relative to Tidal Inundation and Substrate in Salt Marshes Near Tofino, British Columbia, Canada. **HUGHES, JONATHAN.**
- 14:00 Progress in the Development of Native Forbs for Great Basin Restoration. **DEBOLT, ANN M., and Nancy L. Shaw.**
- 14:20 Development of a Predictive Model for Plant Community Rarity Ranks. **RUST, STEVEN K.**
- 14:40 Volunteers, Grants and Native Riparian Habitat Restoration. **DUDLEY, MARY.**

- 15:00 A Phylogenetic Analysis of the Genera of Tribe Episcieae (Gesneriaceae) from Multiple Loci. **DUFFY AARON M., Mindie M. Funke, and James F. Smith.**
- 15:20 Break
- 15:50 Reproductive success as a function of outcrossing distance in *Lepidium papilliferum*. **BILLINGE, STEPHANIE, and Ian Robertson.**
- 16:10 Genetic diversity in *Lepidium papilliferum*. **STILLMAN AMY J., Stephen J. Novak, Ian Robertson, and James F. Smith.**
- 16:30 Discussion and Wrap-up

**TUESDAY 7 MARCH, 13:20-17:30**

**Symposium: Amphibian and Reptile Conservation**

Chair: Chuck Peterson

Location: White Water

- 13:20 The U. S. Geological Survey's Amphibian Research and Monitoring Initiative. **CORN, P. STEPHEN.**
- 13:40 Genetic Comparison Between Coastal and Idaho Populations of Rough-Skinned Newts, *Taricha granulosa*. **BAUDER, JAVAN M., and Jack Sullivan.**
- 14:00 Chytridiomycosis: Is It a Problem for Amphibian Populations in the Northern Intermountain West? **ST-HILAIRE, SOPHIE, Sarah Bruer, Peter Murphy, Debra Patla, and Charles Peterson.**
- 14:20 Ranaviruses and Amphibian Epizootics: Tiger Salamanders as a Case Study. **STORFER, ANDREW.**
- 14:40 Species-Specific Responses of Amphibians to Wildfire in Glacier National Park. **HOSSACK, BLAKE R., and P. Stephen Corn.**
- 15:00 Effects of Non-Native Fish on Amphibian Reproduction and Occupancy at Multiple Spatial Scales. **PILLIOD, DAVID S., and others.**
- 15:20 Break
- 15:50 Landscape Genetics of the Columbia Spotted Frog in the Palouse Ecoregion of Northern Idaho. **GOLDBERG, CAREN S., and Lisette P. Waits.**
- 16:10 Mapping Amphibian Habitat Using Hyperspectral Imagery. **SHIVE, JEREMY P., and Charles R. Peterson.**
- 16:30 A Survey of Amphibians and Reptiles in the Bureau of Land Management's Shoshone Field Office Area. **Lorenz, Brian A., and SCOTT J. BAILEY.**
- 16:50 Conservation Biology of Great Basin Rattlesnakes: Linking Landscape Disturbance to Rattlesnake Populations. **JENKINS, CHRISTOPHER L.**

17:10 Habitat Management Guidelines for Reptiles in the Northwestern United States. **COSSEL JR., JOHN, Chris Jenkins, and Charles R. Peterson.**

**TUESDAY 7 MARCH, 13:20-17:10**

**Contributed Papers Session 1: Wildlife Management**

Chair: Chuck Blair

Location: River Fork

- 13:20 Idaho Department of Fish and Game Wildlife Management Areas: Important Refuges for Nongame Birds. **MOULTON, COLLEEN E., and Rex Sallabanks.**
- 13:40 Directional Bias in Avian Copulation. **TUREK, NICHOLE C., and David J. Delehanty.**
- 14:00 Trumpeter Swan Translocation in Southeastern Idaho 2001-2005: Survival and Movement. **KILPATRICK, DARLENE, Kerry P. Reese, Lauri Hanauska-Brown, and Tom Hemker.**
- 14:20 Twenty-five Years of Trumpeter Swan Management in Southeast Idaho. **HANAUSKA-BROWN, LAURI, Ruth Shea, Tom Hemker, and Rex Sallabanks.**
- 14:40 Using DNA Sequence Analysis to Detect and Identify Carnivores in National Parks of the Southwest. **KEEHNER, JON, Dave Onorato, and Lisette Waits.**
- 15:00 South Fork of the Snake River Bat Surveys. **MILLER, KATIE ERIN G.**
- 15:20 Break
- 15:50 Distribution and Status of Pacific Lamprey in the Clearwater River Drainage of North Central Idaho. **CLAIRE, CHRISTOPHER W., and Timothy Cochnauer.**
- 16:10 Ecological Characterization and Comparison of Lake Types in the Columbia National Wildlife Refuge, Washington. **Bader, J., and A. GABRIEL.**
- 16:30 Approaches to Improving the Efficiency and Usefulness of the Habitat Evaluation Procedure Methodology. **BLAIR, CHUCK.**
- 16:50 It's Not As Simple As "Counting Fish": Estimating Rotary Screw Trap Efficiency For Juvenile Steelhead Trout. **TATTAM, IAN A., James R. Ruzycki, Wayne H. Wilson, Jaym'e E. Schricker, and Hiram W. Li.**
- 17:10 Adjourn

**TUESDAY 7 MARCH, 13:20-17:30**

**Symposium: Highways and Wildlife**

Chair: Chris Servheen

Location: Cedar

- 13:20 Bears And Highways: Identifying Road Crossing Habitat Characteristics Using the Brownian Bridge. **LEWIS, JESSE S., Janet Rachlow, and Jon Horne.**
- 13:40 Predicting Wildlife Crossing Locations. **OLENICKI, THOMAS, and Lance Craighead.**
- 14:00 Roadway Mortality of Raptors in Southern Idaho. **BOVES, THAN J., and James R. Belthoff.**
- 14:20 The Effects of Highways on Elk Habitat in the Western United States and Proposed Mitigation Approaches. **RUEDIGER, BILL, Ken Wall, and Robin Wall.**
- 14:40 Eastern Idaho Wildlife Linkage, Data Collection, Highway Crossing Projects and Perspectives. **CRAMER, TIM, and William Shaw.**
- 15:00 Getting the Chickens Across the Road. **TERRA-BERNS, MARY.**
- 15:20 Break
- 15:50 Employing Management Solutions for the McArthur Lake Wildlife Corridor. **SOULTS, SCOTT.**
- 16:10 The Use of Interactive GIS Tools to Support Identification and Maintenance of Wildlife and Highway Linkage Areas. **WALL, KEN.**
- 16:30 Road Watch in the Pass: A Web-Based GIS Project to Monitor Wildlife Movement Across Highway 3 in The Crowsnest Pass. **DUKE, DANAH.**
- 16:50 Panel Discussion.
- 17:10 Closing Comments—Where Do We Go From Here On This Issue? **SERVHEEN, CHRIS.**

**WEDNESDAY 8 MARCH, 08:00-11:50**

**Symposium: Landscape Ecology**

Chair: David Peterson

Location: River Fork

- 08:00 Old Datasets, New GIS and Historic Fluctuations of Glaciers and Climate, Mount Hood, Oregon. **LILLQUIST, KARL, and Karen Walker.**
- 08:20 Overview and Current Status of Northwest Gap Analysis Project. **AYCRIGG, JOCELYN L.**
- 08:40 Mortality and Early Coniferous Forest Development. **LUTZ, JAMES A., and Charles B. Halpern.**



- 09:00 Shrub-Steppe Vegetation Trends, Middle Fork Salmon River. **PEEK, JAMES M.**
- 09:20 Does One Size Fit All? Creating Landscape-Scale Models of Northern Goshawk Nesting Habitat in Washington State. **FINN, SEAN P.**
- 09:40 Landscape Genetics of Wolverines in Western Montana. **BALKENHOL, NIKO, Lisette P. Waits, Christine C. Cegelski, and Neil J. Anderson.**
- 10:00 Break
- 10:30 Classification and Distribution of Lake Types in Washington State. **GABRIEL, A., K. Lillquist, A. Perkins, and J. Rhoades.**
- 10:50 Mapping Cheatgrass (*Bromus tectorum*) in the Intermountain West with Satellite Imagery. **PETERSON, ERIC B.**
- 11:10 Impacts of Fuel Reduction Thinning on Oak and Chaparral Vegetation Communities of Southwestern Oregon. **PERCHEMLIDES, KEITH, and Patricia Muir.**
- 11:30 Effects of Lake Size and Limnology on the Nesting Success of Horned Grebes (*Podiceps auritus*). **WELLS, JEFFREY J., Kate Martin, and Mark Lindberg.**
- 11:50 Lunch (on your own)

**WEDNESDAY 8 MARCH, 08:00-10:00**

**Symposium: Lichens And Non-Vascular Plants**

Co-chairs: Roger Rosentreter and Katie Glew

Location: Rapids

- 08:00 Aging Archaeological Rock Structures Using Lichens. **ROSENTERETER, ROGER, Terri Rudolph, Molly Bennick, and Ann DeBolt.**
- 08:20 Curious Lichens from the Piltun Region of Sakhalin Island, Russian Far East. **GLEW, KATHERINE, and Erin Berry-Bibee.**
- 08:40 The California Lichen Society's Conservation Committee: Goals and Processes. **PETERSON, ERIC B.**
- 09:00 Characteristics of Biological Soil Crusts Within Shrubland Plant Communities of Southwest Idaho. **RUST, STEVEN K., and Jennifer J. Miller.**
- 09:20 How to Find an Arctic Lichen Without Actually Going to the Tundra. **HOLT, EMILY A., Bruce McCune, and Peter Neitlich.**
- 09:40 Rare Bryophytes in Garry Oak and Associated Habitats of Coastal British Columbia: The Continuing Need for Inventory. **MCINTOSH, TERRY T.**
- 10:00 Break

**WEDNESDAY 8 MARCH, 10:30-11:50**

**Symposium: Invertebrates**

Chair: Bill Bosworth

Location: Rapids

- 10:30 Using Rotary Flight Mills to Quantify Fat Use by Douglas-Fir Beetle, *Dendroctonus pseudotsugae*. **WILLIAMS, WYATT, and Ian Robertson.**
- 10:50 Petal Herbivory by Chrysomelid Beetles (*Phyllotreta* sp.) is Detrimental to Pollination and Seed Production in *Lepidium papilliferum* (Brassicaceae). **LEAVITT, HOLLIE, and Ian C. Robertson.**
- 11:10 Assessing Steelhead Reintroduction Potential Using Benthic Macro-Invertebrate Community Structure and Habitat Condition Analyses on Manastash Creek, Kittitas County, Washington. **DIDRICKSEN, DANIEL J.**
- 11:30 Butterfly Occurrences on Lands Managed by the Burley Bureau of Land Management Field Office, Twin Falls and Cassia Counties, Idaho. **FOTHERGILL, KENT.**
- 11:50 Lunch (on your own)

**WEDNESDAY 8 MARCH, 08:00-12:10**

**Symposium: The Future of Sagebrush Conservation and Management—Visions and Solutions**

Chairs: Steve Hanser and Steve Knick

Location: Cedar

- 08:00 Anchoring the Sagebrush Sea: To Seed or Not to Seed? **SALO, LUCINDA F., Michael E. Rhodes, and David A. Pyke.**
- 08:20 Effects of Shrub Removal and Nitrogen Addition on Soil Moisture in Sagebrush Steppe. **INOUYE, RICHARD S.**
- 08:40 SageSTEP: Sagebrush Steppe Treatment Evaluation Project. **MCIVER, JAMES.**
- 09:00 Pygmy Rabbits on State Lands in Eastern Oregon. **HAGAR, J., C. Carey, and G. Lienkaemper.**
- 09:20 Winter Survival and Seasonal Home Range Quality of Sage-Grouse Hens in South Phillips County, Montana. **BATTAZZO, ANGELA M.**
- 09:40 Natal Dispersal and Mortality Rates of Juvenile Pygmy Rabbits in the Lemhi Valley, Idaho. **ESTES-ZUMPF, WENDY A., and Janet L. Rachlow.**
- 10:00 Break
- 10:30 Linking Occurrence and Fitness to Persistence: A Habitat-Based Approach for the Endangered Greater Sage-Grouse in Alberta. **ALDRIDGE, CAMERON L., and Mark S. Boyce.**

- 10:50 Modeling and Mapping Greater Sage-Grouse Reproductive Habitat at the Landscape-Level. **SHEPHERD, JAY F., Kerry P. Reese, and John W. Connelly.**
- 11:10 The Draft Conservation Plan for Greater Sage-Grouse in Idaho: A Framework for Progress. **MAKELA, PAUL, and Tom Hemker.**
- 11:30 Integrating Sensitive Species Studies and Biodiversity Inventories to Develop a Conservation Management Plan for the Idaho National Laboratory. **JENKINS, CHRISTOPHER L., and Craig R. Groves.**
- 11:50 The Federal Farm Bill and Shrub-Steppe Conservation. **LARSEN, DON.**

**WEDNESDAY 8 MARCH, 08:00-12:10**

**Contributed Papers Session 2: Avian Ecology**

Chair: David J. Delehanty

Location: White Water

- 08:00 Identification of Sage-Grouse Nest Predators Using Videography. **COATES, PETER S., and David J. Delehanty.**
- 08:20 Juvenile Greater Sage-Grouse Dispersal Ecology in Northwestern Colorado. **Thompson, Thomas R., KERRY P. REESE, and Anthony D. Apa.**
- 08:40 Summer and Fall Use of the Blue Creek Wetland Area by Greater Sage-Grouse on the Duck Valley Indian Reservation. **GOSSETT, DANIEL N.**
- 09:00 Northern Goshawk Foraging Habitat Selection in South Central Idaho. **HASSELBLAD, KRISTIN, and Marc Bechard.**
- 09:20 Estimating Space Use of a Central-Place Forager Using Satellite Telemetry. **MOSER, BRIAN W., and Edward O. Garton.**
- 09:40 Ferruginous Hawk Use of Nesting Substrate: Implications for Monitoring. **KOCHERT, MICHAEL N., and Karen Steenhof.**
- 10:00 Break
- 10:30 Range-Wide Genetic Variation in Mountain Quail. **DELEHANTY, DAVID J., and Susie Dunham.**
- 10:50 Changes in Flammulated Owl Occurrence Over a 14-Year Period in the Northern Rocky Mountains. **EVANS MACK, DIANE, and Joel Sauder.**
- 11:10 Nest Survival of Two Woodpecker Species in Ponderosa-Pine Dominated Forests: Does Survival Vary With Location? **STORY, SCOTT, and Victoria Saab.**
- 11:30 Influence of Post-Fire Timber Harvest on Black-Backed Woodpecker Nest Survival. **FORRISTAL, CHRIS, and Victoria Saab.**
- 11:50 Red-Headed Woodpecker Habitat Selection In A Burned Ponderosa Pine Forest. **VIERLING, KERRI T., and Leigh B. Lentile.**

**WEDNESDAY 8 MARCH**

12:10-13:10 **TWS Membership Luncheon:** all TWS members are invited (Evergreen)  
The Wildlife Society—The Society's priorities and direction  
**Rob Brown**, President, The Wildlife Society  
**Michael Hutchins**, Executive Director, The Wildlife Society

**★ WEDNESDAY 8 MARCH, 13:20-17:10**

**Contributed Papers Session 3: Emerging Challenges in Wildlife Conservation**

Chair: Rita Dixon  
Location: Rapids

- 13:20 Wind Energy Development in Idaho: A Case Study Perspective.  
**SERVHEEN, GREGG, and Mike McDonald.**
- 13:40 Water for Wildlife: Improving Access and Reducing Mortality for Bats and Other Wildlife at Livestock Water Developments. **TAYLOR, DANIEL A. R., and Stuart R. Tuttle.**
- 14:00 Reproductive and Population Parameters of the River Otter in Idaho and Liver Concentrations of Environmental Contaminants. **PATTON, GINA.**
- 14:20 An Analysis of *Flavobacterium psychrophilum* Carbohydrate Antigens and Their Potential Role in Protective Immunity. **LAFRENTZ, BENJAMIN R., Scott E. LaPatra, William D. Shewmaker, Aaron Weighall, and Kenneth D. Cain.**
- 14:40 Assessing the Sustainability of Wildlife Under the 2005 Forest Service Planning Rule. **SURING, LOWELL, Kim Mellen, William Gaines, Barbara Wales, and Shawne Mohoric.**
- 15:00 Is it Time to Delist the Yellowstone Grizzly Bear? **HANAUSKA-BROWN, LAURI, and Steve Nadeau.**
- 15:20 Break
- 15:50 Wolf Management in Idaho. **NADEAU, STEVE.**
- 16:10 An Online System for Reporting Wolf Sightings. **LUCID, MICHAEL K., Jason S. Husseman, Brent Thomas, and Steve Nadeau.**
- 16:30 Developing Long-Term Monitoring Protocols for Wolves in Idaho. **MACK, CURT, Kyran Kunkel, and Wayne Melquist.**
- 16:50 Discussion and Wrap-up

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**WEDNESDAY 8 MARCH, 13:20-17:10**

**Symposium: The Role of Citizen Science in the Conservation and Management of Fish and Wildlife**

Organizer: John Pierce

Location: Cedar

**SUCCESS STORIES**

Chair: Sara Vickerman

- 13:20 Advocacy, the Media, Litigation, Public Perceptions and the Future of Science in Natural Resource Management: Why Citizen Science Is So Important. **GRUE, CHRISTIAN E.**
- 13:40 Recommendations for Rangelwide Population Trend Monitoring of North American Landbirds. **RICH, TERRELL D.**
- 14:00 Save Our Streams: Two Decades of Volunteer Water Quality Monitoring. **FRANKLIN, THOMAS M.**
- 14:20 The Opportunities and Challenges of Citizen Science: The Cornell Experience. **BONTER, DAVID.**
- 14:40 Distribution and Habitat of the Pigmy Short-Horned Lizard in Washington State. **PETERSEN, DIANE, and Karen M. Dvornich.**
- 15:00 Algae People, Fern Frondlers, and Beetle Blitzers: Exploring Biodiversity in Great Smoky Mountains National Park. **HILTEN, JEANIE.**
- 15:20 Break

**OPPORTUNITIES AND CHALLENGES**

Chair: Chris Grue

- 15:50 Fifteen Years of *Naturemapping*: Successful Experiences and Lessons Learned. **DVORNICH, KAREN M.**
- 16:10 K-12 Field Investigations Support Fish and Wildlife Conservation. **TUDOR, MARGARET.**
- 16:30 Cougars and Citizen Science: An Evaluation of the Ability of 3<sup>rd</sup>, 5<sup>th</sup>, and 8<sup>th</sup> Grade Students to Collect Accurate Information on Wildlife and Their Habitats. **KERTSON, BRIAN N., and Christian E. Grue.**
- 16:50 A Model for a Citizen Science Network to Monitor the Biodiversity of Washington. **PIERCE, JOHN, Karen M. Dvornich, and Margaret Tudor.**
- 17:10 Adjourn

**WEDNESDAY 8 MARCH, 13:20-17:10**

**Contributed Papers Session 4: WILDLIFE MANAGEMENT**

Chair: Terry Bowyer

Location: River Fork

- 13:20 Density-Dependent Effects on Physical Condition and Reproduction in North American Elk: An Experimental Test. **STEWART, KELLEY M., R. Terry Bowyer, and John G. Kie.**
- 13:40 Influence of Nutrition on Wildlife Management: A Synthesis. **SHIPLEY, LISA A., and Charles T. Robbins.**
- 14:00 Challenging Dogma—Changing Paradigms: Greater Sage-Grouse Harvest Management in the U.S. **CONNELLY, JACK.**
- 14:20 Density-Dependence and Sustainability of Harvest on Greater Sage-Grouse Populations. **GARTON, OZ, Jack Connelly, and Kerry Reese.**
- 14:40 Trial Use of Unmanned Aerial Vehicle to Survey Greater Sage-Grouse Leaks. **MUSIL, DAVID, Jamie A. Duberstein, Kyuho Lee, Scott Bowman, Henry F. Percival, and Pete Zager.**
- 15:00 The Effects of Vertical Structures on Prairie Grouse. **HAGEN, CHRISTIAN A.**
- 15:20 Break
- 15:50 Reducing Post-Release Movement by Female Sharp-Tailed Grouse Through Release-Site Selection. **COATES, PETER S., and David J. Delehanty.**
- 16:10 Subjective Knowledge Produces a Rigorous Sampling Design for Mule Deer in Hells Canyon, Idaho and Oregon. **EDELMANN, FRANK, and Kirk Steinhorst.**
- 16:30 Lava Lake Land and Livestock: Science Based Grazing Management Plan. **O'SULLIVAN, MARY TESS, Michael S. Stevens, Alan R. Sands, and Jason W. Karl.**
- 16:50 Mountain Goats in Idaho: Status and Management. **TOWELL, DALE E.**
- 17:10 Adjourn

**WEDNESDAY 8 MARCH, 13:20-16:50**

**Contributed Papers Session 5: Wildlife Ecology**

Chair: Janet Rachlow

Location: White Water

- \* 13:20 The Role of Competition in the Dynamics of Elk and Deer Populations. **MANNING, JEFFREY A., and Edward O. Garton.**
- 13:40 Population Structure of the Idaho Ground Squirrel (*Spermophilus brunneus*) Using Mitochondrial Data. **HOISINGTON, JESSICA, Lisette Waits, Jack Sullivan, Janet Rachlow, and Steve Brunsfeld.**

- 14:00 Resource Selection and Space Use by Shiras Moose in Northern Idaho. **JONATHAN D. MUIR, and Janet L. Rachlow.**
- 14:20 Evaluating Wildlife-Habitat Relationships: A Comparison of Two Model-Building Approaches. **LONG, RYAN A., Jonathan D. Muir, Janet L. Rachlow, and John G. Kie.**
- 14:40 Spatial Analysis of Black Bear Gene Flow on the Kenai Peninsula, Alaska. **ROBINSON, STACIE, Lisette Waits, Raymond Dezzani, and Ian Martin.**
- 15:00 Analysing Animal Movements Using Brownian Bridges. **HORNE, JON S., Edward O. Garton, Layne G. Adams, and Mark R. Fuller.**
- 15:20 Break
-  15:50 Effects of Wolf Reintroduction on Cougars in the Idaho Wilderness. **AKENSON, JAMES, and Holly Akenson.**
- 16:10 Understanding Ungulate Population Dynamics in Idaho. **ZAGER, PETE, Mark Hurley, George Pauley, and Craig White.**
- 16:30 Discussion and Wrap-up

**ABSTRACTS OF PAPERS AND POSTERS Presented at the Idaho Chapter and Northwest Section of the Wildlife Society, Northwest Scientific Association, and Northwest Lichenologists Annual Meeting**

**AKENSON, JAMES, and Holly Akenson.** University of Idaho, Taylor Ranch Field Station.  
*EFFECTS OF WOLF REINTRODUCTION ON COUGARS IN THE IDAHO WILDERNESS.*

Wolves were reintroduced in the central Idaho wilderness in 1995 and 1996 and rapidly established packs in areas previously occupied by cougars. We spent four winters studying the relationship between sympatric wolves and cougars in the Idaho wilderness. We examined the potential for competition between resident cougars and a newly established wolf pack for food, space, and habitats through radio telemetry tracking and examination of 192 carcasses. We found that wolf and cougar diets were almost identical. Winter home ranges of wolves and cougars significantly overlapped, although the wolf pack home range size was 5-10 times the size of individual cougar home ranges. We observed wolf utilization of cougar killed prey and evidence of wolf avoidance by cougars. Although no interspecific killing was documented between wolves and cougars, the effects of competition and a declining prey population were expressed in the cougar population dynamics: low recruitment and dispersal. A large-scale wildfire provided a unique opportunity to compare wolf and cougar responses to catastrophic environmental change. Wolves, with a large home range were more adaptable than cougars. The combination of declining prey numbers, addition of wolf competitors, and large-scale habitat alteration amplified the competition between wolves and cougars. This high level of interspecific competition made it easier to recognize how the cougar population adjusted to wolves joining the large mammal community.

**ALDRIDGE, CAMERON L., and Mark S. Boyce.** Colorado State University & U.S. Geological Survey, 2150 Centre Ave., Bldg. C, Fort Collins, CO 80526-8118 (CLA); Department of Biological Sciences, University of Alberta, Edmonton, Alberta T6G 2E9 Canada (MSB).  
*LINKING OCCURRENCE AND FITNESS TO PERSISTENCE: A HABITAT-BASED APPROACH FOR THE ENDANGERED GREATER SAGE-GROUSE IN ALBERTA.*

Detailed empirical models addressing both species occurrence and fitness across a landscape are necessary to understand processes related to population persistence. Failure to consider both occurrence and fitness may result in incorrect assessments of habitat importance leading to inappropriate management strategies. We take a 2-stage approach to identifying critical nesting and brood-rearing habitat for the endangered Greater Sage-Grouse in Alberta at a landscape scale. First, we use logistic regression to develop spatial models predicting Sage-Grouse nest and brood occurrence on the landscape. Secondly, we use Cox proportional hazards survival models to identify the most risky habitats across the landscape. Finally, we combine these two approaches to identify attractive Sage-Grouse habitats that pose minimal risk of failure (source habitats) and 'attractive' sink habitats that pose increased risk (ecological traps). Our models show that Sage-Grouse select for heterogeneous patches of moderate sagebrush cover and avoid anthropogenic edge habitat for nesting. Nests were more successful in heterogeneous habitats but nest survival was independent of anthropogenic features. Similarly, broods selected heterogeneous high-productivity habitats with sagebrush while avoiding human developments, cultivated cropland, and high densities of oil wells. Chick failure tended to occur in proximity to oil and gas developments and along riparian habitats. Approximately 10% and 5% of the study area was considered source habitat, whereas 19% and 15% of habitat was attractive sink habitat for nest and broods, respectively. Limited source habitats appear to be driving poor nest success (39%) and low chick survival (12%). Our habitat models identify areas of protection priority and areas that require



immediate management attention to enhance recruitment to secure the viability of this population.

**AYCRIGG, JOCELYN L.** University of Idaho, National Gap Analysis Program, Moscow, ID 83843.

*OVERVIEW AND CURRENT STATUS OF NORTHWEST GAP ANALYSIS PROJECT.*

The goal of the National Gap Analysis Program is to 'keep common species common'. With this goal in mind, the Northwest Gap Analysis Project, which encompasses 5 states (Montana, Wyoming, Idaho, Washington, and Oregon) was begun in September 2004. We started with mapping ecological systems of western Washington, which was completed in November 2005. We are currently mapping ecological systems in Montana, eastern Oregon and Washington. In 2006, we will be mapping northern Idaho and parts of Wyoming. We are taking a novel approach to species distribution modeling. First, we are engaging Natural Heritage Programs in each state in data collection and maintenance at the beginning of the modeling process. Second, we plan to map the range, distribution, and habitat of each species separately. And lastly, we will utilize both deductive and inductive modeling approaches. Using these modeling approaches will improve our model outputs, engage data users early in the process, and increase the likelihood of these models being applied to biological conservation.

