# Program and Abstracts
# Idaho Chapter of The Wildlife Society
# Annual Meeting

10-12 March 2009
University Inn • Moscow, Idaho

**Meeting Introduction**
The Idaho Chapter of The Wildlife Society's annual meeting will feature a diverse scientific program with a plenary lecture, contributed oral presentations, social activities and the annual business meeting. Pre–conference activities include the Idaho Bat Working Group and the Idaho Partners in Amphibian and Reptile Conservation.

The conference will take place 10-12 March 2009 in Moscow, 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. Alternatively, a registration form can be downloaded from the Web site for submission by mail or FAX. The registration fee is $100, which includes the banquet. In addition, a one day only registration of $60 may be purchased at the registration table on each day of the conference.

**Host City — Moscow, Idaho**
Moscow is located in north-central Idaho, between Moscow Mountain and the rolling hills of the Palouse. With the University of Idaho, Moscow is a small, college town that provides a diversity of cultural and recreational activities. The meeting location, Best Western University Inn, is approximately 1.5 miles from downtown Moscow and within walking distance of several restaurants and a mall.

Local attractions include:

Idaho Birding Trail (see http://fishandgame.idaho.gov/IFWIS/ibt/site.aspx?id=N39)
Palouse Recreation Trail system, incl. the Bill Chipman Palouse Trail, Paradise Path, and Latah Trail
UI Arboretum and Botanical Gardens – native species, as well as various North Temperate cultivars
Idler's Rest Conservatory – northeast of Moscow, woods adjacent to Palouse farmlands
Elk Creek Falls Recreation Area (54 miles east of Moscow: series of waterfalls in pine and cedar forest)

Appaloosa Museum - www.appaloosamuseum.org - 882-5578 x279
McConnell Mansion - www.latah.id.us/historicalsociety - 882-1004
UI Prichard Art Gallery - www.uiweb.uidaho.edu/galleries - 883-3586

**Conference Venue**
All conference activities and associated workshops will take place at the Best Western University Inn Hotel and Convention Center www.uinnmoscow.com - 1516 Pullman Road, Moscow, Idaho 83843. Phone (208) 882-0550.

**Conference Contact**
Dave Stricklan strickland@byui.edu - (208) 496-2008

**REGISTRATION**
The full registration fee includes admission to all oral sessions, pre-conference workshops, the opening reception, coffee breaks, the banquet, complimentary meeting gift, and the program and abstracts.

Registration Fee:

| | |
|---|---|
| $100 | registration (includes the banquet & meeting gift) |
| $ 75 | retiree registration (includes the banquet & meeting gift) |
| $ 60 | one day registration (includes the banquet & meeting gift) |
| $ 50 | student registration (includes the banquet & meeting gift) |
| $ 30 | extra banquet ticket |
| $ 10 | one session for students (does not include the banquet or meeting gift) |

**Organizing Committee**

| | |
|---|---|
| **Dave Stricklan** | Brigham Young University - Idaho |
| **Sam Mattise** | Retired BLM |
| **Sylvia Copeland** | ERO Resources |
| **Jonathan Dudley** | USFS Rocky Mountain Research Station |

**Paper Judge Coordinator**

| | |
|---|---|
| **Anna Owsiak** | Idaho Department of Fish and Game |

Note: The 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.

**Sponsors**

We appreciate the sponsorship from the following organizations.


Power Engineers
3940 Glenbrook Drive
Hailey, ID 83333
Phone (208) 788-3456
Fax (208) 788 - 2082


Idaho State Office
Bureau of Land Management
1387 South Vinnell Way
Boise, ID 83709

## Program at a glance

| **Tuesday 10 March** | **Idaho Room** |
|---|---|
| Time | |
| 8:30 –11:30 a.m. | Idaho Partners in Amphibian & Reptile Conservation |
| 1:00 – 4:30 p.m. | Idaho Bat Working Group |

| **Wednesday 11 March** | **University Room** |
|---|---|
| Time | |
| 8:30 – 8:45 | Welcome – ICTWS President: Dave Stricklan |
| 8:45 – 9:00 | Remarks – TWS Northwest Section President: Terry Bower |
| 9:00 – 9:45 | Keynote Address: Paul Krausman |
| 9:45 – 10:00 | SHORT BREAK |
| 10:00 – 11:45 | Panel Discussion |
| 11:45 – 1:10 | LUNCH BREAK – on your own |
| 1:10 – 2:40 | Invited Speakers |
| 2:40 – 3:00 | BREAK |
| 3:00 – 4:30 | Invited Speakers |
| 4:50 – 6:00 | Business Meeting - **University Room** |
| 6:00 – 8:00 | Cash No Host Bar/Mixer & Poster Session - **University Room** |

| **Thursday 12 March** | **Palouse Room** | **Idaho/Washington Rooms** |
|---|---|---|
| Time | | |
| 8:20 – 10:20 | Modeling and landscape ecology | Avian ecology |
| 10:20 – 10:40 | BREAK | BREAK |
| 10:40 – 12:00 | Genetics and Population Dynamics | Avian ecology |
| 12:00 – 1:20 | LUNCH BREAK – on your own | LUNCH BREAK – on your own |
| 1:20 – 2:40 | Restoration ecology and planning | Population dynamics & Mammalian ecology |
| 2:40 – 3:00 | BREAK | BREAK |
| 3:00 – 4:20 | Open | Population dynamics & Mammalian ecology |
| 6:30 – 9:30 | Social & banquet - **University Room** | |

**Plenary Speaker**
**Paul Krausman, University of Montana**

Paul Krausman is currently the Boone and Crockett Professor of Wildlife Conservation at the University of Montana in Missoula. Previously he was a Professor and Research Scientist at the University of Arizona and an Assistant Professor at Auburn University. He earned a B.S. degree in Zoology from The Ohio State University and a M.S. degree in Wildlife Science at New Mexico State University. His Ph.D. is from the University of Idaho where he worked under E. D. Ables.

Paul is a committed teacher and mentor to younger biologists. He has taught a wide variety of courses and his influence has been felt widely in the wildlife field through the efforts of 50 plus M.S. students and 15 Ph.D. students. Paul has published widely on a variety of wildlife topics and species including; mountain sheep, pronghorn, coyotes, pumas and numerous other ungulate and predator species. He is the author of the wildlife management text used by most University programs nationally and internationally.

Paul is a tireless advocate for wildlife and wildlifers. He serves on numerous committees and working groups and is acknowledged as one of the premiere contributors of our time to the discipline of wildlife management.

**Panel Discussion on Policy and Science**

Paul Krausman, Boone and Crockett Professor of Wildlife Conservation, University of Montana
Dale Bosworth, Former Chief of the USDA Forest Service
Virgil Moore, Deputy Director, Idaho Department of Fish and Game

**Banquet Speaker**
**Doug Smith, Yellowstone National Park**

Douglas W. Smith is currently project leader for the Yellowstone Gray Wolf Restoration Project in Yellowstone National Park. He worked as biologist for the project from 1994-1997 and has been with the program since its inception. Doug has studied wolves for 27 years. Prior to Yellowstone, he worked on Isle Royale with wolves from 1979-1992, and also with wolves in Minnesota in 1983. He received his Bachelor of Science in Wildlife Biology from the University of Idaho in 1985.

His coursework and fieldwork from 1985-1988 earned him a Master of Science in Biology from Michigan Technological University. Smith received his Ph.D. from the University of Nevada, Reno in the program of Ecology, Evolution, and Conservation Biology. The dissertation topic which earned him his Ph.D. was titled *Dispersal Strategies and Cooperative Breeding In Beavers*. He has produced numerous publications on the subject of both the wolf and the beaver, as well as contributing many hours of lecture time on both topics. Some of the publications authored and co-authored by Smith include: *Yellowstone After Wolves, Wolf-Bison interactions in Yellowstone National Park, Winter severity and wolf predation of a formerly wolf-free elk herd, Wolves in the greater Yellowstone ecosystem: Restoration of a top carnivore in a complex management environment,* and *Denning behavior of non-gravid wolves.* He has co-authored two books *The Wolves of Yellowstone (1996)* a chronology of the first two years of the wolf recovery effort and *Decade of the Wolf (2005)* summarizing the first ten years of wolf restoration in Yellowstone National Park.

Doug has participated in numerous media interviews including four National Geographic specials and one BBC special. Doug is an avid canoeist, having run many wild and remote rivers within Alaska, Ontario, Nunuvut, Yukon, and Northwest Territories. He and his wife, Christine, and two sons Sawyer and Hawken make their home in Gardiner, Montana.

**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.

**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.

**Messages, job postings, and volunteer opportunities**
We will set up a message and job board next to the registration desk.

