# Montana Chapter
# Society for Conservation Biology

## 6th Annual Research Symposium
## November 6-8, 2013

## Montana State University, Bozeman, MT

## SCHEDULE:

**WEDNESDAY, NOVEMBER 6TH –**
**MSU STUDENT UNION BUILDING ROOM 233/235:**

**Registration 12:00-1:00**

**Continuing Education Workshops 1:00-5:00**

1. **Science Communication**
   Instructor: Bebe Crouse, The Nature Conservancy
   Location: Student Union Building, Room 235

2. **GIS Skills**
   Instructor: Tara Chesley-Preston, US Geological Survey
   Location: Gaines Hall, Room 140

**Registration 6:00-6:30**

**Plenary Lecture 6:30-7:30**
LEVERAGING SUCCESS
**Mike Phillips**, Turner Endangered Species Fund, Bozeman.

Abstract: Mike Phillips will explore various approaches to leveraging partnerships to achieve success that might not be possible otherwise. Typical and atypical approaches to leveraging will be considered as well as practical ideas for leveraging partnerships. Phillips will draw from his extensive experience leading controversial wildlife conservation efforts including restoring red wolves to the southeastern U.S. and gray wolves to the Greater Yellowstone Ecosystem. He will also draw from his experience working with Ted Turner to ensure the persistence of select imperiled species and their habitats with an emphasis on private lands conservation. Lastly, Phillips will consider his work as a state legislator leading efforts as disparate as restoring American plains bison, passing the nation's most comprehensive legislation concerning geologic sequestration of CO2, and collaborating with the White House and the US Senate on green energy and climate legislation to improve economic development and durability, national security, and environmental integrity. The talk will illustrate that through leveraging the whole can be made greater than the sum of the parts. Phillips will make the case that there is an increasing urgency for conservation biologists to become more adept at leveraging partnerships that include the general public and elected officials. Concerning the latter he will emphasize the need for more conservation biologists themselves to serve in elected office to leverage the power of a seat at the "decision making table".

**Beer/wine reception and poster session 7:30-9:00**

**POSTERS:**

IMPLEMENTING WILDLIFE CROSSING INFRASTRUCTURE: UNDERSTANDING THE CULTURE OF U.S. STATE DEPARTMENTS OF TRANSPORTATION

**Angela V. Kociolek,** Rob Ament and Tony Clevenger**,** Western Transportation Institute at Montana State University, Bozeman; Roger Surdahl**,** Federal Highway Administration, Central Federal Lands Highway Division.

Currently, the decision to implement wildlife crossings remains with individual state Departments of Transportation (DOT), tribal governments, or federal land management units; whereas large-scale habitat connectivity for wildlife would likely improve with systemic implementation at regional or national scales. The purpose of this interview and survey effort was to better understand the role of DOT culture in the consideration of wildlife crossings. Three main themes emerged as the primary barriers to overcome for widespread implementation. Findings from this study may inform the promotion of new solutions so that wildlife crossings become a standard practice across the US road network.

CLIMATE CHANGE ALTERS DISTRIBUTION OF FOUR TREE SPECIES IN MONTANA WITH RESPECT TO LAND MANAGEMENT STATUS AND SOILS: ARE THERE IMPLICATIONS FOR ADAPTATION?

**Dominique M. Davíd**, Hopa Mountain Native Science Fellow; R. Travis Belote, The Wilderness Society, Bozeman; Matt Dietz, The Wilderness Society, San Francisco; Gregory H. Aplet, The Wilderness Society, Denver.

Climate-based predictions of species distributions provide evidence for understanding impacts of climate change. However, such models lack inclusion of other ecological (disturbance) or soil-based factors that determine plant species distributions. Additionally, improving understanding of geographic shifts will require considerations of management zones where certain activities could facilitate or impede responses to climate change. We focused on current and future distributions of four trees across Montana: whitebark pine (*Pinus albicaulis*), a keystone timberline species; western larch (*Larix occidentalis*), a fire-dependent, deciduous conifer; quaking aspen (*Populus tremuloides*), a disturbance-dependent, broadleaved tree; and ponderosa pine (*Pinus ponderosa*), a seral species. Current and future "climate space" of species distributions were overlaid with geology, soils, and land management data. Geographic distribution of viable "climate space" contracted for whitebark pine, western larch, and ponderosa pine by 2060 while aspen predicted an expansion in Montana. Predicted geographic shifts of trees due to climate change may result in new soil conditions with novel plant-soil feedbacks. Additionally, the percent of a species' range occurring in designated wilderness area is expected to more than double. Climate adaptation strategies will benefit from considering the influence of soil-based conditions and management zones as species shift in response to climate change.

USING FIELD DATA TO VALIDATE SATELLITE MODELS OF LAND USE EFFECTS ON ELK FORAGE IN THE UPPER YELLOWSTONE RIVER BASIN

**Erica Garroutte** and Andrew Hansen, Montana State University, Bozeman.

Spatial and temporal variation in grassland phenology and primary productivity play a critical role in migration patterns of elk (*Cervus elaphus*) in the Upper Yellowstone River Basin. Concern that human land-use modifications of grassland phenology and productivity may affect migration is a major focus of research in this area. While research suggests that shifts in the distribution of elk is, in part, due to private areas' increased access to high quality forage, few studies have quantified the effects of human land-use on phenology, productivity, and forage quality. Satellite-derived Normalized Difference Vegetation Index (NDVI) shows potential as a tool to predict these effects on grassland biomass and phenology caused by land use, but is limited by validation at varying scales, in human land use areas, and in its relationship to

forage quality. In order to inform research and management on the utility of NDVI in predicting land-use effects on elk migration, this study will 1.) validate satellite-derived NDVI at varying scales 2.) determine the relationship between NDVI and forage quality, 3.) quantify the effects of land-use on phenology, productivity, and forage quality, and 4.) determine how the effects of human land-use relate to elk movement in the Upper Yellowstone River Basin.

INVESTIGATING COEXISTENCE BETWEEN TROUT AND LONG-TOED SALAMANDERS
**Erin Kenison**, Andrea R. Litt, and Tom McMahon, Montana State University, Bozeman; David Pilliod, USGS Forest and Rangeland Ecosystem Science Center, Boise.

In many lakes, trout have been introduced for recreational fishing and have replaced native amphibians as top predators. Trout are associated with reducing the abundance of amphibians and have extirpated populations of long-toed salamanders. Salamander larvae and trout may coexist in lakes where habitat characteristics are present (e.g., emergent vegetation). When salamander larvae detect predators they often alter their foraging behavior and use of open water, but still may experience predator attempts and/or altered body morphology. We sought to identify key habitat features that may allow co-occurrence and potential sublethal effects of fish. We sampled 7 lakes with fish and 7 without in northwestern Montana between July and August 2012. We used minnow traps to capture larvae and then compared capture rates and habitat characteristics between lakes. We also compared body and tail measurements to determine whether salamanders differed between lakes. We did not detect differences in habitat characteristics, although, preliminary results suggest that, in lakes with fish, salamander capture rates were higher (33%, 95% CI = 13-84%) and salamanders had 31% shorter tails (10-53%). Our findings suggest that salamanders utilize similar habitat in these lakes regardless of the presence of fish, but may pay a “price” for coexistence.