**Bader, J., and A. GABRIEL.** Central Washington University, Department of Geography and Land Studies, Ellensburg, WA 98926.

*ECOLOGICAL CHARACTERIZATION AND COMPARISON OF LAKE TYPES IN THE COLUMBIA NATIONAL WILDLIFE REFUGE, WASHINGTON.*

The Columbia National Wildlife Refuge, established in 1944, is located in the heart of the Columbia Basin, a region characterized as a semi-arid shrub-steppe environment with rainfall at less than 8 inches per year. As a result of groundwater seepage from the Columbia Irrigation Project (CIP) established in 1949, hundreds of lakes and ponds were subsequently created in low-lying depressions and coulees of the refuge. The goal of this paper is to ecologically classify, characterize and compare the structural and functional aspects of various lake types existing within the refuge. Using a combination of aerial photo and GIS layer interpretation, field observations, and descriptive and historical data previously collected through the refuge, the refuge lakes were classified into various types based on hydrologic characteristics, size, water chemistry, and whether the lakes pre-dated the CIP. Representative reference sites were established for four general lake types, in order to ecologically characterize the physical, biological and chemical parameters typically found in each lake. The lake types include freshwater drainage lakes pre-existing and created by the CIP, a created freshwater seepage lake, and a seepage alkali lake representing pre-CIP conditions. Field data, collected between November 2004 and October 2005, was used to assess the relationship between lake types and environmental conditions, including differences in characteristics such as water quality (temperature, dissolved oxygen, pH, conductivity, and clarity), nutrient levels, sediment composition, and aquatic vegetation. Baseline data gathered from this project will aid in management decisions affecting recreational use of lakes and the surrounding habitat within the refuge.

**BALKENHOL, NIKO, Lisette P. Waits, Christine C. Cegelski, and Neil J. Anderson.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844-1136 (NB, LPW); Idaho Department of Fish and Game, Eagle, ID 83616 (CCC); Montana Fish, Wildlife & Parks, Bozeman, MT 59717 (NJA).

**LANDSCAPE GENETICS OF WOLVERINES IN WESTERN MONTANA.**

We investigated the influence of different landscape variables on genetic population structure of wolverines (*Gulo gulo*). Our data set consists of 88 animals that were trapped in western Montana between 1989 and 2000. Two previous studies found strong genetic structure in the data, and suggested that this structure was mainly caused by human land-use and habitat alteration. We calculated different pair-wise genetic distances and kinship coefficients for all individuals. We then used Mantel tests and autocorrelation statistics to evaluate the spatial genetic structure, and to determine its relationship to various landscape variables. Besides straight geographical distance, we also tested several effective distances for a correlation with genetic indices. Effective distances were determined by a least cost analysis. For this, we modelled our study area in terms of land-cover, human population density, road density, and other variables in a GIS. Our findings show that there is a significant isolation-by-distance pattern in the data. Also, a variety of landscape variables seem to influence gene flow in the wolverines of the study area. Our results also indicate that the wolverines might be differently affected by these factors, depending on their location within the study site.

**BARNES, KEITH P., and James R. Belthoff.** Boise State University, Department of Biology and Raptor Research Center, Boise, ID 83725.

**BREEDING BIOLOGY OF FLAMMULATED OWLS IN IDAHO.**

Our study is designed to gather information about breeding biology and habitat use of flammulated owls (*Otus flammeolus*) within the Boise National Forest of Idaho. Natural resource agencies consider flammulated owls a *sensitive species*, and additional information on their biology is needed. We used song-playback surveys to document return from migration during the first week of May and locate 31 calling male flammulated owls within portions of the Lowman Ranger District. Using audio lures and mist nets, we captured and radio-tagged 13 flammulated owls and located and monitored four active nests. Using radio telemetry, we located paired and unpaired (2 of 6 males were unpaired) adult males, adult females, and juvenile owls. None of the radio-tagged adults suffered mortality, whereas one of three juveniles was depredated. Clutch size averaged 2.7, and brood size and number of fledglings averaged 2.0. Mean dates for nesting were: egg-laying - 4 June, hatching - 28 June, and fledging - 19 July. Unpaired male owls made large movements away from their territories that were uncharacteristic of paired males. Neither juveniles nor their adult caregivers moved more than 500 m from their nest site during the post-fledging period. We also measured habitat use at three scales: the nest tree, vegetation immediately surrounding the nest tree, and vegetation within and adjacent to owl territories. There were few significant differences between used and available habitat at any scale. (Poster Presentation)

**BATTAZZO, ANGELA M.** University of Montana, School of Forestry and Conservation, Missoula, MT 59812.

**WINTER SURVIVAL AND SEASONAL HOME RANGE QUALITY OF SAGE-GROUSE HENS IN SOUTH PHILLIPS COUNTY, MONTANA**

Greater sage-grouse (*Centrocercus urophasianus*) populations have been declining since the early 1900s. Many studies have shown habitat loss and degradation negatively affect productivity and survival, and contribute to population declines. Researchers have begun to recognize the substantial influence of weather variation

on sage-grouse populations. A thorough understanding of how seasonal weather variation and winter habitat quality influence sage-grouse reproductive success and survival is required to address management and conservation objectives. Winter season ecology, physiology, and habitat needs as they relate to sage-grouse demographics have not been identified. Juvenile and yearling winter survival is not well understood, and is often assumed to be low. In August 2004, we initiated a two-year study to evaluate age-specific winter survival rates and habitat-use patterns for resident sage-grouse hens in South Phillips County, Montana. The 1,050 square-mile study area includes a matrix of US BLM, USFWS, and State of Montana managed lands interspersed with active private ranches. During 2004, 75 hens were captured, aged, and equipped with radio-telemetry collars. Despite sporadic snow accumulation and temperature variation ranging from -40 F to 67 F, we did not sustain a single mortality during the winter study season. This data set contradicts long-held assumptions regarding juvenile and yearling winter survival. Additionally, winter season home range quality is currently being evaluated for the effect on across-season fitness aspects including hen condition, survival, and fecundity.

**BAUDER, JAVAN M., and Jack Sullivan.** University of Idaho, Department of Fish and Wildlife Resources (JMB); University of Idaho, Department of Biological Sciences (JS), Moscow, ID 83844.

*GENETIC COMPARISON BETWEEN COASTAL AND IDAHO POPULATIONS OF ROUGH-SKINNED NEWTS, TARICHA GRANULOSA.*

The rough-skinned newt (*Taricha granulosa*) has an extensive range in the Pacific Northwest west of the Cascade Mountains. This species is also found in a small number of manmade ponds on and around Moscow Mountain, north of Moscow, Idaho. These populations have traditionally been assumed to be the result of anthropogenic introduction. However a recent range-wide study suggested that the Latah Co. populations are actually naturally occurring. Because these opposing views have dramatically conflicting conservation and management implications, we tested these hypotheses using phylogenetic and coalescent methods. We used mitochondrial DNA sequences from the cytochrome b gene from six Idaho newts and 39 newts from west of the Cascade Mountains in our analyses. Five of the six Idaho newts were found to differ by one nucleotide substitution from west coast samples. One sample from the north Oregon Cascades contained a shared haplotype with five Idaho samples. Idaho samples were found to differ by 0.001581 maximum substitutions per site from western samples. Coalescent analysis estimated a recent time of molecular divergence between coastal and inland populations. These results suggest that the Idaho populations are not relictual populations but are the result of anthropogenic introductions.

**BILLINGE, STEPHANIE and Ian Robertson.** Boise State University, Department of Biology, Boise, ID 83725.

*REPRODUCTIVE SUCCESS AS A FUNCTION OF OUTCROSSING DISTANCE IN LEPIDIUM PAPILLIFERUM.*

Plant populations are often spatially structured such that individuals closer to one another are more genetically related than those farther apart. Individuals that reproduce with closely related individuals may experience reduced fruit production and/or reduced fitness in offspring owing to partial or full self-incompatibility, inbreeding depression, or both. Individuals that reproduce with distantly related individuals may also experience a reduction in fruit production and offspring fitness owing to self-incompatibility or outbreeding depression. By crossing plants that grow at different distances from each other and examining the resulting fruit and seed production, as well as the germination ability and growth rates of the offspring, it is

possible to infer the spatial genetic structure within populations. We examined fruit production and offspring vigor as a function of outcrossing distance in slickspot peppergrass, *Lepidium papilliferum* (Brassicaceae), a rare mustard endemic to southwest Idaho. Fruit production increased significantly with increasing distance between parents up to approximately 3 m, and then declined slightly at greater outcrossing distances, suggesting that populations are spatially structured. The effect of outcrossing distance on seed germination and growth will also be presented.

**BLAIR, CHUCK.** CH2M HILL, Boise, ID 83702.

*APPROACHES TO IMPROVING THE EFFICIENCY AND USEFULNESS OF THE HABITAT EVALUATION PROCEDURE METHODOLOGY.*

The Habitat Evaluation Procedure (HEP) methodology was developed by the USFWS in the late 1970s and early 1980s to evaluate large water development projects. It is a useful planning tool for assessing project impacts, comparing alternatives, determining mitigation requirements, and evaluating mitigation and restoration plans for terrestrial and aquatic species and their habitat. There are three problems that often occur during HEP studies. One is that the mitigation requirements seem to never end because mitigation can create additional impacts, which require further mitigation. The second is that the selection of evaluation species can be subjective depending on the particular favorites of the parties involved. Finally, the process can be very cumbersome and time consuming. Over the last 10 years I've used HEP to evaluate 5 major water development and river restoration projects and reservoir and river management studies. This paper presents some innovative approaches that address these problems and improve both the efficiency and usefulness of the HEP procedure.

**BONTER, DAVID.** Cornell University, Lab of Ornithology, Ithaca, NY 14850.

*THE OPPORTUNITIES AND CHALLENGES OF CITIZEN SCIENCE: THE CORNELL EXPERIENCE.*

The potential exists to gather vast amounts of data across large spatial scales through citizen-based data collection programs (citizen science). However, researchers, managers, and conservationists seeking to develop a successful citizen science project face numerous challenges beyond the financial hurdles. Challenges include creating data collection protocols that are easy for participants to follow while simultaneously gathering the information required by researchers, marketing the program in order to recruit participants, providing training and technical support to participants, developing simple and flexible systems for acquiring data from participants, managing and error checking the data collected, analyzing large, "messy" data sets, and translating the results of the project into useful products. The challenges faced by the Cornell Lab of Ornithology's large-scale citizen science projects, and the approaches used to address these challenges, will be discussed. Specific reference will be made to Project FeederWatch, a program involving 15,000 participants annually in the United States and Canada that has collected more than 1.1 million checklists since 1988.

**BOVES, THAN J. and James R. Bellhoff.** Boise State University, Department of Biology, and Raptor Research Center, Boise, ID 83725.

*ROADWAY MORTALITY OF RAPTORS IN SOUTHERN IDAHO.*

Especially in North America, we know little about what appears to be an increasingly serious wildlife conservation issue: mortality of raptors along highways. Roadway mortality is the leading cause of direct mortality of wildlife in North America. We are (1) quantifying raptor mortality along an interstate highway in s. Idaho, including portions that traverse the Snake River Birds of Prey National Conservation Area, and (2) gathering information on seasonal trends; species, ages, and sex classes involved;

and cover types and geographic features within the median and adjacent areas of highways at locations where raptors are being killed. Beginning in July 2004, we surveyed a 250-km portion of Interstate 84 twice per month. This stretch of highway traverses grasslands, rangelands, and croplands. Surveys (n = 34 to date) located an average of 14.5 dead raptors per survey, representing 12 species. Barn Owls (*Tyto alba*) were the most frequent species found dead along the highway (n = 424, range = 2 – 103 per survey). Barn Owls may be most susceptible to roadway mortality because of attraction to agricultural areas along the roadway, their use of roadways during winter months, or other reasons.

**BOYD, AMANDA.** Brigham Young University-Idaho, Rexburg, ID 83460.

**NESTING HABITAT TYPIFICATION: RED-TAILED TROPICBIRD *PHAETHON RUBRICAUDA* ON MIDWAY ATOLL.**

Red-tailed tropicbirds (*Phaethon rubricauda*) are pantropical pelagic birds which nest on Midway Atoll (National Wildlife Refuge). Red-tailed tropicbirds nest in both the native Naupaka (*Scaevola sericea*) shrublands and the introduced Ironwood (*Casuarina equisetifolia*) forests. Nest site characteristics were compared between the two different habitats types. Nest density was also determined for each habitat type. Nest density varied between the Naupaka shrublands and the *Casuarina* forests (51/Ha vs. 18/Ha). Other nest characteristics which include aspect, temperature, and nest proximity to edge of plant, also varied in the 77 nests sampled. We suggest that in the future a survivability study be conducted to further understand the differences of nesting Red-tailed tropicbirds in the two different habitat types. (Poster Presentation)

**COATES, PETER S., and David J. Delehanty.** Idaho State University, Pocatello, ID 83209.

**IDENTIFICATION OF SAGE-GROUSE NEST PREDATORS USING VIDEOGRAPHY.**

Videography of greater sage-grouse (*Centrocercus urophasianus*) nests is a powerful technique to study nest depredation because it provides unambiguous identification of nest predators and documents nest fate. Conventional methods of predator identification (e.g. examination of eggshell fragments) may cause misidentification of predators. We used continuous time-lapsed video recorders and infrared micro-cameras to identify sage grouse nest predators, predator behavior, variation in depredation sign, and incubation time budgets in relation to predators in NE Nevada during 2002-2005. Wyoming ground squirrels (*Spermophilus elegans nevadensis*) and Piute ground squirrels (*Spermophilus mollis*) encountered intact sage-grouse eggs during the incubation period and attempted to open eggs with their teeth but were not successful. American badgers (*Taxidea taxus*) and common ravens (*Corvus corax*) regularly depredated nests and left similar sign at depredated nests. American badgers exhibited substantial individual variation in predatory behavior and subsequent nest remains. Videography of nests allows researchers to observe explicitly how nests failed and to avoid misidentification of nest predators using conventional methods of predator identification.

**COATES, PETER S., and David J. Delehanty.** Idaho State University, Pocatello, ID 83209.

**REDUCING POST-RELEASE MOVEMENT BY FEMALE SHARP-TAILED GROUSE THROUGH RELEASE-SITE SELECTION.**

Prairie grouse populations are difficult to reestablish following extirpation. Following translocation, distances individuals move from the release site appear to affect restoration success. We examined the movement of 131 (66 males and 65 females) radio-marked Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) translocated during the springs of 1999-2002 as part of a reintroduction to their historical range in northeastern Nevada. We examined post-release

movement among translocated grouse. We released grouse from 2 sites. The first release site (site 1) was chosen based on its physiographic similarities to the capture sites in Idaho and was used during 1999 and 2000. At site 1, females moved greater distances than males through time and no differences were found between years. The second release site (site 2) was located 10 km south of site 1 and was used in 2001 and 2002. We changed the release site based on nest locations of previously translocated females. Grouse released from site 2 moved substantially shorter distances than grouse from site 1 and distances moved did not differ between sexes of grouse or years at site 2. During 2004, we observed 23 grouse displaying on a lek near site 2 and no grouse were observed near site 1. Releasing grouse in areas used for nesting lead to reduced female movement. Wildlife managers should consider the needs of nesting females during the selection of restoration areas to reduce distances moved from release sites during spring translocations.

**CLAIRE, CHRISTOPHER W., and Timothy Cochnauer.** Idaho Department of Fish and Game, Clearwater Region, 3316 16<sup>th</sup> St., Lewiston, ID.

*DISTRIBUTION AND STATUS OF PACIFIC LAMPREY IN THE CLEARWATER RIVER DRAINAGE OF NORTH CENTRAL IDAHO.*

Pacific lamprey *Lampetra tridentata* have received little attention in fishery science until recently. Pacific lamprey in Idaho have to circumvent the eight lower Snake River and Columbia River hydroelectric facilities for migration downstream as juveniles to the Pacific Ocean and again as adults migrating upstream to their spawning grounds. The number of adult Pacific lamprey annually entering the Snake River basin has declined from an average of just over 18,000 in 1962-1969 to fewer than 600 during 1997-2004. Lower Granite Dam adult passage counts have dropped from approximately 1200 in 1994 to less than 200 in 2004. Historical adult counts at the Lewiston Dam in 1950 were in excess of 5,000 fish. Based on potential accessible streams upstream of Lower Granite Dam, it is expected that no more than 50 Pacific lamprey adult spawners annually utilize the Clearwater River drainage for spawning and contribution to the larval rearing population. Dworshak Dam on the N.F. Clearwater River halted passage to approximately 213 km of suitable habitat for this species. Migratory corridor hydroelectric facility impacts in combination with inbasin habitat degradation are considered the primary factors contributing to declines. We utilized electroshocking methods in 2000-2005 to capture, enumerate, and obtain biological information from rearing Pacific lamprey in order to determine the distribution and status of the species in the Clearwater River drainage, Idaho. The rearing population dynamics are disjunct in the South Fork Clearwater River and Red River, a tributary to the South Fork Clearwater. Age classes 3, 4, and 5 are absent or underrepresented in the South Fork Clearwater, with age classes 0, 1, 2, and potentially age 3 absent from Red River. Pacific lamprey persistence patterns in the Clearwater River drainage are potentially linked to habitat in subbasins with high water quality. Present distribution in the Clearwater River drainage is now limited to the lower mainstems of the Lochsa and Selway rivers, the mainstem M.F. Clearwater River, the mainstem Clearwater River, the entire S.F. Clearwater River mainstem, and the lower 7.5 km of Red River.

**CONNELLY, JACK.** Idaho Department of Fish and Game and Idaho State University, Department of Biological Sciences, Pocatello, ID 83209.

*CHALLENGING DOGMA—CHANGING PARADIGMS: GREATER SAGE-GROUSE HARVEST MANAGEMENT IN THE U.S.*

The greater sage-grouse (*Centrocercus urophasianus*) has been one of the most popular game birds of the western United States for many years. However, managing the harvest of this species has been characterized by controversy and changing

philosophies. Various resource professionals have expressed concern over appropriate levels of harvest and comments made at a 2005 conference for local working groups indicated that hunting is a concern of many involved in the conservation of sage-grouse. Management of sage-grouse hunting in the U.S. was based in largely on research conducted on a variety of small game animals >30 years ago. Recent investigations have suggested that principles developed from this work were flawed or overly simplistic. States are now beginning to implement new harvest management programs for sage-grouse that are more biologically defensible. The purpose of this paper is to discuss changes in harvest management for sage-grouse and describe the development of the current approach to harvesting this species.

**CORN, P. STEPHEN.** US Geological Survey, Aldo Leopold Wilderness Research Institute, 790 E Beckwith Ave, Missoula, MT 59801.

*THE U.S. GEOLOGICAL SURVEY'S AMPHIBIAN RESEARCH AND MONITORING INITIATIVE.*

The US Geological Survey (USGS) developed the Amphibian Research and Monitoring Initiative (ARMI), beginning in 2000, with the goals to monitor trends in amphibian populations and to determine the causes of declines. Monitoring is conducted by USGS herpetologists in collaboration with USGS hydrologists, geographers, and statisticians in 7 regions across the country. Key elements of monitoring include defining the scope of inference with probability-based study designs, assessment of detectability of each species studied, collaboration with other agencies and groups to extend surveys beyond Department of the Interior lands, and intensive data collection at a few selected study sites. Data collected by ARMI are stored in a national database linked to a web-based mapping tool. Research studies sponsored by ARMI generally address causes of amphibian decline and are awarded through a competitive process within USGS. ARMI projects in the Rocky Mountain Region have emphasized monitoring status of amphibians in the national parks on the Continental Divide, and studies of the effects on amphibians of fire, disease, and climate change.

**COSSEL JR., JOHN, Chris Jenkins, and Charles R. Peterson.** Northwest Nazarene University, Nampa ID 83686 (JC); Idaho State University, Pocatello, ID 83209 (CJ, CRP).

*HABITAT MANAGEMENT GUIDELINES FOR REPTILES IN THE NORTHWESTERN UNITED STATES.*

Habitat loss is the primary cause of many amphibian and reptile population declines. Awareness of this problem has increased, but the lack of information has limited land managers and landowners from establishing suitable conservation measures. In an effort to overcome this problem, Partners in Amphibian and Reptile Conservation (PARC), an inclusive organization with the primary goal of conserving amphibians, reptiles and their habitat, is producing Habitat Management Guides (HMG) for each of five U.S. regions (Northeast, Southeast, Midwest, Southwest and Northwest). A HMG for the Northwest region is in the final stages of preparation and we describe the purpose, goals and structure of this document. We developed the guidelines for desert shrubland management and provide an overview of the chapter's content, including a case study on the impacts of altered fire regimes and exotic annuals on reptile populations.

**CRAMER, TIM, (M.S., Rigby) and William Shaw (P.E., Boise).** Idaho Transportation Department.

*EASTERN IDAHO WILDLIFE LINKAGE, DATA COLLECTION, HIGHWAY CROSSING PROJECTS AND PERSPECTIVES.*

Linkage zone investigation began in 2005 supported by funds from Federal Highway Administration. ITD District 6 Rigby completed its work in 2005, District 2 Lewiston will be completed in 2006. Linkage zone work for the remaining districts will begin this year and be completed in 2007. District 6 maintains a road kill database and has

submitted research proposals to document wildlife movement patterns at several key locations. Fish and wildlife stakeholder groups initiated collaborative work with ITD to plan, fund and develop projects. Several projects that incorporate highway crossing concerns are complete and two are in the planning stage. Wildlife linkage zone management is one of many issues considered during the project planning process.

**DEBOLT, ANN M., and Nancy L. Shaw.** USDA Forest Service, Rocky Mountain Research Station, 322 East Front Street, Boise, ID 83702.

**PROGRESS IN THE DEVELOPMENT OF NATIVE FORBS FOR GREAT BASIN RESTORATION.**

*Penstemon*, *Lomatium*, and *Eriogonum* species are widely distributed across the Great Basin, increasing biodiversity, improving habitat for many organisms, and adding to the aesthetics of western wildlands. The restoration potential of seven widespread species (*Lomatium dissectum*, *L. grayi*, *L. trifernatum*, *Penstemon acuminatus*, *P. deustus*, *P. speciosus*, and *Eriogonum umbellatum*) within these genera is being examined. Although these forbs are components of many native communities, their use in revegetation has been limited, largely due to inadequate seed supplies. Germplasm collection and common garden evaluations are underway for more than 100 accessions, and seed biology characteristics are being evaluated. Cultural practices, pollination biology requirements and limitations, seed and plant predator relationships, and herbicide and drip irrigation practices are being investigated by various collaborators. Research components facilitate the development of propagation and seed production protocols, seed supplies, and seed transfer guidelines for these common native forbs. Habitat invasion by non-native species following fire drive much of this critical need. (Oral and poster presentation)

**DEINES, LYNELL, Tara Barkes, Marcia Wicklow-Howard, Roger Rosentreter, and Marcelo Serpe.** Boise State University, Department of Biology, Boise, ID 83725 (LD, TB, MWH, MS); USDI Bureau of Land Management, Boise, ID 83709 (RR).

**GERMINATION AND WATER STATUS OF GRASS SEEDS ON LICHEN-DOMINATED BIOLOGICAL SOIL CRUSTS.**

Biological soil crusts dominated by lichens are commonly found throughout arid and semiarid steppe communities of the Great Basin of North America. We conducted growth chamber experiments to investigate the effects of these crusts on seed germination of two grasses: *Bromus tectorum* and *Vulpia microstachys*. For each of these species, we recorded germination time courses on bare soil and two types of biological soil crusts; one composed predominantly of *Diploschistes muscorum* (lichen crust) lichens and the other comprised of an assortment of lichens and mosses (mixed crust). On the lichen crust, the final germination percentage (FGP) for both grass species was about a third of that on soil. In addition to differences in FGP, the mean germination time (MGT) was three to four days longer on the lichen crust than on soil. In contrast to the lichen crust, the mixed crust did not reduce the FGP or increase the MGT compared to the soil treatment. Similar results were observed in the two species studied. We also investigated the mechanism by which lichen-dominated crusts affected germination by analyzing the water status of seeds on soil and biological soil crusts. Our results indicate that biological soil crusts with dissimilar composition can have different effects on seed germination. Furthermore, a biological soil crust dominated by the lichen *Diploschistes muscorum* had a negative effect on seed water status and significantly reduced seed germination. (Poster Presentation)

**DELEHANTY, DAVID J., and Susie Dunham.** Idaho State University, Pocatello, ID 83209.  
**RANGE-WIDE GENETIC VARIATION IN MOUNTAIN QUAIL.**

Mountain quail (*Oreortyx pictus*), a New World quail endemic to the western mountains of North America, have declined substantially in distribution and



abundance over the past 50 years. The degree to which the range-wide population consists of discrete subpopulations has become central to developing conservation strategies. Currently, 5 subspecies are recognized by the American Ornithologists' Union, but these are based on poorly defined morphological (primarily plumage) characteristics and are ascribed to poorly defined subspecies boundaries. We used microsatellite DNA analysis to measure genetic differentiation among mountain quail collected in California, Oregon, and Idaho. These sites represent the 3 subspecies with the greatest geographic range and encompass the area of greatest current conservation concern. We analyzed 1-20 quail from 54 sites representing the subspecies *O. p. pictus*, *O. p. palmeri*, and *O. p. eremophilus*. We detected significant regional differences in microsatellite signatures across the species range. These differences, however, were not concordant with historic subspecies descriptions or boundaries. The relictual and isolated mountain quail population of western Idaho appears to be both inbred and different from all other mountain quail populations sampled. We did not detect a genetic boundary between *pictus* and *palmeri* ranges. We detected two distinct microsatellite signatures within a Mojave Desert population of *eremophila* occupying a wildlife guzzler complex installed during the 1970s.

**DIDRICKSEN, DANIEL J.** Central Washington University, Ellensburg, WA 98926.  
*ASSESSING STEELHEAD REINTRODUCTION POTENTIAL USING BENTHIC MACRO-INVERTEBRATE COMMUNITY STRUCTURE AND HABITAT CONDITION ANALYSES ON MANASTASH CREEK, KITTITAS COUNTY, WASHINGTON.*

Manastash Creek, in Kittitas County, Washington historically supported a healthy steelhead population. Irrigation practices extirpated steelhead by the mid 1970's and resulted in portions of the creek being dewatered for months at a time. Based on the federal listing of Middle Columbia River steelhead as a threatened evolutionarily significant unit in 1999, legal action was proposed against stream stakeholders unless the habitat in Manastash Creek was rehabilitated as a step towards steelhead reintroduction. This paper will assess benthic macro-invertebrate community structure as an indicator of stream health to help determine the system's potential to support a steelhead reintroduction. In addition, this paper will provide a holistic analysis of the creek's habitat conditions including spawning habitat, rearing habitat, and physical water quality parameters at three spatially separated sites to aid in the reintroduction decision.

