Science and Conservation in a Changing World

Annual Research Symposium of the Montana Chapter of the Society for Conservation Biology

November 5-6, 2009

University Center – University of Montana, Missoula, MT

SCHEDULE WITH ABSTRACTS:

Thursday, November 5th:

6:30-7:00 pm **Registration** - University Center Theater foyer

7:00-8:00 pm **Plenary 1** - University Center Theater

WOLF PREDATION AND ELK DYNAMICS IN THE YELLOWSTONE ECOSYSTEM
Scott Creel, Montana State University, Bozeman, MT

Predators affect their prey by direct killing, but also by inducing anti-predator responses that reduce the risk of being killed, but carry other costs. In many systems, these nonconsumptive 'risk effects' have important consequences for prey dynamics, but most studies of the dynamics of large carnivores and their prey have focused only on direct predation. For example, the EIS evaluating the likely consequences of wolf reintroduction to Yellowstone included several models of elk dynamics, all of which considered only direct predation, implicitly assuming that risk effects would not play an important role in elk dynamics. Elk behavior responds to the presence of wolves on a spatial scale of several kilometers and a time scale of minutes to days. In the Gallatin Canyon portion of the Yellowstone Ecosystem, predation risk from wolves varies spatially and temporally, and elk respond to the presence of wolves by altering patterns of aggregation, vigilance, foraging habitat selection and diet selection. These behavioral responses carry nutritional and physiological costs that affect the rate of calf production with important consequences for population dynamics. This example illustrates the importance of risk effects to understand wolf-elk dynamics, an issue of central importance for conservation and management in Montana.

8:00-10:00 pm **Social and Poster Session** - University Center Theater foyer

1. BIO-OIL AND BIOCHAR FROM PYROLYTIC BIOMASS CONVERSION: RENEWABLE ENERGY, SOIL ENHANCEMENT AND CARBON SEQUESTRATION

Kristin M. McElligott, University of Idaho, Moscow, ID
Mark Coleman, University of Idaho, Moscow, ID
Deborah Page-Dumroese, Rocky Mountain Research Station, Moscow, ID

The removal of forestry residues from forests in the Inland Northwest is essential for reducing the risk of stand-replacing wildfires. Using this waste biomass for bio-energy production may improve the economics of biomass removal and produce a renewable form of energy. However, removing biomass reduces soil organic carbon (SOC) and can have negative impacts on soil fertility. Pyrolysis (thermoconversion of biomass under anaerobic conditions) generates bio-oil, gaseous fuels, and a biochar byproduct that is recalcitrant against decomposition and can be applied as a soil amendment to increase SOC and enhance forest soils. Additionally, it can be used as a carbon-neutral energy source and to sequester carbon for centuries. To evaluate the environmental potential of biochar soil management in conjunction with energy production and fuels reduction using pyrolysis, we investigated the effects of biochar additions on various forest soils. We tested soil physical, chemical and biological properties in a lab study and used a greenhouse bioassay to examine woody biomass growth. A field study comparing biochar application to biomass removal and fell-and-leave forestry management methods is in progress at the Umpqua National Forest. Results from the parallel greenhouse bioassay and soil core lab study are currently being analyzed and will be presented.

2. DO FLOWERS LIMIT BEES? THE INFLUENCE OF AN INVASIVE PLANT ON NATIVE BEE COMMUNITIES AND THE REPRODUCTION OF A SOLITARY BEE, *OSMIA LIGNARIA*

Jennifer Palladini, University of Montana, Missoula, MT

Animal-mediated pollination is ubiquitous and an essential interaction for ecosystem functioning and the production of plant-based foods. Bees are the major pollinators of both wild plants and crops; however, the maintenance of this essential ecosystem service is in peril, as dramatic declines in native bee populations have been reported in many parts of the world. Identifying the resources that regulate bee populations is essential for conservation. We know surprisingly little about what factors influence bee abundance. Floral resources are often correlated with bee abundance, but their influence on demographic processes is rarely examined. My research explores how an increase in floral resources provided by an introduced plant, leafy spurge (*Euphorbia esula,* Euphorbiaceae), influences bee communities and the reproduction of a solitary bee, *Osmia lignaria* (Megachilidae). I found that, bee abundance is correlated with floral abundance, though the relationship between leafy spurge invasions and bee abundance depends on the floral community in which the invasion takes place. Likewise, nest initiation and offspring production were correlated with floral abundance. These results suggest that floral resources can limit bee abundance. Thus, alterations in plant communities that alter floral availability will likely have impacts on bees, with possible implications for pollination services.