A COMPARISON OF TWO AVIAN SURVEY METHODS AND THE IMPLICATIONS FOR CONSERVATION MONITORING IN ARID ENVIRONMENTS
**Jessie Golding** and Victoria J. Dreitz, University of Montana, Missoula.

Avian communities are important in conservation monitoring. As concerns over the loss of biodiversity continue, the demand for widespread and accessible taxa for monitoring programs is growing. Recently, avian communities have been adopted in many land management monitoring efforts. Birds are identifiable to a variety of stakeholders and generally require simple survey efforts. Point counts are the most common method used to monitor birds and offer many advantages, such as comparison with long-term data sets. However, recent research suggests this method is heavily biased and not reliably representing avian communities. Double observer transects have emerged as an alternative that avoids many of the biases in point counts. We initiated a study in 2012 to compare these methods in sagebrush habitat. Our results suggest that the probability of detecting an individual is higher using double observer transect than point counts, which allows for more accurate assessments of avian communities. These results are important when using avian communities to monitor management actions in sagebrush habitats, where species abundance can vary widely between years and species richness is generally low; it is essential to have a reliable method to detect the potentially fine-scale changes that occur in the avian community in this habitat.

UNDERSTANDING MOVEMENT PATTERNS OF CHIRICAHUA LEOPARD FROGS (*LITHOBATES CHIRICAHUENSIS*) TO PROMOTE SPECIES PERSISTENCE IN DESERT ECOSYSTEMS
**Ross K. Hinderer**, Andrea R. Litt, and Robert Garrott, Montana State University, Bozeman; Magnus McCaffery, Turner Endangered Species Fund, Bozeman.

One-third of the described species of amphibians worldwide are threatened with extinction, including the Chiricahua leopard frog (*Lithobates chiricahuensis*). This frog is highly aquatic, found in portions of Arizona and New Mexico, and is listed as threatened under the Endangered Species Act. Currently, most of the range of the Chiricahua leopard frog is restricted to anthropogenic sources of water, including tanks maintained for livestock. Movement habits of this frog and patterns of dispersal between disjunct water sources are not well understood. On the Ladder Ranch in southern New Mexico, we constructed pitfall traps to capture frogs leaving stock tanks and attached radio transmitters to 14 individuals during the summer of 2013. Individuals captured in stock tanks ($n$=11) showed very high site fidelity, never leaving their source location while carrying transmitters up to 18 days. Individuals captured in a nearby creek ($n$=3) moved as much as 2800 m over a 17-day period. Daily movements of these individuals varied greatly (mean=121 m, SD=249) and could be related to individual, weather, and landscape characteristics; we will explore these relationships as part of future research. Identifying movement corridors will allow biologists to manage anthropogenic water sources to support movement of amphibians between habitat patches.

INFLUENCE OF LITTER COMPOSITION AND DROUGHT SEVERITY ON ARTHROPOD COMMUNITIES IN GULF COASTAL PRAIRIES

**Adam B. Mitchell** and Andrea R. Litt, Montana State University, Bozeman; Forrest S. Smith and Anthony D. Falk, Caesar Kleberg Wildlife Research Institute, Kingsville.

Nonnative plant species can alter ecosystem processes and soil chemistry, but few studies have investigated how these changes influence belowground communities. We compared soil and litter arthropods in areas dominated by native plants to areas dominated by nonnative Old World bluestem grasses (OWBs, e.g., *Bothriochloa*, *Dichanthium* spp.), in addition to examining the influence of drought between 2011 and decreased severity in 2012. Abundance of soil arthropods was relatively similar between plant communities, yet abundance in 2011 (mean=5.6 arthropods/$m^2$, 95%CI= 1.8-14.8) was one-tenth of that observed in 2012 (56.5, 32.4-98.6), suggesting abiotic factors may be more influential on this community than plant identity. Abundance of litter arthropods in native plant communities (261.6 arthropods/$m^2$, 171.0—400.2) was nearly ten times greater than OWB-dominated communities in 2011; we did not detect differences in 2012, which may be due to decreases in litter cover that were independent of plant composition. Available soil nitrogen in native plant communities (81.5 kg/ha, 30.4—218.9) was ten times greater than in OWB monocultures, suggesting litter availability and quality may influence litter arthropod communities and associated microbiota. Changes in belowground communities may help link changes observed in aboveground communities, and help identify mechanisms by which invasion impacts native ecosystems.

OUTREACH MATTERS! HIGHWAY WILDLIFE MITIGATION OUTREACH ACTIVITIES ON THE FLATHEAD INDIAN RESERVATION AND SURROUNDING AREAS, MONTANA

**Kylie Paul**, People's Way Partnership and Defenders of Wildlife, Missoula; Whisper Means, Tribal Wildlife Management Program, Confederated Salish and Kootenai Tribes, Pablo;
Marcel Huijser and Rob Ament, Western Transportation Institute, Bozeman.

On the Flathead Indian Reservation in northwest Montana, there are 41 fish and wildlife crossing structures (WCS) and 16.6 miles of wildlife fencing along a reconstructed 56-mile segment of U.S. Highway 93 North, also referred to as the 'the People's Way.' The People's Way Partnership is a collaboration of the Confederated Salish and Kootenai Tribes (CSKT), Western Transportation Institute at Montana State University, Montana Department of Transportation (MDT), and Defenders of Wildlife, with most funding from small private or non-profit foundation grants. Our mission is to effectively communicate the conservation value of the wildlife mitigation measures along US 93 North. The partnership was created when we recognized that many people in the region were not sufficiently aware of the value or efficacy of the mitigation measures. We have undertaken numerous outreach efforts to

increase knowledge of and support for healthy, connected wildlife populations and to promote a sense of environmental stewardship among residents living near US 93 North. These efforts can serve as a model for successful educational activities aimed at generating support for wildlife-highway mitigations. We gave presentations to 950 children (from kindergarten to high school) in the region about the highway project. We combined these presentations with a drawing contest to encourage the children to think about the importance of WCS for human and wildlife safety. Several other outreach activities have been undertaken. A large outreach poster was designed and printed to display photos of the diversity of wildlife species using the WCS. We created an informational brochure detailing the history of the project and the purpose of the WCS. We give these materials to agencies, classes, and the general public with frequent requests for additional copies. In addition, we provide numerous public-friendly, interactive presentations to classrooms, agencies, and organizations throughout the area. We are currently creating permanent educational signs for the traveling public at pertinent locations along the transportation corridor. We envision our efforts will lead to increased citizen, institutional, and governmental support for more sustainable highway practices throughout the West and the United States.