**DUDLEY, MARY.** Idaho Department of Fish and Game, 600 S. Walnut, Boise, ID 83707.  
*VOLUNTEERS, GRANTS AND NATIVE RIPARIAN HABITAT RESTORATION.*

Volunteers and grants have enabled the Idaho Department of Fish and Game to restore native riparian habitats along rivers and creeks that support anadromous fish in Idaho. Volunteers provide the workforce and grant monies provide funding for plant materials and equipment so that we can continue to work with landowners and natural resource agencies in an ongoing effort to restore native riparian habitats. Since 1996 we have been planting native species on sites protected from livestock from one half mile to five miles in length along the Little Salmon River and its tributaries Round Valley and Four Mile Creeks. We started restoration planting along the East Fork of the South Fork of the Salmon River and its tributary Meadow Creek in 2004. In addition to planting native shrubs and trees we have established photo GPS points to monitor restoration efforts annually and have conducted water quality and macro-invertebrate sampling. The Idaho Department of Fish and Game is fortunate to have a seasoned group of dedicated, hard working and reliable volunteers who have planted thousands of native shrubs and trees to improve and restore wildlife habitat in Southwest Idaho. Collectively we have many years of wildland planting experience. The value of seasoned volunteers cannot be underestimated.

**DUFFY, AARON M., Mindie M. Funke, and James F. Smith.** Boise State University, Department of Biology, 1910 University Drive, Boise, ID 83725.  
*A PHYLOGENETIC ANALYSIS OF THE GENERA OF TRIBE EPISCIEAE (GESNERIACEAE) FROM MULTIPLE LOCI.*

Episcieae have long been considered monophyletic based on unique nodal anatomy and chromosome numbers among Gesneriaceae (Gesnerioideae). The placement of several genera has been questionable, or the genera have been placed in other tribes- primarily *Rhoogeton*, *Cremersia*, *Lampadaria*, and *Lembocarpus*. Recently collected material places three of these genera in Episcieae, but sister to the remainder of the tribe. *Paradrymonia* and *Nautilocalyx* may not comprise a monophyletic group independently of each other and *Chrysothemis*. The fleshy-fruited genera of the *Columnea* alliance are well supported although generic delimitations are not as clear as previously classifications. *Nematanthus* and *Codonanthe*, with n=8 chromosomes, are sister to each other, and *Codonanthopsis* is sister to this clade. The remaining genera form two monophyletic groups, one sister to the *Columnea* clade, the other sister to the n=8 clade. Fleshy fruits and reversals from epiphytic to terrestrial habit appear to have occurred multiple times in this group.

**DUKE, DANAH.** Miistakis Institute for the Rockies, c/o Environmental Design, University of Calgary, Alberta, Canada.

*THE USE OF REMOTE CAMERAS TO MONITOR SPATIAL AND TEMPORAL ACTIVITY OF HUMANS AND WILDLIFE IN THE LIVINGSTONE RIVER AREA OF SOUTHWESTERN ALBERTA.*

The Livingstone Range of SW Alberta comprises multiple-use public lands wherein a wide range of opportunities for unmanaged recreation activities is available. The area is ecologically critical in providing landscape connectivity for large mammals between the protected area complexes of Waterton/Glacier to the south and Kananaskis/Banff to the north. Limited research focused on the impacts of motorized recreation on wildlife necessitates the examination of the relationships between human use of trails, with a particular emphasis on off highway vehicle (OHV) use, and wildlife movement. Field methods include simultaneous monitoring of access roads, OHV trails and adjacent wildlife trails using remote cameras. Two field seasons have resulted in 155, 14 day sampling periods including over 153,000 hours of camera operation. Results include over 2175 unique wildlife events (18% large carnivores) with 3961 human events on recreation trails. Initial results indicate patterns of spatial and temporal separation between human recreation and wildlife. Final results will be used to determine human trail use and access thresholds with respect to habitat fragmentation, and will contribute to regional land-use management that includes considerations for the maintenance and restoration of ecological connectivity while providing for appropriate levels of human use. (Poster Presentation)

**DVORNICH, KAREN M.** University of Washington, Seattle, WA 98195.

*FIFTEEN YEARS OF NATUREMAPPING: SUCCESSFUL EXPERIENCES AND LESSONS LEARNED.*

The NatureMapping Program was co-founded by the Washington Cooperative Fish and Wildlife Research Unit and Washington Department of Fish and Wildlife while conducting the Washington Gap Analysis Project (GAP) in 1992 to facilitate the exchange of information between natural resource agencies, academia, land-use planners, local communities, and schools through public education and participation in data acquisition, and because resource agencies were demanding measurable results of education program impact on resources. Although eight other state NatureMapping programs are in different stages, Washington, Virginia, and Iowa are the regional leaders. Most of the emphasis for the three states was to develop materials and provide training, with each state identifying regional differences/similarities within their programs with the goal to create state and national

standards. Data analysis is one of the current priorities with the development of feedback to the program participants. The other priority is linking NatureMappers with researchers to conduct local research projects. These projects are extensive, allowing NatureMappers to conduct their own research as part of larger agency-driven research projects.

**EDELMANN, FRANK, and Kirk Steinhorst.** Idaho Power Company, Boise, ID 83707 (FE); University of Idaho, Moscow, ID 83844 (KS).

*SUBJECTIVE KNOWLEDGE PRODUCES A RIGOROUS SAMPLING DESIGN FOR MULE DEER IN HELLS CANYON, IDAHO AND OREGON.*

When applied in a suitable sampling design, a sightability survey can yield an unbiased estimate of population size. Unsworth et al. (1994) recommended methods for designing aerial sightability surveys for big game using a stratified random design. However, criteria were not provided for differentiating abundance strata or allocating sampling effort among strata. Therefore, we explored the performance of several stratification and allocation methods with the goal of identifying an unbiased design that estimates numbers of wintering mule deer in Hells Canyon to within 10% of the true abundance, as determined by census, at least 95% of the time. We constructed an array of candidate designs with combinations of two stratification approaches (i.e., objective and subjective subdivisions), four allocation methods (i.e., prescription, uniform, proportional, and Neyman), and five target-sampling intensities (i.e., 50, 60, 70, and 80%). We parameterized designs with four years of census data and then tested the performance of each design by simulating the sampling of a fifth holdout census. Although several designs performed well, the subjective stratification approach combined with a prescriptive allocation was unbiased and met our estimation objectives with the least sampling effort (50-60%). A balanced distribution of sample units among strata and focused effort on units with relatively high deer abundances were key to design efficiency. Several years of censuses aided the rigorous, although subjective, development and testing of an unbiased survey sampling design.

**ESTES-ZUMPF, WENDY A., and Janet L. Rachlow.** University of Idaho, Department of Fish and Wildlife Resources, Center for Research on Invasive Species and Small Populations, Moscow, ID 83844.

*NATAL DISPERSAL AND MORTALITY RATES OF JUVENILE PYGMY RABBITS IN THE LEMHI VALLEY, IDAHO.*

Natal dispersal is an important life history characteristic affecting both genetic and demographic profiles of wildlife populations. Habitat fragmentation and the tendency for local extinctions make knowledge of the dispersal capabilities of pygmy rabbits (*Brachylagus idahoensis*) critical for conservation planning. We studied movements of juveniles from shortly after emergence from natal burrows (April-July) through mid-winter during 2004-2006. We trapped 60 juveniles (30 males, 30 females) at 0-4 weeks post emergence, and attached glue-on radio transmitters weighing 1g. Glue-on transmitters were replaced with 5g radio collars when juveniles reached 200-300g. Dispersal of juvenile pygmy rabbits usually occurred as a single event involving rapid movement over a short period of time (0.5-1.5 weeks). All dispersal movements occurred before 13 weeks of age, with the majority of movements occurring before 8.5 weeks of age. Median natal dispersal distances for males and females that reached 8.5 weeks of age were 1.1km and 3.0km, respectively (range = 0.1km to 12.1km). Overall mortality rate of juvenile pygmy rabbits (n = 40) was 66.7% (63.3% males, 70% females). This research is the first to document juvenile dispersal in this species. Results suggest that pygmy rabbit populations potentially have higher rates of

connectivity and gene flow than anticipated based on previous movement studies of adults.

**EVANS MACK, DIANE, and Joel Sauder.** Idaho Department of Fish and Game, McCall, ID 83638 (DEM); Idaho Department of Fish and Game, Lewiston, ID 83501 (JS).

*CHANGES IN FLAMMULATED OWL OCCURRENCE OVER A 14-YEAR PERIOD IN THE NORTHERN ROCKY MOUNTAINS.*

We conducted a retrospective study of Flammulated Owls (*Otus flammeolus*) on the Payette and Nez Perce National Forests to examine changes in occurrence since the early 1990s. In 2005 we repeated 20 transects established on the Payette NF in 1991 and 6 transects established on the Nez Perce NF in 1992. Owls were detected on nocturnal playback surveys during mid May through mid July. Eleven transects, all on the Payette, had changes in presence/absence (0 vs. >1 owl). These were evenly divided between transects that had owl presence in 1991 but not in 2005 and those that gained presence over the 14-year period. Excluding sites with differences of +1 detection, detections declined at 9 transects and increased at 4. Overall numbers of detections declined by 45% between the 2 time periods, ranging 0-91% declines at individual transects. Timing of surveys did not explain differences in owl numbers. Changes in habitat quantified at a subsample of sites best explained apparent declines. We compared overstory vegetation at two scales, 50-ha plots and larger landscapes, to explore the relationships between harvest and fire, the primary agents of change, and owl abundance.

**FINN, SEAN P.** 2106 W. Jefferson St., Boise, ID 83702.

*DOES ONE SIZE FIT ALL? CREATING LANDSCAPE-SCALE MODELS OF NORTHERN GOSHAWK NESTING HABITAT IN WASHINGTON STATE.*

Northern goshawks (*Accipiter gentilis*) are thought to be forest-habitat generalists throughout their North American range even though many local-scale habitat relationship studies suggest that regional goshawk populations exhibit strong affinities to specific forest characteristics. Because goshawk populations are firmly established in landscapes as diverse as high elevation Aspen pockets and coastal mesic conifer forest, managers are confronted with the prospect of managing a wide array of ecotypes to retain healthy, diverse populations of goshawks. To address this concern, I created landscape-scale habitat models for goshawks in four ecoregions (Olympic Peninsula [OP], West Cascades [WC], East Cascades, and Okanogan Highlands) in Washington state using the Landscape Ecology (*rle*) modules in the GRASS Geographic Information System, and compared the four models using MANOVA and Discriminant Function analyses. Based on four predictor variables (Percent Late Seral Forest, Percent Non-Forest, Shannon's Index, and Contrast) the 1387-ha circle surrounding goshawk nest sites (i.e., surrogate Home Range) differed among ecoregions (Wilkes' Lambda,  $F = 5.86$ ,  $df = 12, 995$ ,  $P > 0.001$ ). In general, the more mesic, western nest sites (OP, WC) were surrounded by less Non-Forest and had less contrast in the landscape (i.e., more uniform patch size and shape). However, cross-validation analysis indicated that only 54.6% of the 383 nest sites could be classified into the correct ecoregion. Although the landscapes immediately surrounding goshawk nest sites in Washington are similar (e.g., have  $\geq 35\%$  late seral forest,  $< 20\%$  non-forest and a uniform texture [low Shannon's and contrast indices]), a model derived from one region, or from statewide data, may not adequately predict the type of landscape used by goshawks in a different region. The problems associated with developing a useful landscape-scale goshawk habitat model suggest that, given currently available data, managers should focus their efforts at the district or forest rather than a regional scale.

**FORRISTAL, CHRIS, and Victoria Saab.** Montana State University, Department of Ecology, and USFS, Rocky Mountain Research Station, Bozeman, MT 59717.

**INFLUENCE OF POST-FIRE TIMBER HARVEST ON BLACK-BACKED WOODPECKER NEST SURVIVAL.**

Post-fire timber harvest practices (i.e. post-fire salvage logging) on public lands are a highly contentious issue in the western United States. Harvest of burned trees impacts a number of species, particularly those specialized for using post-wildfire habitats. We are assessing the effects of post-fire salvage logging on black-backed woodpecker (*Picoides arcticus*) nest survival and distribution within burned, mixed conifer forests of south-central Oregon. Multiple treatment and control plots were monitored two years pre-logging (2003-04) and one year post-logging (2005). We are investigating the following predictions: (1) nest density and survival will be lower in harvested vs. unlogged control sites; (2) nests will be located away from forest edges created by salvage logging and the interface with green, unburned forest; and (3) nest density will be higher in larger vs. smaller burned patches. A total of 165 black-backed nests were monitored in the first three years post-fire. Similar to previous studies, our preliminary results indicate that black-backed woodpeckers exhibit high nest survival, and that they select nest sites with higher snag densities than non-nest random sites. Nest survival (unlogged 72.30%, n=41; logged 74.13%, n=16) and density (unlogged 0.084 nests/ha  $\pm$  0.007 [1 SE]; logged 0.050 nests/ha  $\pm$  0.028) did not respond as hypothesized in the first year post-logging. Upon completion, this project will supply agencies and managers with scientific data regarding post-fire habitat conservation for a sensitive woodpecker species.

**FOTHERGILL, KENT.** Conservation Seeding and Restoration, Inc., Kimberly, ID 83341.

**BUTTERFLY OCCURRENCES ON LANDS MANAGED BY THE BURLEY BUREAU OF LAND MANAGEMENT FIELD OFFICE, TWIN FALLS AND CASSIA COUNTIES, IDAHO.**

The Burley Bureau of Land Management Field Office manages over 1,000,000 acres in Cassia and Twin Falls Counties. It is the mission of the Bureau of Land Management to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations. Insects are a vital system component to sustain the health, diversity and productivity of the land. Butterflies were chosen to survey because of the following attributes: well known taxonomically and ecologically, relatively easy to find as adults, intimate relationships with plants during life cycle, and increasing human awareness of these animals.

The survey was performed entirely on lands managed by the Burley BLM with 21 survey excursions between May and October of 2005. Photographs, location, and temporal data were collected for sightings providing records of alpha diversity, adult flight times, caterpillar dates, and insect-plant relationships. Fifty-two species of butterfly were observed during surveys, but it is anticipated that further sampling will encounter additional species. The Cotterel Mountains had the highest number of species observed, many of which were not observed at other locations in the Burley BLM.

**FRANKLIN, THOMAS M.** The Izaak Walton League of America, Gaithersburg, MD 20878.

**SAVE OUR STREAMS: TWO DECADES OF VOLUNTEER WATER QUALITY MONITORING.**

Citizen generated water quality monitoring data can be used to inform and educate people about the condition of local streams and can help establish a baseline of the water quality of a stream, since data for many streams is sparse or non-existent. Monitoring data also can be used to locate emerging land use problems, identify pollution problems, determine whether pollution regulations are being followed, and gauge whether enhancement efforts are successful. The Izaak Walton League of America's Save Our Streams program, operating since 1983, uses biological monitoring of aquatic macroinvertebrates to provide an effective, easy-to-

understand method of determining if a stream has been affected by pollution. The simple, reliable technique is based on the fact that different groups of stream macroinvertebrates have different tolerances to pollution, and therefore can serve as useful indicators of water quality. The SOS monitoring method involves collecting a sample of macroinvertebrates from the stream, identifying the organisms, and rating the water quality. Measuring the biological health of the stream is a fast, effective way to determine the overall condition of a stream. Citizen monitoring programs that are designed and carried out in cooperation with government agency scientists can fill a need for biological data that cannot be obtained by government personnel alone. The benefits and challenges of using SOS and other citizen monitoring programs to support State Wildlife Action Plans and the National Fish Habitat Initiative are discussed.

**GABRIEL, A., K. Lillquist, A. Perkins, and J. Rhoades.** Central Washington University, Resource Management Program, Ellensburg, WA 98926.

*CLASSIFICATION AND DISTRIBUTION OF LAKE TYPES IN WASHINGTON STATE.*

The biophysical characteristics of lakes, such as hydrology, watershed size, flushing rate, size, shape, depth and trophic state, are principally established when a lake forms. In turn, these characteristics influence a lake shoreline's ecological functions, as well as their sensitivity to ecological changes. Using a series of scoping questions outlined in a Decision Support System for Lake Shoreline Assessment developed for the Washington Department of Ecology, over 1200 lakes over 20 acres in size were classified into several principal types: coastal, coulee, glacial drift plain, kettle, glacial scour, cirque, oxbow, and impoundment lakes. Accessed through GIS datasets, aerial photographs, topographic maps, and lake reports, primary variables used by the classification framework included physiographic zones, surficial geology, basin shape, hydrology, and degree of human modification. This classification provides for a better understanding the physical characteristics influencing shoreline functions and processes, as well as each lake type's relative sensitivity in terms of nonpoint pollution, changes to recharge, littoral zone impacts, and alteration of wave energy regimes. Statewide distributions of lake types are also presented and linked to patterns of lake ontogeny.

**GARRETT, LISA, Leona K. Svancara, and Tom Rodhouse.** Upper Columbia Basin Network, National Park Service, Moscow, ID.

*UPPER COLUMBIA BASIN NETWORK NATURAL RESOURCE INVENTORY AND MONITORING PROGRAM.*

Knowing the condition of natural resources in national parks is fundamental to the National Park Service's (NPS) ability to manage park resources "unimpaired for the enjoyment of future generations". The challenge of protecting and managing a park's natural resources requires a multi-agency, ecosystem approach because most parks are open systems, with threats such as air and water pollution or invasive species, originating outside of the park's boundaries. National parks are part of larger ecosystems and must be managed in that context.

The intent of park vital signs monitoring is to track a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources. The broad-based, scientifically sound information obtained through natural resource monitoring will have multiple applications for management decision-making, research, education, and promoting public understanding of park resources.

The Upper Columbia Basin Network (UCBN) was formed to address the need of park managers to know the condition of natural resources through a program of natural resource inventory and monitoring. The parks in the UCBN include: Big Hole National

Battlefield, City of Rocks National Reserve, Craters of the Moon National Monument and Preserve, Hagerman Fossil Beds National Monument, John Day Fossil Beds National Monument, Lake Roosevelt National Recreation Area, Minidoka National Internment Monument, Nez Perce National Historical Park, and Whitman Mission National Historic Site. The UCBN is just 1 of 32 networks across the country formed to implement network-wide natural resource inventory and monitoring programs. (Poster Presentation)

**GARTON, OZ, Jack Connelly, and Kerry Reese.** University of Idaho, Fish and Wildlife Department, Moscow, ID 83844 (OG, KR); Idaho Department of Fish and Game, 1345 Barton Road, Pocatello, ID 83221 (JC).

**DENSITY-DEPENDENCE AND SUSTAINABILITY OF HARVEST ON GREATER SAGE-GROUSE POPULATIONS.**

Populations of greater sage-grouse (*Centrocercus urophasianus*) have declined more than 50% in western North America during the past 50 years. Petitions to list the species under the Endangered Species Act were rejected recently but concerned individuals and groups still question continued harvest of this species throughout most of its range. We analyzed the results of a harvest management experiment using an approach that simultaneously evaluates density-dependence in population growth rates while assessing the effects of harvest and evaluating the probability of various levels of harvest reducing the population below a minimum value. Applying this approach to 19 populations of greater sage-grouse subjected to various rates of harvest provides highly significant evidence for inverse density-dependence in growth rates and insightful conclusions concerning the sustainability of harvest and its potential impact on long-term viability of these populations in North America.

**GEBHARDT, KARA, Justin Doble, and Lisette Waits.** University of Idaho, Wildlife Resources, Moscow, ID 83844.

**DEVELOPMENT OF A MOLECULAR SEX IDENTIFICATION MARKER FOR NON-INVASIVELY COLLECTED FEATHERS.**

Visual sex identification of more than 50% of bird taxa is impossible due to the sexes being morphologically indistinguishable (Griffiths et al. 1998). Inability to determine sex of birds hinders research on their biology and ecology. Several papers have published the development of molecular tools that permit sexing of birds by DNA analysis of the CHD (chromo-helicase-DNA-binding) genes of the W and Z sex chromosomes (Bermudez-Humaran et al. 2002; Fridolfsson & Ellegren 1999; Griffiths et al. 1998). Unfortunately these methods are not optimal for non-invasively collected feathers. Bermudez-Humaran et al. (2002) present the use of restriction enzymes to determine sex of the genus *Ara*, but these enzymes require extensive optimization for each species and may not be applicable across taxa. Fridolfsson and Ellegren (1999) present a set of DNA primers whose amplified fragment sizes are too large to be used reliably with feathers. Griffiths et al (1998) present a smaller amplified fragment however, the female specific fragment is larger than the fragment that both sexes share making it possible to erroneously identify females as males due to allelic dropout. The ability to utilize feathers in population genetics research eliminates the cost and effort of capturing birds to obtain samples making them an important new advancement in the study of birds. We present the development of a set of DNA primers to use for molecular sex identification of most birds from non-invasively collected feathers. (Poster Presentation)

**GLEW, KATHERINE, and Erin Berry-Bibee.** University of Washington, Herbarium, Seattle, WA 98195 (KG); Oregon Health Sciences University, Portland, OR 97239 (EBB).

**CURIOUS LICHENS FROM THE PILTUN REGION OF SAKHALIN ISLAND, RUSSIAN FAR EAST.**

Lichens were collected during the summer of 2003, as part of the International Sakhalin Island Project. The focus of this NSF funded study was to inventory the biodiversity of the island. One of the more interesting locations on the island was in the Okhinsky Region, south of a lagoon called Zaliv Piltun, at a latitude of 52°N. Conditions resembled a transition between tundra and taiga zones, occurring on the coast.

Over 100 collections were made at this site. Common lichens were *Cladonia boryi*, *C. phyllophora*, *C. rangiferina*, *C. uncialis*, *Hypogymnia physodes*, *Ochrolechia frigida*, *Vulpicida juniperinus*, *V. pinastri*. Several brown Cetrarioides of interest: *C. islandica*, *C. laevigata*, *Cetrariella delisei*, *C. fastigiata*, *Tuckermannopsis sepincola*. Comparisons were made in distributions between Sakhalin Island and similar latitudes in North America on the Pacific Coast. Some Russian lichen species were found at a lower latitude on the island than in western North America. Several species found in Europe and the Russian Far East, do not occur on the western shores of North America. Part of the explanation for this could be the sandy environment, common on the northern part of Sakhalin Island, and the influence of the Sea of Okhotsk, which frequently freezes in the winter.

**GOLDBERG, CAREN S., and Lisette P. Waits.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844.

**LANDSCAPE GENETICS OF THE COLUMBIA SPOTTED FROG IN THE PALOUSE ECOREGION OF NORTHERN IDAHO.**

The influence of landscape features on the connectivity of amphibian populations is largely unknown. In the Palouse ecoregion of northern Idaho, 97% of natural wetlands that existed in 1870 have been destroyed or converted to agricultural uses. Columbia Spotted Frogs (*Rana luteiventris*) in this area breed in small groups almost entirely in artificial ponds on private land. We used 8 microsatellites to analyze the relationships among 20 breeding populations of Columbia Spotted Frogs in the vicinity of Moscow Mountain. Preliminary data analysis shows a pattern of isolation by distance that is not improved when distance is measured along drainages instead of straight lines. Within the study area, however, frogs show a pattern of higher relatedness within than between watersheds, after accounting for geographic distance. Forested lands with higher topographic relief show a correlation with higher levels of genetic distance than flatter lands with agriculture and urban development.

**GOSSETT, DANIEL N.** Wildlife and Parks Department, Shoshone-Paiute Tribes, P.O. Box 219, Owyhee, NV 89832.

**SUMMER AND FALL USE OF THE BLUE CREEK WETLAND AREA BY GREATER SAGE-GROUSE ON THE DUCK VALLEY INDIAN RESERVATION.**

We followed radio-tagged sage-grouse to determine seasonal habitat use on the Duck Valley Indian Reservation, in northeastern Nevada and southwest Idaho. Spring to Summer movement from nearby leks were generally within a 5.5 km radius. Large numbers of grouse were found foraging and roosting in areas of the Blue Creek Wetlands Complex. Receding high water levels provided moisture for large areas of Poverty Sumpweed (*Iva axillaris*), a succulent forb, to grow, adjacent to decadent Silver Sagebrush (*Artemisia cana*). This forb was found almost exclusively in crop contents regurgitated by young grouse after night-time capture in August and September. Grouse use of this area continued through October, when much of the sumpweed began to turn brown and desiccated during colder weather. Cattle use of the area indicated moderate to heavy grazing on many grasses and rushes, but no apparent grazing on the sumpweed.



**GRUE, CHRISTIAN E.** University of Washington, Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, Seattle, WA 98195.  
*ADVOCACY, THE MEDIA, LITIGATION, PUBLIC PERCEPTIONS AND THE FUTURE OF SCIENCE IN NATURAL RESOURCE MANAGEMENT: WHY CITIZEN SCIENCE IS SO IMPORTANT.*

As scientists, we hope that natural resource management decisions will be based on the best available science and that, through adaptive management, decisions and policies will evolve concurrently with advancements in understanding. Increasingly, however, it appears that advocacy, the media, and litigation are driving natural resource management decisions and, as a result, public perceptions of the value of science have been diminished. Additionally, this comes at a time when the political views on a number of social and environmental issues are highly polarized and when a number of legislative acts dealing with the environmental protections are due for reauthorization. To what extent have we, as scientists, contributed to this situation? Or, does it reflect the increasing complexities of science and natural resource management at a time of diminishing natural resources, increasing human population, increasing concerns over private property rights, and advances in communication and information transfer? The potential role of citizen science in addressing these challenges will be discussed.

**HAGAR, J., C. Carey, and G. Lienkaemper.** USGS-FRESC, Corvallis, OR 97330 (JH, GL); ODFW, Bend, OR 97702 (CC).  
*PYGMY RABBITS ON STATE LANDS IN EASTERN OREGON.*

The pygmy rabbit (*Brachylagus idahoensis*) is a sage-associated species that is patchily distributed throughout the Great Basin, and is classified by the federal government as a species of concern because of its specialized habitat requirements and evidence of declining populations. The range of the pygmy rabbit in Oregon has decreased in historic times, and the current distribution is uncertain. We conducted a survey on State Lands in Oregon to help identify the current distribution of breeding populations of pygmy rabbits. We developed a GIS model to help us prioritize survey areas, and then verified presence or absence of pygmy rabbits within those areas. We compared soil and vegetation characteristics between occupied and unoccupied sites to help us assess model performance and explain patterns of site occupancy. The results of this study augment and update information on the current location and extent of pygmy rabbit populations in Oregon, facilitating the conservation and management of this species.