**Lost And Found/Security**
Please bring lost and found items to the Registration Desk.

## SCIENTIFIC PROGRAM

### TUESDAY 10 MARCH

**08:30–11:30** **Workshop:** Idaho Partners in Amphibian and Reptile Conservation
Chair: Chuck Peterson
Idaho Room

- National and Regional PARC Updates – Chuck Peterson (ISU, IMNH)
- Amphibian and Reptile Habitat Management Guidelines – first look
- Scientific Name Changes for some Idaho Amphibians and Reptiles
- Discussion of Amphibian and Reptile Species Status in Idaho
- General discussion of projects relevant to amphibian and reptile conservation in Idaho. All meeting attendees are encouraged to contribute their information in the following topic areas.
  - Research
  - Inventory and Monitoring
  - Management
  - Policy and Regulations
  - Education

**1:00 – 4:30** **Workshop:** Idaho Bat Working Group
Chair: Rita Dixon
Idaho Room

- Western Bat Working Group update (Rita Dixon, IDFG)
- General discussion of current bat projects in Idaho. All meeting attendees are encouraged to contribute their information in the following topic areas:
  - Research
  - Inventory and Monitoring
  - Management
  - Policy and Regulations
  - Education

**WEDNESDAY 11 MARCH**

**Plenary Session**
University Room

| | |
|---|---|
| 8:30 - 8:45 | Welcome: Dave Stricklan |
| 8:45 – 9:00 | Northwest Section welcome and remarks: Terry Bower |
| 9:00 – 9:45 | Keynote address: Dr. Paul Krausman<br>*$C^3$: Change, Challenges, and Creations for Sustainable Wildlife* |
| 9:45 – 10:00 | BREAK |
| 10:00 – 11:45 | Panel Discussion: *Policy and Science (Looking Back, Looking Forward)*<br>Dale Bosworth – Former Chief of the USDA Forest Service<br>Paul Krausman – Boone & Crockett Professor of Wildlife Conservation, University of Montana<br>Virgil Moore – Deputy Director, Idaho Department of Fish and Game |
| 11:45 – 1:10 | LUNCH BREAK – on your own |

**Invited Papers**
University Room

| | |
|---|---|
| 1:10 | **Long-term sage-grouse research: A look behind the scenes.** JOHN W. CONNELLY |
| 1:40 | **Landbird stopover ecology in southern Idaho in the big picture of migratory bird conservation.** JAY CARLISLE |
| 2:10 | **The status of woodland caribou in the Selkirk Mountains.** WAYNE WAKKINEN |
| 2:40 | BREAK |
| 3:00 | **Evaluating persistence of greater sage grouse populations: Which approach forecasts correctly?** GARTON, E. O., J. S. Horne, A. Moser, J. W. Connelly, M. A. Schroeder, J. M. Scott |
| 3:30 | **Wildlife Corridor Considerations.** PETE COPPOLILLO |
| 4:00 | **Idaho Herpetological Issues.** CHARLES PETERSON |

THURSDAY 12 MARCH

## CONTRIBUTED PAPERS SESSIONS

The names of presenters are capitalized; those names with an * following their name are student presenters

**Modeling and landscape ecology**

Palouse Room – Session Chair: Rita Dixon

8:20 **Assessing the ecological context of the National Park and National Wildlife Refuge Systems.** LEONA K. SVANCARA, J. M. Scott, T. R. Loveland, and A. B. Pidgorna

8:40 **Movement corridor modeling for woodland caribou in the Selkirk Mountains.** WAYNE WAKKINEN and J. B. Slone

9:00 **Does hunting regulate cougar populations? A test of the Compensatory Mortality Hypothesis.** HILLARY S. COOLEY, R. B. Wielgus, G. M. Koehler, H. S. Robinson, and B. T. Maletzke

9:20 **Mirror, mirror, on the wall: Reflections on the North American Model of Wildlife Conservation**. MICHELE BEUCLER and G. Servheen

9:40 **An evaluation of wildlife habitat and silvicultural treatments in northern Idaho.** SCOTT ROBINSON

10:00 **Predicting winter survival of mule deer fawns from climatic and vegetative community covariates.** MARK A. HURLEY, M. Hebblewhite, C. G. White, M. D. Scott, H. M. Miyasaki, J. R. Skalski, R. L. Townsend, J. W. Unsworth, and P. Zager

10:20 BREAK

**Avian ecology**

Idaho/Washington Rooms – Session Chair: Carl Mitchell

8:20 **Strategic bird conservation in the National Wildlife Refuge System: Opportunities for increasing species' representation and redundancy**. DAVID RUPP* and J. M. Scott

8:40 **Effects of sheep grazing on Brewer's sparrow nest site selection and reproductive success in mountain big sagebrush habitat.** MARK G. POLLOCK* and K. T. Vierling

9:00 **An overview of Avian Influenza monitoring efforts in Idaho (2006- Present) in direct support of *An Early Detection System for Highly Pathogenic H5N1 Avian Influenza in Wild Migratory Birds, U.S. Interagency Strategic Plan*.** S. STOPAK and J. Knetter

9:20 **Nest habitat use by greater sage-grouse.** DAVID MUSIL

9:40 **Long term monitoring of a mountain quail (*Oreortyx pictus*) translocation project in the Bennett Hills of Idaho.** GIFFORD GILLETTE*, D. Delehanty, and J. W. Connelly

10:00 **From the nest to the lek: survival, natal dispersal, and recruitment of juvenile greater sage-grouse in northwestern Colorado.** T. THOMPSON*, K. P. Reese, and A. Apa

10:20 BREAK

**Genetics and Population Dynamics**
Palouse Room – Session Chair: Jerry Scrivner

10:40 **Monitoring an Idaho gray wolf population: A noninvasive genetic approach.** J. STENGLEIN*, C. Mack, D. Ausband, M. Mitchell, P. Zager, S. Nadeau, and L. Waits

11:00 **Hierarchical population genetic structure in cougars (*Puma concolor*) of Idaho and western Montana.** NIKO BALKENHOL*, J. Holbrook, P. Zager, C. White, J. Rachael, D. Onorato, R. DeSimone, and L. Waits

11:20 **Development of a fecal DNA detection method for pygmy rabbits.** LISETTE WAITS, J. Adams, B. Bosworth, and J. Rachlow

11:40 **Elk population status, survival and causes of mortality in 11 elk management zones in Idaho**. CRAIG WHITE, G. Pauley, P. Zager, and M. Hurley

12:00 Lunch break – on your own

**Avian ecology**
Idaho/Washington Rooms – Session Chair: Josh Rydalch

10:40 **A comparison of internal temperatures between nest boxes and artificially-created cavities for secondary cavity-nesting birds in northern Idaho**. JESSICA POLLOCK* and K. T. Vierling

11:00 **Movement patterns and population dynamics of greater sage-grouse in Mono County, California.** LIEF A. WIECHMAN* and K. P. Reese

11:20 **Nesting ecology of red-naped sapsuckers: choices, consequences, and the role of scale.** GIANCARLO SADOTI* and K. T. Vierling

11:40 **The state of sage-grouse in Idaho**. ANN MOSER, T. Hemker, and D. Kemner

12:00 LUNCH BREAK – on your own

**Population Dynamics and Mammalian Ecology**
Idaho/Washington Rooms – Session Chair: Frances Cassirer

1:20 **Growth of male white-tailed deer: consequences of maternal effects.** K. L. MONTEITH*, L. E. Schmitz, J. A. Jenks, J. A. Delger, and R. T. Bowyer

1:40 **Cause-specific mortality and the role of predators and climate in neonatal elk survival across five western states.** K. GRIFFIN, M. Hebblewhite, P. Zager, S. Barber-Meyer, D. Christenson, S. Creel, N. Harris, M. Hurley, D. Jackson , B. Johnson, D. Mech, W. Myers, J. Raithel, M. Schlegel, B. Smith, C. White, and P. White

2:00 **Resource selection and movements by female mule deer: effects of reproductive status**. RYAN A. LONG*, J. G. Kie, and R. T. Bowyer

2:20 **Patterns of amphibian Chytrid fungus on pond-breeding amphibians of north Idaho.** C. S. GOLDBERG* and L. P. Waits

2:40 BREAK

**Restoration Ecology and Planning**
Palouse Room – Session Chair: Paul Makela

1:20 **Idaho Department of Fish and Game's farm bill coordination program – habitat development and restoration assistance to farmers and ranchers**. DON KEMNER

1:40 **Conservation reliant species: our new relationship with nature**. J. MICHAEL SCOTT

2:00 **Suburban and exurban influences on wildlife and fish.** P. R. Krausman, SONJA M. SMITH*, J. Derbridge, and J. A. Merkle

2:20 **Development of the Idaho BLM Land Cover Classification System and associated mapping standards.** SIGNE SATHER-BLAIR, L. K. Svancara, D. McConnaughy, M. DeArmond, S. Filkins, C. L. McDonald, B. Ralston, T. Rinkes, and R. Rosentreter

2:40 BREAK

**Population dynamics and Mammalian ecology**
Idaho/Washington Rooms – Session Chair: Diane Evans Mack

3:00 **The Idaho Wilderness: Is it still a source population for cougars?** HOLLY A. AKENSON

3:20 **Effect of wolf predation on elk demographics in the Lolo elk management zone, Idaho.** M. Hurley, G. PAULEY, C. White, and P. Zager

3:40 **Metrics of predation: perils of predator-prey ratios.** R. T. BOWYER, J. G. Kie, D. K. Person, and K. L. Monteith

4:00 **Evaluating sublethal effects of telemetry on wildlife: radio collars on pygmy rabbits.** JANET RACHLOW, R. Peter, L. Shipley, A. Price, D. Sanchez, and W. Estes-Zumpf

4:20 **Fecal indices in mule deer wintering in close proximity to elk.** PAUL ATWOOD, P. Zager, J. J. Millspaugh, M. D. Matocq, R. T. Bowyer, and J. G. Kie.

**ABSTRACTS OF INVITED PAPERS:**
**Presented at the Idaho Chapter of the Wildlife Society Annual meeting.**

**Landbird stopover ecology in southern Idaho in the big picture of migratory bird conservation.** JAY CARLISLE, Idaho Bird Observatory, Boise State University, Boise, ID 83725.

Determining factors limiting migratory bird populations is an increasingly important subject as migrants face continuing changes in habitat conditions, land use patterns, and climate. Here, I highlight results from studies of the ecology of en route migrants in Idaho at two widely separated sites in southern Idaho and consider how such efforts fit into migratory bird conservation efforts. The study sites vary especially in their habitat composition, with Lucky Peak in the Boise Foothills being characterized by a mix of montane deciduous and coniferous habitats whereas the site at Camas National Wildlife Refuge (NWR) on the upper Snake River Plain is a wooded riparian oasis composed of a mix of native and non-native vegetation. In particular, I compare autumn stopover performance of migrants between the two stopover sites during 2005 and 2006, contrast spring versus autumn migration patterns at the Camas NWR site from 2005 to 2007, and interpret differences between sites and seasons.