3. HERBIVOROUS INSECTS REDUCE GROWTH AND REPRODUCTION OF BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA*)

Masaru Takahashi, Idaho State University, Pocatello, ID
Nancy Huntly, National Science Foundation, Arlington, VA

Insect herbivores can reduce growth, seed production, and population dynamics of host plants, but do not always do so. Although sagebrush steppe is one of the most threatened ecosystems of North America, the impact of insect herbivores on big sagebrush, its dominant and characteristic shrub, is largely unknown. Several studies have described occasional large effects of outbreak insect herbivores, but no study has quantified the impact of more typical, nominal herbivory that is produced by the diverse community of insects associated with big sagebrush. In 2008, we removed insects from big sagebrush plants with insecticide to evaluate whether insect herbivores reduced growth and seed production of big sagebrush. Removal of herbivores led to significant and substantial increases in inflorescence growth (22%), undamaged-flower production (325%), and seed production (1053%) of big sagebrush. Two herbivore guilds, leaf feeders and sap-suckers, were common in 2008. Our results showed the impact of herbivory in the current growing season on the growth and reproduction of big sagebrush and revealed an unrecognized, significant role of non-outbreak herbivores on big sagebrush. We are extending our study to examine the long-term impact of insect herbivores on big sagebrush in other years, when weather and herbivore populations may differ.

4. IMPACTS OF ELK BROWSING ON SMALL MAMMAL ASSEMBLAGES IN HIGH ELEVATION SNOW MELT DRAINAGES

Elliott W.R. Parsons, University of Montana, Missoula, MT

Large mammalian herbivores are major drivers of plant community structure and function in many terrestrial systems. Although the direct effects of ungulate herbivory are well studied, we know much less about how herbivore-driven alteration of habitat indirectly influences animals that rely on that habitat. We studied the effects of elk (and to a lesser extent deer) herbivory on small mammal communities that utilize high elevation snow melt drainages in Arizona. Using 10 ha elk exclosures and paired unfenced drainages, we examined how cessation of browsing influenced vegetation and the relative abundances, richness, and diversity of small mammals. Four years of elk exclusion resulted in gains in shrub and leaf litter cover and declines in forb cover. These changes in habitat structure paralleled changes in the relative abundance of all members of the small mammal assemblage, which included deer and brush mice (*Peromyscus maniculatus* and *boylii*), woodrats (*Neotoma neomexicana*), and voles (*Microtus mexicanus*). Small mammal species richness increased in exclosures relative to controls, while species diversity showed a positive trend in the same direction. Taken together, results show that habitat alteration by large ungulates can strongly structure small mammal assemblages over a relatively short time period.

5. BEST MANAGEMENT PRACTICES FOR MAKING OFF-ROAD VEHICLE MANAGEMENT DECISIONS ON FORESTLANDS

Adam Switalski, Wildlands CPR, Missoula, MT
Allison Jones, Wild Utah Project, Salt Lake City, UT
Jim Catlin, Wild Utah Project, Salt Lake City, UT

Off-road vehicles (ORVs) can have negative effects on the environment and non-motorized recreationists. Management of ORVs on forestlands has become increasingly difficult as various user groups compete for a finite amount of land on which to recreate. Additionally, there are no uniform methods for managing ORVs in forests to reduce their impacts to the environment and lessen conflicts with other user groups. We reviewed the environmental and social effects of ORVs, proposed Best Management Practices (BMPs) for forestlands to help minimize their negative impacts, and highlighted needed research. We found extensive scientific literature documenting the physical and ecological impacts of ORVs, ranging from soil compaction to non-native plant dispersal. Many species of wildlife are also affected by ORV use through direct and indirect mortality, disturbance, and cumulative loss of habitat. Conflict with non-motorized users has been documented as well, resulting in diminished recreational experience which may lead to the displacement of quiet users. While ORVs can be harmful to the environment and negatively affect non-motorized recreationists, implementing science-based BMPs can help reduce their impacts and user conflicts.