**HAGEN, CHRISTIAN A.** Oregon Department of Fish and Wildlife, 61374 Parrell Rd, Bend, OR 97701.  
*THE EFFECTS OF VERTICAL STRUCTURES ON PRAIRIE GROUSE.*

Much of the native prairie and sagebrush (*Artemisia* spp.) steppe habitats were converted to agricultural land as European-American settlements expanded westward. Many prairie grouse (*Tympanuchus* spp.) and sage grouse (*Centrocercus* spp.) populations declined or were extirpated with this large scale conversion that occurred in between the mid- 1800s and 1900s. The remaining habitat, where these species still occur, continues to experience disturbance and impacts from human developments. It has been hypothesized that the introduction of vertical structures (e.g., transmission lines, radio-towers, trees) to landscapes that otherwise would be void of such features have negatively effected local populations. Using field data from a 6-year study lesser prairie-chickens (*T. pallidicinctus*) in Kansas and trend data on greater sage-grouse (*C. urophasianus*) in Oregon, I examine the potential effects of vertical structures on these species. I discuss the implications of these findings in the context of long term conservation and guidelines for future developments in remaining habitats.

**HANAUSKA-BROWN, LAURI, Ruth Shea, Tom Hemker, and Rex Sallabanks.** Idaho Department of Fish and Game (LHB, TH, RS); The Trumpeter Swan Society (RShea).  
*TWENTY-FIVE YEARS OF TRUMPETER SWAN MANAGEMENT IN SOUTHEAST IDAHO.*

In 1932 there were less than 10 trumpeter swans summering in southeast Idaho. Since that time the local breeding population has increased to 158 birds and is stable at best with large fluctuations in annual productivity. Management efforts to boost the population over the last 25 years have included the releases of 160 swans into desirable southeast Idaho expansion areas. Twenty three percent of released birds were the result of a captive rearing program that collected eggs from local nests. Although habitat improvements have increased the number of available nesting sites, disturbance, fluctuating water levels and drought conditions alter their suitability each year. During the winter months the number of swans using southeast Idaho increases to approximately 3,000 as birds migrate south from Canadian breeding areas. This migration threatens the resources needed in spring by the local breeding population. Hazing and winter translocations over the past 25 years have increased the distribution of both local and Canadian trumpeters using southeast Idaho as well as furthering our knowledge of swan behavior. We'll review the history of swan management in southeast Idaho, as well as discuss future work on population management and monitoring.

**HANAUSKA-BROWN, LAURI, and Steve Nadeau.** Idaho Department of Fish and Game, Idaho Falls (LHB); Idaho Department of Fish and Game, Boise (SN).

*IS IT TIME TO DELIST THE YELLOWSTONE GRIZZLY BEAR?*

During the summer of 2005 three grizzly bears were captured in southeast Idaho as part of routine research trapping. An additional three grizzlies were captured in response to human-bear conflict situations and two more bears were detected in southeast Idaho by radio telemetry. What habitats are these bears using and how will southeast Idaho citizens cope with an expanding bear population? The Idaho Department of Fish and Game and its cooperators are working to answer these questions with continued research and education efforts. Research trapping in southeast Idaho will continue into 2006. The door-to-door education campaign and 'Living in Bear Country' workshops will also continue. Management will be directed by the 2002 Idaho state plan after delisting of the species. Details of this plan and its relation to the federal 'Conservation Strategy for Grizzly Bears in the Yellowstone Ecosystem' will be discussed.

**HASSELBLAD, KRISTIN, and Marc Bechard.** Boise State University, 1910 University Dr., Boise, ID 83725.

*NORTHERN GOSHAWK FORAGING HABITAT SELECTION IN SOUTH CENTRAL IDAHO.*

To assess northern goshawk (*Accipiter gentilis*) habitat selection at two scales in south central Idaho, we radio-tracked six breeding males throughout the breeding seasons of 2001 and 2002. We acquired a mean of 54 (+ 3.3) independent locations per bird. Average linear error associated with triangulated locations was 130 m. Habitat variables measured included: distance from used and available locations to the nearest seedling (< 2.5 cm dbh) stand, sapling/pole (2.6-12.9 cm dbh) stand, "small tree" (13-34 cm dbh) stand, road/trail, and camp area. We used logistic regression to identify those features that may be important in predicting individual goshawk use of a perching site. Five out of six males selected perching sites closer to "small tree" habitat and camp areas than expected. Two males selected perching locations closer to roads/trails than expected, and two males selected higher or lower elevations than expected. At the home range scale, goshawks selected for less sapling/pole habitat, and greater habitat diversity as measured by Shannon's diversity index, similar to results from other studies.

**HAUGO, RYAN D., and Charles B. Halpern.** University of Washington, College of Forest Resources, Seattle, WA 98195.

**VEGETATION DYNAMICS FOLLOWING CONIFER ENCROACHMENT IN A DRY, MONTANE MEADOW OF THE WESTERN CASCADE RANGE.**

Conifer encroachment into montane and subalpine meadows is widespread throughout much of the Pacific Northwest. Yet, little is known about consequences of encroachment for loss of meadow habitat and biological diversity. Bunchgrass Ridge, a dry, montane meadow in the western Cascade Range of Oregon has experienced encroachment of grand fir (*Abies grandis*) and lodgepole pine (*Pinus contorta*) for ca. 200 years. I used a chronosequence approach to reconstruct changes in ground vegetation and investigate how these changes relate to forest structural development.

Within four 1-ha plots, vegetation composition and tree size and age distributions were determined for 356 10 x 10 m subplots representing a broad range of forest ages and structures. NMS ordination revealed a strong gradient in species composition paralleling the transition from open meadow to old forest; the primary ordination axes were highly correlated to changes in light availability and the gradual replacement of lodgepole pine by grand fir. Cover of meadow species declined steeply once conifer density reached a threshold; richness of meadow species dropped more gradually. Declines in the cover and richness of meadow species showed stronger correlations to changes in forest structure ( $R^2$  of 0.59 and 0.51 in multiple regression models) than did increases in cover and richness of forest species ( $R^2$  of 0.34 and 0.46).

Although the meadow flora appears sensitive to conifer encroachment, persistence of some species suggests the potential for restoration. The weaker relationship between overstory variables and cover of forest species suggests that factors other than forest structure regulate understory development.

**HILTEN, JEANIE.** Discover Life in America, Inc., 1314 Cherokee Orchard Rd., Gatlinburg, TN 37738.

**ALGAE PEOPLE, FERN FRONDLERS, AND BEETLE BLITZERS: EXPLORING BIODIVERSITY IN GREAT SMOKY MOUNTAINS NATIONAL PARK.**

The All Taxa Biodiversity Inventory (ATBI) in Great Smoky Mountains National Park is a unique endeavor to explore the 800 square mile reserve in search of all species of life. Coordinated by Discover Life in America (DLIA), the ATBI is also a remarkable opportunity for citizens to participate actively in research for conservation. Since the first field season in 1999, the project has drawn world-renowned scientists, teachers, students, volunteers, and Park staff together. Balancing the needs, interests, directives, and demands of everyone involved has been almost as complex as investigating the life forms and ecosystems themselves. Events such as Fern Forays, Beetle Blitzes, Lepidoptera Bio-Quests, Algal Forays, and Snail Searches result in interesting scientific finds—thanks to the combined efforts of a mix of talented people. The annual DLIA grant program encourages inventory work that will improve understanding of the various taxonomic groups in the Park, their distribution, and ecological relationships. As of 1/06, 565 species new to science have been found, plus 3,572 new Park records.

Discover Life in America, with its partners within and surrounding the Smokies, strives to make the findings of the ATBI relevant to the wider community and useful to resource managers. Training "citizen scientists" in field and lab methods, and communication with Park staff about the knowledge needed for conservation are major parts of the endeavor. To convey to the world the importance of biological diversity—from lichens and mosses in the tree canopy to snails and springtails of the forest floor—requires not only the tools and methods of science and technology, but also those of the arts, education, and public relations. As more reserves conduct ATBIs, we learn from each

other about how to carry the exciting new discoveries, obtained by the teamwork of all involved, into the wider realm of policy and decision-making.

**HOLCOMB, D., and Kimberlee Beckmen.** Institute of Arctic Biology, University of Alaska, Fairbanks, AK 99775 (DH); Division of Wildlife Conservation, Alaska Department of Fish and Game, 1300 College Rd., Fairbanks, AK 99701-1599 (KB).

*A SURVEY OF LUNGWORM INFESTATION IN DALL SHEEP (OVIS DALLI) AND MOOSE (ALCES ALCES) IN ALASKA.*

Lungworms (small, white nematodes that belong to the family Protostrongylidae) are prevalent in Dall and bighorn sheep, as well as in goats, antelope, deer, caribou, and muskox. Verminous pneumonia is a serious disease that is caused by these lung worms and has had a major impact on several animals across North America and has also resulted in death in Dall sheep in Alaska. During infection, animals may appear healthy. Severe infections may produce symptoms such as difficulty breathing and coughing. Animals that are under environmental stress may be especially vulnerable to verminous pneumonia due to a weaker immune system. We hypothesized that there would be no difference in the mean larvae per gram of feces (LPG) between different sexes, ages, and locations. To test our hypothesis, we tested 49 Dall sheep and 59 moose from various locations in Alaska collected from 2002 and 2004 using the Baermann Technique to separate lungworm larvae from the feces. We then examined and counted the larvae under a microscope. All but one of the Dall sheep samples were positive for lungworm, while all the moose tested negative. We found no significant differences of LPG between Dall sheep from different locations and sex and also found no correlation between age and LPG, although our sample sizes were low in many of the areas tested. We suggest further testing using larger sample sizes from each location. (Poster Presentation)

**HOLT, EMILY A., Bruce McCune, and Peter Neiflich.** Oregon State University, Department of Botany and Plant Pathology, Corvallis, OR (EAH, BM); Western Arctic National Parklands, National Park Service, Winthrop, WA (PN).

*HOW TO FIND AN ARCTIC LICHEN WITHOUT ACTUALLY GOING TO THE TUNDRA.*

Our goal was to identify land classifications that best describe lichen communities in the Bering Land Bridge National Preserve of northwestern Alaska. We used GIS datasets to reflect vegetation, soils, geology, elevation, geography, and physiography at various scales in our study area. These classifications were compared with field measures of macrolichen abundance sampled in 2003. We found that all GIS classifications separated lichen communities more strongly than by chance alone. However, the strength of these groupings ranged from strong (Alaska subsections, soil variables, and surficial geology classifications) to weak (watersheds and reindeer allotment ownership). We also noted that classification strength positively related to number of groups within each classification. There was no correlation, however, between patch size and the success of each classification. Using hierarchical agglomerative cluster analysis with the field dataset, we were also able to form natural macrolichen community groups. We then compared these groupings to the GIS classification used as a stratification principle in sampling. Our results suggest congruence between our lichen community groups and the cover types used in stratification. This research highlights factors to which arctic lichens respond, and identifies successful classifications for future work in neighboring areas of the Arctic.

**HOLYAN, JIM, Isaac Babcock, and Curt Mack.** Nez Perce Tribe, Lapwai, ID.

*TEN YEARS OF WOLF RECOVERY – A CONSERVATION SUCCESS.*

The Nez Perce Tribe (Tribe) maintains strong cultural, spiritual, and historical ties to the gray wolf (*Canis lupus*). Since 1995, the U.S. Fish and Wildlife Service, Tribe, and other

federal and state partners have worked collaboratively to recovery wolves to Idaho and the northern Rocky Mountains. Ten years after the first reintroductions into central Idaho, wolf recovery in the northern Rocky Mountains is recognized as one of the greatest conservation success stories in recent history. Currently, Idaho supports a viable wolf population of around 600 wolves and 60 wolf packs. Wolf managers are now transitioning from federal wolf recovery and protection under the Endangered Species Act (ESA), to long-term state and tribal conservation and management. Success has been facilitated by a unique inter-governmental partnership implementing a comprehensive recovery strategy including monitoring; control; information, education and outreach; and research to address recovery needs of wolves and socio-political concerns of Idahoans. Future challenges include finalizing the delisting process (the federal administrative process for removing wolves from the federal list of threatened and endangered species and the protection of the ESA); developing long-term monitoring strategies; and implementing science-based responsive and responsible wolf management that maintains public tolerance for wolves, focuses on conflict resolution, and balances long-term conservation species needs with socio-political concerns of Idahoans. (Poster Presentation)

**HOSSACK, BLAKE R., and P. Stephen Corn.** USGS-Northern Rocky Mountain Science Center, Missoula, MT.

*SPECIES-SPECIFIC RESPONSES OF AMPHIBIANS TO WILDFIRE IN GLACIER NATIONAL PARK.*

We have monitored amphibian populations in Glacier National Park during 1999–2005, a period of fire activity unmatched since at least 1655. Several wildfires have burned areas where we had pre-fire data on wetland occupancy by larvae of the boreal toad, Columbia spotted frog, and long-toed salamander, as well as relative abundance of larvae of the Rocky Mountain tailed frog in small streams. A general pattern has emerged based on comparison of before-and-after changes in wetland occupancy following 3 lowland wildfires that suggests fire provides short-term benefits for the boreal toad, with little apparent effect on Columbia spotted frog and long-toed salamander populations. Occupancy of ponds in neighboring unburned areas has changed little since 1999. No obvious changes in the chemical or physical characteristics of wetlands explain the increase in boreal toad breeding sites, but preliminary data suggest toads may be responding to favorable changes to the terrestrial environment. In 4 streams we first sampled in 2001 that later burned in 2003, abundance of tailed frog larvae decreased after the fire relative to the trend in 4 unburned streams, with the greatest effect on abundance of age-1 larvae compared to age-2 and age-3 larvae. Our data indicate short-term amphibian responses to wildfire range from positive to negative, but the long-term consequences of wildfire to amphibian populations in Glacier National Park and the West are still unknown.

**HUGHES, JONATHAN.** University of Washington, U.S. Geological Survey at Department of Earth and Space Sciences, Seattle, WA 98195.

*VERTICAL DISTRIBUTION OF VASCULAR PLANTS RELATIVE TO TIDAL INUNDATION AND SUBSTRATE IN SALT MARSHES NEAR TOFINO, BRITISH COLUMBIA, CANADA.*

Two salt marshes on Vancouver Island differ in the vertical zonation of their vascular plants, differences that depend more on substrate than on elevation or tidal inundation. The study sites, English Cove and Jensen's Bay, are less than one kilometer apart but differ in shape and sandiness. I used ordination with plant cover-abundance measures to divide plots into groups and to assess variation explained by elevation and inundation. Distributions of 25 vascular-plant species at English Cove delimit four vegetation zones: muddy low, middle, high, and forest-edge marshes. At Jensen's Bay I found 29 species and two additional zones: sandy low marsh and alder-sedge carr. The sandy low marsh, a regionally rare community, includes *Triglochin*

*maritimum*, *Plantago maritima*, *Salicornia virginica*, *Spergularia canadensis*, and *Puccinellia pumila*. Most species grow lower in the intertidal at English Cove than at Jensen's Bay; especially *Carex lyngbyei*, which extends lower by nearly two thirds of a meter. With plants thus occupying more of the intertidal range, vegetation zones at English Cove are more distinct than at Jensen's Bay. The sandy low marsh and *Carex lyngbyei* affinity for mud suggest that substrate is a controlling factor in the low marsh. By contrast for elevation and inundation, ordination constrained by either of these variables reveals that they explain less than one-fifth of variation in species distributions. Different vegetation assemblages at neighboring sites demonstrate the importance of site-specific measures of environmental gradients for salt-marsh restoration and studies of past and future sea-level change.

**HOISINGTON, JESSICA, Lisette Waits, Jack Sullivan, Janet Rachlow, and Steve Brunsfeld.**

University of Idaho, Moscow, ID 83844.

**POPULATION STRUCTURE OF THE IDAHO GROUND SQUIRREL (*SPERMOPHILUS BRUNNEUS*) USING MITOCHONDRIAL DATA.**

We examined the mitochondrial DNA genetic diversity and structure of the northern Idaho ground squirrel (*Spermophilus brunneus brunneus*), an endangered subspecies, and the southern subspecies (*S. b. endemicus*), a candidate for listing. Both subspecies have undergone population declines due to habitat loss and fragmentation. Previous analyses of nuclear microsatellite DNA diversity and structure showed lower genetic diversity and higher genetic structure in *S. b. endemicus*. We have analyzed the same populations for *S. b. brunneus* (Squaw Butte, Bissel Creek, Sand Hollow, Clay Peak, Holland Gulch, Skow, Rolling Hills and Henley Basin) and *S. b. endemicus* (Summit Gulch, Tree Farm, Squirrel Farm, Cold Springs, Chipmunk Springs, Lost Valley and Price Valley) by generating 472 nucleotides of mtDNA control region (106 *S. b. brunneus* and 103 *S. b. endemicus*) and 1018 nucleotides of cytochrome b sequence data (17 and 23, respectively). We have detected 18 unique control region DNA sequences (haplotypes) and 15 cytochrome b haplotypes. Contrary to microsatellite data, we observed lower mtDNA diversity in the northern subspecies. As expected, no haplotypes were shared across subspecies suggesting current isolation of the two subspecies. The most divergent haplotypes were observed in the Lost Valley and Chipmunk Springs populations. We will discuss the implications of these results for conservation and management of this endemic species.

**HORNE, JON S., Edward O. Garton, Layne G. Adams, Mark R. Fuller.** University of Idaho, Department of Fish and Wildlife, Moscow, ID 83844 (JSH, EOG); USGS-Alaska Science Center, 1011 East Tudor Road; MS701, Anchorage, AK 99503 (LGA); USGS, Forest and Rangeland Ecosystem Science Center, Snake River Field Station, and Boise State University - Raptor Research Center, 970 Lusk St., Boise, ID 83706 (MRF).

**ANALYSING ANIMAL MOVEMENTS USING BROWNIAN BRIDGES.**

Brownian bridges can be used to model the expected movement path of an animal between successive locations. We develop a Brownian bridge movement model for estimating animal space use based on discrete location data obtained at relatively short time intervals. The model estimates the relative frequency of use in an area by modeling the probability of occurrence between successive pairs of locations, dependent on the time between locations, the distance between locations, and the Brownian motion variance which is related to the animal's mobility. We develop a maximum likelihood approach to estimate the Brownian motion variance. As an example application, we used the Brownian bridge movement model to describe migration routes.

**INOUE, RICHARD S.** Idaho State University, Center for Ecological Research and Education, and Department of Biological Sciences, Pocatello, ID 83209-8007.  
*EFFECTS OF SHRUB REMOVAL AND NITROGEN ADDITION ON SOIL MOISTURE IN SAGEBRUSH STEPPE.*

I monitored soil moisture profiles in sagebrush steppe in SE Idaho, USA, for 6 years, a period that included four consecutive years of drought. Recharge of soil moisture was primarily the result of winter and early spring precipitation, and soil moisture declined during the spring and summer growing season. During the growing season only an unusual rainfall event will recharge soil moisture deeper than 80 cm. Any shift in precipitation from winter months to spring or summer would likely reduce recharge of soil moisture at depths of 100 cm or more. Recharge was substantially lower during drought years, and a single year of average precipitation did not restore soil moisture to pre-drought levels. Relative to control plots, there was more soil moisture on shrub removal plots and less soil moisture on nitrogen addition plots, particularly at depths of 100 – 180 cm. These differences suggest that in this ecosystem shrubs extract more moisture from deeper in the soil profile than perennial grasses, and that increased nitrogen availability can significantly affect soil water balance.

**JENKINS, CHRISTOPHER L.** Greater Yellowstone Program, Wildlife Conservation Society, 1780 1st Street, Idaho Falls, ID 83401.  
*CONSERVATION BIOLOGY OF GREAT BASIN RATTLESNAKES: LINKING LANDSCAPE DISTURBANCE TO RATTLESNAKE POPULATIONS.*

The synergistic effects of livestock grazing and invasive plants are altering natural fire regimes and threatening sagebrush steppe ecosystems of southern Idaho. This phenomenon is having a negative impact on a number of wildlife species that inhabit these systems. The goal of this study is to determine how these landscape changes are influencing Great Basin rattlesnake populations. We used radio telemetry, habitat sampling, and small mammal trapping to determine if disturbance is altering prey resources available to rattlesnakes. We found significant differences in the availability of habitat and prey among undisturbed, grazed, and burned areas. In addition, we found that small mammal biomass is associated with habitat characteristics typical of undisturbed sagebrush steppe including a positive relationship with shrub height and biological crust cover and a negative relationship with grass cover. We also found that snakes using areas with higher prey availability gained more weight during the active season. Coarse scale analyses support these results, specifically regions of the study area with more disturbance, had lower prey availability and snakes with lower reproductive output (i.e., lower body condition, slower growth, longer ages to maturity and pregnancy intervals, and fewer and smaller offspring). Our results suggest that widespread disturbance is having a negative impact on rattlesnake populations through a series of trophic interactions. Suggestions for conserving remaining undisturbed areas and restoring disturbed areas are discussed.

**JENKINS, CHRISTOPHER L., and Craig R. Groves.** Greater Yellowstone Program, Wildlife Conservation Society, Bozeman, MT 59715.  
*INTEGRATING SENSITIVE SPECIES STUDIES AND BIODIVERSITY INVENTORIES TO DEVELOP A CONSERVATION MANAGEMENT PLAN FOR THE IDAHO NATIONAL LABORATORY.*

Sagebrush steppe ecosystems continue to be degraded by livestock overgrazing, invasive plants, and altered fire regimes. The Idaho National Laboratory (INL) contains some of the least degraded sagebrush steppe remaining. Although a number of wildlife studies have been conducted on the INL over the last 30 years, the ecological condition, status, and distribution of most species and communities is poorly known. To rectify this, we are undertaking two sets of activities. First, we are designing studies that will estimate the distribution and abundance of two sagebrush-obligate species (i.e.,

pygmy rabbits and sage grouse). To estimate the distribution and abundance of pygmy rabbits and sage grouse, we are incorporating ground, aerial, and remote survey techniques to develop detectability, habitat, and geostatistical models and abundance indices. We will present preliminary results from pygmy rabbit surveys during winter 2005/2006. For sage grouse, we will describe our methodological approach and how it relates to other regional efforts to assess grouse populations. Second, we are designing more extensive biological surveys of plants, amphibians, reptiles, birds, and mammals for a selected portion of the INL where future development is more likely to take place. Results from these activities combined with information from previous studies will be used to develop a conservation management plan for the INL during the next 2-3 years.

**KEEHNER, JON, Dave Onorato, and Lisette Waits.** No contact information provided.  
*USING DNA SEQUENCE ANALYSIS TO DETECT AND IDENTIFY CARNIVORES IN NATIONAL PARKS OF THE SOUTHWEST.*

Understanding the ecological influences of medium sized carnivores which occur in many National Parks is important for management decisions. Non-invasive genetic sampling (NGS) may become a cost-effective and accurate method to monitor the presence of many species. We had 3 main objectives for this study: 1) to determine which carnivore species could be detected by hair snares and fecal DNA sampling in seven southwestern National Parks, 2) to determine success rates for positive identification using DNA sequencing and 3) to explore spatial habitat preference analyses.. We detected the presence of black bear (*Ursus americanus*), gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), bobcat (*Felis rufus*) and cougar (*Puma concolor*) using mitochondrial DNA sequencing analysis of hair and feces. Success rates of positive species identifications using primers developed by Farrell et al. (2000) were much higher, (97.7%) compared to hair analysis studies using primers developed by Paxinos et al. (1997) (53.0%). Digital maps were created of the areas where species were detected; however, detailed information from the presence/absence of selected species within vegetation classifications was confounded by snare deployment biases, potential behavioral responses and an insignificant number of samples for the scale of the spatial analysis.

**KERTSON, BRIAN N., and Christian E. Grue.** Washington Cooperative Fish and Wildlife Research Unit and Wildlife Science Group, College of Forest Resources, Box 352110, University of Washington, Seattle WA 98195 (BNK); Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fisheries Sciences, Box 355020, University of Washington, Seattle WA 98195 (CEG).

*COUGARS AND CITIZEN SCIENCE: AN EVALUATION OF THE ABILITY OF 3<sup>RD</sup>, 5<sup>TH</sup>, AND 8<sup>TH</sup> GRADE STUDENTS TO COLLECT ACCURATE INFORMATION ON WILDLIFE AND THEIR HABITATS.*

Field investigations of wildlife often face challenges stemming from budget limitations and staffing shortages. Citizen science is the use of trained volunteers to collect scientific data and information on wildlife and their habitats as a means to meet research and management objectives. If citizen science is to be accepted as a viable resource to assist wildlife biologists in research and management activities, questions of data quality must be addressed. As part of an investigation of citizen science data quality, we evaluated the ability of 3<sup>rd</sup>, 5<sup>th</sup>, and 8<sup>th</sup> grade student volunteers from the Cle Elum/Roslyn School District to collect accurate scientific data and information on cougar ecology as part of the Washington Department of Fish and Wildlife's Project CAT (Cougars and Teaching). Students were evaluated setting up and completing winter track transect surveys and spring habitat plots. Students and researchers conducted 100 meter track transect surveys during the winter from



student homes in an attempt to characterize wildlife distribution in different densities of residential development. In the spring, students and researchers quantified and characterized wildlife habitat in the Project CAT study area focusing on attributes of ungulate ecology and winter range. Students received eight hours of training for set up and completion of winter work and 5 hours for spring habitat plots. Teachers provided training in the classroom and field with advanced training provided by *NatureMapping* Program partners and project researchers. We used paired t-tests, frequency distributions, and descriptive statistics to compare citizen scientist and researcher datasets. Results indicate the ability of student to set up experiments and collect accurate scientific data is variable. Student datasets did not differ from researchers for several tasks, but students struggled with portions of setting up experiments, track identification, plant identification, and the concept of scientific bias. Overall, the use of K-12<sup>th</sup> grade students working as citizen scientists to assist biologists and managers with wildlife research and management objectives appears to hold promise. Logistical concerns (volunteer training, coordination, and supervision) may pose a greater challenge to the use of citizen scientists in investigations of wildlife than concerns of data quality. Beyond scientific data collection, the greatest benefit of utilizing students as citizen scientists stems from increased community support for, and understanding of, wildlife ecology, conservation, and research objectives.

**KILPATRICK, DARLENE, Kerry P. Reese, Lauri Hanauska-Brown, and Tom Hemker.** University of Idaho, Moscow, ID (DK, KPR); Idaho Department of Fish and Game, Idaho Falls, ID (LHB); Idaho Department of Fish and Game, Boise, ID (TH).