**Long-term sage-grouse research: A look behind the scenes.** JOHN W. CONNELLY, Idaho Department of Fish and Game, Department of Biological Sciences, Idaho State University, Pocatello, ID 83209

The Idaho Department of Fish and Game has had a long history of research on big game animals including elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*). Recently management of greater sage-grouse (*Centrocercus urophaisianus*) and, to a lesser degree, Columbian sharp-tailed grouse (*Tympnauchus phasianellus*) has become controversial because of potential listing of these species under the Endangered Species Act. Unfortunately, other than Colorado, Idaho is the only western state that has supported long-term research on sage-grouse and Columbian sharp-tailed grouse. Agency biologists outside of Idaho often ask how this long-term work could be supported, given Idaho's strong interest in and commitment to big game species. Here I examine Idaho's long-term grouse research, identify key people involved with this program, describe the broad approach to this work, and briefly present a conceptual model summarizing these efforts. I also offer an alternative explanation to this program's success based on the buffalo theory.

**Corridors, connectivity and the challenge of conservation on the ground in and around the Yellowstone ecosystem.** PETE COPPOLILLO, R. Inman, J. Berger, J. Beckmann, and A. Toivola. Wildlife Conservation Society, Yellowstone Rockies Program; 301 N. Willson Av. Bozeman, MT, 59715

Corridors are widely championed conservation objectives in a variety of contexts, from protected-area management, to conflict mitigation, metapopulation management and climate change adaptation, but protecting and enhancing connectivity is not always straightforward. We propose a framework for understanding and prioritizing connectivity, and using historical and current data on animal movements, begin to confront some of the real-world challenges to conserving and enhancing connectivity for carnivores and ungulates in and around the Greater Yellowstone Ecosystem. We argue that an empirical research strategy is critical to answering key connectivity questions and propose a research agenda for doing so.

**Evaluating persistence of greater sage grouse populations: Which approach forecasts correctly?** GARTON, E. O.[1], J. S. Horne[1], A. Moser[2], J. W. Connelly[2], M. A. Schroeder[3], J. M. Scott[1]. [1]Univ.of Idaho, Fish & Wildlife, Moscow, ID 83844, [2]DFG, 1345 Barton Rd., Pocatello, ID 83221, [3]DFG, P.O. Box 1077, Bridgeport, Washington, 98813.

United States Fish and Wildlife Service is currently re-considering listing Greater Sage Grouse (*Centrocercus urophasianus*) under the Endangered Species Act because of a lawsuit by Western Wathersheds Project. Listing petitions express concerns about impacts of grazing, energy development, wildfires, residential development, invasive plants and introduced diseases affecting sage-brush habitats and grouse populations across Western North America. We have been evaluating numerous biologically reasonable models of population dynamics of Greater Sage Grouse at multiple scales to forecast the probability that Greater Sage Grouse populations will persist for 30 or 100 years into the future. Standard models with negative density dependent effects of limited resources predict very high likelihood of persistence in most regions. However, new models portraying both positive and negative density dependence at local scales as well as an observed long-term decline in carrying capacity and delayed density dependence at large scales forecast moderate to high probability of extinction in some regions. How can this information be used to inform the listing decision process?

**Idaho herpetological studies.** CHARLES R. PETERSON, Professor of Biology, Idaho State University.

Abstract not available at time of printing.

**The Status of Woodland Caribou in the Selkirk Mountains.** WAYNE WAKKINEN, Idaho Dept of Fish and Game, Bonners Ferry, ID 83805.

Woodland caribou (*Rangifer tarandus caribou*) in the Selkirk Mountains of northern Idaho, northeastern Washington, and southern British Columbia belong to the "Mountain" ecotype and were emergency listed under the ESA in 1983. Approximately 1,900 Mountain caribou are currently found in British Columbia. The Selkirk population of approximately 25 animals was augmented with 103 caribou from other populations in British Columbia. Idaho translocated 60 animals from 1987-90 and Washington moved 43 animals in 1996-98. Predation, primarily from cougars (*Felis concolor*) in the summer and early fall, appears to have the largest influence on survival rates and therefore population trend. Large scale habitat changes, both human-caused and natural, have changed the predator/prey system. Current habitat conditions favor ungulate species that prefer young seral forests. This abundance of ungulates in turn supports higher densities of predators. Predation on caribou is opportunistic when there is geographic overlap with other ungulate species. An annual winter census indicates a slightly increasing population over the past 5 years. The 2008 census counted 46 animals in the ecosystem, 3 of which were in the U.S. Woodland caribou recovery efforts throughout their range in B.C. are now a higher priority with Canada's recently enacted Species at Risk Act (SARA). Management actions, including changes in timber harvest practices, restrictions on timber harvest, and restrictions on winter recreation, are controversial but may yield long-term benefits for caribou. The recent acquisition of 136,000 acres (212 $mi^2$) of a privately-held forestry company by the Nature Conservancy of Canada will also benefit recovery efforts. While caribou numbers remain low, I am cautiously optimistic about the long term persistence of caribou in the Selkirk ecosystem.

**ABSTRACTS OF CONTRIBUTED PAPERS:**
**Presented at the Idaho Chapter of the Wildlife Society Annual meeting. Presenter names are capitalized; those with an * following their names are students.**

**AKENSON, HOLLY A.**[1], B. B. Ackerman[2], T. K. Ruth[3], and J. J. Akenson[1]. [1]Taylor Wilderness Research Station, University of Idaho, HC 83 Box 8070, Cascade, ID 83611; [2]Idaho Department of Fish & Game, 600 S. Walnut, Boise, ID 83709; [3]Selway Institute, 76 Sunflower Rd, Salmon, ID, 83467. ***THE IDAHO WILDERNESS: IS IT STILL A SOURCE POPULATION FOR COUGARS?***

Cougar research from the 1960s suggests that the central Idaho wilderness maintained source populations of cougars (*Puma concolor*) that provided emigrating subadults to recolonize other parts of the state. Cougar harvest in Idaho increased from 1973 to 1998 and has fallen since then. With the decreasing harvest there is a need to more closely examine whether productivity in wilderness populations continues to exceed mortality and, thus, whether these populations continue to function as source populations. We assessed changes in harvest rate over time and compared age and sex composition of harvested cougars in 5 Data Analysis Units (DAUs). We evaluated source and sink characteristics and implications for productivity using research population estimates and Idaho Department of Fish and Game mandatory carcass check harvest composition data. The harvest level in one wilderness unit (3,100 sq km) increased 4-fold over a 40-year period, producing a high mortality rate of all resident adults (29-48%) and of resident adult females (21-32%). The two wilderness DAUs, representing over 24,000 sq km, had the highest proportions of adult females in the harvest (31-33%) among 18 Idaho DAUs. The high proportions of adult harvest, especially females, in wilderness DAUs have reduced the ability of cougars in wilderness to function as source populations. Instead of still being a source population, high harvest in wilderness DAUs has now likely contributed to declines in wilderness cougar populations as well as in adjacent areas where immigration is no longer offsetting hunter harvest mortality.

**ATWOOD, PAUL M.***[1], P. Zager[2], J. J. Millspaugh[3], M. D. Matocq[4], R. T. Bowyer[1], and J. G. Kie[1]. [1]Department of Biological Sciences, Idaho State University, Pocatello, ID 83209; [2]Idaho Department of Fish and Game, Lewiston, ID 83501; [3]Department of Fisheries and Wildlife Science, University of Missouri, Columbia, MO 65211; [4]Department of Natural Resources and Environmental Science, University of Nevada Reno, Reno, NV 89512. ***FECAL INDICES IN MULE DEER WINTERING IN CLOSE PROXIMITY TO ELK.***

We measured nitrogen, neutral detergent fiber, and glucocorticoid metabolites in mule deer (*Odocoileus hemionus*) feces at Tex Creek Wildlife Management Area near Idaho Falls, Idaho, USA, during Jan-Mar 2007 and Jan-Apr 2008. We also used DNA techniques to determine sex of the individual depositing each fecal group. Finally, we used location data derived from GPS collars placed on elk (*Cervus elaphus*) and kernel techniques to build maps of elk population density for each month for both winters. We then analyzed each fecal index as a function of year, month, sex, elk population density, and interactions among those variables. In 2007, there was a significant positive relationship between elk population density and glucocorticoid metabolites found in deer feces, indicating increased stress among mule deer wintering near large numbers of elk. Conversely, deer fecal nitrogen was inversely related to elk density, possibly because of reduced protein intake when competing closely with elk. Neutral detergent fiber in deer feces, a function of dietary digestibility, did not vary as a function of elk density. No differences between sexes in any of the fecal indices among deer were observed. The first year of this study (2007) was a mild winter, and elk started to leave the winter range in late February. Consequently, glucocorticoid metabolites in deer feces decreased and fecal nitrogen in deer feces increased as elk began to migrate. The increase in deer fecal nitrogen was likely also a result of early green-up of vegetation. The second winter (2008), by contrast, was more severe with deeper snow persisting for most of winter, and both mule deer and elk stayed on the winter range for longer

than in 2007. The 2008 data was not all available at this time this abstract was written, but will be presented and discussed at the meeting.

**BALKENHOL, NIKO**[*1], J. Holbrook[1], P. Zager[2], C. White[2], J. Rachael[2], D. Onorato[3], R. DeSimone[4], and L. Waits[1]. [1]Department of Fish & Wildlife Resources, University of Idaho, Moscow, PO Box 441136, ID 83844-1136, USA; [2]Idaho Department of Fish & Game; [3]Florida Fish and Wildlife Conservation Commission; [4]Montana Fish, Wildlife and Parks. ***HIERARCHICAL POPULATION GENETIC STRUCTURE IN COUGARS (PUMA CONCOLOR) OF IDAHO AND WESTERN MONTANA.***

Evaluating the genetic structure of wildlife populations is important for conservation and management because it can help identify natural and human-caused barriers to animal movement. Genetic approaches for evaluating landscape connectivity are particularly valuable for research on large carnivores that live at low densities and are able to disperse over long distances. We investigated the genetic population structure of cougars (*Puma concolor*) across Idaho and the Garnet Mountains in Montana by genotyping over 360 individuals using 12 highly-variable microsatellite loci. We then used Wombling, a barrier detection method, to elucidate major genetic discontinuities. In addition, we explored three different genetic clustering methods, and a gradient-based approach to quantify hierarchical genetic structures. Finally, we tested for sex-biased dispersal and landscape influences on observed genetic patterns. Our results show that genetic differentiation of cougars in our study area is hierarchically structured into different levels. Genetic discontinuities correspond to major landscape boundaries like the Snake River Plain at broad spatial scales and to more subtle landscape gradients at finer spatial scales. These patterns generally hold for both sexes, and the analyses provided only weak evidence for sex-biased dispersal. Our results offer important information regarding the management of cougars in the region, and illustrate how complex genetic structures can be analyzed through a combination of analytical approaches.