Friday, November 6th:

7:30-8:00 am **Registration** - University Center Rooms 330/331 foyer

8:00-9:00 am **Plenary 2** - University Center Rooms 330/331

CONSERVATION-RELIANT SPECIES: OUR NEW RELATIONSHIP WITH NATURE

J. Michael Scott, US Geological Survey Idaho Cooperative Research Unit, Department of Fish and Wildlife University of Idaho, Moscow, ID

With passage of endangered species regulations in the United States, Australia, Canada and elsewhere came an expectation that species at risk would be identified, management actions implemented on their behalf, the species would increase in numbers and distribution to a point of recovery, be de-listed and fall under existing regulatory actions no longer in need of the species specific protections afforded by endangered species laws. Recovered species like the peregrine falcon, gray whale and Aleutian Canada goose met this expectation, but 84% of the 1311 species listed under the US ESA do not. We characterized these species as conservation-reliant. That is, continuous human intervention in the form of predator control, nest parasite control, prescribed burns or other species specific management actions is required to sustain these species at numbers above those considered at risk. Examples of conservation-reliant species that have been or are proposed for delisting and those that might be de-listed will be discussed. We will describe Recovery Management Agreements, a biologically and legally defensible tool between government and a second party, public or private, that allows for species “adoption” to facilitate removing a species from the endangered species list. Man’s relationship with nature has

changed, and at least a subset of species is dependent upon our continuous intervention for their existence, often at population sizes and distributions that are best considered minimally viable.

9:00-9:15 am **Break** - University Center Rooms 330/331 foyer

Session 1: Species Conservation in a Changing Landscape

University Center Rooms 330/331
Moderators: Joel Berger and Scott Mills

9:15-9:35 am
CLIMATE CHANGE IN YELLOWSTONE AND THE ELK-ASPEN INTERACTION
Jedediah Brodie, University of Montana, Missoula, MT

Most climate change research has focused on direct responses of organisms to altered abiotic conditions. Yet recent work suggests that responses to climate change could also be strongly determined by altered species interactions. Our knowledge of the relative strength of these effects is scant, hampering our ability to predict the impacts of climatic changes. Through field work in Yellowstone, I show that aspen shoots respond negatively to snow, likely because deep snow shortens the effective growing season at a specific site. This would suggest that the observed decline of snow levels in the ecosystem should enhance aspen recruitment; indeed some "bioclimatic envelope" models predict the expansion of aspen in the system. Yet deep snow also hinders elk movement in winter, thereby providing physical protection to aspen shoots. Elk browsing rates are strongly, negatively correlated with snow levels. The negative direct effects of snow (shortened growing season) and the positive indirect effects of snow (protection from elk) exactly cancel each other out. This suggests that population-level responses to climate change could be difficult to predict in natural systems.

9:35-9:55 am
THE FAILING MEXICAN WOLF REINTRODUCTION PROGRAM: POLICY, POLITICS, AND GENETICS
Rich Fredrickson, University of Montana, Missoula, MT

Beginning in 1995, 66 wolves from Canada were released into central Idaho (35) and Yellowstone National Park (31). Ten years later these populations numbered at least 565 and 325 wolves, respectively. In contrast, following the release of 92 captive-born Mexican wolves and 99 wolf translocations in Arizona and New Mexico over the last ten years, only 52 wolves could be counted in January 2009. Why has the Mexican wolf reintroduction program not succeeded? Here I review policy, decision-making, and landscape differences between the two reintroduction programs that are limiting the reintroduced population's ability to succeed. I also examine the effect of a fundamental biological difference between northern gray and Mexican wolves – the high fixed genetic load in the three founding Mexican wolf lineages and its manifestation as strong inbreeding depression following genetic rescue of the Mexican wolf population. It was hoped that the abundance of highly fit wolves produced in captivity following genetic rescue would be used in a reintroduction program. Failure to act on this time-limited opportunity, combined with restrictive policies and management has resulted in a reintroduced population that has been flat or declining the last five years. Lastly I review genetic management options for Mexican wolves.