ECOLOGICAL CONSEQUENCES OF MOUNTAIN PINE BEETLE OUTBREAKS FOR WILDLIFE IN WESTERN NORTH AMERICAN FORESTS

**Victoria A. Saab**, Quresh S. Latif, Mary M. Rowland, Tracey N. Johnson, Anna D. Chalfoun, Steven W. Buskirk, Joslin E. Heyward, and Matthew A. Dresser.

Mountain pine beetle (*Dendroctonus ponderosae*) (MPB) outbreaks are increasingly prevalent in western North America, causing considerable ecological change in pine (*Pinus* spp.) forests with important implications for wildlife. We reviewed studies examining wildlife responses to MPB outbreaks and post-outbreak salvage logging to inform forest management and guide future research. Our review included 16 studies describing MPB outbreak relationships with 89 bird species and 6 studies describing relationships with 11 mammalian species, but no studies of reptiles or amphibians. We included studies that compared wildlife response metrics temporally (before versus after the outbreak) and spatially (across sites that varied in severity of outbreak) in relation to beetle outbreaks. Outbreaks ranged in size from 20,600 to 107 ha and studies occurred 1–30 years after the peak MPB outbreak, but most studies were conducted over the short-term (i.e., < 6 years after the peak of MPB-induced tree mortality). Birds were the only taxa studied frequently; however, high variability existed among those studies to allow many inferences, although some patterns were evident. Avian studies concluded that cavity-nesting species responded more favorably to beetle-killed forests than species with open-cup nests, and species nesting in the shrub layer favored outbreak forests compared with ground and open-cup canopy nesters that generally showed mixed relationships. Mammalian responses to MPB outbreaks were mixed. Studies consistently reported negative effects of MPB outbreaks on red squirrels (*Tamiasciurus hudsonicus*). However, there is evidence that red squirrels can persist after an outbreak under some conditions, e.g., when non-host tree species are present. For small mammal species associated with forest understories, responses may be most pronounced during the post-epidemic period (< 6 years after the peak of beetle-induced tree mortality) when snags fall to produce coarse woody debris. Post-outbreak salvage logging studies (n = 6) reported results that lacked consensus. Post-outbreak salvage logging may have an impact on fewer wildlife species than post-fire salvage logging, probably because only host-specific tree species are removed after beetle outbreaks.

**THURSDAY, NOVEMBER 7TH –**
**MSU STUDENT UNION BUILDING ROOM 233/235:**

**Registration and Breakfast 7:30-8:30**

**Opening Plenary: 8:30-9:30**
MONTANA'S AQUATIC INVASIVE SPECIES PROGRAM – AN OVERVIEW
**Alison Begley**, Fish, Wildlife and Parks, Helena.

Abstract: The Montana Aquatic Invasive Species (AIS) Program continues to evolve and grow. The AIS Program works to implement the AIS Management Plan through coordination and collaboration, prevention of new AIS introductions, early detection and monitoring, control and eradication, and outreach and education. Each of these components serves to minimize the harmful impacts of AIS through the prevention and management of AIS into, within and from Montana. One entity is not capable of accomplishing all the goals of prevention and control of invasive species alone, rather to a great deal of coordination and collaboration with other partners is critical. This presentation will discuss each component of the AIS program while tying in the vast number of partners that are used to meet the needs. Controlling or preventing invasive species truly requires leveraging partnerships for conservation of native species and habitats.

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

**Session 1: Invasive Species 10:00-11:40**
10:00-10:20
INVASIVE PLANTS IN MONTANA – PAST, PRESENT, AND FUTURE
**Jane Mangold**, Montana State University, Bozeman.

Invasive plants have been at the forefront of natural resource management in Montana for several decades. In spite of efforts to understand the biology and ecology of invasive plants and manage them using integrated control methods, invasive plants remain a concern. This presentation will provide an overview of some of the most widespread invasive plants in the state as well as new invaders that are currently not established or occur in only small, isolated populations. All of these invasive plants are on the state noxious weed list. While the management priority for widely established species is containment, the management priority for less common species is prevention and eradication. The distribution of different species will be discussed along with methods that have been used to manage them according to their frequency in Montana. What methods have been most successful and why will also be discussed along with ideas for improved management in the future.

10:20-10:40
PLANT INVASIONS AND DISTURBANCE REGIMES: COMPLEX CONSEQUENCES FOR ANIMAL POPULATIONS AND COMMUNITIES
**Andrea Litt**, Montana State University, Bozeman.

Ecologists and managers often seek to reestablish natural disturbances to restore structure and function in altered ecosystems, yet restoring these processes in areas invaded by nonnative plants may yield unanticipated effects. Nonnative plants can alter the fire regime, creating novel conditions to which native species may not be well-adapted. When fire is restored in semi-desert grasslands invaded by Lehmann lovegrass (*Eragrostis lehmanniana*), for example, fires burn more completely than in native plant-dominated grasslands. Under these more homogenous conditions, effects of fire on many species of small mammals differ based on the degree of nonnative-grass dominance. Despite these interactive effects, fires can have some restorative influences on habitat for small mammals. When changes to the

fire regime far exceed the natural range of variation, however, native species may be eliminated. For example, invasion by cheatgrass (*Bromus tectorum*) greatly increases fire frequency and intensity, such that sagebrush-steppe systems become converted to annual grasslands and many native plants and animals can no longer persist. Most ecosystems will continue to change in response to plant invasions, changing climate patterns, and other anthropogenic stressors; reestablishing key ecological disturbances may trigger novel interactions that require an increased understanding to create effective solutions for conservation.

10:40-11:00
INVASIVE PLANT ERODES LOCAL SONG DIVERSITY IN A MIGRATORY SONGBIRD
**Yvette Ortega**, Rocky Mountain Research Station, US Forest Service, Missoula; Erick Greene and Aubree Benson, University of Montana, Missoula.

Exotic plants are likely to impact higher trophic levels by overrunning native plant communities, but few studies have examined the specific nature of such effects. We studied savannas that were either dominated by native vegetation or invaded by spotted knapweed, a notorious exotic forb. Previously, we found that chipping sparrows breeding in knapweed-invaded habitat had reduced food resources, reproductive success, and site fidelity. In this study, we predicted elevated prevalence of yearling versus older birds in invaded compared to native habitat, and that this shift in age ratios would affect song learning. We found that the prevalence of yearlings versus older birds was twice as high in invaded habitat. In both habitat types, yearlings tended to match the songs of older birds rather than introduce new song types. Therefore, in invaded habitat where age ratios were skewed away from older birds, song similarity among individuals was significantly higher and the number of song types lower relative to that found in native habitat. Degradation of habitat quality typically affects site fidelity and age ratios in migratory songbirds and hence may commonly alter local song attributes. More work is needed to elucidate the links between demographic processes and song learning across taxa.