**BEUCLER, MICHELE and Gregg Servheen**, Idaho Department of Fish and Game, Boise, Idaho 83707. ***MIRROR, MIRROR, ON THE WALL: REFLECTIONS ON THE NORTH AMERICAN MODEL OF WILDLIFE CONSERVATION.***

In this presentation, we offer our observations on the relevance and usefulness of the North American Model of Wildlife Conservation (the Model) in the 21st century by compiling demographic, participation, and attitudinal information about hunting and hunters from recent human dimensions research and National Survey data. Although the Model has been rightly touted as a success, we offer reflections on why the Model needs to adapt to better resonate with the majority of citizens who do not hunt as well as to confront the more insidious threats to 21st century wildlife conservation such as increasing human development and nature-deficit disorder. First, we present four reflections of the Model to deepen the conversation around it. We then propose to more clearly describe "declining participation in hunting" within the contexts of agency revenue, management options, hunting legacy, and political support. We explain five reasons why hunter recruitment and retention efforts may be ineffective and may be distracting state wildlife agencies from engaging citizens in general and helping to broaden wildlife conservation. Next, we give examples of how state wildlife agencies might connect with and engage non-hunters, including adopting a citizen-based business model and expanding what we call "hunting" and who we call "hunters". Finally, we suggest an adaptation of the Model to encompass 21st century conservation challenges and to expand recruitment and retention beyond hunting and into broader outdoor experiences.

**BOWYER, R. TERRY**[1], J. G. Kie[1], D. K. Person[3], and K. L. Monteith[1]. [1]Department of Biological Sciences, Idaho State University, Pocatello, ID 83209; [3]Division of Wildlife Conservation, Alaska Department of Fish & Game, Ketchikan, AK 99901. ***METRICS OF PREDATION: PERILS OF PREDATOR-PREY RATIOS.***

Our purpose is to examine the usefulness of predator-prey ratios and delineate factors that may cloud their interpretation. The validity of predator-prey ratios has been questioned and many caveats are necessary for their meaningful interpretation. Despite these well-known difficulties, predator-prey ratios are widely used by wildlife agencies and their use regularly reappears in the scientific literature. Potential problems with predator-prey ratios include determining where and when to sample, the double-variable nature of ratios, interpretation of point estimates with no variance, their inability to cope with compensatory mortality, a potential lack of equilibrium between populations of predators and prey, and time lags in response of predators to changing prey density. Further complications for interpreting predator-prey ratios include variation in functional response of predators to prey density, presence of alternative prey, and the nearness of the prey population to carrying capacity ($K$). We used program STELLA to model population dynamics, including density dependent processes, under all combinations of predator and prey increase and decline. We conclude that these effects were impossible to disentangle. We also present a new technique to develop confidence intervals for predator-prey ratios, which should aid in their interpretation. We discuss the sensitivity of predator-prey ratios with respect to compensatory mortality and conclude they cannot cope with this process. We caution that the temptation to use predator-prey ratios is often irresistible, but their reliability is highly questionable.

**GILLETTE, GIFFORD*, D. Delehanty, and J. Connelly**, Idaho State University, Pocatello, Idaho, 83201. ***LONG TERM MONITORING OF A MOUNTAIN QUAIL (OREORTYX PICTUS) TRANSLOCATION PROJECT IN THE BENNETT HILLS OF IDAHO.***

The objective of our project is to augment a vulnerable population of 50-75 mountain quail in a portion of suitable historic habitat in southern Idaho while obtaining life history information. This reintroduction began with translocations in 2006 and evaluating its success has posed three challenges: 1) inaccessible private lands 2) evidence of reproduction, and 3) evidence of winter survival. The addition of a second release site, transmitters with mortality signals, and trapping quail with a modified night-netting technique has helped to alleviate these challenges. The results are from the first year (winter 2007-08 and spring/summer 2008) of a two year project. Seventy-five percent (9/12) of mountain quail monitored through the winter of 2007-08 were confirmed mortalities and none of the monitored birds were confirmed to survive. Snow accumulation in the Bennett Hills was much deeper and persisted much longer than average. However, anecdotal evidence indicates that some birds survived the harsh winter avoiding population collapse. The following spring 73 mountain quail (46 radio-collared) were released at two sites 20 km apart on May 1, 2008. After 150 days of monitoring, the combined survivorship for the two sites was 44%. We found no difference in survivorship between sites despite a significant difference in distance moved ($p=0.01$, $n=22$) between sites. During the breeding season, 60% of monitored nests were successful ($n=10$). Of these, 50% produced successful broods with at least one bird surviving to 28 days. In addition, 2 incidental broods were observed. The translocation project in the Bennett Hills has consistently shown higher survival rates than average for this species. And, for the first time, evidence of reproduction is comparable to other mountain quail studies. Population dynamics in the Bennett Hills may be influenced by the prevailing winter conditions.

**GOLDBERG, CAREN S.* and L. P. Waits**, University of Idaho, Moscow, Idaho 83843. ***PATTERNS OF AMPHIBIAN CHYTRID FUNGUS ON POND-BREEDING AMPHIBIANS OF NORTH IDAHO.***

The amphibian chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*) has recently been described in association with amphibian population declines around the world and is now believed to be responsible for the decline or extinction of up to 200 species of frogs. Genetic evidence indicates that this is a newly emerged pathogen; positive specimens in North America date back to 1961. While the introduction of this pathogen has been documented causing mass mortalities in amphibian communities at high elevation tropical sites, impacts on temperate communities are

less well known. We collected swab samples from 315 long-toed salamanders (*Ambystoma macrodactylum*) and 228 Columbia spotted frogs (*Rana luteiventris*) at 64 ponds in north Idaho during the spring and summer of 2004 and 2005. We determined the amount of *Bd* these amphibians were carrying using quantitative PCR and tested for evidence of genetic bottlenecks using 8 microsatellite markers. Columbia spotted frogs were infected with *Bd* at all sites where >1 individual was sampled while only 2 long-toed salamanders tested positive for this fungus. Columbia spotted frogs did not show evidence of genetic bottlenecks that would indicate recent reductions in population size. Long-toed salamanders in this system breed in late winter, before Columbia spotted frogs are active, and spend the rest of the year in terrestrial habitat. This difference in thermal climate during aquatic activities, primarily non-overlapping use of wetlands, and the terrestrial habitat of long-toed salamanders during the non-breeding season may limit their exposure to *Bd* in this system. More research is needed before we can determine whether *Bd* is a threat to the persistence of this amphibian community, however, we did not find evidence that this fungus is currently causing declines in the sampled populations of these species.

**GRIFFIN, KATHLEEN**, M. Hebblewhite, P. Zager, S. Barber-Meyer, D. Christenson, S. Creel, N. Harris, M. Hurley, D. Jackson, B. Johnson, D. Mech, W. Myers, J. Raithel, M. Schlegel, B. Smith, C. White, and P. White. University of Montana, Missoula, Montana, 59812. ***CAUSE-SPECIFIC MORTALITY AND THE ROLE OF PREDATORS AND CLIMATE IN NEONATAL ELK SURVIVAL ACROSS FIVE WESTERN STATES.***

Knowledge of elk (*Cervus elaphus*) calf survival and cause-specific mortality is essential to our understanding of elk population dynamics. Past local studies of elk have demonstrated that survial and cause-specific mortality rates may fluctuate regionally with environmental conditions, habitat quality, the assemblage of predators present, as well as characteristics particular to individuals such as sex, age, birth weight and date, and condition of the mother. A regional meta-analysis of elk calf survival allows researchers to answer questions about the large-scale role of climate, predation, and habitat quality on elk calf recruitment that can not be answered within any one specific study area. Our overall goal was to estimate mean neonatal elk survival rates and variation across broad spatial and temporal scales which include different habitats, elk population densities, age, predator assemblages, and climatic conditions. For this meta-analysis, we used data from 12 different studies in Oregon, Washington, Idaho, Montana, and Wyoming ranging from 1973-2006. Most mortality of calves occurs within the first summer, thus our analysis was focused on neonatal elk (May – September). We used telemetry data on over 2,000 marked calves to model survival as a function of a number of regional and independent covariates in a Cox proportional hazards framework. We characterize cause-specific mortality and quantify spatial and temporal patterns of elk calf survival across the 5 states. Ultimately, we provide wildlife managers with a regional perspective of trends in neonate elk survival and its drivers towards a goal of better elk management.