*TRUMPETER SWAN TRANSLOCATION IN SOUTHEASTERN IDAHO 2001-2005: SURVIVAL AND MOVEMENT.*

After the recovery of trumpeter swans from near extinction, the Rocky Mountain Population (RMP) rebounded in the last century to over 4000 birds. Today the issues for the RMP have changed due to overcrowding in their wintering range. Managers have been attempting to expand the range of the RMP to alleviate impact on resources for resident breeders, reduce the risk of disease transmission due to the localized population, and establish alternate wintering grounds in areas where weather conditions are less severe. IDFG and other government agencies collaborated to translocate 376 cygnets through the winters of 2001-2005. This was the first winter translocation project to relocate only cygnets instead of adults or family groups. Previous winter translocation projects had minimal success. For the 2001-05 project, approximately half of the cygnets were released at the capture site to act as a control group and the other half were translocated over 200 km south to the Bear River drainage in Idaho. Survival of the translocated cygnets was similar or higher than survival of control cygnets. A number of the translocated swans returned in the following years as adults to the translocation area and to other locations south of the core RMP wintering area. To further evaluate the success of the translocation project, movement behavior and survival will be discussed in more detail.

**KOCHERT, MICHAEL N., and Karen Steenhof.** USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise, ID 83706.

*FERRUGINOUS HAWK USE OF NESTING SUBSTRATE: IMPLICATIONS FOR MONITORING.*

Ferruginous Hawks nest on many natural and human-made substrates. Between 1976 and 1996, 46% of the nests studied in southwest Idaho were on cliffs, rock outcrops, and the ground; 54% of nests occurred on artificial platforms and utility structures. Nesting success varied by substrate. Success on transmission towers and artificial nesting platforms (84%) was higher than that (52%) of pairs that nested on nearby available natural substrates. Higher success on human-made sub-strates may have

been related to accessibility of nests to humans and other mammalian predators. No nests on utility structures and artificial platforms were classified as accessible compared to 82% of nests on natural substrates. Success averaged 51% for accessible nests compared to 79% nests on inaccessible substrates. Pairs reused nests on artificial substrates more often than nests on natural sites. Occupancy of historical territories decreased over time, while the total number of occupied territories found increased. Nesting population Monitoring based on surveys of only historical nesting territories can be misleading or erroneous.

**LAFRENTZ, BENJAMIN R., Scott E. Lapatra, William D. Shewmaker, Aaron Weighall, and Kenneth D. Cain.** University of Idaho, Department of Fish and Wildlife Resources and the Aquaculture Research Institute, Moscow, ID 83844-1136 (BRL, KDC); Clear Springs Foods, Inc., Research Division, Buhl, ID 83316 (SEL, WDS, AW).

**AN ANALYSIS OF FLAVOBACTERIUM PSYCHROPHILUM CARBOHYDRATE ANTIGENS AND THEIR POTENTIAL ROLE IN PROTECTIVE IMMUNITY.**

*Flavobacterium psychrophilum* is the etiological agent of coldwater disease (CWD) and rainbow trout fry syndrome (RTFS) and has emerged as one of the most significant bacterial pathogens in salmonid aquaculture in the Pacific Northwest and worldwide. The carbohydrate antigens of *F. psychrophilum* were characterized by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and western blot analyses. Two distinct carbohydrate banding patterns were identified. One banding pattern is characteristic of bacterial lipopolysaccharide, while the other banding pattern has not previously been characterized. We suggest that this newly identified carbohydrate antigen is the loosely associated slime layer, or glycocalyx of *F. psychrophilum*. Passive immunization experiments utilizing a monoclonal antibody specific for the glycocalyx are underway to determine if antibodies to the glycocalyx of *F. psychrophilum* provide protection to rainbow trout following experimental CWD challenge. If protection is conferred, future research will focus on purification and further characterization of the glycocalyx as a potential vaccine candidate antigen for CWD and RTFS.

**LARSEN, DON.** Washington Department of Fish and Wildlife, 316 West Boone Avenue, Suite 450, Spokane, WA 99201.

**THE FEDERAL FARM BILL AND SHRUB-STEPPE CONSERVATION.**

The Farm Security and Rural Investment Act of 2002 (the most recent federal Farm Bill) has been described as the largest commitment of resources to natural resources conservation in our Nation's history. In the year 2005 in Washington State alone, over \$100 million was spent on Farm Bill conservation programs. Many of the conservation programs authorized by this legislation specifically include wildlife among their stated purposes. Shrub-steppe dependent species have benefited from Farm Bill conservation programs, particularly from the Conservation Reserve Program (CRP) - a landscape-level program. In Washington State alone, over 1.5 million acres of environmentally sensitive cropland, primarily in former steppe and shrub-steppe areas, have been planted to grass, forb, shrub and tree cover through CRP. Research has documented use of CRP fields by a variety of birds, reptiles, amphibians and mammals. CRP has been shown to be particularly important for at-risk western sage-grouse and Columbian sharp-tailed grouse species.

**LEAVITT, HOLLIE, and Ian C. Robertson.** Boise State University, Boise, ID 83725.

**PETAL HERBIVORY BY CHRYSOMELID BEETLES (PHYLLOTRETA SP.) IS DETRIMENTAL TO POLLINATION AND SEED PRODUCTION IN LEPIDIUM PAPILLIFERUM (BRASSICACEAE).**

Insect herbivory directed at flowers can decrease fruit and seed production by decreasing the attractiveness of a damaged flower to potential pollinators, by

disrupting the transfer of pollen between pollinators and stigmas, or both. We examined the effects of petal herbivory by a chrysomelid beetle (*Phyllotreta* sp.) on pollination and seed production in *Lepidium papilliferum* (Brassicaceae), a rare mustard plant endemic to southwestern Idaho. Under natural conditions, flowers with a hole chewed in a petal produced seed at a significantly lower rate than undamaged flowers (44% vs 80%, respectively,  $P=0.0037$ ). However, when damaged and undamaged flowers were hand pollinated, there was no significant difference in seed set rate (84% vs 80%, respectively,  $P=0.65$ ). Thus, petal herbivory in *L. papilliferum* disrupts the effectiveness of insect-mediated pollination, but it does not physically inhibit pollination or seed production.

**Lee, Tracy, DANA H DUKE, and Michael Quinn.** Miistakis Institute for the Rockies, c/o Environmental Design, University of Calgary, Alberta, Canada.

**ROAD WATCH IN THE PASS: A WEB-BASED GIS PROJECT TO MONITOR WILDLIFE MOVEMENT ACROSS HIGHWAY 3 IN THE CROWSNEST PASS.**

*Road Watch in the Pass* is a citizen science project that enables participants to report wildlife observations along a 44 km stretch of highway through the Crowsnest Pass in southwestern Alberta, Canada. Through the use of Web-based GIS, interested citizens can contribute information that will be instrumental in making final decisions concerning measures to mitigate the effects of highway expansion. There are currently 56 people whom have contributed over 750 observations to *Road Watch*. A preliminary comparison of eleven months of *Road Watch* data (representing successful crossings) and wildlife mortality data (representing wildlife vehicle collisions) collected by highway maintenance contractors is presented to demonstrate that the use of citizen science not only augments more conventional approaches, but also results in the emergence of new knowledge and insights. Using a segment approach, both datasets identified 12% of Highway 3 as zones with high crossing or collisions but the location of the high crossing or collision zones showed a poor level of spatial agreement. This highlights that wildlife are successfully crossing in areas not identified by the wildlife mortality data. This has important implications for design and mitigation efforts of Highway 3 and other roadways.

**LEWIS, JESSE S., Janet Rachlow, and Jon Horne.** University of Idaho, College of Natural Resources, Department of Fish and Wildlife Resources, Moscow, ID 83844-1136.

**BEARS AND HIGHWAYS: IDENTIFYING ROAD CROSSING HABITAT CHARACTERISTICS USING THE BROWNIAN BRIDGE.**

The impacts of roads on wildlife populations are a major concern throughout North America. Highways, and their associated human development, may create barriers, which isolate wildlife populations and reduce their long-term persistence by influencing demographic and genetic characteristics. In the Purcell Mountains of northern Idaho, Highway 95 may pose a potential barrier to black bear movements. We evaluated (1) whether black bears crossed the highway, and (2) if bears did cross, which habitat characteristics were associated with crossing locations. In 2005, we fitted 11 black bears and 1 grizzly bear with GPS collars, which were programmed to record a location every 20 minutes. Most bears did not cross Highway 95 and appeared to use the highway as a home range boundary. For bears that crossed the highway, we evaluated the highway crossing habitat characteristics using the novel Brownian bridge approach, which relates GIS habitat layers to a probability distribution. The Brownian bridge is dependent upon the time and distance between locations. Preliminary results indicated that black bears were selecting highway crossings that were within forest cover and away from human development. This work will continue through 2006.

**LILLQUIST, KARL and Karen Walker.** Central Washington University, Geography and Land Studies Department, Ellensburg, WA 98926 (KL); 3700 Ogelthorpe, Schertz, TX 78154 (KW). *OLD DATASETS, NEW GIS AND HISTORIC FLUCTUATIONS OF GLACIERS AND CLIMATE, MOUNT HOOD, OREGON.*

Glacier termini are sensitive to climate changes. We assessed terminus fluctuations of five glaciers at Oregon's Mount Hood, and the correspondence of these fluctuations to temperature and precipitation patterns from 1901 to 2001. Historic ground and aerial photographs, written descriptions, and ground survey data, combined with contemporary GPS measurements and GIS analysis, revealed generally synchronous periods of retreat and advance within an overall retreat during the past century. Glacier terminus retreat ranged from -62 m at the Newton Clark Glacier to -1102 m at the Ladd Glacier. Comparison of the glacier record to a long term climate data set revealed that glaciers retreated between 1901 and 1946 during a period of rising temperatures and declining precipitation. A mid-century cool, wet period was associated with glacier advances. Glaciers retreated from the late 1970's to the mid 1990's during rising temperatures and declining precipitation. High precipitation in the late 1990's preceded slight advances in 2000 and 2001. The general correspondence of Mount Hood's glacier fluctuations with other alpine glaciers in Washington and Oregon suggests that regional-and decade-scale weather and climate events, such as the Pacific Decadal Oscillation, play a key role in shaping Pacific Northwest glacier terminus dynamics. Local differences in glacier aspect, altitude, size, and steepness as well as volcanic and geothermal activity, topography, and debris cover may have caused deviations from the general glacier fluctuation pattern noted above.

**LONG, RYAN A., Jonathan D. Muir, Janet L. Rachlow, and John G. Kie.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844 (RAL, JDM, JLR); Idaho State University, Department of Biological Sciences, Pocatello, ID 83209 (JGK). *EVALUATING WILDLIFE-HABITAT RELATIONSHIPS: A COMPARISON OF TWO MODEL-BUILDING APPROACHES.*

Resource selection functions (RSFs) have been proposed as a unifying concept for analysis and interpretation of wildlife habitat data. Logistic regression contrasting used and unused or used and available units is one of the most common analyses for developing RSFs. Recently, resource utilization functions (RUFs) have been developed based on differential use of habitat attributes without an assessment of availability. This new approach considers use as a continuous variable summarized by a utilization distribution (UD). A direct comparison of these two approaches is lacking. We evaluated performance of RSFs and RUFs by applying both approaches to 3 years of elk and mule deer data from the Starkey Experimental Forest and Range in northeastern Oregon. We evaluated differences in maps of predicted probability of use, relative ranking of habitat variables, and predictive power between the 2 models. For both elk and mule deer, maps of predicted probability of use differed substantially between the RSF and the RUF, as did the relative ranking of habitat variables. However, elk distribution was most accurately predicted by the RSF, while mule deer distribution was most accurately predicted by the RUF. We discuss potential reasons for these differences within a framework of model assumptions, form, and structure.

**Lorenz, Brian A., and SCOTT J. BAILEY.** Idaho Department of Fish and Game, Magic Valley Region, Jerome, ID 83338. *A SURVEY OF AMPHIBIANS AND REPTILES IN THE BUREAU OF LAND MANAGEMENT'S SHOSHONE FIELD OFFICE AREA.*

We inventoried reptiles and amphibians in the Shoshone BLM Field Office Area during 2005. We identified 124 aquatic sampling sites and conducted anuran calling surveys

at each site and visual encounter surveys and larval amphibian sampling where conditions permitted. We also recorded incidental observations and classified vegetation/hydrologic features at each sample and incidental observation site. We detected 8 amphibian and 10 reptile species. Pacific treefrog (*Pseudacris regilla*) and spadefoot toad (*Spea intermontana*) were the most frequently detected anurans. Other amphibian species observed included boreal chorus frog (*Pseudacris maculata*), western toad (*Bufo boreas*), Columbia spotted frog (*Rana luteiventris*), northern leopard frog (*R. pipiens*), bullfrog (*R. catesbeiana*), and long-toed salamander (*Ambystoma macrodactylum*). Reptiles detected included: gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), common garter snake (*Thamnophis sirtalis*), racer (*Coluber constrictor*), western terrestrial garter snake (*Thamnophis elegans*), rubber boa (*Charina bottae*), sagebrush lizard (*Sceloporus graciosus*), short-horned lizard (*Phrynosoma douglassii*), side-blotched lizard (*Uta stansburiana*), and western whiptail lizard (*Cnemidophorus tigris*). We recommend continuation and expansion of this inventory effort and further sampling at selected sites to monitor local populations. We also recommend research on the potential influence of grazing and other land management activities such as herbicide application, energy development, prescribed fire, and off-road vehicle use on amphibian reproductive success and population viability. Results of this research should influence future land use planning decisions.

**LOWE, BRAD S., and David J. Delehanty.** Idaho State University, Pocatello, ID 83209.  
*GREATER SAGE-GROUSE USE OF REHABILITATED AREAS IN SOUTH-CENTRAL IDAHO.*

Greater sage-grouse (*Centrocercus urophasianus*) have experienced population declines throughout their range for the past century. Because sage-grouse populations are low, their sensitivity to habitat degradation has increased such that additional alterations to their habitat may cause further declines or even extirpation of populations. The effects of fire on sage-grouse are of particular interest. Fire frequency has increased following alterations in the vegetation community. Threetip sagebrush (*Artemisia tripartita*) is often the first species of sagebrush to reestablish following fire. We used radio-marked female sage-grouse captured in the Laidlaw Park area, Idaho, southwest of Craters of the Moon National Monument, to measure the use of threetip sagebrush as nest cover relative to other sagebrush species. Threetip and big sagebrush (*A. tridentata*) were the only sagebrush species used as nest cover. Sage-grouse used big sagebrush disproportionately relative to threetip sagebrush abundance. We did not observe a statistically significant difference in nest success in sage-grouse using threetip sagebrush or big sagebrush as nest cover. We also assessed the use of rehabilitated burn areas by sage-grouse. Large areas within the study site burned in 1992 and in 1996. The Bureau of Land Management rehabilitated portions of the burned areas. Preliminary data suggest that sage-grouse use rehabilitated areas in greater proportion than they are available. (Poster Presentation)

**LUCID, MICHAEL K., Jason S. Husseman, Brent Thomas, and Steve Nadeau.** Idaho Department of Fish and Game, 3101 South Powerline Rd., Nampa, ID 83686.  
*AN ONLINE SYSTEM FOR REPORTING WOLF SIGHTINGS.*

Observations by the general public can provide important information to wildlife managers and it is important to provide a medium to relay sightings. The Idaho Department of Fish and Game's (IDFG) on-line reporting form has proven a valuable tool for quick dissemination of wolf sightings to Idaho wolf managers. This system allows managers from multiple agencies to mobilize field crews to verify pack activity and respond to wolf complaints. Since the debut of IDFG's on-line reporting form in 2003 over 900 wolf observations have been submitted by the public, IDFG personnel

and biologists from other agencies. Each year sightings are mapped with a Geographic Information System and clusters of sightings provide biologists with starting points for new pack verification.

**LUTZ, JAMES A., and Charles B. Halpern.** University of Washington, College of Forest Resources, Seattle, WA 98195-2100.

**MORTALITY AND EARLY CONIFEROUS FOREST DEVELOPMENT.**

Current successional models assume that mortality during early forest development is dominated by density-dependent processes. We examined changes in forest structure and patterns of tree mortality 14-38 yr after clearcut logging of two watersheds in the western Cascade Range of Oregon. A total of 193 permanent plots were sampled six times generating 75,126 data records and 7,146 instances of mortality. At final sampling, stem density varied by two orders of magnitude among plots, and biomass by a factor of ten. Biomass of most hardwood species increased through canopy closure as dominant stems achieved large sizes. Shade-tolerant conifers accounted for 26% of stems after 38 yr. Suppression mortality was >2.5 times as frequent as mechanical damage (windthrow, stem snap, and crushing). However, biomass lost to mortality via mechanical damage was nearly four times that lost to suppression, a result of episodic storms that created windthrow patches. Although suppression was the dominant demographic process, mechanical damage yielded greater loss of biomass and greater structural heterogeneity. Gap-forming processes that operate late in succession contribute to structural complexity early in stand development.

**MACK, CURT, Kyran Kunkel, and Wayne Melquist.** Nez Perce Tribe, Lapwai, ID (CM); Mountain Thinking Conservation Science Collaborative, Gallatin Gateway, MT (KK); University of Idaho, Moscow, ID (WM).

**DEVELOPING LONG-TERM MONITORING PROTOCOLS FOR WOLVES IN IDAHO.**

To date, the Nez Perce Tribe and the United States Fish and Wildlife Service have used radio telemetry as the primary method for monitoring wolves (*Canis lupus*) in the northern Rocky Mountains. While this method is reliable and was appropriate for a small, recovering Idaho wolf population, it is too expensive, logistically difficult, intrusive, and unnecessary for long-term statewide conservation and management of a much larger recovered wolf population. More appropriate wolf monitoring protocols are needed to address management objectives on 2 different levels: (1) short-term documentation of minimum population levels above a federal re-listing threshold to satisfy delisting requirements, and (2) long-term population distribution, status, and trend for effective conservation and management of the species. We reviewed 396 relevant papers and sent questionnaires internationally to evaluate existing survey and monitoring methods and assess their application to Idaho's unique landscapes. We determined that no single method would adequately address identified monitoring objectives, nor be applicable statewide across the varied landscapes of Idaho. We recommend a suite of coordinated methods for further field testing and evaluation.

**MAKELA, PAUL, and Tom Hemker.** U.S. Bureau of Land Management, Idaho State Office (PM); Idaho Department of Fish and Game, Wildlife Bureau, Boise, ID 83707 (TH).

**THE DRAFT CONSERVATION PLAN FOR GREATER SAGE-GROUSE IN IDAHO: A FRAMEWORK FOR PROGRESS.**

In 1997 Idaho completed a sage-grouse management plan that set the stage for coordinated sage-grouse conservation planning across the state, and the establishment of Local Working Groups (LWGs) in priority areas. New information and on-going concerns about sage-grouse populations, habitats and threats rangewide

suggested that a revision and update of the 1997 plan was needed. In 2004, a subcommittee of the Idaho Sage-grouse Advisory Committee began to craft a more detailed, comprehensive document. As with the 1997 plan, it was important that the revision be consensus-driven, and supportable by a diverse constituency, to foster implementation and effectiveness. In early 2005, a professionally facilitated, independent panel of six Idaho scientists familiar with sage-grouse, rangeland, fire, and landscape ecology was convened to assist with identifying and ranking statewide threats, and to address sage-grouse extirpation risk. Key components of the draft plan include revision of Sage-grouse Planning Areas; more specific direction for Local Working Groups and preparation of LWG plans; background information on populations and habitats by Sage-grouse Planning Area; descriptions of statewide threats, including maps and supporting data; recommended conservation measures; and monitoring approaches. We also included, as appendices, additional information useful for sage-grouse conservation planners, including copies of the USFWS greater sage-grouse petition summary; USFWS 12-Month Finding; Idaho Science Panel Executive Summary; WAFWA Guidelines to Manage Sage-grouse Populations and Their Habitats, and other documents, to ensure these tools are readily available to users. Adoption of the plan is anticipated in Spring 2006.

**MANNING, JEFFREY A., and Edward O. Garton.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844.

*THE ROLE OF COMPETITION IN THE DYNAMICS OF ELK AND DEER POPULATIONS.*

Competition has been heralded as a potent ecological process, but controversy continues over its relative importance. We estimated effects of interspecific competition relative to density dependence, summer forage quality, winter severity, and harvest level on the dynamics of Rocky Mountain elk (*Cervus elaphus nelsoni*) and mule deer (*Odocoileus hemionus*) populations in 3 locations across Idaho. Annual population sizes were estimated from aerial sightability surveys, quality of summer forage was indexed by the normalized difference vegetation index, and winter severity from monthly snow accumulation. Winter densities ranged from 0.68-10.1 deer/Km<sup>2</sup> and 0.13-0.62 elk/Km<sup>2</sup> of winter range. Instantaneous rates of population growth ranged from  $\bar{0.85}$ -0.84 deer and  $\bar{0.073}$ -0.31 elk. Ricker models predicted equilibrium densities at 1.25-3.64 deer/Km<sup>2</sup> and 0.59 elk/ Km<sup>2</sup> of winter range. Comparisons of modified Ricker models showed that where winter severity and harvest were generally low and quality of summer forage high, competition by elk was equally as important as these factors in its effect on deer population growth. Competition by elk had a relatively small effect on deer population growth where winter severity and harvest were high and quality of summer forage was low.

**MCCAULEY, LUANA M., and Peter Koetsier.** Boise State University, Biology Department, Boise, ID 83725.

*EFFECTS OF PERIODIC SUBSTRATE SCOURING ON BENTHIC SCRAPER-ALGAE INTERACTIONS IN A SMALL IDAHO STREAM.*

Our objective was to examine how a stream benthic community would organize under periodic scouring events occurring at two different time intervals. We conducted our study in a small, 2<sup>nd</sup> ordered, mountain stream. We divided a series of stream segments into 3 treatment sections: 1) substrate was manually scoured twice a month, 2) the substrate was scoured once a month, and 3) the substrate was left undisturbed (control). We sampled algal biomass, benthic invertebrates and measured physiochemical variables (DO, water temperature, conductivity, pH, discharge) once every two weeks from June 1 to August 31. We found that scraping invertebrates (primarily *Baetis*, *Cinygmula*, *Epeorus*, *Glossosoma*) decreased with increased scouring, while algal biomass was positively related to scouring frequency.

The algae recovered quickly between scouring intervals, the scraping invertebrates did not. By keeping scraper numbers low, scouring dampened grazing activity on the algae resulting in an increase in its biomass. Scouring may also have removed senescent algae, allowing metabolically active cells more access to nutrient, sunlight, etc. (Poster Presentation)

**MCINTOSH, TERRY T.** 3-1175 E. 14th Ave., Vancouver, BC V5T 2P2.

**RARE BRYOPHYTES IN GARRY OAK AND ASSOCIATED HABITATS OF COASTAL BRITISH COLUMBIA: THE CONTINUING NEED FOR INVENTORY.**

Biodiversity inventory is an essential element of species-directed conservation management. Specialist-driven inventory provides conservation managers with baseline data that help identify conservation-critical habitats. In 2003, we initiated a bryophyte diversity survey in coastal Garry oak and associated habitats, focusing on rare or 'interesting' bryophytes, with an emphasis on seasonally wet and other less common, and often more threatened, habitats. Some of the mosses of interest that we have gathered distributional and ecological information on are the mosses *Bartramia stricta*, *Entosthodon fascicularis* (including the largest population in Canada), *Ephemerum serratum* (new to British Columbia and western Canada), *Funaria muehlenbergii*, and *Syntrichia laevipila*, and the liverworts *Athalamia (Clevea) hyalina*, *Fossombronia longiseta*, *Sphaerocarpos texanus*, and *Targionia hypophylla*. Recently, we have focused on the liverwort genus *Riccia*, which, as our inventory proceeds, appears to be comparatively rich in coastal BC, with at least six species present in Garry oak habitats along the coast. *Riccia cavernosa* and *R. sorocarpa* have been reported for a long while, but four additional species, all new to Canada, have been found over the past year. They include *R. cf. ciliata* and *R. cf. tenella*, as well as two unidentified species. Further, we may have discovered a new species (to science) of *Asterella*, but confirmation is pending.

**MCIVER, JAMES.** Oregon State University, Eastern Oregon Agricultural Research Center, P.O. Box E, Union, OR.

**SAGESTEP: SAGEBRUSH STEPPE TREATMENT EVALUATION PROJECT.**

SageSTEP (Sagebrush Steppe Treatment Evaluation Project) is an interdisciplinary, 5-year research program that will explore ways to improve the health of sagebrush rangelands across the Great Basin. The purpose of the SageSTEP project is to conduct research and provide land managers with improved information to make decisions about restoring sagebrush rangelands. Land management treatment options, including prescribed fire, mechanical thinning of shrubs and trees, and herbicide applications will be used to learn how healthy and diverse plant communities can be created that will be more resilient to fire and resistant to weed invasion.

The project is funded by the federal government's Joint Fire Science Program and is a collaborative effort among Oregon State University, University of Idaho, University of Reno-Nevada, Utah State University, Brigham Young University, USDA Agricultural Research Service and Forest Service, and USDI Bureau of Land Management and U.S. Geological Survey.