11:00-11:20
CHEATGRASS (*BROMUS TECTORUM* L.) BIOCONTROL: EFFECTS ON TARGET AND NON-TARGET SPECIES
**Krista A. Ehlert**, Z. Miller, Jane Mangold, F. Menalled, Montana State University, Bozeman.

Cheatgrass control largely centers on herbicide applications, which cannot affect its large carryover seedbank. However, a soil-borne fungal pathogen *Pyrenophora semeniperda* causes seed death and reduced seedling vigor. We investigated *P. semeniperda*'s impact on 15 target and non-target species: five crop (e.g.) *Triticum aestivum*), five forage/pasture (e.g.) *Agropyron cristatum*), and five rangeland species (e.g.) *Koeleria cristata*). Treatments were a) inoculated and b) non-inoculated (control). Plant density was recorded weekly, and aboveground biomass was harvested, dried, and weighed after four weeks. Our findings suggest that *P. semeniperda* affects species' emergence ($P < 0.0001$) and biomass ($P < 0.0001$). In general, *P. semeniperda* decreased emergence, relative to the control. This was pronounced for rangeland species; for example, *K. cristata* emergence decreased from 45% to 18%. Crop species' emergence decreased by 7% to 23%. Treatments resulted in similar plant biomass for all species. For example, *A. cristatum* biomass was similar between the control (14.5 kg plant$^{-1}$) and *P. semeniperda* (15.3 kg plant$^{-1}$) treatment. Thus, although *P. semeniperda* decreases target and non-target species' emergence, plants that escape *P. semeniperda*-caused mortality grow larger because of reduced competition for space and nutrients, suggesting that using *P. semeniperda* may influence plant community composition.

11:20-11:40
POLLINATOR-MEDIATED INTERACTIONS BETWEEN SPOTTED KNAPWEED AND NATIVE FORBS IN MONTANA RANGELAND
**Christina Herron-Sweet**, Jane Mangold, Erik Lehnhoff, Laura Burkle and Jeff Littlefield, Montana State University, Bozeman.

We have many theories to explain why weeds are successful invaders; they have escaped their natural enemies, they maintain high propagule pressure, or they are better competitors for resources, to name a few. One recent idea has surfaced as another possible explanation for why weeds might be successful: they are more attractive to pollinators. We tested this hypothesis by 'creating' a range of spotted knapweed (*Centaurea maculosa*) infestation densities in pots adjacent to the native plant hairy false goldenaster (*Heterotheca villosa*) near Bozeman, Montana, during the summer of 2013. We then observed pollinator visitation patterns and quantified the effect of invasion on seed set in our target native plant. A total of 600 hours of pollinator observations were completed, and over 2,500 seed heads were collected from the goldenaster plants. Although spotted knapweed received more insect visitors than goldenaster, the number of insect visitors to the native plant did not differ between invasion treatments and was highly variable. Movement by insects between knapweed and goldenaster flowers was uncommon but did occur occasionally. These results suggest that although pollinators do visit spotted knapweed flowers with high frequency, invasion by spotted knapweed has no indirect pollinator-mediated impacts on the reproduction of goldenaster.

**Lunch Break 11:40-1:00**

**Session 2: Invasive Species II 1-2:20**

1:00-1:20

ECOLOGY AND MANAGEMENT OF EXOTIC SPECIES

**Dean E. Pearson** and Yvette Ortega, Rocky Mountain Research Station, US Forest Service, Missoula.

Exotic species threaten native ecosystems around the globe. Understanding how exotic organisms influence native species and ecosystem functions is an essential first step toward mitigating invader impacts. Here we present highlights from 15 years of research on exotic species ecology and management to demonstrate the range of effects that invaders can have on native species including plants, invertebrates, birds, and mammals. We also illustrate the challenges of invasive species management by showing that management tools themselves can have side effects that can result in complex unintended outcomes. It is only through a comprehensive understanding of invader impacts and the potential side effects of our management tools that we can begin to address the global threat posed by biological invasions.

1:20-1:40

BIOGEOGRAPHICAL STUDY OF *PINUS CONTORTA* INVASIONS IN THE GREATER YELLOWSTONE ECOSYSTEM, CHILEAN PATAGONIA, AND SOUTH ISLAND, NEW ZEALAND

**Kimberley Taylor** and Bruce Maxwell, Montana State University, Bozeman; Anibal Pauchard, Universidad de Concepcion, Chile; Duane Peltzer, Landcare Research, New Zealand.

Studies of invasive plants are often conducted only in the non-native range of the invader. However, biogeographical studies that examine invasive plants in the native and non-native range are necessary to elucidate mechanisms of invasion success and to provide support for hypotheses such as enemy release. Here we aim to determine if lodgepole pine (*Pinus contorta*) behaves differently in its native range in the Greater Yellowstone Ecosystem (GYE) than in the Southern Hemisphere where it is extremely invasive. We conducted transects from source populations out to the edge of the invasion in the GYE, South Island, New Zealand and Coyhaique, Chile. Along the transects we recorded density, and in randomly placed plots we also recorded tree size, age, and reproductive output. To test the enemy release hypothesis we conducted seed predation experiments in each location. Finally, we assessed the potential impact of *P. contorta* invasion on plant diversity by collecting data on species cover in 1 $m^2$ and 25 $m^2$ plots in areas of different invasion density. *P. contorta* appears to be significantly less invasive in many areas of the GYE than it is in the Southern Hemisphere. This difference in behavior may be a combined result of differences in seed predation, tree physiology and climate.

1:40-2:00
HABITAT PREFERENCES AND FOOD WEB PERTURBATIONS OF THE NEW ZEALAND MUDSNAIL: *POTAMOPYRGUS ANTIPODARUM* ON THE PORTNEUF AND MADISON RIVERS.
**Eric Richins,** University of Montana, Missoula; Kaleb Heinrich and Colden V. Baxter, Idaho State University, Boise; and Lisa Eby and Laurie Marczak, Univeristy of Montana, Missoula.