**HURLEY, MARK**[1], M. Hebblewhite[2], C. G. White[3], M. D. Scott[4], H. M. Miyasaki[5], John R. Skalski[6], Richard L. Townsend[6], James W. Unsworth[7], Pete Zager[8]. [1]Idaho Department of Fish and Game, P. O. Box 1336, Salmon, ID 83467; [2]Wildlife Biology Program, College of Forestry and Conservation, University of Montana, Missoula, Montana, 59812; [3]Idaho Department of Fish and Game, 3101 S. Powerline Road, Nampa, ID 83686; [4]Idaho Department of Fish and Game, 555 Deinhard Lane, McCall, ID 83638; [5]Idaho Department of Fish and Game, 4279 Commerce Circle, Idaho Falls, ID 83401; [6]School of Aquatic and Fisheries Sciences, University of Washington, 1325 Fourth Avenue, Suite 1820, Seattle, WA, 98101; [7]Idaho Department of Fish and Game, P. O. Box 25, Boise, ID, 83707; [8]Idaho Department of Fish and Game, 1540 Warner Ave., Lewiston, ID 83501. ***PREDICTING WINTER SURVIVAL OF MULE DEER FAWNS FROM CLIMATIC AND VEGETATIVE COMMUNITY COVARIATES.***

Idaho's mule deer (*Odocoileus hemionus*) monitoring program has included measures of winter fawn survival to estimate the demographic effects of high annual variation in survival. Beginning

in 1998, 185 to 253 6-month old fawns were marked with radio collars within 6 permanent and 3-4 roving sites each year. Our objectives were to provide managers with current winter survival and develop predictive models to estimate fawn survival in the absence of marked fawns. For predictive covariates, we used digital monthly precipitation and temperature spatial data, and characterized landscape scale vegetation communities using an existing digital vegetation type map (http://sagemap.wr.usgs.gov). We estimated seasonal 95% kernel home ranges from the cumulative sample of radio collared fawns for each site, and determined the spatial climate and vegetation community composition covariates for each season and year, 1998-2006. Winter survival was divided into 3 time periods beginning 15 December and ending 15 May based on similar mortality hazard. We estimated fawn survival using known fate survival models developed in SURPH. We ranked 3 suites of climate models; energy assimilation, energy expenditure, and combinations of both using AIC. Models were constructed using the entire data set and validated with a 5-fold cross validation procedure. The top climate-only model included precipitation and minimum temperatures in the previous winter, late summer, early winter, and late winter explained 60% of the variance in winter fawn survival. The third ranked model only included climate covariates prior to 1 January and explained 54% of the variance. Vegetative community covariates were not important in general models, however, additional models will be developed to examine the variance introduced by location. Climate variables were useful for predicting winter fawn survival. The ability to predict fawn survival pre-winter will allow managers the time necessary to change management proposals prior to the next hunting season.

**KEMNER, DON**, Idaho Department of Fish and Game, Boise, Idaho 83707. ***IDAHO DEPARTMENT OF FISH AND GAME'S FARM BILL COORDINATION PROGRAM – HABITAT DEVELOPMENT AND RESTORATION ASSISTANCE TO FARMERS AND RANCHERS.***

Idaho Fish and Game is providing fish and wildlife habitat restoration technical service to private landowners via U.S. Department of Agriculture's farm bill conservation programs. During the past 5 years, Fish and Game farm bill coordinators, located in USDA county service centers, have assisted approximately 300 private landowners. Habitat development or restoration projects included stream and riparian restoration, wetland construction, CRP seeding and rehabilitation, and shrubland manipulation. The Department is currently implementing CRP-SAFE (State Acres for Wildlife Enhancement) to improve Columbian sharp-tailed grouse habitat in eastern Idaho, and assisting the Idaho Soil Conservation Commission with the Idaho CREP (Conservation Reserve Enhancement Program).

**LONG,RYAN***, J. G. Kie, and R. T. Bowyer. Department of Biological Sciences, Idaho State University, Pocatello, ID 83209. ***RESOURCE SELECTION AND MOVEMENTS BY FEMALE MULE DEER: EFFECTS OF REPRODUCTIVE STATUS.***

Many life history events such as births in large mammals are of interest to ecologists. For example, when and where mule deer (*Odocoileus hemionus*) choose to give birth in heterogeneous landscapes can have important conservation implications. Such events, however, can be difficult to detect. We investigated whether movement patterns derived from GPS telemetry collars could be used to infer the timing and location of parturition in mule deer in eastern Oregon, USA. In addition, we evaluated whether patterns of resource selection by female mule deer differed among periods associated with gestation, parturition, and lactation. Female mule deer showed a pronounced reduction in mean movement rates in early June when most were giving birth. In addition, they frequently exhibited an abrupt shift in patterns of resource selection during the week of parturition, showing selection for steeper and more northerly slopes, closeness to water sources, and forested habitats with smaller trees. Deer also avoided high densities of North American elk (*Cervus elaphus*) during parturition. We suggest that movement rates derived from GPS collars can be a useful tool in studying resource selection associated with parturition in mule deer and other large mammals.

**MONTEITH, KEVIN***[1,2], L. E. Schmitz[3], J. A. Jenks[1], J. A. Delger[1], and R. T. Bowyer[2]. [1]Department of Wildlife and Fisheries Sciences, Box 2140B, South Dakota State University, Brookings, SD 57007; [2]Department of Biological Sciences, 921 South 8th Avenue, Stop 8007, Idaho State University, Pocatello, ID 83209; [3]South Dakota Department of Game, Fish and Parks, 3305 West South Street, Rapid City, SD 57702. ***GROWTH OF MALE WHITE-TAILED DEER: CONSEQUENCES OF MATERNAL EFFECTS.***

Identifying maternal effects on offspring is critical to interpreting population dynamics, but the duration of maternal effects and which life-history traits they influence is not well understood. We quantified growth and development of male white-tailed deer (*Odocoileus virginianus*) originating from the Black Hills, and from eastern South Dakota, USA, in a controlled environment with high-quality nutrition. Despite being in good nutritional condition, males from the Black Hills ceased rapid growth 41 days earlier, were 29% smaller at asymptotic body mass, and grew significantly smaller antlers than males from eastern South Dakota. Females from eastern South Dakota were 14.9 kg larger than females from the Black Hills, yet birth mass of male offspring was similar for females from the 2 regions. Male offspring of 1st-generation deer from the Black Hills attained a 30% larger asymptotic body mass and grew significantly larger antlers than their sires. Body mass and antler size of 2nd-generation males of Black Hills origin approached that of 1st-generation males from eastern South Dakota at maturity. Suppression in growth of 1st-generation males of the Black Hills and increased growth by their offspring supported an influence of maternal and grandmaternal condition during gestation on subsequent growth of offspring and highlighted the significance of nutrition during gestation. These intergenerational effects indicate that measures of animal condition and population performance might reflect past rather than current conditions, and illustrate the potential for time lags in responses of populations to improved environmental conditions.

**MOSER, ANN, T. Hemker, and D. Kemner**, Idaho Department of Fish and Game, Boise, Idaho 83707. ***THE STATE OF SAGE-GROUSE IN IDAHO.***

The first Idaho sage-grouse State Plan was completed in 1997. Since then, much has happened in the sage-grouse world, both locally and range-wide, such as ESA actions and lawsuits, significant changes in the shrubsteppe landscape, and the advent of sage-grouse local working groups. This presentation summarizes the state of sage-grouse in Idaho over the last 11 years, including reports on sage-grouse populations and habitats, research studies, and conservation efforts.

**MUSIL, DAVID D.**, Idaho Department of Fish & Game, Jerome, Idaho 83338. ***NEST HABITAT USE BY GREATER SAGE-GROUSE.***

Greater sage-grouse (*Centrocercus urophasianus*) nest sites (n=146) and random plots (n=138) were sampled during 2003-2005 throughout their population range in southern Idaho to describe differences of use vs. available habitat and between nest success and age classes. Standard methods were used to measure habitat within 10 m from the center of the nest or random plot including: line intercept for canopy coverage of shrubs, Daubenmire frames for understory coverage, and drupe height of grasses and shrubs. A modified Robel pole was used to measure horizontal cover from the perspective of the nesting hen. Multivariate analysis of variance revealed sage-grouse used sites with less cover of bare rock, more horizontal cover, taller live grass, and greater canopy coverage of sagebrush. Principle component analysis was used to reduce 91 habitat variables to 3 components that accounted for 51% of the variance in the data. Principle component I had 31% of the variance and was represented by 8 measurements of shrub height. Component II (11% of variance) combined 8 variables of horizontal cover. Component III (9% of variance) used 6 variables of shrub density. Sage-grouse used nest sites with taller shrubs and less shrub density than available at random. Adult nests appeared to have greater horizontal cover than yearling nests. Generally, habitat use by nesting greater sage-grouse was

within the recommended guidelines established for breeding habitat and grouse are likely selecting nest sites for concealment from predation and adequate views of approaching predators.

M. Hurley, **PAULEY, G.**, C. White, and P. Zager. Idaho Department of Fish and Game, Kamiah, Idaho, 83536. ***EFFECT OF WOLF PREDATION ON ELK DEMOGRAPHICS IN THE LOLO ELK MANAGEMENT ZONE, IDAHO.***

We estimated survival and cause-specific mortality rates of adult cow and 6-month-old calf elk in the Lolo zone, Idaho. We monitored radio-collared cow elk for 6 years (2002-08), and calf elk during 2 years (2005-06). Both adult cow (0.79) and calf (0.73) survival rates were lower than expected, and well below thresholds necessary to sustain the population in the absence of hunting. Wolf predation was the primary cause of death accounting for 79% and 67% of cow and calf deaths, respectively. Malnutrition was implicated as a predisposing factor in only 2 of 28 cow deaths attributed to wolf predation, while malnutrition was not a factor in any wolf-caused calf elk deaths. Body condition data suggested fat reserves of captured cow and calf elk were adequate for over-winter survival. The mean age of cow elk killed by wolves was 8.1 years, and 61% were prime-age (≤9 years). During a previous investigation, cow survival was estimated to be 0.89, during 1986-91, prior to wolf reintroduction. The Lolo Zone elk population is limited by the additive effects of wolf predation.

**POLLOCK, JESSICA* and K. Vierling**. University of Idaho, Moscow, Idaho 83843. ***A COMPARISON OF INTERNAL TEMPERATURES BETWEEN NEST BOXES AND ARTIFICIALLY-CREATED CAVITIES FOR SECONDARY CAVITY-NESTING BIRDS IN NORTHERN IDAHO.***

The internal microclimate of a tree cavity can affect both egg and nestling survival in cavity nesting bird species. In 2007, we compared internal cavity temperatures among 3 cavity types: natural cavities (n=23), nest boxes (n=23) and artificially created internal cavities (n=23). We placed temperature data loggers (DS1921Z-F5 Dallas Thermochron iButton) near the bottom center of each cavity and took temperature readings every 60 minutes for a four day period at the end of the breeding season. Temperatures between natural and artificial internal cavities did not differ significantly from each other, but both differed significantly from nest box temperatures ($F = 3.38$, $P = 0.0404$). Daily minimum temperatures inside the natural and artificial internal cavities averaged ~ 2.5 °C higher than inside nest boxes. Using AIC and multiple linear regression we found that the best predictors of cavity temperature inside natural and artificial internal cavities were tree diameter at breast height and decay stage. Small diameter trees with high decay showed the greatest extremes in cavity temperature relative to the ambient environment. We suggest that artificial internal cavities are climatically equivalent to natural cavities, and suggest that their use as a mitigation tool be further examined.