9:55-10:15 am

MECHANISMS OF COEXISTENCE BETWEEN AN ENDANGERED SPECIES AND AN INTRODUCED COMPETITOR

Jake Ferguson, Montana State University, Bozeman, MT
Chris Guy, Montana State University, Bozeman, MT
Mark Taper, Montana State University, Bozeman, MT

The invasion of lake trout into lakes occupied by bull trout has contributed to dramatic decreases in bull trout populations in northwestern Montana lakes. Coexistence of bull trout and lake trout has been observed in some systems, however the conditions for this coexistence are not clear. We show that coexistence between these species may occur due to life history shifts that result in only partial life history overlap. We use available gill net data on 5 lakes, over a large range of sizes, to distinguish between interactions that may drive lake population dynamics, examining how different forms of interactions between these species generate different patterns of coexistence. We further show that predation of bull trout by lake trout can lead to similar patterns seen in empirical data and can occur in many possible lake-river systems.

10:15-10:35 am

THE COLLAPSE OF WHITEBARK PINE AND THE FUTURE OF THE YELLOWSTONE GRIZZLY

Louisa Willcox, Natural Resources Defense Council (NRDC), Livingston, MT

The seeds of whitebark pine (*Pinus albicaulis*) are critically important to the health of the Yellowstone grizzly bear *(Ursus arctos)* population. The whitebark pine forests of the Greater Yellowstone Ecosystem (GYE) are threatened by mountain pine beetle (*Dendroctonus ponderosae*), global warming, and white pine blister rust (*Cronartium ribicola*). Whitebark pine is the engine that drives the health of the GYE grizzly; the adverse consequences of its loss to the Yellowstone grizzly population have been thoroughly researched and documented. In the summer of 2009, in order to better understand the extent and severity of pine beetle outbreak, the Natural Resources Defense Council, US Forest Service, Geo/Graphics and others collaborated to conduct aerial surveys across the entire whitebark pine distribution within the GYE. Our method used airplane over-flights in conjunction with Global Positioning System technologies and digital photography. The results reveal a widespread ecological collapse of the whitebark pine ecosystem. In certain areas essentially the entire whitebark pine overstory is dead and in other areas only a minor component of living whitebark pine remains. In this presentation we will present data from our 2009 aerial survey and will discuss the implications for the future of the Yellowstone grizzly bear.

10:35-10:50 am **Break –** University Center Rooms 330/331 foyer

10:50-11:10 am

VARIATION IN LIFE HISTORY AND DEMOGRAPHY IN THE AMERICAN BLACK BEAR

Julie Beston, University of Montana, Missoula, MT

Variation in life history and demography can inform researchers about pressures a species faces and whether information can be borrowed from previous studies for decision-making. I

performed a hierarchical Bayesian meta-analysis of demographic studies of black bears (*Ursus americanus*) to explore how vital rates vary across their range, their population status, and whether managers can generally apply information from previous studies. Cub, yearling, and adult survival and fecundity varied between eastern and western North America. Subadult survival did not show geographic structuring. Adult survival and fecundity appear to trade off, with higher survival in the west and higher fecundity in the east. Although adult survival had the highest sensitivity, differences in reproduction drove differences in population growth rate. The mean population growth rate was higher in the east than the west, but less than 1 for both halves. Substantial proportions of the populations are expected to be increasing throughout the range. Because population growth rates are close to 1, researchers should employ caution in borrowing vital rates from other populations. Further work needs to be done to address the apparent tradeoff between adult survival and fecundity and explore how the estimated growth rates are likely to affect population status of black bears.