New Zealand mudsnail, *Potamopyrgus antipodarum* (NZMS), a native snail of New Zealand, has invaded streams globally beginning at least as early as 1850 and can reach densities of 800,000 per $m^2$. The spread of non-native species represents one of the most harmful and least reversible of anthropogenic disturbances. Invasive species, once established, have been shown to alter the physical properties of habitats, reduce native biodiversity, and in the case of NZMS dominate both the carbon and nitrogen cycles of invaded streams. NZMS have been shown to reduce biomass of and alter the community composition of native benthic invertebrates. We hypothesize that this perturbation may cause changes in the biomass of emerging aquatic insects and that of terrestrial riparian insectivores. We seek to answer this question by measuring the biomass of emerging aquatic insects and tetragnathid spiders (known indicators of aquatic production) along a gradient of NZMS densities on two invaded rivers. Furthermore we are investigating what abiotic conditions influence the observed patchy distribution of NZMS. We measured stream velocity, depth, distance to shore, and substrate size in combination with NZMS density. We hypothesize that substrate size plays a detectable role in the distribution of NZMS within invaded streams.

2:00-2:20
MANAGING AQUATIC INVASIVE SPECIES IN THE CROWN OF THE CONTINENT: A MULTIJURISDICTIONAL APPROACH
**Caryn Miske**, Flathead Basin Commission

This presentation will focus on managing aquatic invasives species at the landscape level, working across state, provincial, federal and tribal borders. The presentation will focus on the program being developed for the Crown of the Continent via the Crown Managers Partnership, and will discuss how this effort will be used by the Great Northern Landscape Conservation Cooperative to scale up AIS prevention efforts in the future. The presentation will also feature a discourse on lessons learned, and will highlight opportunities for future research and management activities.

**Coffee Break 2:20-2:50**

**Session 3: Osprey Conservation 2:50-4:30**
2:50-3:10
MERCURY AND OTHER MINING-RELATED CONTAMINANTS IN OSPREYS ALONG THE UPPER CLARK FORK RIVER
**Heiko Langner** and Erick Greene, The University of Montana, Missoula; Rob Domenech, Raptor View Research Institute, Missoula; Molly Staats, The University of Montana, Missoula.
Ospreys (*Pandion haliaetus*) are widely- distributed in Montana, eat almost exclusively fish, and are at the top of aquatic food chains. Ospreys nest readily on manmade platforms that are easy to access, and they quickly habituate to human presence and disturbance. All these factors make ospreys an ideal species to monitor environmental contamination in aquatic environments. We investigated links between mining-related contaminants in river sediment and their occurrence in osprey chicks from the Clark Fork River, Blackfoot River, Little Blackfoot River and the Bitterroot River watersheds. We collected blood and feather samples from over 200 osprey chicks from about 50 nests since 2006 along river sections with greatly different levels of contamination. Concentrations of zinc, cadmium, copper, lead and arsenic in blood and feathers were below toxic levels, and exhibited low correlations with concentrations of contaminants in the river sediments. In contrast, mercury concentrations in Osprey blood were highly

correlated with concentrations in river sediments. Osprey chicks in some areas had extremely high levels of mercury (> 500 µg/L) – 2-3 orders of magnitude higher than the upper limit considered safe in human blood (about 5 µg/L).

3:10-3:30
HATCHING SUCCESS OF OSPREY EGGS IS LOW IN AREAS OF HIGH MERCURY
**Erick Greene**, The University of Montana, Missoula; James Junda, Macdonald College of McGill University, Quebec; Heiko Langner and Harrison Cooper, The University of Montana, Missoula; Rob Domenech, Raptor View Research Institute, Missoula.

We have started a long-term ecotoxicology and demography study on ospreys (*Pandion haliaetus*) in western Montana. The concentrations of mercury in the blood and feathers of osprey chicks are extremely high in some watersheds, especially in the Clark Fork River downstream of the confluence with Flint Creek at Drummond. Many osprey chicks in western Montana have concentrations of mercury in their blood greater than 200 µg/L; the upper limit considered safe in human blood about 5 µg/L. Mercury is a potent neurotoxin and disruptor of development in vertebrate embryos. In lab studies, extremely small concentrations of mercury cause developmental problems or death of bird embryos. As a first step in studying the impacts of mercury on osprey reproduction and demography, we are documenting the hatching success of osprey eggs in different areas. In areas where surviving chicks have low concentrations of mercury in their blood (< 100 µg/L) we observed close to 100% hatching success. In contrast, in areas where surviving chicks have higher concentrations of mercury in their blood (> 200 µg/L) hatching success drops to about 55%. These results suggest that high levels of mercury in some of our aquatic ecosystems are causing significant egg mortality in ospreys.

3:30-3:50
WHERE DO OSPREYS (*PANDION HALIAETUS*) FROM WESTERN MONTANA SPEND THE WINTER? SATELLITE TELEMETRY GIVES SOME ANSWERS AND SOME SURPRISES
**Rob Domenech** and Adam Shreading, Raptor View Research Institute, Missoula; Heiko Langner and Erick Greene, University of Montana, Missoula.

We have started a long-term study of ospreys (*Pandion haliaetus*) in western Montana, focusing on demography and ecotoxicology. Ospreys are migratory, and spend about 2/3 of their lives on their wintering grounds. Thus it is important to know where they migrate and spend the winter. Since virtually nothing was known about the migration routes and wintering areas of ospreys from western Montana, in 2012 and 2013 we put satellite transmitters on two families of ospreys (adults and chicks) from near Florence, Montana. These ospreys migrate south through a fairly narrow corridor to Arizona and New Mexico, but then diverge. Some individuals spend the winter in Texas, and others travel to Mexico and as far south as the Nicaragua-Costa Rica border on both the Atlantic and Pacific coasts. Migration paths of the adults were very similar for south-bound and north-bound migrations as well as between years.

3:50-4:10
LANDSCAPE ANALYSIS OF BALING TWINE IN OSPREY NESTS
**Erick Greene**, The University of Montana, Missoula; Amanda Ormesher, Missoula; Matt Parker, Humboldt State University, Arcata; Max Egenhoff. The University of Montana, Missoula; Anička Kratina-Hathaway, University of Wyoming, Laramie; Heiko Langner, The University of Montana, Missoula; Rob Domenech, Raptor View Research Institute, Missoula.

Baling twine is polypropylene rope used to tie together bales of hay. After the hay is used, loose strands of baling twine are often left in fields. Ospreys (*Pandion haliaetus*) have a propensity to collect baling twine and use it to line their nests. Chicks and adults easily become tangled in the baling twine, and it can

kill over 10% of chicks in some areas. To describe the general extent of this problem, we sampled 115 Osprey nests in parts of Montana, Wyoming, Idaho and Washington. To test what landscape features are associated with the amount of baling twine in Osprey nests we used GIS analyses to describe land use within several different distances of nests. Nests that are far (at least 3 km) from any agricultural land tend to have no baling twine. However, the amount of agricultural land and livestock pastures within 1 km of Osprey nests are poor predictors of the amount of baling twine in nests. Our field observations show that Ospreys can travel considerable distance to collect baling twine, and that distant point sources of baling twine are be important. Our efforts in public education about the importance of picking up baling twine are promising.