**POLLOCK, MARK* and K. T. Vierling**, University of Idaho, Moscow, Idaho 83844. ***EFFECTS OF SHEEP GRAZING ON BREWER'S SPARROW NEST SITE SELECTION AND REPRODUCTIVE SUCCESS IN MOUNTAIN BIG SAGEBRUSH HABITAT.***

We studied Brewer's Sparrows (*Spizella breweri*) on private ranchland managed by Lava Lake Land and Livestock, in Blaine County, Idaho. We chose two 50-ha sites dominated by mountain big sage (*Artemisia tridentata vaseyana*), which each included three treatments: ungrazed, lightly grazed (about 20% utilization of herbaceous primary productivity), and heavily grazed (about 50% utilization). In addition to grazing utilization estimates, 16 habitat attributes were measured at 780 random points distributed across the sites, which we subsequently reduced to 4 synthetic variables using principle components analysis. Conditional logistic regression analysis of nest site selection at 38 nests revealed a significant quadratic grazing effect (linear term $p = 0.023$; quadratic term $p = 0.013$) indicating a slight preference for lightly grazed sites, but a pronounced avoidance of heavily grazed sites. Other significant effects included preferences for greater

biomass ($p = 0.046$), a higher grass:forb ratio $p = 0.015$), and greater shrub cover $p = 0.042$). Analyses of nest survival and clutch size at 50 nests revealed no significant relationships with grazing severity or habitat components.

**RACHLOW, JANET**[1], R. Peter[2], L. Shipley[3], A. Price[1], D. Sanchez[4], and W. E. Zumpf[5]. [1]Department of Fish and Wildlife, University of Idaho, Moscow, Idaho 83844-1136; [2]National Black-Footed Ferret Conservation Center, 19180 North East Frontage Road, Carr, Colorado 80612; [3]Department of Natural Resources, Washington State University, Pullman, Washington 99164-6410; [4]Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon 97331-3803; [5]Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming 82071. ***EVALUATING SUBLETHAL EFFECTS OF TELEMETRY ON WILDLIFE: RADIO COLLARS ON PYGMY RABBITS.***

Sublethal effects of telemetry transmitters on wildlife are difficult to assess, yet critical to data gathered during wildlife studies. Potential effects include changes in activity, movement patterns, foraging efficiency, reproduction, growth, and body condition. We assessed whether capture and attachment of radio-collars to pygmy rabbits altered the behavior, body mass, or movement patterns of rabbits shortly after collaring. We predicted that rabbits would: 1) increase frequency of grooming behaviors; 2) lose body mass; and 3) exhibit greater movements after capture and radio-collaring relative to subsequent, seasonally-adjusted patterns of space use. We fitted adult pygmy rabbits with radio collars weighing 5 g (approximately 0.9-1.4% of adult body mass). We quantified frequency of grooming and change in body mass for 9 captive pygmy rabbits during 1 week before and 1 week after radio collaring. Frequency of grooming behaviors increased significantly after attachment of radio collars. However, frequency of scratching declined significantly during the week after collaring, and levels were close to pre-collaring rates after 1 week. Body mass fluctuated for captive rabbits, but did not decline significantly following collaring. We used data from rabbits fitted with collars at field sites in the Lemhi Valley, Idaho, during 2003-2008 to evaluate movement parameters including distance from capture location, distance between successive locations, and distance from the geometric center of seasonal locations. Season, sex, year, and study site were covariates in these analyses. Although individual variation was high, rabbits showed a trend towards increased movement immediately following capture and radio-collaring. Many rabbits returned to the proximity of capture locations after 1-2 weeks. Because activity and some movement parameters showed short-term variation associated with capture and collaring, we hypothesize that survival of radio-collared rabbits might be reduced shortly after capture as a function of changes in these behaviors behavior.

**ROBINSON, SCOTT R.**, Bureau of Land Management, Retired, Coeur d'Alene, ID 83815. ***AN EVALUATION OF WILDLIFE HABITAT AND SILVICULTURAL TREATMENTS IN NORTHERN IDAHO.***

The Bureau of Land Management removed 5.4 million board feet of timber from 700 acres of BLM public lands in Boundary County, Idaho. Approximately 50% of this volume was small diameter trees and 20% was pulpwood material, which was either too small or too defective to be manufactured into dimensional lumber. This presentation describes the inventory (before) and monitoring (after) of habitat for elk and migratory birds as it relates to the NEPA analysis, but is not intended to pass judgment of either the proposed or resultant removal of timber. Forest vegetation data was collected and processed using the Forest Service's Forest Vegetation Simulator, which projects tree growth into future years. Using the "before" data, the foresters proposed cutting prescriptions and I analyzed the effects to wildlife. Using the "after" data, I compared the resultant cutting against the anticipatory effects to wildlife habitat. "Before" and "after" values for tree top height, canopy closure, crown profile area, and crown volume match one another during the first 50 years after treatment. "Before" and "after" values for trees per acre, foliage biomass, snags, and dead surface fuels (aka logs) have similar but separate trend

lines. The completed project met the snag requirements, but failed to meet the stipulation to retain larger dead surface fuels. "After" values consistently hide less of an elk at 200 feet than the "before" values. Antidotal observations during 2007 correspond to 78% of an elk that could be visible at 200 feet. Therefore, the resultant cover to forage ratio of 12:88 as predicted in the Environmental Analysis is validated. Based upon my observation and interpretation of these results, the forestry growth model provides a useful tool for assessing and monitoring the impacts to wildlife habitat from prescribed silvicultural treatments.

**RUPP, DAVID*** and J.M. Scott, University of Idaho, Moscow, Idaho 83844. ***STRATEGIC BIRD CONSERVATION IN THE NATIONAL WILDLIFE REFUGE SYSTEM: OPPORTUNITIES FOR INCREASING SPECIES' REPRESENTATION AND REDUNDANCY.***

The U.S. Fish and Wildlife Service (USFWS) has developed wildlife, habitat, and biodiversity goals for the National Wildlife Refuge System (NWRS) in response to the NWRS Improvement Act of 1997. The NWRS is attempting to coordinate its efforts towards strategic growth and maintaining biodiversity at multiple scales and with conservation partners. To assess the current status of the NWRS in reaching some of these goals, we used bird lists from the refuges to assess the representation and redundancy of all bird species at multiple scales across the System. We obtained 381 lists covering 427 (78.3%) of the 545 refuges, including lists from all six refuges in Idaho. Of the 90 federally listed endangered or threatened bird species, subspecies, and distinct population segments in November 2008, 55 occurred on at least one refuge. Those species not occurring in the System could serve as conservation targets for strategic growth of the System. When these targets are combined with an analysis of the distribution of refuges by Bird Conservation Regions, priority conservation opportunities become readily apparent. When we focused this process on the species listed as Birds of Conservation Concern by the USFWS in the Great Basin and Northern Rockies Bird Conservation Regions of which Idaho is a part, we found that the Idaho refuges provide 18.8% of the Lewis's Woodpecker (*Melanerpes lewis*)and 14.3% of the Greater Sage-Grouse (*Centrocerus urophasianus*) occurrences in the NWRS. The Flammulated Owl (*Otus flammeolus*) and the White-headed Woodpecker (*Picoides albolarvatus*), species from these lists with only six NWRS occurrences each and none in Idaho, could serve as conservation targets in this region. When identifying conservation targets, we propose that National Wildlife Refuges cannot be understood separately from the entirety of conservation lands in the United States and surrounding regions.

**SCOTT, J. MICHAEL**, US Geological Survey and Wildlife Biology, University of Idaho, Moscow, Idaho 83844. ***CONSERVATON RELIANT SPECIES: OUR NEW RELATIONSHIP WITH NATURE.***

Passage of the Endangered Species Act (ESA) in 1973 carried with it the assumption that we would identify species at risk and threats to their existence, implement management actions that would mitigate or eliminate threats, the species would increase in numbers and distribution, recovery goals would be achieved, and the species would be delisted as recovered and thrive under existing regulations. The protections afforded under the ESA would no longer be needed. Eighty percent of species currently under the ESA fail to meet that assumption. They require species-specific conservation interventions (e.g., control of predators, competitors, nest parasites, prescribed burns, altered hydrological processes, etc.). They are conservation reliant. Can they be delisted?

**SMITH, SONJA M.***, P. R. Krausman, J. Derbridge, and J. A. Merkle. University of Montana, Missoula, Montana 59812. ***SUBURBAN AND EXURBAN INFLUENCES ON WILDLIFE AND FISH.***

Urbanization is a primary threat to biodiversity and wildlife populations. However, urban sprawl has been addressed as a serious issue only recently, and no state is immune to the issues facing wildlife and the conflicts created by urbanization. We reviewed >400 articles related to game, non-game, and fish species that address how suburban and exurban growth influence fauna in

Montana and other states. Most studies were descriptive, examined game species, lasted 2—5 years, and were university-funded. Although some species adapt well to urban sprawl, many more are negatively affected. Fish face challenges due to contaminants, altered passageways via roads and culverts, and impervious surface cover, which combined can cause a decline in stream richness and fish communities. Reptiles and amphibians also decrease with increasing urbanization due to reduced and fragmented habitat and increases in predation, road networks, and exotic species. There is a reduction of native avian species richness and diversity as urbanization increases due to exotic species, increased nest predation, and urban noise. Mammals are negatively affected by urbanization due to habitat alteration, human-wildlife conflicts, and a score of other issues. Habitat conservation is the most important way to minimize the effects of urbanization on wildlife populations. Anthropogenic effects of urbanization and the conflicts that arise can only be addressed properly through collaborative cooperation that provides clear objectives with the mechanisms to obtain them.