11:10-11:30 am

RECOVERY OF THE GRAY WOLF IN THE NORTHERN ROCKY MOUNTAINS OF THE UNITED STATES

Edward E. Bangs, et al. U.S. Fish and Wildlife Service, Helena, MT

Gray wolf (*Canis lupus*) populations were deliberately eliminated from the northern Rocky Mountains (NRM) of the northwestern United States by 1930. Naturally dispersing wolves from Canada first denned in Montana in 1986. In 1995 and 1996 wolves from western Canada were reintroduced to central Idaho and Yellowstone National Park, Wyoming to accelerate recovery. By December 2008, 1,645 wolves were being managed in the NRM under the federal Endangered Species Act. Wolves occupy over 110,000 square miles in the NRM and the population is biologically recovered. Wolf restoration proceeded more quickly, with more benefits (public viewing and restoration of ecological processes), and fewer problems (livestock and pet depredation and impacts to wild ungulate populations) than predicted. However, from 1987-2008, a minimum of 1,109 cattle, 2,133 sheep, 115 dogs, 28 goats, 21 llamas, 10 horses, and a mule were confirmed killed by wolves and about $1,400,000 was paid from private and state wolf damage compensation funds. In addition to a wide variety of non-lethal tools, the U.S. Fish and Wildlife Service (Service) and its cooperators relocated wolves 117 times and killed 988 to reduce conflicts. 2008 was a record year for livestock damage, compensation, and wolf control, suggesting the wolf population has saturated suitable habitat in the NRM. In Spring 2009, the NRM wolf population was removed from federal protection and will be managed just like other resident wildlife by the affected States and Native American Tribes, except in Wyoming, where wolves will continued to be managed by the Service because Wyoming lacks a state wolf management plan. The States of Montana and Idaho will manage wolves in suitable habitat just as they do other resident wildlife like black bears, mountain lions, elk, and deer. That will include regulated hunting by the public. Montana will manage for about 400 wolves, Idaho for over 500 and continued Service management in Wyoming will maintain about 300 wolves. The controversy and emotion typically associated with wolves and wolf management will continue as the American public debates its relationship with wolves and wildness. Science and biology are poor tools to resolve the complex legal, policy, and human values that are being debated symbolically through wolves.

11:30-11:50 am
CASCADES OF SYMBOLISM: WHERE DOES THE SCIENCE FIT INTO MONTANA WOLF CONSERVATION?
Carolyn Sime, Montana Fish, Wildlife, and Parks, Helena, MT

11:50 am-1:00 pm **Lunch** - University Center 2nd floor Cafeteria

**MTSCB Brown Bag – Location TBA – we will discuss chapter goals and priorities for the coming year. All those interested in becoming more involved with the chapter is invited to attend

Session 2: Collaborative Conservation

University Center Rooms 330/331
Moderator: TBA

1:00-1:20 pm
CONNECTING LANDSCAPES IN THE CABINET-PURCELL AND ROCKY MOUNTAIN ECOSYSTEMS: TRANSBOUNDARY LESSONS FROM SCIENCE-DRIVEN COALITION WORK
Dave Quinn, Wildsight, Kimberly, BC

Since 2006, the Yellowstone to Yukon Conservation Initiative and Wildsight have coordinated the Cabinet Purcells Mountain Corridor Project (CPMCP), a unique transboundary conservation collaborative involving over 70 First Nation, biologist, non-governmental organization, and individual partners from both the U.S. and Canada. The project aims to reconnect healthy grizzly populations in the Canadian Purcells to the U.S. Cabinet Mountains and eventually to the main Rocky Mountain corridor via the Selway-Bitteroot ecosystem. Conservation priority areas and issues in the CPMC are partner-driven, and dictated by modern conservation biology. This talk will give an overview of the CPMCP area, summarize how science has driven the conservation priorities of the project, and focus on lessons learned from the collaborative process.

1:20-1:40 pm
COWS, BIRDS, AND GRASS: BRIDGING CONSERVATION AND RANCHING THROUGH GRASSBANKING
Barbara Cozzens, The Nature Conservancy in Montana, Lewistown, MT
Brian Martin, The Nature Conservancy in Montana, Lewistown, MT

Perhaps the most significant challenge to large landscape conservation is getting diverse stakeholders to work together across social and political boundaries. In 2000, The Nature Conservancy purchased the 60,000 acre Matador Ranch in northcentral Montana. While relatively large, we recognized that we could not achieve tangible conservation outcomes at-scale without an innovative approach that engaged local landowners and land management agencies. To accomplish this goal, in 2003 we launched a grassbank directed at protecting vital native habitat and enhancing habitat conditions for endemic grassland species, particularly rare or declining grassland birds. The grassbank offers discounts for leased forage in return for private lands conservation. The Conservancy provides grazing discounts for both ecosystem-level conservation practices, such as forgoing sodbusting, as well as specific biodiversity-

associated conservation measures, including protection of prairie dog complexes and sage grouse habitat. Presently, we have expanded our conservation reach using this tool from 60,000 to over 288,000 acres, and protected more than 34,000 acres of Sage Grouse habitat and 1,500 acres of Prairie Dog complexes. The result is quantifiable benefits to both ranching and conservation, demonstrating collaboration and learning over conflict. These results would be difficult to replicate using the traditional top-down, expert-driven conservation methods.