4:10-4:30
SUCCESS USING WEB CAMERAS AND SOCIAL MEDIA IN WILDLIFE EDUCATION AND CONSERVATION BIOLOGY: A CASE STUDY WITH OSPREYS
**Allison Mills**, University of Montana, Missoula; Charles Eldermire, Cornell Lab of Ornithology, Ithaca; Erick Greene, Heiko Langner, and Harrison Cooper, University of Montana, Missoula; Rob Domenech, Raptor View Research Institute, Missoula.

As part of a long-term study of Ospreys in western Montana, we use high-resolution web cameras, social media, and interactive web experiences to promote environmental education. The competitive landscape for online viewers is challenging due to the exploding number of wildlife web cams: there are many thousands of online wildlife web cameras around the world, and over 200 just in Montana. There is wide variation among web cameras in the viewing experience, and this variation influences the number of viewers and their potential level of engagement with featured wildlife. We have been running several successful web cameras: for example an Osprey nest in Missoula, Montana was watched in 182 countries and registered almost 3 million streams during the 2013 breeding season; a Red-tailed Hawk nest in Ithaca, New York was watched in 185 countries and registered almost 16 million streams. We outline our successful approaches, summarize our experiences and outcomes, and suggest some "best practices" to help leverage available time and effort to maximize the impact of different types of conservation outreach in the virtual world. We will also discuss some of the challenges and rewards of working with a hyper-connected and passionate viewing community in a high-exposure, real-time environment.

**Session 4: Native Species Ecology and Conservation I 4:30-4:50**
4:30-4:50
NESTING ECOLOGY OF THE TURTLE *APALONE SPINIFERA* IN THE MISSOURI RIVER IN MONTANA: IMPLICATIONS FOR MANAGEMENT AND CONSERVATION
**Brian J. Tornabene**, Montana Cooperative Fisheries Research Unit, Montana State University, Bozeman; Robert G. Bramblett, Montana State University, Bozeman; Stephen A. Leathe, PPL Montana, Great Falls; Alexander V. Zale, U.S. Geological Survey, Montana Cooperative Fisheries Research Unit, Bozeman.

The nesting ecology of spiny softshell turtles in Montana, where they are at the northern extent of their range and a state Species of Concern, is poorly understood and sparsely investigated. We used telemetry, visual surveys, observation from shore-based blinds, and remote cameras to document nesting behavior, habitat, and timing in a 130-kilometer reach of the Missouri River. We located 25 nests in 2011 and 97 in 2012. Most nests were in mixed-gravel substrates; only 3% were in pure sand. Proportion of nests found on island and mainland habitats were similar in 2011, but 90% of nests were on islands in 2012. Predation occurred on 46 nests; mainland nests incurred higher predation than island nests. Nesting followed peak river stage, and mostly occurred in the afternoon. Nesting and emergence occurred about three weeks later and three times less nests were successful in 2011 than in 2012. Flooding in 2011 probably decreased nesting effort and success by reducing habitat availability, delaying the onset of nesting and prematurely ending incubation. However, flood events maintain and create nesting habitats

by clearing vegetation and depositing substrates. Premature termination of incubation suggests that the northern range of this species is probably limited by successful incubation.

**Evening social/dinner (no-host) at Bridger Brewing 5:00**

## FRIDAY, NOVEMBER 8TH – MSU STUDENT UNION BUILDING ROOM 233/235:

**Registration and Breakfast 7:30-8:30**

**Session 5: Partnerships in Conservation 8:30-10:10**

8:30-8:50

SUCCESSES AND CHALLENGES OF ALL STEPS OF THE CONSERVATION PROCESS: LESSONS LEARNED FROM 11 BROAD-SCALE CONSERVATION PROGRAMS IN MT AND AROUND THE WORLD

**Erik A. Beever**, U.S. Geological Survey, Bozeman; Brady J. Mattsson, U.S. Geological Survey, Sacramento; Matthew J. Germino, U.S. Geological Survey, Boise; Max Post van der Burg, U.S. Geological Survey, Jamestown; John B. Bradford, U.S. Geological Survey, Flagstaff; Mark W. Brunson, Utah State University, Logan.

Integration of conservation partnerships across geographic, biological, and administrative boundaries is increasingly relevant because drivers of change, including climate shifts, fire, and invasive species transcend these multidimensional boundaries and pervade conservation efforts at individual sites. We explored successes and challenges of established conservation programs that span multiple watersheds and considered both social and ecological concerns to enhance effectiveness of such broad-extent conservation. We asked representatives of 11 diverse, broad-extent conservation partnerships in 29 countries 17 questions that pertained to launching and maintaining partnerships for broad-extent conservation, specifying ultimate management objectives, implementation, and learning. Partnerships invested more funds in implementing conservation actions than any other aspect of conservation, and a program's context (geographic extent, U.S. vs. other countries, developed vs. developing nation) appeared to substantially affect program approach. Despite demonstrated successes of these organizations and the compelling benefits of broad-extent conservation, specific challenges related to uncertainties in scaling up information and to coordination among a relatively diverse set of issues, governance structures, and partners hindered long-term success. Engaging stakeholders, developing conservation measures, and implementing adaptive management were dominant challenges. We developed integrative research questions pertaining to each of these challenges to inform and support effectiveness of existing and emerging broad-extent conservation efforts.

8:50-9:10

TAKING ACTION TO ADDRESS CLIMATE CHANGE EFFECTS ON WILDLIFE AND WATERSHEDS IN SOUTHWEST MONTANA

**Molly Cross**, Wildlife Conservation Society, Bozeman.

Recognition of the need to consider climate change in management decisions is growing, but capacity for taking action continues to lag. I will illustrate how collaborative planning involving scientists and managers is helping to build that capacity and leading to the implementation of strategies for conserving wildlife, watershed function and ranching livelihoods as climate changes in southwest Montana. By combining expert-based discussions of climate change impacts and adaptation options with data-driven models, we are identifying critical areas for taking climate-informed conservation actions in the region.

Climate-informed actions include efforts to increase water storage in riparian ecosystems, wetlands and upland areas through beaver mimic dams, beaver reintroductions and conflict mitigation, innovative irrigation management and upland micro-catchments. I will describe efforts to pilot these actions that involve diverse public agency, private landowner and conservation organization partners. I will discuss several opportunities we have capitalized on to move from climate change planning to action, including taking advantage of trusted relationships to counter skepticism about climate change, focusing initially on actions that are widely accepted as beneficial and endorsed by diverse experts and decision-makers, and introducing practitioners to relatively low-cost and low-tech strategies that are more palatable and can be implemented at larger scales.

9:10-9:30
A COMPARISON OF NATURAL RESOURCES APPLICATIONS OF SCENARIO PLANNING
**Erika Rowland** and Molly Cross, Wildlife Conservation Society, Bozeman. Holly Hartmann, Arid Lands Information Center, Tucson.