**Miller, Jennifer J., and Steven K. Rust.** Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID 83707.

**CHARACTERISTICS OF THE BIOLOGICAL SOIL CRUST IN UTAH JUNIPER (JUNIPERUS OSTEOSPERMA) AND PINYON-JUNIPER (PINUS MONOPHYLLA-J. OSTEOSPERMA) HABITAT IN SOUTH-CENTRAL IDAHO.**

The northern extent of juniper and pinyon-juniper woodlands is in south-central Idaho. These open to closed tree canopy woodlands occur on mesas, ridgetops, and low mountains, and inhabit some of the most arid environmental areas in Idaho. A study



was conducted to examine relationships between vegetation composition and structure and bird habitat use in ecological reference areas. The objective of this paper is to examine in more detail the characteristics of the biological crusts within stands of juniper and pinyon-juniper woodlands. Soil crust and surface substrate components were sampled on point-intercept transects placed within twenty-seven 0.4 hectare circular fixed area plots. Components of the biological crust were categorized by morphological group. Preliminary results from this quantitative data suggest that the overall best single explanatory variable of total crust cover within pinyon-juniper woodlands is elevation. However, the variance in crust cover may be better explained from the interaction of predictor variables slope and basal cover. When considered separately moss versus lichen cover moss shows a similar positive correlation to slope and lichen does not. Slope is the most important predictor of total moss cover and aspect is the most important predictor of total lichen cover. (Poster Presentation)

**MILLER, KATIE ERIN G.** Idaho State University, Pocatello, ID 83209.

**ECOLOGICAL CORRELATES OF GENETIC STRUCTURE IN TOWNSEND'S BIG-EARED BATS IN SOUTHEAST IDAHO.**

Some of the largest known populations of Townsend's big-eared bats (*Corynorhinus townsendii*) occur in the lava flows of southeastern Idaho. In this project, we integrate genetic and field studies to examine patterns of genetic diversity and how these are related to microclimate roost characteristics and landscape level habitat associations of this species. We have collected wing biopsies from seven hibernacula sites (n=57) in the upper Snake River plain; 2 HOBO data loggers were installed at each site. Additional samples will be collected through intensive summer mist-netting and trapping at maternity sites. Individuals will be genotyped at five autosomal microsatellite loci. Gene flow and genetic variability within and between hibernacula will be estimated by pairwise FST. We will assess the degree of correlation between genetic diversity and individual roost habitat characteristics such as distance to water, vegetation composition, precipitation, and hibernacula size using GIS and SAS software. (Poster Presentation)

**MILLER, KATIE ERIN G.** Idaho Department of Fish and Game, Idaho Falls, ID 83401.

**SOUTH FORK OF THE SNAKE RIVER BAT SURVEYS.**

As an inter-agency cooperative agreement, the south fork of the Snake River was intensively surveyed for bats from mid-June to mid-August. Five survey sites were selected within a 104 mi<sup>2</sup> area along the south fork of the Snake River on both National Forest and Bureau of Land Management lands. Each site was acoustically surveyed for one night in June, July, and August and additional mist-net surveys were conducted in the same time period for a total of 28 nights of effort. A total of seven species were trapped and acoustically detected during the course of the survey. 80% of the individuals caught were male; 89% of the individuals caught were adult. Pregnant, lactating, and post-lactating females were caught from six species indicating that these species are breeding in the area. The south fork of the Snake River maintains a high diversity of bat species. Additional surveys at new locations in additional habitat types should be conducted, as should efforts to locate maternity colonies.

**MORGAN, HOLLY.** Brigham Young University-Idaho, Rexburg, ID 83440.

**DENSITY AND SEED BANK OF VERBESINA ENCELIROIDES ON MIDWAY ATOLL NATIONAL WILDLIFE REFUGE.**

Golden Crownbeard (*Verbesina encelioides* Family: Asteraceae) is a highly invasive annual plant species on Midway Atoll (USFWS National Wildlife Refuge). Golden

Crownbeard occupies approximately 70% of the 1600 acres of the refuge. Densities varies from <1 ind/M<sup>2</sup> to 282.4 ind/M<sup>2</sup>. Various techniques have been used to reduce densities with hand pulling being the most common. The purpose of this study is to evaluate the effect of hand pulling on density of re-growth and the seed bank of Golden Crownbeard in selected plots. Germination tests were also performed on fresh and seed bank material to evaluate the productivity of the seed bank. Hand pulling has showed to have no significant difference in re-growth density from one year to the next when compared to untreated sites. Density of the seeds bank showed a significant reduction ( $\alpha = .15$ ) between treated and untreated sites. This might be indicative of depletion in the seed bank over time. (Poster Presentation)

**MOSER, BRIAN W., and Edward O. Garton.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844.

*ESTIMATING SPACE USE OF A CENTRAL-PLACE FORAGER USING SATELLITE TELEMETRY.*

Satellite telemetry is commonly used to study long-range animal movements. However few studies have used satellite telemetry to evaluate animal space use within the home range due to large location errors. We tested space-use similarity from samples of PTT locations taken at points simulated in a GIS and approximating a wide-ranging central-place forager. We compared fixed-kernel home range size, percent home range overlap, and volume of intersection (VI) of utilization distributions (UD) between the null and sample models for 2 bandwidth selection methods. Our results indicate satellite telemetry can be a useful tool for estimating home range size and space use of a central-place forager with a home range of >1000 ha. We then applied these techniques to estimate home range sizes of male ( $n = 7$ ) and female ( $n = 12$ ) goshawks in northern Idaho. The mean 95% fixed-kernel breeding season home ranges were 2814 ha for males, and 1631 ha for females. Female goshawks were non-migratory and generally stayed near their breeding areas during the non-breeding season. However, female home range size expanded to 8333 ha during fall and winter.

**MOULTON, COLLEEN E., and Rex Sallabanks.** Idaho Department of Fish and Game, 600 S. Walnut, Boise, ID 83707.

*IDAHO DEPARTMENT OF FISH AND GAME WILDLIFE MANAGEMENT AREAS: IMPORTANT REFUGES FOR NONGAME BIRDS.*

The Idaho Bird Inventory and Survey (IBIS) is a plan to monitor all birds (waterbirds, shorebirds, waterfowl, and landbirds) throughout the state in a coordinated, standardized manner. Phase I of the IBIS Program emphasizes monitoring of aquatic species and habitats. To begin monitoring of aquatic species, and address the need for an inventory of IDFG Wildlife Management Areas (WMAs), we initiated waterbird monitoring at 11 WMAs throughout the state in Spring/Summer 2005. Monitoring efforts included general waterbird counts, marsh bird playback surveys, and colonial waterbird counts. Almost 17,000 bird detections were recorded during general waterbird counts from May through July. Fifty-eight percent of these detections were nongame waterbirds and shorebirds, and 42% were waterfowl. This proportion of nongame species is higher than that found in surveys at 10 non-WMA sites surveyed in 2005 (45% nongame). Marsh bird surveys at 9 WMAs detected all targeted species, and recorded similar detection rates at both WMA and non-WMA sites. Overall, 64 waterbird species were detected on WMAs; 44 of which were nongame waterbirds and shorebirds, and the remaining 20 were waterfowl. In addition, 22 of the 25 waterbirds identified as priority species in Idaho's Comprehensive Wildlife Conservation Strategy were detected on WMAs. The results of our initial field season document that although wetland management on Idaho WMAs is generally focused

on waterfowl production, their management is also highly beneficial to nongame waterbirds.

**MUIR, JONATHAN D., and Janet L. Rachlow.** University of Idaho, Department of Fish and Wildlife Resources, Department of Fish and Wildlife Resources, Moscow, ID 83844.

*RESOURCE SELECTION AND SPACE USE BY SHIRAS MOOSE IN NORTHERN IDAHO.*

Recently, range expansion by Shiras moose has been documented in the western United States. Information related to habitat selection by individuals in recently established populations is important for building our understanding of how and why these populations have expanded. We examined spring and summer resource selection at two scales by female moose in a recently established population near Moscow, Idaho. At the larger spatial extent (selection within the study area), vegetation type and an index of shrub abundance best explained home range establishment. Moose in this area appeared to respond to relatively frequent disturbance in the form of logging, and to select home ranges that included a high proportion of seral shrub fields interspersed with dense, closed-canopy forest. Proximity to water also was important. At the smaller spatial scale, moose selected for areas with similar habitat attributes, but generally avoided roads and human developments. These results suggest that availability of water and seral shrub communities associated with disturbance interspersed with closed-canopy timber stands may be important resources facilitating range expansion for moose in northern Idaho. In addition, human density may play a role in determining areas suitable for range expansion by moose.

**MUSIL, DAVID, Jamie A. Duberstein, Kyuho Lee, Scott Bowman, Henry F. Percival, and Pete Zager.** Idaho Department of Fish and Game, Jerome (DM) and Lewiston (PZ); Florida Cooperative Fish and Wildlife Research Unit (JAD), University of Florida, Micro Air Vehicle Laboratory (KL); University of Florida (SB); Florida Cooperative Fish and Wildlife Research Unit (HFP).

*TRIAL USE OF UNMANNED AERIAL VEHICLE TO SURVEY GREATER SAGE-GROUSE LEKS.*

We used an unmanned aerial vehicle (UAV) to survey greater sage-grouse on 2 leks in Idaho, during April, 2005. The UAV has a 2 m wingspan, a digital video camera mounted in the fuselage, and an onboard computer with global positioning system for navigating manually and by autopilot. We flew the plane over 2 active leks on 2 separate mornings under optimal weather conditions. The flights were controlled from base stations 500-800 m from the leks. On both occasions, sage-grouse were alerted to the UAV during take-off, apparently by the sound of the electric engine. As the plane approached the first lek at 140 m above ground level (AGL), sage-grouse halted strutting activities and crouched in prone positions, behaviorally similar to responses to aerial predators. As the plane tracked away at approximately 800 m, the birds resumed strutting. Each time, as the plane returned for another pass, the birds again stopped strutting and crouched down. We tried starting at > 200 m AGL on the second lek and at least 1 male remained standing but did not display. We made multiple passes on each lek at progressively lower elevations but were unable to identify individuals upon later review of the video. In the crouched position, male sage-grouse are able to conceal white breeding plumage and effectively blend into the landscape, resembling rocks or bare ground. Future attempts at using UAVs should include higher AGL flight paths, infra-red imagery, slower airspeeds, ground stations further from the leks, and higher resolution video imagery. The use of UAVs is appealing for remote areas and for reducing risks to biologists traditionally using helicopters for lek surveys.

**NADEAU, STEVE.** Idaho Department of Fish and Game, Boise, Idaho 83707.

**WOLF MANAGEMENT IN IDAHO.**

The state of Idaho became the designated agent for wolf management in January 2005 under authorities granted to the State by the Department of Interior under the new 10(j) rule. MOAs between the State, FWS, Nez Perce Tribe, and Animal Damage Control Board help guide the coordinated efforts to monitor and manage wolves in Idaho. This paper gives a brief overview of what State management means to wolves and people of Idaho. Wolf population status, proposal to capture wolves in the wilderness, proposal to control wolves to improve ungulate populations, and other management topics will be discussed.

**NIELSON, JORDAN.** Friends of the Teton River, Driggs ID 83422.

**YELLOWSTONE CUTTHROAT TROUT POPULATION ASSESSMENT: TETON RIVER HEADWATERS.**

A quantitative assessment of trout populations from fifteen headwater creeks of the Teton River was performed during the summer of 2005. Using backpack electrofishing units, 100m of each stream was sampled every 2 km starting from a random point within 1 km of the Caribou/Targhee National Forest boundary. At one out of every three sample sites, a multiple pass survey was done to extract capture efficiencies in order to determine population numbers at all sites. Species abundance and size of individuals was also noted. Using the population numbers extracted, comparisons were made with the population numbers from 1998/1999 IDFG surveys. Four streams have only Yellowstone Cutthroat Trout (YCT) (*Oncorhynchus clarki bouvieri*). Eastern Brook Trout (*Salvelinus fontinalis*) comprised 75% of the trout populations in nine of the streams. Where Cutthroat Trout and Brook Trout co-exist, Brook Trout is the dominant trout species. YCT populations showed dramatic declines since 1998/1999 surveys in 5 streams and show stable populations in 3 of the streams studied. (Poster Presentation)

**OLENICKI, THOMAS, and Lance Craighead.** Craighead Environmental Research Institute, Bozeman, MT 59715.

**PREDICTING WILDLIFE CROSSING LOCATIONS.**

Identification of locations wildlife may attempt to cross highways and be most successful is an important first step in facilitating connectivity and reducing vehicle/wildlife collisions. In an ongoing study in the Bozeman Pass area between Bozeman and Livingston, MT, we have currently recorded 1,459 incidents of animal mortality along Interstate 90. We identified statistically significant "hotspots" of increased mortality along this ~25 mile stretch, which occur at different locations depending on species or groupings of similar species. Correlation analysis has indicated the importance of individual variables by species or groups, and preliminary multivariate models have been developed. Highway mortality data and crossings locations for common species such as deer and elk are relatively abundant and easy to obtain, allowing analysis and construction of empirical models for predicting animal crossing locations. However, little data is available for rare species such as grizzly bear, wolverine, and lynx, necessitating the use of expert opinion models. Therefore, we developed a GIS model incorporating commonly available inputs and simple expert opinion weighting that is adaptable for a variety of species. The model is based on the idea that habitat will bring animals in contact with the road, but highway characteristics will determine locations with the greatest chance of a successful crossing. Current efforts have produced a model for predicting the most likely locations grizzly bears may attempt to cross roads and which locations will be most successful, with an example for the Bozeman Pass area. However, the strength of the model lies in its ability to be easily adapted for other species and locations when data is not available. Our combination of empirical and expert-opinion models offers a

useful tool for identifying locally important wildlife crossing locations for a variety of species.

**O'SULLIVAN, MARY TESS, Michael S. Stevens, Alan R. Sands, and Jason W. Karl.** Lava Lake Land and Livestock, P.O. Box 2260, Hailey, ID 83333.

*LAVA LAKE LAND AND LIVESTOCK: SCIENCE BASED GRAZING MANAGEMENT PLAN.*

In order to integrate Lava Lake's biodiversity conservation and livestock production objectives for our 750,000 acre operating area in the Pioneer Mountains and Craters of the Moon region, we have developed a comprehensive grazing management plan. We began by partnering with The Nature Conservancy to conduct a forage assessment of a significant portion of our operating area to identify scientifically derived, ecologically appropriate grazing levels. Available livestock forage was assessed in two distinct analyses – capability and capacity. Capability analysis involved establishing criteria that distinguish areas that are capable of being grazed from those judged as incapable of being grazed. Capability thresholds were established for criteria including soil erosion hazard, slope steepness, distance from water, and minimum levels of forage production. Capacity analysis estimated the amount of forage available within identified capable areas. Each analysis used conservative criteria to estimate available livestock forage. Following the forage assessment, we conducted a suitability analysis to review the compatibility of grazing capable areas relative to social, regulatory, and additional ecological factors. Finally, we developed a three year grazing management plan that reflected the results of the capability, capacity, and suitability analyses and outlined specific grazing plans and monitoring protocols for Lava Lake's sheep operation.

**PATTON, GINA.** Idaho Department of Fish and Game, Boise, ID 83707.

*REPRODUCTIVE AND POPULATION PARAMETERS OF THE RIVER OTTER IN IDAHO AND LIVER CONCENTRATIONS OF ENVIRONMENTAL CONTAMINANTS.*

Two-hundred thirty-seven river otter carcasses were collected from recreational trappers during the 2002-2004 trapping seasons through the Idaho Fish and Game Department's mandatory harvest report. Complete necropsies were conducted and sex ratio, age structure, and reproductive parameters determined. Trapping seasons were pooled and the combined sex ratio was 1:1; 50.2% (n = 119) of the harvested otters were male and 49.8% (n = 118) of the harvested otters were female. Of the individuals that could be aged the majority were juveniles (n = 61 or 26.9%) and yearlings (n = 65 or 28.7%). The mean age of otters trapped (seasons pooled) was 2.06-years. Reproductive rates were determined by counting corpora lutea and blastocysts in female river otters. Because of their trophic position in aquatic ecosystems, river otters may serve as an indicator of the health of their aquatic environment, reflecting contaminant levels in organisms lower on the aquatic food chain and the aquatic ecosystem itself. Concentrations of environmental contaminants were determined for the following toxins: mercury and other heavy metals, organochlorine pesticides, and polychlorinated biphenyls. This paper provides details on population and reproductive parameters of the river otter in Idaho, concentrations of environmental contaminants in livers of river otters in Idaho, and potential correlations between environmental contaminants and reproductive rates of river otters in Idaho.

**PEEK, JAMES M.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83844-1136.

*SHRUB-STEPPE VEGETATION TRENDS, MIDDLE FORK SALMON RIVER.*

The Middle Fork Salmon River drainage has a history of livestock grazing from 1890 to 1950, and changes in grazing pressure from native ungulates. High mule deer

populations occurred between 1940 and 1960, and high elk populations occurred in the 1990s. This paper describes the shrub-steppe communities inside and adjacent to exclosures established in the late 1940s and early 1950s in the Middle Fork. Vegetative appearance at a site photographed in 1925, 1968, and 1988 shows changes in a bitterbrush community. Production of bluebunch wheatgrass over a 17-year period including following the 2000 fire in Big Creek is also included. Photographs of plant communities prior to and for 4 years following the fire of 2000 are presented. Comparisons of plant species composition and characteristics, plus knowledge of grazing and fire history, provide a basis for interpreting vegetation change and relationships to herbivore populations.

**PERCHEMLIDES, KEITH, and Patricia Muir.** Oregon State University, Botany Department, Corvallis, OR 97331.

*IMPACTS OF FUEL REDUCTION THINNING ON OAK AND CHAPARRAL VEGETATION COMMUNITIES OF SOUTHWESTERN OREGON.*

Decades of fire suppression have led to changes in vegetation structure and uncharacteristic accumulations of fuels in many ecosystems. This pattern is assumed by federal land managers to apply to the oak and chaparral vegetation of southwestern Oregon. Based on this, fuel-reduction thinning has been applied to thousands of acres of these vegetation types on Medford BLM lands. Management goals include: 1) creation of a fuels structure compatible with wildfire control and prescribed burning, and 2) restoration of multi-aged and open vegetation patterns at the landscape level. However, the response of native plant systems to these thinning treatments remains unknown and has gone largely unmonitored. There is concern that an unintended consequence of canopy-removal thinning will be the spread of invasive weeds, including annual grasses that may significantly alter fuel composition and fire regimes. This study seeks to identify changes in vegetation composition in response to fuel reduction thinning in the oak woodland and chaparral communities of southwestern Oregon. Study design is based on retrospective paired transects at sites thinned between 1996 and 2001. During 2005 a set of 44 transect pairs were established and sampled throughout the study area. Data collection included percent cover and presence-absence at the species level for trees, shrubs, grasses and forbs, as well as canopy and ground cover. It is anticipated that results will show increases in all understory species following thinning with a greater proportion of exotic and invasive species relative to native grasses and forbs. Preliminary results of data analysis will be presented.

**PETERSEN, DIANE, and Karen M. Dvornich.** Waterville Elementary School, Waterville, WA (DP); Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, WA 98195 (KMD).

*DISTRIBUTION AND HABITAT OF THE PIGMY SHORT-HORNED LIZARD IN WASHINGTON STATE.*

Before the 4<sup>th</sup> grade class at Waterville Elementary School began collecting data in 1997, there were fewer than 100 documented Pigmy short-horned lizard (*Phrynosoma douglasii*) sightings for Washington State. Data and supporting literature showed the lizards occur only on undeveloped land. In just a few years the Adopt-a-Farmer Project, partnering farmers and students, have quadrupled the amount of sightings on the Waterville Plateau, dominated by dryland wheat farms interspersed with dry streambeds, dirt roads and scab patches (e.g., a mixture of basalt bedrock, dirt, and sagebrush). Thirty-nine farmers have reported 314 individuals from 290 locations. Sixty-nine percent of the lizards were reported within farm fields, 16% along dirt roads bisecting the fields, 3% in dry streambeds, and 7% in the scab patches. The rest were found around farmer's homes. Farmers bring their data forms to the school each fall. Data analysis began with students marking locations on topographic maps and

progressed to digitizing the locations onto digital orthophotos of the farmer's lands using GIS. The rest of these data are entered into a spreadsheet, submitted to NatureMapping's database, and linked to the GIS maps where students produce maps for their adopted farmer. Student and scientist questions drive the emphasis for each year's work. Food preference, how lizards overwinter, and behavioral studies have been conducted, and presented at professional conferences. The current research focus is tracking radio-collaring lizards. Students collared 3 lizards and monitored their movements. Initial data show lizards move into the farm fields during the day and return to shrub/scab patches in the evening. Scientist and technical support came from The NatureMapping Program and a local graduate student conducting similar data in shrub-steppe habitats. Waterville Elementary began NatureMapping in 1993.

**PETERSON, ERIC B.** Nevada Natural Heritage Program, 901 South Stewart Street # 5002, Carson City, NV 89701.

**THE CALIFORNIA LICHEN SOCIETY'S CONSERVATION COMMITTEE: GOALS AND PROCESSES.**

The California Lichen Society (CAL S) seeks to promote the appreciation, conservation, and study of lichens. The focus of the Society is on California, but its interests include the entire western part of the continent. Over the last few years, CAL S has developed an active conservation committee (CALSCC). CALSCC is working to develop lists of rare and sensitive lichen taxa in California and other southwestern states. These lists will be modeled off those used by the California Native Plant Society. CALSCC also works in cooperation with the California Department of Fish and Game's Natural Diversity Database, a Natural Heritage organization and employs methods similar to those used by NatureServe and Natural Heritage programs across the Americas. Due to the strength of conservation laws in California, CALSCC feels it is necessary to develop solid background information on proposed taxa and has developed a sponsorship program that allows anyone knowledgeable with particular lichen taxa to participate.

**PETERSON, ERIC B.** Nevada Natural Heritage Program, 901 South Stewart Street # 5002, Carson City, NV 89701.

**MAPPING CHEATGRASS (*BROMUS TECTORUM*) IN THE INTERMOUNTAIN WEST WITH SATELLITE IMAGERY.**

*Bromus tectorum* (cheatgrass) invades many landscapes in the western U.S. after disturbances including wildfire, forming dense stands with fine fuels that shorten typical fire intervals. Thus *B. tectorum* and wildfire form a positive feedback mechanism that threatens native ecosystems. To provide land managers and conservation efforts a better understanding of landscape condition with respect to *B. tectorum* invasion, the Nevada Natural Heritage Program is using imagery from Landsat series satellites to map the degree of invasion across the landscape. The species has an early phenology for both green-up and senescence. This phenology can be detected by using the difference in greenness between two well-timed satellite images. The method was tested in 2003, resulting in a map of estimated percent ground cover of *B. tectorum* across 32.8 million acres of northern and central Nevada (46.4 % of the state); accuracy assessment indicated a Root-Mean-Square Error of under 10 percent-cover and a correspondence between estimated and measured cover with  $R^2 = 0.51$ . Similar methods are currently being employed to map the entire state of Nevada and some neighboring portions of adjacent states. Mapping will then continue into the Owyhee Uplands of Oregon and Idaho.

**PIERCE, D. JOHN, Joseph B. Buchanan, Brian L. Cosentino, and Shelly Snyder.** Washington Department of Fish and Wildlife, Olympia WA 98501.

*ESTIMATING THE AMOUNT OF SUITABLE SPOTTED OWL HABITAT ON NON-FEDERAL LANDS IN WASHINGTON.*

Forest Practices Rules for the Northern Spotted Owl (*Strix occidentalis caurina*) were adopted in May 1996. These rules, which apply to non-federal lands, established 10 landscapes – known as Spotted Owl Special Emphasis Areas (SOSEAs) – wherein proposed harvest of suitable owl habitat would receive environmental review designed to provide a high level of protection. Under the rules, the level of habitat protection varied depending on whether habitat was located inside an owl management circle located inside or outside of SOSEAs or whether or not habitat lands were part of a Habitat Conservation Plan (HCP) approved by the US Fish and Wildlife Service. In the summer of 2004, the Department of Natural Resources and Washington Department of Fish and Wildlife entered into a cooperative agreement to gather information, as part of the Forest Practices Board's rule review, to assess the status and recent changes in spotted owl habitat on state and private lands affected by the Forest Practices Rules. The results presented on this poster address one of the primary objectives of this study: to estimate the amount of suitable spotted owl habitat in 2004 on lands affected by state and private forest practices. (poster presentation)

**PIERCE, D. JOHN, Karen M. Dvornich, and Margaret Tudor.** Washington Department of Fish and Wildlife, Olympia, WA 98501 (DJP, MT); University of Washington School of Aquatic Sciences, Seattle, WA 98195 (KMD).

*A MODEL FOR A CITIZEN SCIENCE NETWORK TO MONITOR THE BIODIVERSITY OF WASHINGTON.*

In 2004, Governor Locke established the Washington Biodiversity Council to develop and promote more effective ways of conserving the biodiversity in Washington. At the same time, the Governor's performance agreement with the Washington Department of Fish and Wildlife included the establishment of a Biodiversity Index for the state. To meet the expectations of the Governor and needs of the Biodiversity Council, we propose the creation of a Citizen Science Network. The design, development and integration of an organized Citizen Science Network into the monitoring strategy of the recently completed Comprehensive Wildlife Conservation Strategies is the only way to achieve the long-term goals for conservation and biodiversity. We propose establishment of a Citizen Science Network, organized by Ecoregions within the state. The foundation of the Network will be K-20 Schools, and non-governmental organizations. Volunteer adults, teachers, parents, and students will be charged with collecting biodiversity data using NatureMapping techniques according to scientifically designed protocols and plot locations. These data will be coupled with Agency and other professionally collected data to create a simple biodiversity index for Washington.

**PILLIOD, DAVID S., and others.** California Polytechnic State University, San Luis Obispo, CA 93407-0401.

*EFFECTS OF NON-NATIVE FISH ON AMPHIBIAN REPRODUCTION AND OCCUPANCY AT MULTIPLE SPATIAL SCALES.*

If the introduction of non-native fishes is a cause of regional amphibian declines, then fish effects must extend beyond the waters in which they are stocked. We tested this hypothesis for 2 native amphibians by modeling the probability of breeding in 2260 water bodies and in 3 nested levels of catchments within subwatersheds (approx. 8<sup>th</sup>-6<sup>th</sup> level HUCs) in relation to fish presence in the Rocky Mountains. After accounting for habitat features, *Ambystoma macrodactylum* was 5.3 times and *Rana luteiventris* was



1.3 times more likely to breed in fishless lakes than in lakes with fish. At the 8<sup>th</sup> and 7<sup>th</sup> level but not the 6<sup>th</sup> level HUCs, the probability of *A. macrodactylum* breeding in a catchment decreased as the proportion of water bodies with fish in a catchment increased. The probability of *R. luteiventris* breeding in a catchment was a function of available habitat and was not influenced by presence of fish. The effects of fish appear to extend beyond the lakes in which they were planted.

**RICH, TERRELL D.** USFWS and Partners in Flight, Boise, ID 83709.

**RECOMMENDATIONS FOR RANGEWIDE POPULATION TREND MONITORING OF NORTH AMERICAN LANDBIRDS.**

Partners in Flight has assessed the rangewide population monitoring needs of the 448 species of landbirds that regularly breed in the US and Canada. Population trend over the past 30 years is one of six criteria used to assess species vulnerability. Data from the Breeding Bird Survey (BBS) were used most often to assign population trend scores. However, there were 295 species of landbirds (66%) for which long-term trend data from any source were inadequate. For each species not adequately monitored, we identified the single monitoring approaches that would best address information gaps. Improving the quality of BBS will be the most efficient means of improving our knowledge for 64 species. Another 165 species can be adequately assessed with multi-species surveys in geographic regions not well sampled at present, such as the boreal forest. A variety of other approaches will be needed, including high-elevation and species-specific protocols.

**RIDING, COREY S., and James R. Belthoff.** Boise State University, Department of Biology, 1910 University Dr. Boise, ID 83725.