1:40-2:00 pm

A SUMMARY OF AMERICAN WILDLANDS' WILDLIFE LINKAGE AND HIGHWAY SAFETY ASSESSMENT: A PRIORITIZATION AND PLANNING TOOL FOR WESTERN MONTANA

Dylan W. Taylor, American Wildlands, Bozeman, MT
Julie K. Betsch, University of Montana, Missoula MT
Sarah K. F. Olimb, World Wildlife Fund – Northern Great Plains Office, Bozeman, MT
Elizabeth R. Williamson, American Wildlands, Bozeman, MT

Human transportation systems pose a major threat to wildlife connectivity – a critical conservation goal for wildlife managers and conservationists across the Nation. To help identify and prioritize potential wildlife mitigation project areas along U.S. highways in western Montana, American Wildlands conducted a rapid wildlife linkage and highway safety assessment. We used four criteria to identify high priority highway mitigation project areas for wildlife: 1) road kill concentration areas; 2) important wildlife linkage areas; 3) planned transportation projects; and 4) land ownership (as an indicator of the likelihood of conservation success). Using kernel density estimation and percent volume contours we identified high risk areas for both wildlife and human safety based on high road kill volumes (i.e. high concentration areas). We then applied additional GIS data layers related to wildlife linkage, planned transportation projects and land ownership to further refine our results into priority mitigation project areas. The results of this assessment will be used not only to guide American Wildlands' Safe Passages Initiative, but to inform relevant stakeholders in the public and private sectors. Furthermore, we encourage state and federal agencies to expand on and adapt the lessons learned from this assessment to create state-wide initiatives throughout the West.

2:00-2:20 pm

BOZEMAN PASS WILDLIFE PRE-AND POST FENCE MONITORING PROJECT

April C. Craighead, Craighead Environmental Research Institute, Bozeman, MT
Frank L. Craighead, Craighead Environmental Research Institute, Bozeman, MT
Lauren Oechsli, Craighead Environmental Research Institute, Bozeman, MT

Roads can have devastating effects on wildlife populations through direct mortality and indirect impacts of habitat fragmentation and loss of connectivity. In an effort to mitigate the negative impacts on wildlife and humans, transportation planners have begun to incorporate wildlife mitigation structures in planned upgrades of roads and bridges. The Bozeman Pass fencing project with the inclusion of two miles of wildlife fencing, jump-outs and 'Texas guards' added to a bridge rebuild project successfully highlights the effectiveness of wildlife mitigation structures. In the Bozeman Pass area, we have recorded nine years of road kill and animal movement data on I-90 between Bozeman and Livingston, Montana. Since the inclusion of

wildlife fencing in 2007, ungulate road kill has been reduced significantly ($p<.02$) between the pre-and post-fencing time period in the fenced area. We have also seen a significant increase of ungulates traversing the area beneath the bridge to move safely from one side to the other ($p<.01$) from our track bed analyses. Preliminary results do not indicate that there has been increased mortality at the fence ends. This project highlights the effectiveness of wildlife mitigation structures in reducing wildlife mortality, increasing driver safety, and maintaining habitat connectivity in a rapidly changing landscape.

2:20-2:35 pm **Break –** University Center Rooms 330/331 foyer

2:35-2:55 pm

RESEARCH NATURAL AREAS IN THE NORTHERN REGION, U.S. FOREST SERVICE: ISSUES AND RESEARCH OPPORTUNITIES IN A FEDERAL PROTECTED AREAS SYSTEM

Steve Shelly. USDA Forest Service, Region 1, Missoula, MT

The Research Natural Area (RNA) program is one of the oldest formal programs in the U.S. Forest Service. Since 1927, these areas have been designated as part of a national network of sites protected in perpetuity for research and education purposes, and as a tool for conserving biological diversity. To date, 482 RNAs have been designated on Forest Service lands nationwide, protecting a total of over 570,000 acres. As the RNA program has matured many issues have arisen, primarily related to stewardship of the areas. Historically, RNAs were viewed as 'hands off" reserves, intended to protect features in a strictly unmanaged state. As the ecological effects of fire suppression and introduced species have become more clearly understood, a philosophical shift has occurred within the Forest Service (and the natural areas profession). Stewardship management in RNAs is now more commonplace as a result. Research Natural Areas provide baseline sites for ecological research in a wide range of habitats and plant communities. Research use in RNAs has been modest to date, but there is outstanding potential for such use regarding climate change and ecological restoration. Ongoing studies utilizing RNAs in the Northern Region are examining the effects of increased atmospheric CO_2 on tree growth, and the efficacy of restoration treatments in old growth forests and grasslands.