**STENGLEIN, JENNIFER** *, C. Mack, D. Ausband, M. Mitchell, P. Zager, S. Nadeau, and L. Waits. University of Idaho, Moscow, Idaho 83844. ***MONITORING AN IDAHO GRAY WOLF POPULATION: A NONINVASIVE GENETIC APPROACH.***

Radio-telemetry has traditionally been used to monitor the Idaho gray wolf population and though effective, radio-telemetry is costly, time intensive and invasive. As gray wolf numbers are growing in Idaho, the number of wolf packs without a radio-collared individual is increasing. Cost-effective alternative monitoring methods are thus needed to monitor wolf distribution and numbers. In this study, we evaluate a noninvasive monitoring approach of collecting scat and hair at predicted rendezvous sites. In the summers of 2007 and 2008, we conducted a noninvasive genetic sampling survey across a 10,300 $km^2$ area of central Idaho where packs were simultaneously monitored with radio-telemetry. In 2007 we collected 247 scat and hair samples, successfully genotyped 123 of them and detected 60 unique wolves. In 2008 we collected 1888 scat and hair samples. Currently we have processed 889 of these samples, and successfully genotyped 350. We detected 96 unique wolves and 34 were recaptured from 2007. The noninvasive genetic sampling population estimate for 2007 was 90 (95% CI: 76-128) wolves and for 2008 was 119 (95% CI: 105-140) wolves. These estimates were very close to the population estimates from radio-telemetry of 102 wolves in 2007 and 129 wolves in 2008. Across both years, we detected 24 of 25 study packs and 12 of 19 litters. By comprehensively sampling occupied rendezvous sites, we identified the number of wolves in 6 reproductive packs. This noninvasive genetic sampling approach holds much promise for accurate monitoring of the wolf population in Idaho in targeted areas where number of breeding units, pack counts, and wolf abundance estimates are management goals.

**STOPAK, SCOTT** and J. Knetter. U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Wildlife Services, 9134 W. Blackeagle Dr., Boise, ID 83709; Idaho Department of Fish and Game, P.O. Box 25, Boise, ID 83707. ***AN OVERVIEW OF AVIAN INFLUENZA MONITORING EFFORTS IN IDAHO (2006- PRESENT) IN DIRECT SUPPORT OF AN EARLY DETECTION SYSTEM FOR HIGHLY PATHOGENIC H5N1 AVIAN INFLUENZA IN WILD MIGRATORY BIRDS, U.S. INTERAGENCY STRATEGIC PLAN.***

The role of migratory birds in the spread of highly pathogenic avian influenza (HPAI) is not well understood. The occurrence of HPAI, subtype H5N1, has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the United States. In 2006, an annual surveillance plan was developed to detect this virus in wild, migratory birds, such as waterfowl and shorebirds, in the United States. As part of this nationwide effort, biologists from the Idaho Department of Fish & Game, the USDA-APHIS-Wildlife Services, the U.S. Fish & Wildlife Service, and the ShoBan Nation participated in these monitoring and

surveillance activities in Idaho. We present a summary of current HPAI monitoring efforts in Idaho, as well as an overview of the national monitoring program.

**SVANCARA LEONA K.**, J. M. Scott, T. R. Loveland, A. B. Pidgorna. ***ASSESSING THE ECOLOGICAL CONTEXT OF THE NATIONAL PARK AND NATIONAL WILDLIFE REFUGE SYSTEMS.***

Since establishment of Yellowstone National Park (1872) and Pelican Island National Wildlife Refuge (1903), dramatic changes have occurred in both ecological and cultural landscapes across the US. The ability of protected areas to maintain current levels of biodiversity depend, at least in part, on the integrity of surrounding lands. Our objective was to quantify the extent and pattern of natural land cover, risk of conversion, and relationships with demographic and economic variables in counties surrounding both parks and refuges, just parks, just refuges, or counties distant from either type of protected area. We found that conservation risk (ratio of converted to protected lands) in counties surrounding parks or refuges was significantly lower than distant counties and even lower in those counties near both parks and refuges. In addition, counties surrounding both parks and refuges had significantly higher per capita income than any others. Our results provide a consistent, national-level assessment of potentially adverse changes on lands surrounding parks and refuges and indicate that any one agency or organization cannot conserve biodiversity alone.

**THOMPSON, TOM*** and K. Reese, University of Idaho, Moscow, Idaho 83844, and A. Apa., Colorado Division of Wildlife, Grand Junction, Colorado 81505. ***FROM THE NEST TO THE LEK: SURVIVAL, NATAL DISPERSAL, AND RECRUITMENT OF JUVENILE GREATER SAGE-GROUSE IN NORTHWESTERN COLORADO.***

Juvenile survival, dispersal, and recruitment are important factors influencing the persistence and growth of wildlife populations. There is currently limited information on how these factors could be contributing to the recent and wide-spread decline in greater sage-grouse (*Centrocercus urophasianus*) populations. In 2005 we initiated this study to determine these rates by radio-marking and tracking individuals from their natal nest through first breeding season. Between 2005 and 2007 we radio-marked 578 chicks from 129 broods at 1-3 days post-hatch, and then at 16-weeks of age we radio-marked 155 juveniles (107 known from hatch and 48 random). Survival to 16 weeks averaged 21.3% and was variable among years. After 16-weeks survival was consistent over the 3 years. For both genders survival was lowest during the fall compared to the winter (73.0% and 93.9%, respectively). Overall survival of juveniles from hatching to entering the breeding population the following year was 14.6% and differed among years. Greater than 98% of all juveniles returned to the populations where they were produced or captured. During the first breeding season, all juvenile males averaged 5.7 km from the natal area. In contrast, females were on average 2.8 km of their natal area with 63.9% of the first nest within 2 km of the natal nest. Our results indicate that juvenile survival and recruitment can be highly variable between years and that these factors most likely influence population persistence and growth at much smaller spatial scales (lek complex or local population level) than previously thought. We will discuss possible management implications for these findings.

**WAITS, LISETTE**[1], J. Adams[1], B. Bosworth[2], and J. Rachlow[1]. [1]University of Idaho, Moscow, ID 83844-1136. [2]Idaho Department of Fish and Game, Boise, ID 83707. ***DEVELOPMENT OF A FECAL DNA DETECTION METHOD FOR PYGMY RABBITS.***

The pygmy rabbit (*Brachylagus idahoensis*) is a species of conservation concern across its range, yet accurate data on current distribution are lacking in many areas. Survey methods for pygmy rabbits include the detection of burrows, fecal pellets, and/or tracks. The geographic range of the pygmy rabbit overlaps with the range of the mountain cottontail (*Sylvilagus nuttallii*), desert

cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), and white-tailed jackrabbit (*Lepus townsendii*). Thus, field identification based on detection of indirect sign has the potential to be misleading. To address this challenge, we assessed the feasibility of identifying pygmy rabbits using DNA extracted from fecal pellets. Using published and newly generated sequence data from the mitochondrial DNA cytochrome B region, we developed species-specific PCR primers that produce DNA fragments of different lengths for pygmy rabbits and all sympatric species. Preliminary testing on 53 tissue samples from known black-tailed jackrabbits, white-tailed jackrabbits, mountain cottontails, eastern cottontails, and pygmy rabbits indicated that all species were correctly identified with the genetic test. This test was applied to 158 fecal pellets collected during 2006 – 2008. The amplification success rate for 128 fecal samples collected across multiple seasons during 2006–2007 was 73%. In 2008, we evaluated DNA amplification rate for 30 samples collected on snow and detected a high success rate of 93%. Species identified by the 122 successful fecal samples included 80 pygmy rabbits, 30 mountain cottontails, 8 eastern cottontails, 2 black-tailed jackrabbits, and two samples that appeared to contain pellets from more than one species. Our results indicate that DNA extracted from fecal pellets can provide an accurate, cost-effective procedure for identifying the pygmy rabbit.

**WAKKINEN, WAYNE**, Idaho Department of Fish and Game, Bonners Ferry, ID 83805 and J. Brent Slone, AMEC Earth & Environmental, Raleigh, N.C., 27612. ***MOVEMENT CORRIDOR MODELING FOR WOODLAND CARIBOU IN THE SELKIRK MOUNTAINS.***

We modeled potential travel corridors for Woodland Caribou (*Rangifer tarandus caribou*) within the Selkirk Mountains of northern Idaho, northeastern Washington, and southern British Columbia. We used CorridorDesigner software (Northern Ariz. Univ.) and caribou habitat quality maps to model corridors based on "resistance". Modeling assumed that habitat quality relates directly to permeability, or the ease at which an animal can move through the landscape. As part of the modeling process we used a moving window analysis (4.4 km radius) to identify high-quality habitat blocks with a minimum patch size of 61.8 $km^2$, the approximate size of a seasonal home range. We developed a selection screen to identify important habitat blocks that serve as corridor terminal points. Using these terminal points, the modeling software identified 12 potential movement corridors within the ecosystem. CorridorDesigner generates multiple corridors between the terminal points that vary in width by utilizing incremental percentages of the landscape. We evaluated the 12 corridors that had a minimum width of 2 km throughout at least 90% of its length. Two kilometers is approximately 3 times the average daily movement. Each corridor was evaluated based on a generalized habitat quality map and on seasonal maps (Spring, Summer, Early Winter, Late Winter). These movement corridors can be used to aid recolonization of currently unoccupied but suitable habitat and to facilitate gene flow throughout the ecosystem.