**OLD NEST MATERIAL AFFECTS BURROW REUSE BY BURROWING OWLS.**

We investigated the potential effects of material from previous nests on burrowing owl (*Athene cunicularia*) reoccupation of artificial burrows. Before both the 2004 and 2005 breeding seasons, we removed old nest material from all burrows used for nesting in the previous season. We then divided the burrows into the following groups: 1) control, material replaced in burrow; 2) ectoparasite removal, microwave heated material to kill ectoparasites and replaced in burrow; and 3) material removal, material not replaced. Owls used these groups, respectively, at 50%, 22%, and 12% in 2004 and 36%, 64%, and 24% in 2005. For both years combined, owls reused the material removal burrows significantly less often. The number of young fledged did not differ among groups. Thus, although there was no detectable effect on productivity, burrowing owls were more likely to reuse burrows where old nest material was not removed. We recommend that resource managers leave previous nest material in artificial burrows if reuse of sites is an objective. (Poster Presentation)

**ROBINSON, SCOTT R.** Bureau of Land Management, Coeur d'Alene Field Office, ID. **BALD EAGLE NESTING IN NORTH IDAHO** (poster presentation; no abstract available)

**ROBINSON, SCOTT R.** Bureau of Land Management, Coeur d'Alene Field Office, ID. **BALD EAGLES OF WOLF LODGE BAY.** (poster presentation; no abstract available)

**ROBINSON, STACIE, Lisette Waits, Raymond Dezzani, and Ian Martin.** University of Idaho, Moscow, ID 83844 (SR, LW, RD); Kenai Fjords National Park, Seward, AK 99664 (IM). **SPATIAL ANALYSIS OF BLACK BEAR GENE FLOW ON THE KENAI PENINSULA, ALASKA.**

The definition of population genetic structure is a central concern of population genetics as well as wildlife management. Information regarding population subdivision and connectivity is particularly important for guiding wildlife management in an increasingly fragmented landscape. In this study we elucidate spatial patterns in

the population genetic structure of black bears (*Ursus americanus*) on the Kenai Peninsula, Alaska, merging techniques from population genetics and spatial statistics. Bayesian assignment tests revealed 3 genetically distinct clusters and bears were assigned to one of these clusters based on the proportion of ancestry (Q). Individuals were mapped in a GIS along with population genetic data including the proportion of ancestry (Q) ascribed to each of the population clusters and status as a resident or migrant in the location of capture. Moran's I statistic was used to describe global autocorrelation in values of genetic ancestry. Local Indicators of Spatial Association (LISA) statistics, which decompose Moran's I to a local scale, were used to assess local spatial patterns in genetic variation. By measuring the change in autocorrelation across increasing distances, we defined the extent of the genetic neighborhood of each population cluster. Local patterns in the genetic data indicated areas of high gene flow among different population clusters and corridors that maintained connectivity within population cluster.

**ROSENTERER, ROGER, Terri Rudolph, Molly Bennick, and Ann DeBolt.** Bureau of Land Management, 1387 S. Vinnell Way, Boise, ID 83709 (RR); The Environmental Company Inc., 250 Bobwhite Court, Suite 200, Boise, ID 83706 (TR, MB); USDA Forest Service, Rocky Mountain Research Station, 322 E. Front, Suite 401, Boise, ID 83702 (AD).

*AGING ARCHAEOLOGICAL ROCK STRUCTURES USING LICHENS.*

Cairns, hunting blinds, and other types of rock structures are scattered infrequently across southern Idaho and other portions of the Great Basin, but little is typically known about their origin and age. Rock cairns and rock-rimmed pits, the latter also known as hunting blinds, were aged based on the mean size of the three or five largest lichen colonies growing on them. The lichenometric techniques used were based on rock structures of known age from the same general area in southwest Idaho. The mean age of lichens growing on rock cairns was between 33 and 140 years. In contrast, the mean age of lichens on two hunting blinds was 406 and 541 years, indicating much older structures. Several large lichen colonies growing on natural rock outcrops near the archaeological structures had a mean age of 739 to 875 years. Lichenometric techniques can be used as a non-invasive method of dating many other types of archaeological rock structures.

**RUEDIGER, BILL, Ken Wall, and Robin Wall.** Wildlife Consulting Resources, 1216 Creek Crossing, Missoula, MT 59802 (BR); Geodata Services, Inc., 104 South Ave. E., Missoula, MT 59801 (KW, RW)

*THE EFFECTS OF HIGHWAYS ON ELK HABITAT IN THE WESTERN UNITED STATES AND PROPOSED MITIGATION APPROACHES.*

Elk (*Cervus elaphus*) are an important wildlife resource in the Western United States and have significant social and economic values. Elk also are a focal species for most western state wildlife agencies and land management agencies. The authors quantified the existing direct and indirect effects to elk habitat on a state-by-state basis and propose mitigation measures based on the impacts. The authors used recently developed elk habitat mapping (Rocky Mountain Elk Foundation) and superimposed existing state highways over stratified winter and summer elk ranges. They also highlighted important elk migration routes that may put elk in conflict with existing or future highway developments. GIS was used at a broad-scale level to assess elk habitat and its relationships to highways in the western U.S. The authors also have assessed the impacts of two and four lane highways on elk as well as the indirect "displacement" of elk. Proposed mitigation is based on the authors experience and available research.

**RUST, STEVEN K.** Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID 83707.

*DEVELOPMENT OF A PREDICTIVE MODEL FOR PLANT COMMUNITY RARITY RANKS.*

NatureServe conservation status ranking methods are applied to thousands of species and ecological communities by Natural Heritage Programs throughout North and South America. While NatureServe methods are widely viewed as a primary basis for establishing policy regarding species rarity and priorities for plant community conservation, concern has arisen regarding the reliability, repeatability, and transparency of NatureServe conservation status ranking methods. A predictive model of rarity rank will assist in identifying information needed for development and refinement of reliable approaches to determining rarity ranks. The objective of this paper is to report current progress on the analysis of relationships between plant community global rarity rank and quantitative and categorical rank factors. Plant community rarity ranking data have been generated on a project by project basis. This is reflected in patterns of data completeness and scope. Complete data are generally only available for the rarest plant communities. Following data screening, a data set of 127 records consisting of records that have no missing rank factor values was selected for further analysis. Classification tree analysis was applied to the selected data set. The resultant predictive model (root error = 0.63) employs 5 of 10 factors: number of occurrences, number of protected occurrences, the condition of occurrences, environmental specificity of the plant community, and long term trend in the number or condition of occurrences.

**RUST, STEVEN K., and Jennifer J. Miller.** Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID 83707.

*CHARACTERISTICS OF BIOLOGICAL SOIL CRUSTS WITHIN SHRUBLAND PLANT COMMUNITIES OF SOUTHWEST IDAHO.*

Biological soil crusts are an important component of most shrubland vegetation within the northern Great Basin. Patterns in the distribution and abundance of biological soil crust within shrubland plant communities of southwest Idaho, however, have not been described in detail. The objective of this paper is to summarize observations of the distribution and abundance of biological soil crusts within shrubland plant communities of southwest Idaho. Data are compiled from a series of studies regarding the classification and inventory of sagebrush-dominated vegetation. Soil crust and surface substrate components were sampled on point-intercept transects placed within (nearly) four hundred 0.4 hectare circular fixed area plots. Components of the soil crust were categorized by morphological group. Patterns in total crust cover are similar to those reported for other locations within the Great Basin. Total crust cover is generally negatively correlated with elevation; slope gradient; and loose rock, litter, and vascular plant cover. Crust cover is generally positively correlated with embedded rock cover and vascular plant basal area. Embedded rock cover is the single most important predictor of total crust cover. When taken separately moss versus lichen cover both show similar response to variables described above. Embedded rock cover is the most important predictor of total moss cover. Litter cover is the single most important predictor of lichen cover.

**SALO, LUCINDA F., Michael E. Rhodes, and David A. Pyke.** USGS Forest and Rangeland Ecosystem Science Center, Boise, ID 83706.

*ANCHORING THE SAGEBRUSH SEA: TO SEED OR NOT TO SEED?*

Wildfire has contributed to the loss and fragmentation of sagebrush ecosystems across the western U.S. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities occur on the driest big sagebrush lands and are at greatest risk of conversion to cheatgrass (*Bromus tectorum*) monocultures after wildfire.

Understanding which sites are likely to recover as native communities with only passive restoration and which require active restoration, such as reseeding, will help preserve native communities and focus reseeding efforts where they are most needed. In a two-year study of Wyoming big sagebrush sites in southwestern Idaho that were not reseeded after wildfire, we used cheatgrass canopy cover as our proxy for probability of reburn, which in turn determines the probability of recovery as native communities. Our results indicate that the number and distribution of perennial plants (site occupancy), plus the amount and distribution of precipitation, are excellent predictors of cheatgrass canopy cover. We are quantifying site occupancy by developing indices to describe the distribution of gap sizes between perennial plants, and exploring correlations between precipitation and cheatgrass canopy cover. This will allow us to develop guidelines to help land managers better evaluate reseeding needs after wildfire on Wyoming big sagebrush sites.

**SCHERER, GEORGE, and Dave Peterson.** USDA-PNW-Wenatchee Forestry Sciences Lab., 1133 N. Western Ave. Wenatchee, WA 98801.

*FIRE EFFECTS ON MICRONUTRIENT CAPITAL IN FOREST SOILS OF CHELAN MOUNTAINS, WA.*

Little information is available to inland northwest land managers on the effectiveness of post-fire rehabilitation efforts, particularly on sites with successive fire events. One concern is loss of nutrients in the root zone of fire-affected soil. The 47,000-ac 2004 Pot Peak fire in the Chelan Mountains gave us the opportunity to document changes in soil nutrient capital within the first year of the fire event. We bulk sampled soil in a subset of 96 random treatment plots replicated eight times in the 25 mile Cr watershed and analyzed for six macronutrient (N, P, K, Ca, Mg, S) and 5 micronutrient elements (B, Zn, Fe, Cu, Mn). We sampled non-burned forest soil in the same drainage for comparison. We found macronutrients averaged 80% gain in element concentration, with nitrate nearly tripling but calcium showing a 10% loss compared to non-burned forests. Micronutrients showed a 9% overall loss with Zn showing a 67% loss compared to non-burned forest soil. When adjusted for soil volume loss, macronutrient gains were substantially less and micronutrient losses were 2.5 times greater. Fire in this setting released important quantities of macronutrients, but modest quantities of micronutrients were lost. Repeated fires may reduce overall tree growth due to insufficient B and Zn micronutrient reserves. (Poster Presentation)

**SCHOLTEN, MELISSA, Nancy L. Shaw, and Marcelo Serpe.** USDA Forest Service, Rocky Mountain Research Station, Boise, ID 83702 (MS, NLS); Boise State University, Department of Biology, Boise, ID 83725 (MS, MSerpe).

*EMBRYO GROWTH AND GERMINATION IN LOMATIUM DISSECTUM SEEDS.*

*Lomatium dissectum* (fernleaf biscuit root) is a perennial, herbaceous plant found in semiarid habitats of the Western United States. This species produces seeds that are initially dormant. We have investigated the anatomical characteristics of the dormant seeds and the effect of various environmental conditions on breaking dormancy. Dormant seeds have underdeveloped embryos that are completely surrounded by the endosperm. To promote the growth of the embryo and break dormancy, we exposed the seeds to dry-after ripening, warm-moist conditions, and cold stratification. Warm moist conditions or a combination of dry after-ripening followed by warm-moist conditions did not induce embryo growth. In contrast, cold stratification promoted embryo growth. During 12-weeks of cold stratification the embryo grew from 1 to 7 mm, which is approximately the full size of the embryo. Most of the embryo growth occurred during the first 6 weeks of stratification. Cold stratification also promoted germination. However, after 12 weeks of cold stratification the percent germination was only 20%. We are currently investigating the effect of longer stratification periods on breaking dormancy. The presence of

underdeveloped embryos in dormant seeds and the requirement for cold stratification indicate that *L. dissectum* seeds have morphophysiological dormancy. Furthermore, the release from dormancy appears to require long periods of stratification, a characteristic that may lead to the formation of a persistent seed bank. (Poster Presentation)

**SERVHEEN, GREGG, and Mike McDonald.** Idaho Department of Fish and Game, Boise, ID 83707 (GS); Idaho Department of Fish and Game, Jerome, ID 83338 (MM).

*WIND ENERGY DEVELOPMENT IN IDAHO: A CASE STUDY PERSPECTIVE.*

As part of an interagency team evaluating the effects of wind energy development in the Cottarel Mountains southeast of Burley, Idaho; we helped assess the effects of the project on wildlife. We present a summary of the project proposal as measured by the current knowledge of wildlife habitats and populations in the project area and gauge its potential impacts on wildlife. The species most likely to be impacted by the Cottarel Wind Energy project, sage grouse, migratory birds, raptors, and bats, are assessed at local, area, and landscape spatial scales. We identify and categorize wildlife impacts in terms of direct effects such as habitat loss and indirect impacts such as habitat avoidance. Based on estimated impacts and the need for energy production, we present a collaborative approach to mitigation and monitoring for implementation of the Cottarel project. The project is discussed in relation to the other wind energy development projects in Idaho, wind energy site selection, and the cumulative effects of wind energy development in Idaho.

**SHEPHERD, JAY F., Kerry P. Reese, and John W. Connelly.** University of Idaho, Department of Fish and Wildlife Resources, Moscow, ID 83843.

*MODELING AND MAPPING GREATER SAGE-GROUSE REPRODUCTIVE HABITAT AT THE LANDSCAPE-LEVEL.*

Probable causes of greater sage-grouse (*Centrocercus urophasianus*) declines include various forms of habitat degradation, reduction, and fragmentation. Prescribed and natural fire, exotic plant invasions, mechanical or chemical treatments, and conversion to agricultural use has fragmented shrubsteppe habitat. Many studies have attempted to understand microhabitat-level habitat use by sage-grouse, yet at larger scales, the use of habitat has been studied much less and with limited methods. Our objectives were to quantify greater sage-grouse reproductive habitat use at the landscape level. We used remotely-sensed vegetation data to obtain landscape variables that measure habitat composition and heterogeneity. Landscape-level variables were obtained at several extents, including 150 and 450 meter buffered sage-grouse locations, and 70% fixed kernel home ranges. Using non-correlated landscape metrics, we explain nest and brood rearing success at various extents. The models were used in conjunction with discriminant analysis to map potential reproductive habitat at the 150- and 450-m extents within a variety of study areas and jurisdictional boundaries. There is an increased need for the development of empirical methods using remotely-sensed data to understand habitat issues at the landscape level.

**SHIPLEY, LISA A., and Charles T. Robbins.** Washington State University, Department of Natural Resource Sciences, Pullman, WA 99164.

*INFLUENCE OF NUTRITION ON WILDLIFE MANAGEMENT: A SYNTHESIS.*

A vast literature clearly demonstrates that virtually all life processes of animals are fundamentally linked to nutrition, and that inadequate nutrition routinely affects wildlife worldwide. In many ecological settings wildlife are more limited by nutritional resources than other habitat attributes. Therefore, understanding wildlife nutrition is critical for managing wildlife populations. Nutrition includes both the nutrient content

of foods and its availability to animals. Nutrients such as protein and energy influence the nutritional condition (i.e., protein and fat stores) of animals, whereas vitamins and minerals are more rarely limiting, but affect a variety of metabolic processes. Some components of wildlife foods, often called anti-nutrients or plant secondary metabolites, reduce the nutrients that wildlife can assimilate. The availability of nutrients depends on the distribution and structure of foods, which varies with season and environmental conditions. An animal's digestive system, activity, age, and physiological state determine its energy requirements. An individual animal's growth, body condition, reproduction and survival depends directly on acquiring adequate nutrients from the environment. The availability of nutrients, in turn, influences population and community processes, such as population growth, animal movements and distribution, and interactions with predators and competitors. Therefore, wildlife nutrition must be considered when managing habitats and recreational harvest, making policy decisions for public lands, and developing intensive conservation practices, such as captive breeding. We illustrate each of these management implications with examples from wildlife research conducted at Washington State University.

**SHIVE, JEREMY P., and Charles R. Peterson.** Idaho State University, Pocatello, ID 83201.  
*MAPPING AMPHIBIAN HABITAT USING HYPERSPECTRAL IMAGERY.*

We investigated the ability of high-resolution hyperspectral imagery to classify amphibian habitat features across three mountain lake basins in the Frank Church-River of No Return Wilderness, ID. Various image classification techniques were applied to identify standing water, emergent sedge vegetation, and water depth. A 10-year ground sampling dataset was used to validate classification results. Near comprehensive identification of wetland sites was achieved with a producer's accuracy of 96% (42 locations). Emergent sedge microhabitat features were also successfully classified with a producer's accuracy of 89%, and emergent sedge was found to directly predict 72% (23 locations) of the known egg oviposition sites. Types of amphibian habitat, such as breeding, foraging, and overwintering, were also predicted by applying ecological-based criteria. Amphibian breeding habitat showed the highest classification accuracy identifying 74% (14) of the known breeding sites. Hyperspectral imagery is shown to be extremely useful for classifying a variety of wetland habitat features and may assist with future conservation efforts by providing an efficient method for designing field surveys and monitoring wetland changes through time.

**SOULTS, SCOTT.** Kootenai Tribe of Idaho, P.O. Box 1269, Bonners Ferry, ID 83805.  
*EMPLOYING MANAGEMENT SOLUTIONS FOR THE MCARTHUR LAKE WILDLIFE CORRIDOR.*

McArthur Lake Wildlife Corridor is defined as an 11-mile stretch of Highway 2/95 in northern Idaho between the Selkirk and Purcell Mountain ranges. It is the narrowest geographic point between these two mountain ranges for hundreds of miles north and south. A federal highway (4600+ vehicles per day), two railroads (40+ trains per day), a gas pipeline, power transmission lines, and secondary roads are concentrated in a narrow stretch of land. The high use associated with the highway and railroads are likely to reduce the ability of numerous species to travel between the two mountain ranges. Winter mortalities along the highway and railroads have been estimated at 40 elk, 40 moose, and 300 deer in one severe winter. Other species that may use the corridor or identified as "important" to species movement include, but are not limited to, grizzly bear (Grizzly Bear Recovery Plan), lynx, river otter, mink, fisher, wolverine, cougar and blear bear. Since the mid 1990's, individuals have struggled to find and implement solutions that threaten both wildlife and human safety. With the advent of the Kootenai Valley Resource Initiative (KVRI), there has been a renewed

effort to establish partnerships within the community, collaboratively work with local community groups to understand current conditions, potential project activities and their relationships, and how the community can make informed decisions on wildlife and highway interactions.

**ST-HILAIRE, SOPHIE, Sarah Bruer, Peter Murphy, Debra Patla, and Charles Peterson.** Idaho State University, Department of Biological Sciences, Pocatello, ID.

**CHYTRIDIOMYCOSIS: IS IT A PROBLEM FOR AMPHIBIAN POPULATIONS IN THE NORTHERN INTERMOUNTAIN WEST?**

The disease chytridiomycosis, caused by the parasitic fungus, *Batrachochytrium dendrobatidis*, has been implicated as a major cause of death and the disappearance of amphibian populations around the world. The goal of our research is to better understand the environmental parameters that influence the pathogenicity of *B. dendrobatidis* isolates in the Northern Intermountain West and the susceptibility of Western Toads (*Bufo boreas*) to this pathogen. *Batrachochytrium dendrobatidis* has been identified, using molecular tools, in many populations of amphibians in the Northern Intermountain West (MT, ID, and WY). Although there appear to have been population declines in Western Toad populations in parts of the Northern Intermountain West during the past 30 years, no sudden large die-offs can be attributed to *B. dendrobatidis*. Surveillance in Greater Yellowstone Area suggests populations of boreal toads (*Bufo boreas*) persisting despite being exposed to the fungus. This contrasts the Rocky Mountains of Colorado where catastrophic declines of boreal toads have occurred in the past decade and are believed to be due to chytridiomycosis. The Greater Yellowstone Area provides an opportunity to study this fungal pathogen where it does not appear to be decimating amphibian populations. Our research program includes surveying for the presence of the fungus in breeding populations of Western Toads, attempting to culture isolates from sites with no clinical disease, genetic evaluation of isolates collected from the Northern Intermountain West, monitoring water quality parameters in toad breeding locations with and without the pathogen, and exploring the manifestation of chytridiomycosis in the Western Toad under different laboratory environmental conditions.

**STEENHOF, KAREN, and Michael Kochert.** USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise, ID 83706.

**CAUTIONS ABOUT USING SATELLITE TELEMTRY TO ASSESS HABITAT ASSOCIATIONS OF RAPTORS.**

Recent advances in technology have made it possible to track movements of medium-sized birds using relatively small, satellite-received transmitters. Satellite telemetry has provided important insights about long-range movements of raptors and other birds. However, we are concerned that some researchers have failed to consider the inaccuracy of location estimates acquired through satellite telemetry and have used satellite telemetry data to assess home range size at an inappropriate scale. We review the characteristics of the ARGOS system, report published and unpublished data on the accuracy of location estimates for stationary platform transmitter terminals (PTTs) at known locations, and discuss the implications for past and future studies. (Poster Presentation)

**STEWART, KELLEY M., R. Terry Bowyer, and John G. Kie.**

**DENSITY-DEPENDENT EFFECTS ON PHYSICAL CONDITION AND REPRODUCTION IN NORTH AMERICAN ELK: AN EXPERIMENTAL TEST.**

Density dependence plays a key role in life-history characteristics and population ecology of large, herbivorous mammals. We designed an experiment to test hypotheses relating effects of density-dependent mechanisms on physical condition

and fecundity of North American elk (*Cervus elaphus*). We hypothesized that if density-dependent effects were manifested principally through intraspecific competition, body condition and fecundity of females would be lower in an area of high population density than in a low-density area. Our experiment indicated that density-dependent feedbacks affected physical condition and reproduction of adult female elk. Age-specific pregnancy rates were lower in the high-density area, although there were no differences in pregnancy of yearlings or in age at peak reproduction between areas. Pregnancy rates were most affected by body condition and mass, although successful reproduction the previous year also reduced pregnancy rates during the current year. Our results indicated density-dependent mechanisms had a much greater effect on physical condition and fecundity than density-independent factors (e.g., precipitation and temperature).

**STILLMAN, AMY J., Stephen J. Novak, Ian Robertson, and James F. Smith.** Boise State University, 1910 University Drive, Dept. of Biology, Boise State University, Boise, ID 83725-1515.

*GENETIC DIVERSITY IN LEPIDIUM PAPILLIFERUM.*

*Lepidium papilliferum* is endemic to the sagebrush steppe habitat of southwest Idaho. Habitat destruction and fragmentation due to overgrazing, invasive species, and other concerns have led to a decline in this species. Enzyme electrophoresis was used to determine the amount and distribution of genetic variability of *L. papilliferum*. Across all populations 10 of 11 (91%) loci were polymorphic (P), with an average of 4.27 alleles per locus (A). Within-population diversity differed for the two regions. On average, 81% of loci were polymorphic in the populations from the Jarbidge area, whereas 58% were polymorphic in the Snake River populations. Jarbidge populations displayed higher average allelic richness (2.5) compared to Snake River populations (2.1). P and A in the Snake River populations were positively correlated with population size. Management of *L. papilliferum* should include preserving large tracts of habitat and large population sizes, especially in areas that still harbor high amounts of genetic diversity.

**STORFER, ANDREW.** School of Biological Sciences, Washington State University, Pullman, WA 99164-4236.

*RANAVIRUSES AND AMPHIBIAN EPIZOOTICS: TIGER SALAMANDERS AS A CASE STUDY.*

Ranaviruses are one of two key pathogen groups implicated in global amphibian declines and are responsible for the majority of amphibian epizootics in the US. *Ambystoma tigrinum* virus (ATV) is an emerging ranavirus responsible for epizootics in tiger salamanders (*Ambystoma tigrinum*) throughout the western cordillera of North America from the San Rafael Valley, Arizona into Saskatchewan and Manitoba, Canada. The ATV-tiger salamander system is a model for studying emerging diseases in general. A coevolutionary history of tiger salamanders and ATV is supported via an inverse correlation between disease frequency and frequency of cannibalistic salamanders throughout Arizona, likely driven by selection. This suggests ATV is endemic in Arizona and it is thus crucial to investigate factors that may contribute to its emergence. Analyses of phylogenetic concordance of tiger salamanders and iridoviruses from Arizona to Saskatchewan suggest that there has been coevolution, but that human transport of salamanders as bait may be disrupting the natural coevolutionary process. More detailed analyses of spatial patterns of viral sequence variation support the spread of bait salamanders as a basis for viral spread.



**STORY, SCOTT, and Victoria Saab.** Ecology Department, Montana State University, Bozeman, MT 59717.

**NEST SURVIVAL OF TWO WOODPECKER SPECIES IN PONDEROSA-PINE DOMINATED FORESTS: DOES SURVIVAL VARY WITH LOCATION?**

We studied nest survival of two woodpecker species, Hairy Woodpecker (*Picoides villosus*) and Northern Flicker (*Colaptes auratus*), in two National Forests dominated by ponderosa pine (*Pinus ponderosa*). Vegetation characteristics were measured around each nest location. A suite of a priori models was proposed for nest survival including habitat variables and temporal variables. Nest survival for Hairy Woodpeckers was 91% (n=23) in the Okanogan National forest as opposed to 45% (n=32) in the Payette National Forest. Nest survival for Northern Flickers was 70% in the Okanogan National Forest (n=41) and much lower in the Payette National Forest, 48% (n=72). We explore the possible reasons for these differences. Results from our study will provide data useful for management of snags and sensitive woodpecker species.

**Student Chapter of The Wildlife Society [JEFFREY WELLS presenter].** University of Alaska Fairbanks, Institute of Arctic Biology, Biology and Wildlife Department, Fairbanks, AK 99775.

**UNIVERSITY OF ALASKA FAIRBANKS STUDENT CHAPTER OF THE WILDLIFE SOCIETY.**

The University of Alaska Fairbanks (UAF) is arguably the most northern university in the United States of America. It is deemed "America's Arctic University" by UAF Chancellor Steve Jones. UAF is well known for its scientific research in a wide spectrum of areas varying from terrestrial charismatic wildlife and Aurora Borealis to climate change, habitat studies, waterfowl, and seabirds. The university has an especially strong wildlife biology program, which meets the standards set by The Wildlife Society (TWS) to be officially accredited as a professional wildlife biologist. This poster displays several of the opportunities available to students that attend UAF for wildlife biology and other environmentally related majors, of which there are many. There are also many fascinating and critically important study species in Alaska, including three bear species and many large ungulates; there are many employment and recreational possibilities; and the study sites available for research are numerous and breathtaking. Furthermore, the university has a very active student chapter of The Wildlife Society. The activities of the society, which for instance designed this poster, are outlined in this presentation; several representatives from the society are present at the conference. Come by and check out the university with the highest latitude in the United States and its students! (Poster Presentation)

**SURING, LOWELL, Kim Mellen, William Gaines, Barbara Wales, and Shawne Mohoric.** USDA Forest Service, Boise, ID (LS); USDA Forest Service, Portland, OR (KM, SM); USDA Forest Service, Wenatchee, WA (WG); USDA Forest Service, La Grande, OR (BW).