Increasing awareness of the uncertainties associated with the effects of climate change are challenging traditional planning and decision making for natural resources and conservation and forcing practitioners to explore a broad range of decision support methods. Scenario planning offers one option for incorporating irreducible uncertainties from different sources into planning and decision efforts by exploring a set of plausible but divergent futures. While better known for its application in business, the military, and community planning, the use of scenario planning to address climate change and other uncertain system drivers such as socio-economic factors and policy is growing. As part of the development of a scenario-planning guide for the National Landscape Conservation Cooperatives network and their diverse partners, we have assembled several case studies illustrating the application of this decision support method to natural resource conservation and management issues. Many of the case studies represent participatory processes that draw on existing partnerships. We will present highlights from these scenario-planning efforts to illustrate the range of approaches taken and how they have contributed to climate change adaptation planning. Examples cover a range of purpose, complexity, scale of application, required resources, methods for participation, and connections between qualitative and quantitative analysis.

9:30-9:50
WOLF RECOVERY IN THE NORTHERN ROCKIES: A UNIQUE LEVERAGING OF PARTNERSHIPS FOR CONSERVATION
**Magnus McCaffery**, Val Asher, and Mike Phillips, Turner Endangered Species Fund, Bozeman.

From 2000 through 2009 the Turner Endangered Species Fund (TESF) assisted the US Fish and Wildlife Service (Service) and later, Fish, Wildlife and Parks (FWP) with wolf recovery efforts and management in southwest Montana. In that capacity TESF was the only non-governmental conservation organization permitted under the federal Endangered Species Act to assist with the "daily grind" of wolf recovery. In 2010 our fieldwork shifted to focus on the Flying D Ranch, which has supported a wolf pack since December 2002. Since then we have focused on improving understanding of wolf-prey (bison and elk) interactions and the economics of this working ranch. The Flying D Ranch currently supports ~ 3500 bison, 1800 elk, and 20 to 30 wolves (in two packs) and represents a complex and dynamic setting that provides unique opportunities for leveraging partnerships for conservation.

9:50-10:10
MANAGING IN COLLABORATION TO CONSERVE WHITEBARK PINE IN THE GREATER YELLOWSTONE ECOSYSTEM
**Kristin Legg** and Daniel Rienhart, National Park Service, Bozeman.

Whitebark pine (*Pinus albicaulis*) is considered a high-elevation forest species important to ecosystem structure, function, and process, and provides valuable forage to wildlife. Whitebark pine forests are at risk of decline throughout the species' range in North America. In 2011, the U.S. Fish and Wildlife Service determined that whitebark pine was warranted, but precluded from listing under the Endangered Species Act, and is now a candidate species for potential future listing. Throughout its range and in the Greater Yellowstone Ecosystem (GYE), there has been a significant loss of overstory whitebark pine trees to mountain pine beetle (*Dendroctonus ponderosae*) in addition to the continual infection of white pine blister rust (*Cronartium ribicola*). Other factors that may influence whitebark pine distribution and abundance include wildland fire management, and climate change. Land managers in the GYE are working together and in coordination with scientists and other partners to further the understanding of whitebark pine ecosystem dynamics and on ways to maintain whitebark pine on the landscape into the future. The Greater Yellowstone Coordinating Committee, Whitebark Pine Subcommittee has outlined coordinated monitoring of the distribution and health of whitebark pine as well as management strategies to preserve this ecologically important species. Collaborative efforts to provide for a resilient whitebark pine ecosystem include: (1) maintaining an interagency long-term monitoring program, (2) promoting resistance by propagating seeds collected from blister rust resistant trees, (3) protecting specific whitebark pine trees from mountain pine beetle attacks, (4) managing wildland fire, and (5) silvicultural treatments to reduce competition. There are many challenges to overcome during the implementation of these efforts. These include issues such as selection of restoration sites, how to manage this sensitive species in wilderness and federal lands under agency policies, understanding natural regeneration dynamics, and striving to understand the role of climate change toward the future of this important landscape species. In the GYE and throughout its range, managers utilize scientific results from the long-term monitoring program, genetics studies, climate change modeling, and other scientific studies to help inform their decisions. Through this integration of science into decision-making and continued collaboration among land use managers, scientist, and other partners across jurisdictional boundaries, we hope this high alpine iconic species will be maintained for many generations to come.

**Coffee Break 10:10-10:40**

**Session 6: Restoration Ecology 10:40-11:20**

10:40-11:00

SCALING UP LOCAL ROAD RECLAMATION EFFORTS TO RESTORE REGIONAL WILDLIFE CONNECTIVITY

**Adam Switalski**, WildEarth Guardians, Missoula.

Forest roads dissect wildlife habitat causing fragmentation, avoidance, and overall loss of habitat among other impacts. The US Forest Service is in the midst of a five-year planning process to identify an ecologically and fiscally sustainable minimum road system. As the Forest Service moves to "right size" their road system, the agency has already reclaimed more than 50,000 mi (80,000 km) of roads through methods ranging from simply closing the road to entirely reclaiming and restoring the road through full recontour. Large-scale restoration of roaded areas has resulted in measurable benefits to fish and wildlife habitat including the documentation of improvements to bull trout (*Salvelinus confluentus*) and black bear (*Ursus americanus*) habitat. As road reclamation continues, roadless areas have been expanded and the road density in many corridors has been greatly reduced. In this talk I discuss the benefits of road reclamation across Montana and the Rocky Mountains, and the ongoing restoration of core wildlife habitat and landscape-scale connectivity due to these efforts.

11:00-11:20

EFFECTIVENESS OF WILDLIFE GUARDS AT ACCESS ROADS

**Tiffany D.H. Allen** and Marcel P. Huijser, Western Transportation Institute, Montana State University, Bozeman; David W. Willey, Montana State University, Bozeman.

The reconstruction of 90.6 km of U.S. Highway 93 from Evaro to Polson, Montana, includes 41 wildlife crossing structures and 13.4 km of road with wildlife exclusion fencing. These measures aim to reduce wildlife–vehicle collisions and increase human safety, while allowing wildlife to traverse the landscape. In fenced road sections, gaps in the fence for access roads are mitigated by wildlife guards (modified cattle guards). We monitored wildlife movements for two consecutive years at two wildlife guards and one large crossing structure adjacent to a wildlife guard. We investigated wildlife guard effectiveness as a barrier to deer (*Odocoileus* spp.), black bear (*Ursus americanus*), and coyotes (*Canis latrans*). We also compared animal movements across a wildlife guard to movements through an adjacent crossing structure. The wildlife guards were ≥85% effective in keeping deer from accessing the road, 33–55% effective in keeping black bear and coyote from accessing the road, and ≥93.5% of deer, black bear, and coyotes used the crossing structure instead of the adjacent wildlife guard when crossing the road. Our results indicate wildlife guards can be effective for mitigating gaps in a fence at access roads, especially when paired with a crossing structure.