2:55-3:15 pm

10 YEARS OF NUTRIENT REDUCTIONS ON THE CLARK FORK RIVER

Vicki Watson, University of Montana, Missoula, MT
Walter Dodds, Kansas State University, Manhattan, KS
Will McDowell, Clark Fork Coalition, Missoula, MT

In the 1980's much of the Clark Fork River was impaired by nuisance algae and excess nutrients. River studies, models and professional judgment set targets for algae levels and for nutrient levels and loads expected to meet targets. The 10 year nutrient reduction plan ran from 1998 to 2008. Over those years, major point sources reduced Total Nitrogen loads by 18% and Total Phosphorus loads by 66%. Missoula reduced septic systems by 3,000, and nonpoint sources were addressed. Nutrient targets were reached in the middle river in over 90% of N samples & 70% of P samples; compliance was lower in the upper river. Algae targets were met 70% of the time in the lower middle river, but only 30% of the time in the upper river and below Missoula. In-river levels of Total Nitrogen, Total Phosphorus and Soluble Reactive Phosphorus decreased

significantly, but Dissolved Inorganic Nitrogen did not. Algae levels declined or were static in the middle river, but increased or were static in the upper river. The latter's dominant alga -- *Cladophora glomerata* --is notoriously difficult to control. Flows declined over the 10 years, likely providing less scour, and resulting in more nitrogen-rich groundwater entering the river.

3:15-3:35 pm
DIALOGIC DELIBERATION IN ENVIRONMENTAL DECISION-MAKING
Cassandra Hemphill, University of Montana, Missoula, MT
Claudia Pine, University of Idaho, Moscow, ID

Conservation of biological diversity depends on high-quality science. Yet policy-makers base decisions on more than just science; they also consider political and societal values. Can conservation biologists incorporate public interests and politics into a rigorous decision-making process while maintaining their scientific integrity? One model we look to is The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund), under which experts tasked with remediation decisions must consider not only scientific integrity and technical feasibility but also integrate the public's concerns and values and political acceptability throughout the process. Participants in this case study are remediation experts with 15-32 years of professional experience and degrees in mathematics, science, or engineering. Experts studied use *dialogic deliberation*. Dialogue is a form of discourse that remains consciously open, flexible, and mutually negotiated. Dialogic processes are able to represent and consider the views of non-physically represented stakeholders – including non-humans and the environment as stakeholders. Deliberation incorporates experiential input, analogy, historical precedent, and non-hierarchical decision-making as well as technical and scientific considerations. Using *dialogic deliberation,* scientists can productively manage tensions; reduce uncertainty; and reach robust, sustainable decisions. Use of dialogic processes may help conservation biologists forge more durable connections among politics, science, technology, and society.

3:35-3:50 pm **Break -** University Center Rooms 330/331 foyer

3:50-4:50 pm **Plenary 3** - University Center Rooms 330/331

DATA AND DAYDREAMS – IS CONSERVATION SCIENCE LEAVING ROOM FOR LOVE OF WILD PLACES?
Chris E. Filardi, American Museum of Natural History

As a society, SCB promotes study of the maintenance, loss, and restoration of biodiversity – all processes that are exceedingly complex. For instance, drivers of biodiversity loss span all realms of human endeavor, from global economics to community-level politics and individual behavior. No one 'movement' can, or even should, channel all efforts to confront the challenges before us. Through examples of place-based conservation initiatives in North America and the southwest Pacific, this talk will discuss the potential need for conservation scientists' role in reinvigorating a diversity of approaches to conservation that vary in their use of scientific knowledge and perspectives. Differences across a spectrum of science-driven (e.g. climate change), science-based (e.g. species recovery or reintroduction), versus more purely values-driven approaches (e.g. wilderness) suggest that we need them all. Ebbing too far away from any

of these realms as a community may threaten some of the most basic values conservation biologists and practitioners share. We often see the critical need and call for more expansive investment in scientific knowledge. As a community, we may also need to call for more balanced investment in the kinds of organic vision that inspired early conservation efforts in North America as well as the discipline of conservation biology itself.

5:00 pm **Informal dinner and drinks** – Holiday Inn Parkside, Brooks and Brown Lounge