**ASSESSING THE SUSTAINABILITY OF WILDLIFE UNDER THE 2005 FOREST SERVICE PLANNING RULE.**

National Forests will need to assess their ability to sustain native species under the revised planning regulations. Under a process developed for the Pacific Northwest Region, it is expected that most species will be addressed through broad-scale assessments that address ecosystem diversity. Species for which these provisions may not provide ecological conditions capable of supporting populations will be identified (e.g., federally listed threatened and endangered species, species of concern, and species of interest). Assessment will be facilitated by a process which utilizes habitat associations and risk factors to group and evaluate species. Conclusions about habitat sustainability, risk factors, and conservation measures for groups of species will be made from analyzing focal species. Bayesian Belief Network models (BBNs) will be developed for each focal species using environmental parameters (e.g., habitat

quality, quantity) and threat or risk factors (e.g., road density). Current conditions and projected future conditions under various management scenarios will be compared and evaluated. The BBNs will also be used to monitor ecological changes for species with the highest degree of risk or uncertainty.

**SVANCARA, LEONA K., Lisa Garrett, and Tom Rodhouse.** Upper Columbia Basin Network, National Park Service, Moscow, ID.

*TAKING IT TO THE FIELD.*

For decades now, we have relied on information technology (IT) to increase productivity in the workplace. Computers have transformed offices such that month-long tasks now take only days and week-long communication now takes mere seconds. Today's state-of-the-art IT also has the ability to increase productivity of researchers and managers in the field. While global positioning systems (GPS) have been fully operational since 1993, the last 5 years have produced smaller, quicker, and more accurate receivers. They are now WAAS-enabled, allowing real-time correction, and can be teamed with laser-rangefinders to gather coordinates in inaccessible or dangerous locations. The last 5 years have also produced more powerful handheld personal data assistants (PDAs) that virtually eliminate the need for field data forms and pencils. Armed with wireless Bluetooth technology, PDAs can communicate with virtually any other computerized equipment available including GPS, digital cameras, and cell phones. National Park Service managers and scientists in the Upper Columbia Basin Network (UCBN) are challenged daily with knowing the condition of natural resources in their parks, writing management plans, and providing that knowledge to the general public. Given the large expanse of area under management and the relatively limited budgets, the UCBN is taking IT to the field in support of their natural resource inventory and monitoring program. Successfully planning and implementing IT in the field allows UCBN staff to accomplish more for less. Current uses include mapping vegetation, detecting landscape change, monitoring species of concern, and combating land degradation through the identification of invasive species.

**TATTAM, IAN A., James R. Ruzycski, Wayne H. Wilson, Jaym'e E. Schricker, and Hiram W. Li.**

Oregon State University, Oregon Cooperative Fishery Research Unit, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331 (IAT); Oregon Department of Fish and Wildlife, Eastern Oregon University, 203 Badgley, One University Boulevard, La Grande, OR 97850 (JRR); Oregon Department of Fish and Wildlife, P.O. Box 9, John Day, OR 97845 (WHW, JES); Oregon Cooperative Fishery Research Unit, USGS-BRD, 104 Nash Hall, Oregon State University, Corvallis, OR 97331 (HWL).

*IT'S NOT AS SIMPLE AS "COUNTING FISH": ESTIMATING ROTARY SCREW TRAP EFFICIENCY FOR JUVENILE STEELHEAD TROUT.*

Rotary screw traps are essential for capturing outmigrating juvenile salmonids, and thereby estimating production from individual river basins. Abundance estimates hinge on the accuracy with which trap efficiency can be evaluated. Trap efficiency tests, typically a release of marked fish back upstream of the trap, may alter the behavior or catchability of the fish and hence cause erroneous efficiency estimates. We used Passive Integrated Transponder (PIT) tags and detection antennas to evaluate the response of fish to typical trap efficiency procedures. We compared the catchability of newly PIT tagged fish with those migrating downstream after being tagged the previous summer. Transporting juvenile steelhead back upstream of the trap altered their diel migration timing, which in turn reduced their catchability in the trap. This created a negative bias in the conventional estimate of trap efficiency, which resulted in overestimating the true migrant population size.

**TAYLOR, DANIEL A. R., and Stuart R. Tuttle.** Bat Conservation International, P.O. Box 162603, Austin, TX 78716 and USDA Natural Resources Conservation Service, 1585 S. Plaza Way, Flagstaff, AZ 86001.

*WATER FOR WILDLIFE: IMPROVING ACCESS AND REDUCING MORTALITY FOR BATS AND OTHER WILDLIFE AT LIVESTOCK WATER DEVELOPMENTS.*

Livestock water developments are often one of the few water sources available to wildlife. Bats are especially vulnerable to water shortages, sometimes losing up to 50% of their body weight in evaporative water loss daily. Drinking rates of more than one bat/sec are not uncommon at livestock water troughs. Without proper escape structures and maintenance, significant mortality to bats and other wildlife can occur. Recent evidence suggests thousands of birds and mammals are drowned annually on western rangelands. We evaluated more than 300 livestock water troughs from several western states and conducted experiments on the effects of water development configuration and water level on bat access. Obstructions and low water levels significantly altered bat flight approaches and behavior. Although trough escape structures are mandatory on most federal rangelands, <10 percent of the troughs we inspected had escape ramps, and 40 percent were obstructed by fencing or bracing. Fortunately, escape ramps can be inexpensively built and installed and alternative fencing and bracing methods can facilitate bat access. BCI 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 developing wildlife-friendly livestock waters.

**TERRA-BERNS, MARY.** Idaho Department of Fish and Game, Coeur d'Alene, ID 83815.  
*GETTING THE CHICKENS ACROSS THE ROAD.*

Idaho Department of Transportation is in the process of making significant improvements to US 95, Idaho's primary north/south highway. Because of concerns for motorist safety and potential impacts to wildlife populations, early in the planning process it was recognized that wildlife crossings would be necessary along some segments of the highway. In northern Idaho, Idaho Department of Fish & Game, is working with the Idaho Transportation Department to determine the best locations to install wildlife crossings along Highway 95 between Coeur d'Alene and Sandpoint. Data from road kills, animal-vehicle accidents, and snow-tracking are being combined in an attempt to identify areas of substantial wildlife use along this segment of US 95. In addition to the road kill, accident, and snow-tracking data, collaring of white-tailed deer with transmitters is being proposed. Because highway improvements will affect development in the Highway 95 corridor the project incorporates information from Bonner and Kootenai Counties (e.g., locations of recreational facilities-golf courses, theme parks, etc.-, current and future housing developments), to help ensure that implemented highway wildlife crossings remain viable in the future. Information gained from this cooperative effort may be beneficial for other highway improvement projects.

**Thompson, Thomas R., KERRY P. REESE, and Anthony D. Apa.** University of Idaho, Moscow, ID (TRT, KPR); Colorado Division of Wildlife, Grand Junction, CO (ADA).

*JUVENILE GREATER SAGE-GROUSE DISPERSAL ECOLOGY IN NORTHWESTERN COLORADO.*

Dispersal is an important population parameter involved in maintaining the persistence and distribution of a species across a landscape. There is limited empirical information on the dispersal ecology of greater sage-grouse and on how this life history trait helps maintain and regulate spatial structuring of populations. We are investigating the movement patterns of juvenile sage-grouse from their natal area (i.e., nest) to first breeding attempt, and the effects of this movement on the demographic and genetic structure of 2 populations in northwestern Colorado. In

2005 we radio-marked 141 hatch-year sage-grouse from 34 broods and monitored their movements from natal to wintering areas. Survival from hatch to 120 days post-hatch (approximate time of brood break-up) was 27%. Mortalities were highest during the first 14 days with 50 of 103 deaths during this time. Brood break-up started with adult females abandoning broods during early September, and by 15 October, 14 of 16 broods were independent of the female. During this period the remaining 38 juveniles remained weakly cohesive with siblings, and no difference in movement patterns between sexes was observed. Future work and monitoring of juveniles during the spring will be discussed. Results over the next 3 years will aid in managing the species at biologically meaningful landscape and regional levels, as well as provide essential parameter estimates for dispersal capacity of sage-grouse.

**TOWELL, DALE E.** Idaho Department of Fish and Game, PO Box 25, Boise, ID 83707.  
*MOUNTAIN GOATS IN IDAHO: STATUS AND MANAGEMENT.*

Mountain goats (*Oreamnos americanus*) are native to Idaho, the southernmost portion of their Recent distribution in North America. Mountain goat populations apparently declined sharply early in the late nineteenth and early twentieth centuries due to unregulated hunting. The first survey of known mountain goats ranges, completed in 1955, indicated approximately 2,785 animals statewide. Populations have increased only slightly over the 5 decades since, despite efforts to restore populations through transplants into native ranges and unoccupied suitable habitat. Mountain goat populations are believed to have peaked at about 3,000 animals in 1990, and have apparently fluctuated at 2,500 to 3,000 animals since 1950. Currently an estimated 2,590 mountain goats occur in Idaho, many in small and isolated herds. The number of mountain goats in some herds has recently declined rapidly, over <3 years, and two herds have nearly disappeared. Causes of recent declines are not well understood. The best-monitored mountain goat population in Idaho, the Palisades herd, demonstrated early and rapid population growth followed a population crash and near extirpation. Mountain goats are a game animal in Idaho. Harvest is strictly controlled by permit only, and only when populations exceed a threshold size of >50 adult animals as revealed by population survey data. Harvest is limited to <5% of the adults in each herd. Approximately 50-90 permits have been provided annually during the period 1982-present. Hunters are limited to harvest of 1 mountain goat in their lifetime. Hunters may harvest a mountain goat of either sex. Analysis of annual hunter harvest data indicate that hunter success rates are uniformly high (~80%), and that hunter success rates, male:female ratios among harvested animals, and mean age of harvested animals are all poor indicators of population trends.

**TUCKETT, QUENTON, and Peter Koetsier.** Boise State University, Biology Department, Boise, ID 83725.

*WILDFIRE EFFECTS ON STREAM ECOSYSTEM PROPERTIES FOLLOWING DEBRIS FLOWS, 10 YEARS POST FIRE.*

We studied the effects of the 1994 Rabbit Creek Fire on small stream communities in the Boise River Watershed of Central Idaho. Following the fire, several watersheds experienced large scale debris flows, which removed most of the riparian vegetation potentially slowing stream recovery. Burned streams without debris flows were seen to support a much larger riparian overstory. We assessed gross primary production (GPP), community respiration, benthic organic matter (BOM), algal biomass (chlorophyll-a), and ash free dry weight (AFDW) of 9 streams (3 burned, 3 burned with debris flows, and 3 reference) to determine the effects of debris flows on the energy source of streams. Photosynthetically active radiation (PAR) was measured on each stream to indicate the extent of riparian shading. GPP was determined by using single

station diel oxygen curves with reaeration coefficients calculated from site characteristics. BOM was collected from each stream using a standard Surber sampler. Chlorophyll-a was estimated spectrophotometrically following methanol extraction from scrapes of known area. AFDW was determined from weights pre and post combustion. PAR was much greater at streams experiencing debris flows; this might suggest a difference in GPP. We found that GPP was greatest at streams that experienced debris flows. Further, these streams were autotrophic ( $P:R > 1$ ), while burned and reference streams were heterotrophic ( $P:R < 1$ ). In addition, BOM was highest in our reference streams, while lowest in burned and blown out streams. Finally, AFDW was highest for reference streams and lowest for burned streams, while chlorophyll-a showed the opposite trend. This study shows that debris flows can have persistent impacts on the energy source of streams. (Poster Presentation)

**TUDOR, MARGARET.** WDFW, 600 Capitol Way N., Olympia, WA 98501.

*K-12 FIELD INVESTIGATIONS SUPPORT FISH & WILDLIFE CONSERVATION.*

Fish and wildlife conservation in the state of Washington will benefit by developing and using citizen science in formal and non-formal education settings. Although there are numerous examples of citizen science using students, K-12 citizen science activities are often considered extra-curricula and are limited to the commitment of individual teachers. These projects are not integrated and supported by standard science curriculum within the corporate K-12 education system. One of the main reasons is that traditional K-12 science curriculum has been designed around "in the classroom" activities emphasizing controlled investigations. Currently standards testing and performance measures for science reflect this limited definition. Recently a science advisory team to the Office of the Superintendent of Public Instruction was created to expand the definition of science that adopts standardized rigorous field investigation methodology that is accepted by scientists and educators alike. This template refines the criteria for science inquiry in three types of field investigation: descriptive, comparative, and correlative. Students will be tested on science inquiry through field investigation starting in 2007. This unique approach represents a paradigm shift in K-12 science education, which emphasizes inquiry. It also meets the needs of formal K-12 education to provide authentic learning environments and assists students in undertaking research designed by natural resource management agencies. These changes will have a profound affect on K-12 science curricula and the development of a new set of field investigative skill sets in students. Fish and wildlife conservation will benefit by developing Washington's K-12 school system into a major source for citizen science throughout the state.

**TUREK, NICHOLE C., and David J. Delehanty.** Idaho State University, Pocatello, ID 83209.

*DIRECTIONAL BIAS IN AVIAN COPULATION.*

Effective avian management requires a detailed understanding of avian breeding biology. Three recent studies examining 3 bird species have reported "left-side bias" in copulation behavior. That is, the studies report a systematic pattern of copulation occurring on the left side of the female's tail in each species examined. The mechanics of avian copulation do not directly influence management actions in the field, but the forces underlying copulation behavior e.g. cryptic sexual selection, sperm competition, and variance in reproductive success are central to avian breeding biology. Furthermore, captive propagation of rare and endangered birds often requires a detailed understanding of the mechanics of avian copulation to facilitate sperm extraction, artificial insemination and other interventions. We are making field observations of wild birds from 13 families to evaluate if side-bias in copulation is a general phenomenon in North American birds. Preliminary field results indicate birds normally copulate on the female's left side ( $\chi^2_{16} = 9.00, p =$

0.004) perhaps related to unilateral, left-side female reproductive tracts. Avian management that relies on captive breeding programs for rare and endangered birds would benefit from discovering and understanding functional asymmetry in avian copulation.

**VIERLING, KERRI T., and Leigh B. Lentile.** University of Idaho, Moscow, ID 83844-1136.  
*RED-HEADED WOODPECKER HABITAT SELECTION IN A BURNED PONDEROSA PINE FOREST.*

Red-headed Woodpeckers (*Melanerpes erythrocephalus*) have been experiencing population declines at a continental scale, yet little is known about their habitat selection within burned forests. The primary objective of this study was to examine Red-headed Woodpecker habitat selection following a large fire in the Black Hills of South Dakota. We measured characteristics of 17 Red-headed Woodpecker nest sites and 17 random sites between 2001-2004. Red-headed Woodpecker nests occurred farther from grassland edges in large diameter snags within severely burned quaking aspen (*Populus tremuloides*) stands. High severity burns within these aspen stands resulted in a combination of snag and understory characteristics that differed from the surrounding pine matrix. We suggest that interactions between cover type and burn severity can have important ecological consequences for cavity nesters. Furthermore, management activities to increase tree size and the presence of aspen will likely benefit Red-headed Woodpeckers in this region.

**VILLEPIQUE, JEFFREY T., Vernon C. Bleich, and R. Terry Bowyer.** Idaho State University and Sierra Nevada Bighorn Sheep Recovery Program, California Department of Fish and Game, 407 W. Line St., Bishop, CA 93514.

*COMPARING GPS COLLAR ERROR: EVALUATION OF TELEVILT POSREC COLLARS AND A METHOD FOR OUTLIER IDENTIFICATION.*

We deployed 32 POSREC-Science™ 600 series 12-channel GPS collars (Televilt, Lindesberg, Sweden) on mule deer and bighorn sheep in 3 California mountain ranges from 2002-2004. Evaluation of data from these deployments showed numerous implausible movements, which lead us to question the accuracy of the GPS collars. As a result, we tested the precision of Televilt POSREC collars under several conditions: 1) optimal sky visibility; 2) *ad hoc* test locations where collars remained attached to deceased mule deer prior to recovery of the collar; and 3) *ad hoc* test locations inside a 1-floor, wood-framed building in Bishop or outside the homes of 2 biologists, for a total of 663 locations. Errors in excess of 2 km occurred in 2% of locations, while 12% of locations were >1 km and 53% > 100 m from the true location. Comparisons among 5 additional GPS collar models from 3 manufacturers showed POSREC collars to be unique in their lack of precision. Because viewing point data alone may belie the presence of flawed data, we urge researchers using POSREC GPS collars to evaluate patterns of movement to ensure their data are not affected. We suggest a method for screening POSREC data and present an ArcView extension useful for removing erroneous locations. (Poster Presentation)

**WALL, KEN.** Geodata Services, Inc.  
*THE USE OF INTERACTIVE GIS TOOLS TO SUPPORT IDENTIFICATION AND MAINTENANCE OF WILDLIFE AND HIGHWAY LINKAGE AREAS.*

The techniques have been developed in 15 sessions identifying approximately 375 linkage areas over 2,500 miles of state and federal highways in Montana and Idaho. Available data sources useful in linkage mapping, linkage area modeling with GIS layers, and collaborative tools such as GIS enabled conference calls, internet based mapping programs, 3D data visualization and wildlife habitat portal technology will be presented.

**WARWICK, JOSEPH N., and David J. Delehanty.** Idaho State University, Pocatello, ID 83209.

**FUNCTIONAL ASYMMETRY IN CHUKAR REPRODUCTION.**

Detailed understanding of the behavior and physiology of avian reproduction is central to conserving rare and endangered species. We are using chukar (*Alectoris chukar*) as a model species for understanding gametic transfer in birds. Male chukar exhibit pronounced gonadal asymmetry with an enlarged left testis relative to the right during the breeding season. This may be an evolutionary response to the unilateral left-side female reproductive tract. In male chukar, both testes undergo a recrudescence in the spring, prior to the breeding season, followed by regression in the fall. We assessed gonadal asymmetry in male chukar starting from pre-breeding season through mid July to determine whether testis asymmetry exists throughout the entire breeding period. Mass, as well as in situ and in vitro dimensional measurements, were taken on fresh testes collected weekly. We also measured seminiferous tubule diameter to understand the underlying cause of size bias of the testes. We found that the left testis was bigger than the right even in the regressed state. Preliminary data suggests that the left testis contains proportionally more seminiferous tubule mass than the right. (Poster Presentation)

**Weller, Theodore J., Shonene A Scott, THOMAS J. RODHOUSE, Patricia C. Ormsbee, and Jan M Zinck.** USDA Forest Service, Arcata, CA, and Eugene, OR; Portland State University, Portland, OR; National Park Service, Bend, OR.

**IN SEARCH OF SIMPLE CHARACTERS TO DISTINGUISH MYOTIS LUCIFUGUS AND MYOTIS YUMANENSIS IN THE FIELD.**

The ability to accurately identify species is a prerequisite for accurate assessment of biodiversity. In northwestern North America the two sympatric species, *Myotis lucifugus* and *M. yumanensis* are difficult to distinguish based on external morphology and additional tools must be employed to identify individuals in hand. In recent years, it has been shown that it is relatively easy to distinguish these species via DNA analysis. However, many workers do not have ready access to genetic laboratories or the funds necessary to complete molecular analyses allowing unambiguous species identification. At least three previous efforts have attempted to identify characteristics that can be measured in the field to reliably discriminate between the species. However, inference from these studies was limited because of the restricted geographic range over which individuals with linked genetic, morphology, and echolocation data had been obtained. We obtained a sample of over 100 individuals of each species captured throughout northern California, Oregon and Washington for which we have linked genetic, morphology, and echolocation data. We used this data to derive a simple algorithm for discriminating the two species based on characters that can be easily and reliably measured in the field. Specifically, we develop a sex-specific model to determine threshold values for forearm length and characteristic frequency of echolocation calls that can be used to discriminate between *M. lucifugus* and *M. yumanensis* at specified levels of confidence. Results of our model will allow biologists in the region to understand the conditions under which individuals captured in the field can be identified in the field or to screen them prior to submission for DNA analysis. We will challenge the model with data from across the inter-mountain west to determine geographic range of its application. (Poster Presentation)

**WELLS, JEFFREY J., Kate Martin, and Mark Lindberg.** PO Box 750872, Fairbanks, AK 99775 (JJW); University of Alaska Fairbanks, Department of Biology and Wildlife and Institute of Arctic Biology, Fairbanks, AK 99775 (KM, ML).

*EFFECTS OF LAKE SIZE AND LIMNOLOGY ON THE NESTING SUCCESS OF HORNED GREBES (PODICEPS AURITUS).*

Populations of grebes in Alaska may be declining. Based on Breeding Bird Survey data, Horned Grebe are among the 10 most rapidly declining species in North America. This species relies exclusively on wetlands for nesting and rearing young and may therefore be a good indicator of wetland health and productivity. Remote sensing techniques have documented reductions in pond and lake sizes during recent decades in interior Alaska, which could result in negative impacts on the productivity of Horned Grebes. The purpose of this study was to examine the relationship between nest success of Horned Grebes and lake size, limnology, and other variables. We monitored 45 grebe nests located on seven different lakes during the summer of 2005 at the Long Lake wetland complex (66°20' N, 147°58' W) on the Yukon Flats National Wildlife Refuge. Our preliminary analysis does not indicate a strong relationship between nesting success and lake size per se; however, nesting success may be affected by other variables indirectly related to lake size (e.g., wave action). Lake size and related characteristics may have more effect on other components of productivity (e.g., chick survival) than nesting success.

**WHITE, JOSHUA, Quenton Tuckett, and Peter Koetsier.** Boise State University, Biology Department, Boise, ID 83725.

*EFFECTS OF THE 1994 RABBIT CREEK FIRE ON STREAM FISH DIETS: 11 YEARS LATER.*

We examined the gut content of fish collected from 9 headwater streams, some whose watersheds were burned in the 1994 Rabbit Creek Fire (Boise National Forest). We placed the streams into 3 natural treatments: unburned, burned, and burned/blowout (watersheds that experienced a massive post-fire scour event in 1995). We measured photosynthetically active radiation (PAR) in each stream to assess riparian canopy cover. We collected and removed the digestive tract of 9-15 representative fish from each stream. In the lab, we partitioned gut contents into 4 groups: terrestrial or aquatic invertebrates, unidentified organic matter, and inorganic material. Invertebrates were identified to family, and all material types were dried and weighed. Due to the lack of riparian vegetation, our burned/blowout streams had higher PAR values than the other treatments. Consequently, fish from these sites had ingested a high percentage of aquatic, but almost no terrestrial invertebrate biomass. Gut contents from both unburned and burned sites had similar percentages of both aquatic and terrestrial invertebrates and less unidentified organic matter. By removing riparian plants, fire increased the severity of springtime scouring in our burned/blowout streams, slowing the recovery of stream-side vegetation. The overhanging canopy in these sites was less than that of our control or burned streams, 11 years after the initial fire. This slow recovery is evidenced in fish diets. Lacking a close canopy, terrestrial invertebrates were not a major dietary item for the fish, thus fish production or growth may be negatively affected. (Poster Presentation)

**WILLIAMS, WYATT, and Ian Robertson.** Boise State University, Department of Biology, Boise, ID 83725.

*USING ROTARY FLIGHT MILLS TO QUANTIFY FAT USE BY DOUGLAS-FIR BEETLE, DENDROCTONUS PSEUDOTSUGAE.*

Bark beetles (*Coleoptera: Curculionidae: Scolytinae*) use fat reserves while searching for suitable host trees. Our goal was to quantify the metabolism of fat during flight in Douglas-fir beetles. Newly-emerged female beetles were collected and a body condition index was assigned to each. Some beetles were analyzed for fat content



upon emergence (control), whereas others were flown on rotary flight mills for 1 or 4 hours and then analyzed for fat content. Body condition and emergence day were found to reflect the percent body fat in beetles, whereas time in flight was inconclusive. Beetles with high body condition were more likely to be strong flyers than those beetles with low condition. Thus, future efforts will focus only on flying beetles in high body condition. Our overall aim is to determine whether fat content influences individual host selection of female beetles.

**ZAGER, PETE, Mark Hurley, George Pauley, and Craig White.** Idaho Department of Fish and Game.

*UNDERSTANDING UNGULATE POPULATION DYNAMICS IN IDAHO.*

In February 2005, the Idaho Department of Fish and Game initiated a large scale, long term project to understand the demographics of mule deer and elk populations across the range of variation that defines Idaho. The goal is to link ungulate population dynamics to variation in habitat quality and quantity, population density, predation, weather, and other factors. We captured, evaluated, and radio-collared an average of 30 adult female mule deer and 30 adult female elk in each of 12 study areas. We will describe spatial patterns in pregnancy rates, trace element and selenium levels, body condition and estimated mass of those 500+ animals. Including animals previously radio-collared, we are currently monitoring survival and cause-specific mortality factors for about 900 adult mule deer and elk. We will present 1<sup>st</sup> year survival rates and cause-specific mortality data for each of these populations and discuss broad scale spatial patterns, including the impact of wolf predation on these populations. This project is directly linked to IDFG's mule deer fawn overwinter survival project, and is an extension of the bull elk mortality and elk recruitment projects.

**Zarriello, Thomas, KAREN STEENHOF, Sean Finn, and Susan Toussaint.** USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise, ID 83706.

*WEB-BASED BIBLIOGRAPHIES FOR RAPTORS AND GREAT BASIN ECOLOGY.*

The USGS Snake River Field Station (SRFS) is now serving 2 searchable bibliographic databases on the World Wide Web. They provide access to important information about conservation issues in the Intermountain West. The Raptor Information system (RIS) <http://ris.wr.usgs.gov/> consists of more than 35,000 citations of scientific papers, government reports, and academic dissertations. Hard copies of all papers catalogued by RIS are available at the Richard R. Olendorff Memorial Library, at the SRFS offices on the Boise State University campus. The Great Basin bibliography [http://greatbasin.nbii.gov/GB\\_bibliography.html](http://greatbasin.nbii.gov/GB_bibliography.html) contains 3,200 references about the natural and cultural history, ecology, and management of the Great Basin and Columbia Plateau region of the western United States. Users can download the full text of some references by clicking a hotlink. On-line query tools at each site allow users to focus their search by author name(s), year(s) of publication, title of the work, and keywords.