**Session 7: Methods in Conservation Biology 11:20-12:00**

11:20-11:40

THE USE OF GENOTYPES BEYOND AN INDIVIDUAL ID IN POPULATION ESTIMATES

**Elias Rosenblatt**, Montana State University, Bozeman.

Estimates of population size are critical for conservation priorities and management decisions, but in reality these estimates often require intensive field studies. Among large carnivores, the African lion faces numerous threats across its range, but we lack accurate estimates of population size and trend for most populations. Noninvasive genetic methods are commonly used to estimate population size for species such as lions, which are difficult to count by most other methods. In most such studies genotypes simply identify individuals in the same manner that a legband or eartag does. This presentation discusses the development of a new estimator of population size based on reconstructing the population's pedigree, using the detailed information in genotypes to infer the presence of individuals that were not sampled. Using estimated population parameters from a Zambian lion population, Monte Carlo simulations show that this method is unbiased and precise if sampling is of sufficient intensity and duration. This pedigree reconstruction approach detected 2–21% more individuals than were directly sampled across a broad range of simulated sampling schemes. Though this method has limitations, our study shows that using the information content of genotypes, rather than simply treating genotypes as individual identifiers, can improve estimates of population size.

11:40-12:00

WHEN IS A DOG YOUR BEST (SCIENTIFIC) PARTNER? A REVIEW OF CONSERVATION DETECTION DOG EFFICIENCY

**Pete Coppolillo**, Ngaio Richards, Aimee Hurt, and Megan Parker, Working Dogs for Conservation, Three Forks.

Conservation detection dogs (CDDs) hold significant potential for non-invasive monitoring of native and invasive species. Up to 39-fold increases in detection efficiency have been documented, but overall, results have varied widely. To our knowledge, no systematic analysis of CDD results has examined the variables that affect the overall increases in efficiency from CDDs. Such an analysis will help clarify when detection dogs are most efficient and when other techniques are likely a better option. Here, we present results from our analysis of just over 50 applications using detection dogs for natural resource targets. Our objective was to identify they key factors affecting the efficiency and benefits from using CDDs for natural resource monitoring. The results demonstrate the expansion of CDD applications, both geographically and taxonomically for target species. New and less expensive laboratory techniques have also led to a broader set of questions addressed. Comparisons of human vs. canine searching suggest that

the benefits of detection dogs are highest for species at low densities, cryptic species and in structurally diverse landscapes. Financial cost comparisons are few, but where data exist, efficiency is highly correlated with detection efficiency. Best practices for CDD work and for maximizing data quality are also presented.

**Snack Break 12:00-12:20**

**Session 8: Native Species Ecology and Conservation II 12:20-1:30**

12:20-12:40

SHIFTS IN CARIBOU CALVING HABITAT AND SPACE-USE

**Daniella Dekelaita** and Paul R. Krausman, University of Montana, Missoula; Shane P. Mahoney, Newfoundland and Labrador Department of Environment and Conservation.

The woodland caribou (Rangifer tarandus caribou) population in Newfoundland has been declining since the mid-1990s, and will likely continue to decline into the foreseeable future. This decrease in numbers has been accompanied by a large drop in recruitment. Predation is the primary cause of caribou calf mortality in Newfoundland, and since 2003, >80% of radio-collared calves died within the first 6 months of life. Two Newfoundland herds also have shifted their calving grounds over the past 15 to 20 years. Our objective was to investigate why these shifts have occurred. We analyzed 30 years of telemetry data on female locations to delineate early-use (1980s and 1990s) and late-use (2003 and 2010) calving grounds, and to compare use and availability within and across these early- and late-use areas. We used a resource selection framework and evaluated shifts with respect to land-use, landcover, and NDVI over time. We found that females were not avoiding human disturbance or responding to climatic changes, but instead were changing selection choices. Models indicated that caribou were selecting for post-burn vegetation and more cover in late-use calving grounds. These results will likely help direct future research and management decisions to boost calving success in Newfoundland.

12:40-1:00

INTERACTION TURNOVER WITHIN POLLINATION NETWORKS

**Michael P Simanonok**, Laura Burkle, Dave Roberts, Montana State University, Bozeman; Travis Belote, The Wilderness Society, Bozeman.

Pollination is an ecosystem service that is essential for native plant communities, ecosystem function, and agriculture. Interactions between plants and pollinators vary across spatial, temporal, and environmental scales, and it has been predicted that phenological mismatches may occur between these historically linked communities in the wake of climate change and other disturbances. We investigated i.) whether turnover in interactions between species was due to species turnover or host-switching between species, ii.) which component of the network (plants or pollinators) contributed most to interaction turnover, and iii.) the degree to which spatial, temporal, and environmental gradients were important for structuring changes in network interactions. Field work was conducted during summer 2012 on the Beartooth Plateau, an alpine tundra ecosystem in Montana and Wyoming, with weekly observations of plant-pollinator interactions. We found that interaction turnover mostly occurred due to simultaneous species turnover of both plant and pollinator communities with host-switching having marginal contribution. Furthermore, interaction turnover occurred across temporal and environmental gradients, with no significant variation across spatial scales. This study represents the first instance of the partitioning of interaction turnover into individual species components for a pollination network, and these results highlight the potential for phenological mismatch between plants and pollinators.

1:00-1:20

ASSESSING LAND USE PRACTICES IN SAGEBRUSH AND GRASSLAND ECOSYSTEMS: MULTIPLE MIGRATORY BIRD RESPONSES

**Jessie Golding** and Victoria J. Dreitz, University of Montana, Missoula.

Grazing is an important land management tool and an essential part of many economies. Previous research indicates that grazing is more productive when practices maintain healthy native biological communities. Consequently, programs have developed to involve private landowners in grazing that is beneficial to biological communities. It is important to understand how grazing affects biological communities to properly inform these programs. Avian communities in rangeland systems provide an excellent system to evaluate grazing practices; they respond quickly to habitat change because they evolved with periodic disturbance from native grazers. We compared two grazing regimes, rest-rotation and traditional, in a mixed sagebrush grassland habitat. Rest-rotation grazing mimics native grazing patterns and occurs in partnership with private landowners, whereas traditional grazing maximizes livestock production and occurs on public lands. We used two measures of community structure, abundance and species richness, to assess how grazing is affecting avian communities. Our results show there is little difference in the means of these measures between the two grazing regimes, but that variation in rest-rotation regimes is higher. In a system that evolved with disturbance, this variation may more closely reflect the native state of the ecosystem and be an essential part of maintaining these communities.

**Concluding Remarks 1:20-1:30**
Rebecca McCaffery, MTSCB Board President