**WAKKINEN, WAYNE**, Idaho Department of Fish and Game, Bonners Ferry, ID 83805. ***THE STATUS OF WOODLAND CARIBOU IN THE SELKIRK MOUNTAINS.***

Woodland caribou (*Rangifer tarandus caribou*) in the Selkirk Mountains of northern Idaho, northeastern Washington, and southern British Columbia belong to the "Mountain" ecotype and were emergency listed under the ESA in 1983. Approximately 1,900 Mountain caribou are currently found in British Columbia. The Selkirk population of approximately 25 animals was augmented with 103 caribou from other populations in British Columbia. Idaho translocated 60 animals from 1987-90 and Washington moved 43 animals in 1996-98. Predation, primarily from cougars (*Felis concolor*) in the summer and early fall, appears to have the largest influence on survival rates and therefore population trend. Large scale habitat changes, both human-caused and natural, have changed the predator/prey system. Current habitat conditions favor ungulate species that prefer young seral forests. This abundance of ungulates in turn supports higher

densities of predators. Predation on caribou is opportunistic when there is geographic overlap with other ungulate species. An annual winter census indicates a slightly increasing population over the past 5 years. The 2008 census counted 46 animals in the ecosystem, 3 of which were in the U.S. Woodland caribou recovery efforts throughout their range in B.C. are now a higher priority with Canada's recently enacted Species at Risk Act (SARA). Management actions, including changes in timber harvest practices, restrictions on timber harvest, and restrictions on winter recreation, are controversial but may yield long-term benefits for caribou. The recent acquisition of 136,000 acres (212 $mi^2$) of a privately-held forestry company by the Nature Conservancy of Canada will also benefit recovery efforts. While caribou numbers remain low, I am cautiously optimistic about the long term persistence of caribou in the Selkirk ecosystem.

H. S. Cooley[1], **WIELGUS, ROBERT B.[1]**, G. M. Koehler[2], H. S. Robinson[1], B. T. Maletzke[1]. [1]Large Carnivore Conservation Laboratory, Department of Natural Resource Sciences, Washington State University, Pullman, WA, 99164-6410; [2]Washington Department of Fish and Wildlife, Olympia, WA, 98501. ***DOES HUNTING REGULATE COUGAR POPULATIONS? A TEST OF THE COMPENSATORY MORTALITY HYPOTHESIS***

Many wildlife species are managed based on the Compensatory Mortality Hypothesis (CMH), which predicts that harvest mortality (especially adult male mortality) will trigger density-dependent responses in reproduction, survival, and population growth caused via reduced competition for resources. We tested the CMH on two cougar populations (one heavily hunted and one lightly hunted) in Washington. We estimated population growth, density, survival, and reproduction to determine effects of hunting on cougar population demography based on data collected from 2002-2007. The heavily hunted population had an overall hunting mortality rate of 0.24 and 0.46 for males. The lightly hunted population had an overall hunting mortality rate of 0.11 and 0.20 for males. The CMH predicts that higher overall and adult male hunting mortality will result in higher maternity, kitten survival, reproductive success, and lower natural mortality of adult females. We found no differences in rates of maternity or natural mortality. Kitten survival was actually lower in the heavily hunted population. We rejected the CMH because vital rates did not compensate for hunting mortality. Heavy harvest corresponded with increased immigration, reduced kitten survival, reduced female population growth, and a younger overall age structure. Light harvest corresponded with increased emigration, higher kitten survival, increased female population growth, and an older overall age structure. Managers should not assume the CMH when developing harvest prescriptions for cougars.

**WHITE, CRAIG**, G. Pauley, P. Zager, and M. Hurley. Idaho Department of Fish and Game, 3101 S. Powerline Road, Nampa, Idaho 83687. ***ELK POPULATION STATUS, SURVIVAL AND CAUSES OF MORTALITY IN ELEVEN ELK MANAGEMENT ZONES IN IDAHO.***

We fitted 673 adult cow elk (*Cervus elaphus*) with radio collars in 11 elk management zones across Idaho, between 2005 and 2008. We tracked collared elk monthly to monitor their survival and conducted field investigations to determine cause of death. We also determined the average relative gray wolf (*Canis lupus*) density (reported as low, medium, or high) from 2005-2007 for elk management zones in Idaho. Currently, 9 of 11 elk zones met or exceeded the cow elk minimum population state management objectives. Average annual cow elk survival ranged from 75-89%. Causes of death primarily came from 3 causes: hunting, wolf predation, or mountain lion (*Puma concolor*) predation. As expected, relative wolf density was highest through central Idaho and lowest in the north, east and southern elk management zones. In summary, 4 zones had $\geq$85% survival, with harvest the primary cause of mortality, and low to medium wolf density. Three zones had 83-87% survival, with predation (wolf and/or mountain lion) the primary cause of mortality, and high wolf density. Two zones had $\leq$ 81% survival, with wolf predation the primary cause of mortality, but one zone has medium and one has high wolf density.

**WIECHMAN, LIEF A.*[1], K. P. Reese[1], and S. C. Gardner[2].** [1]University of Idaho, Department of Fish and Wildlife Resources, University of Idaho, P.O. Box 441136, Moscow, ID 83844-1136; [2]California Department of Fish and Game, 1812 Ninth Street, Sacramento, CA 95814. ***MOVEMENT PATTERNS AND POPULATION DYNAMICS OF GREATER SAGE-GROUSE IN MONO COUNTY, CALIFORNIA.***

Research has shown that the greater sage-grouse along the California-Nevada border in Mono County are genetically and geographically isolated from populations in the rest of the species range. This, along with the potential geographic isolation between breeding populations within Mono County, requires a better understanding of sage-grouse in the region for proper management. The goals of this study are to determine demographic rates (survival, productivity), movement patterns, and habitat use and suitability of grouse in the county. This study is also investigating sage-grouse movement corridors, which will provide understanding of the connectivity or lack thereof, between grouse breeding populations in Mono County. To meet these objectives, movements of radio-marked birds are being monitored year-round to evaluate habitat use, interaction between the sage-grouse located in the discrete populations, and to determine survival and mortalities including those deaths attributed to West Nile virus. While most habitat requirements of sage-grouse have been described, nocturnal roost site selection has been largely overlooked. This study is investigating nocturnal roost site selection of broods, as they move from nesting habitat to late brood-rearing habitat. Preliminary results, including production and survival from data collected in 2007 and 2008 will be included in the presentation. The ultimate goal of this research is to identify specific areas in the county that are important for the long-term persistence of sage-grouse.

**ABSTRACTS OF POSTERS:**
**Presented at the Idaho Chapter of the Wildlife Society Annual meeting.**

**BOUFFARD, STEPHEN[1], K. V. Tindall[2], and K. Fothergill[3].** [1]2219 Colorado Ave., Boise, ID 83706; [2]University of Missouri, Division of Plant Sciences, Delta Research Center, PO Box 160, Portageville, MO 63873; [3]Conservation Seeding and Restoration, Inc. 506 Center Street West, Kimberly, ID 83341. ***HERBICIDE TREATMENT TO RESTORE ST. ANTHONY DUNE TIGER BEETLE HABITAT: A PILOT STUDY.***

This study was a pilot test to see if herbicide treatments could be used to restore habitat for the St. Anthony Dune Tiger Beetle (*Cicindela arenicola*), a species listed as critically imperiled/ imperiled by Natureserve. The beetle requires open sand dunes for foraging and sparsely vegetated dunes for larval burrows. Its dune habitat is being overgrown with invasive downy brome (*Bromus tectorum* L.) and introduced perennial grasses, especially crested wheatgrass (*Agropyron cristatum* (L.) Gaertn.). Three small test plots in sand dunes were selected and treated at Minidoka National Wildlife Refuge on 2 October 2007 with Imazapic (Plateau®, BASF, Research Triangle Park, NC). Two plots were dominated with downy brome and 1 with crested wheatgrass. Beetles had been observed using both downy brome plots, but had never been seen in the crested wheatgrass plot. On 11 May 2008 no effect was noted in the crested wheatgrass plot; only dead stems of downy brome from the 2007 growing season were present on the remaining plots. Imazapic was a pre and post emergent control over downy brome and other annuals, but did not affect native or introduced perennial grasses or brush species. Beetles were observed in May 2008 in both treated and untreated portions of the downy brome plots; none were seen in the crested wheatgrass plot. A bioassay was done using a surrogate tiger beetle (*C. repanda* Dejean) to see if Imazapic, Glyphosate (Touchdown®, Syngenta, Wilmington, DE), or water (control) treatments affected survivorship. No differences were detected. Imazapic has potential to control unwanted invasive annuals in sand dunes for the St Anthony Dunes and several other rare dune tiger beetle species in the West. Larger scale tests are needed before

making this an operational management practice. A nonselective herbicide, such as glyphosate will be necessary to control perennial grasses on dunes.

**PRICE, AMANDA*[1], W. E. Zumpf[2], and J. Rachlow[1].** [1]Department of Fish and Wildlife, University of Idaho, Moscow, Idaho 83844-1136; [2]Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming 82071. ***SURVIVAL OF JUVENILE PYGMY RABBITS: FACTORS AND MANAGEMENT IMPLICATIONS.***

Survival of juveniles is a critical parameter influencing demography of many wildlife populations. Until recently, natal behavior of pygmy rabbits was largely unknown, and no information on survival of free-ranging juveniles was available. We evaluated survival of radio-tagged juvenile pygmy rabbits at 2 sites in east-central Idaho during 2004 and 2005. Juveniles (n = 58) were captured shortly after emergence from natal burrows, fitted with 1-g radio-transmitters, and located every 3-14 days until they died or until the start of the following breeding season. Mortality rates were high and variable, ranging from 27% for females during 2004 to 63% for males during 2005. Approximately 69% of mortalities were attributed to predation. We evaluated variables influencing juvenile survival through 18 weeks-of-age using known-fate models in Program MARK. We expected survival to decline around the age of natal dispersal and to be lower for young born later in the season. Fourteen candidate models were evaluated that included sex, year, study area, and relative date of birth within each year. Model selection results did not indicate strong support for any single combination of variables, and 8 competing models all included effects of relative date of birth, year, and study area. Young born later in the year had lower survival rates than young born earlier. Similar patterns of annual and site-specific variation were documented in adult pygmy rabbits. Variation among sites and years suggests that, in addition to timing of birth, local factors also are important in shaping survival patterns of pygmy rabbits.