History of Fish Management on Forest Lands [AFS]

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The history of fish habitat management in the Forest Service is a history of environmental law in the United States. Starting with the creation of forest reserves in the late 1800s to the present day, fish habitat management programs have always had a place in the management of our National Forests. With the passing of legislation such as the National Forest Management Act, National Environmental Policy Act and the Endangered Species Act, fisheries has taken on a more complex and an ever increasing role in how are forests are managed for other resources. Fisheries biologists in the Forest Service have always been few in number and represent less than 300 in an agency of over 30,000 employees. A fisheries job in the Forest Service has never been easy and often confrontational, stressful and frustrating. In spite of these drawbacks, the agency has always been blessed with truly professional and dedicated fisheries professionals.

Biological Sciences - Terrestrial

A Private Sector Initiative to Enhance Conservation of Wolves [TWS]

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The Turner Endangered Species Fund is a private, non-profit charity dedicated to conserving biodiversity. We concentrate our efforts on carnivores, grasslands, plant-pollinator complexes, and species that historically ranged onto properties owned by R.E. Turner. As such, one of our priorities has been to advance wolf conservation. We are

working as the only private permittee of the USDI Fish and Wildlife Service (USFWS) on wolf recovery. In cooperation with the USFWS and Wildlife Services, we tested electronic training collars on depredating packs of wolves held on the Flying D Ranch, Bozeman, Montana. These wolves were released and advanced recovery by siring pups. We assist the USFWS with trapping, monitoring and management of wolves in southwest Montana. We proposed a plan for developing a wolf experience center at the Vermejo Park Ranch that would improve the survival potential of captive-born Mexican wolves before they are released to the wild. In cooperation with the USFWS, we developed the Ladder Ranch Mexican Wolf Pre-release Captive Facility in 1997 where we have annually held 4 to 20 wolves. We have produced 5 litters of pups and released 15 individuals to the wild. As in Montana, we also have provided a biologist who routinely assists with the monitoring and management of Mexican wolves. We participated in the Southern Rockies wolf restoration population and habitat viability analysis and workshop. Private stewardship of biodiversity is new and difficult, but we intend to contribute by establishing a new measure for large carnivore conservation.

A Spatial and Relational Analysis of Lion Conflicts Throughout Montana, 1990-2000 ™

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We examined available records of lion (*Felis concolor*) conflicts reported for the fiscal years 1990-2000. Records reviewed included the USDA/APHIS/Wildlife Services animal damage reports, MFWP lion conflict reports, MFWP Enforcement Game Damage Reports, recent and archived newspaper clippings, and Mortality reports from the field. Each record was carefully reviewed and classified as non-incident or incident. Incidents must meet specified requirements and in general did not include mere observations of lions by humans. Incidents included a significant interaction between lions, humans, or livestock or required some significant management action by MFWP or Wildlife Services. In addition, we created a lion mortality data base that included all known non-hunting and hunting mortalities. In addition to these records of mortality, whole lions were extracted from the field whenever possible, and examined at the Wildlife Laboratory in Bozeman. A complete necropsy was performed on each specimen to determine sex, age, reproductive status, animal condition, and general health. We identified 752 total incidents in the record from 1990-2000. There has been a general increasing trend in the number of incidents reported during that period from 26 in 1989-90 to a high of 126 in 1998-99. Livestock-lion incidents increased at a steady rate over this period. The number of human-lion incidents varied annually with a noticeable increase in the past three years following substantially increased lion harvests. We examine various attributes in the mortality data base that includes 5220 hunting and 681 non-hunting mortalities for the 1990-2000 time period. A spatial analysis of these incidents in relation to hunting kills and non-hunting mortality is presented.

Chronic Wasting Disease in Montana-Surveillance and Epidemiology Update [TWS]

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Although the first cases of Chronic Wasting Disease were diagnosed almost 40 years ago (Fort Collins, 1967) widespread concern over this disease emerged in recent years. The most significant change in the epidemiology of this disease has been the discovery of the fatal neurologic disease in captive elk raised in alternative livestock facilities. In 1996 the first cases of CWD were reported in Alternative Livestock from a facility in Saskatchewan. Subsequently since 1996 the disease has been identified in several facilities within Montana, Saskatchewan, South Dakota, Nebraska, Oklahoma, and Colorado. It has been found in wild deer in Colorado, Wyoming and recently Saskatchewan and Nebraska. A national program to control this disease in the Alternative Livestock industry was drafted in 2000 by USDA/APHIS/Veterinary Services and recently funded by Congress. In Montana CWD surveys of wildlife have been conducted since 1998 and since 1999 in the Alternative Livestock. We tested 1367 wild cervids from 1998-2001. An additional sample from approximately 250 deer (*Odocoileus* spp.) and elk (*Cervus elaphus*) harvested in the fall of 2002 was submitted and results are pending. All wild Cervids in Montana have tested negative for this disease. One alternative livestock facility was infected with CWD in Montana and was depopulated in December 1999. The Department of Livestock initiated mandatory testing for CWD in all alternative livestock facilities following this discovery. Since 1999 the Department of Livestock has tested 1705 captive cervids slaughtered for meat markets or in shooting operations. All results to date have been negative but 132 test results recently submitted are pending. Since a rigorous testing program was implemented in 1998 no wild elk or deer have been diagnosed with CWD in Montana. Following the localized outbreak of CWD in one infected alternative livestock facility in Montana further infections have not been identified. We discuss implications of this disease to wildlife and the alternative livestock industry.

Gray Wolf Restoration in the Northwestern United States [*]

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Gray wolf (*Canis lupus*) populations were eliminated from the western United States by 1930. Dispersing wolves from Canada lacked legal protection until passage of the federal Endangered Species Act (ESA) of 1973. By 1986 a pack had naturally formed in northwestern Montana. In 1995 and 1996 wolves from western Canada were reintroduced to remote public lands in Idaho and Yellowstone National Park, Wyoming. Wolves were designated as experimental populations to increase management flexibility. Wolf population growth has occurred rapidly because of the reintroduction. Over 572 wolves were present in December 2001, and the wolf population has a young age structure meaning it has the potential for continued rapid expansion. The wolf population in the northwestern U.S. should meet the recovery goal of having 30 breeding pairs distributed throughout Montana, Idaho and Wyoming for 3 successive years by December 2002. If Montana, Idaho, and Wyoming have state wolf conservation plans in place wolves could be delisted from the ESA in 2003. Wolf restoration has proceeded more quickly and with more benefits (public viewing) and fewer problems (livestock depredations), than predicted. The impact of wolf predation on big game (primarily elk) populations is a major public concern. Several cooperative research projects have yet to detect significant impacts to wolf prey but these ongoing studies will provide accurate information to address public and agency concerns. Because over 85 percent of adult wolf mortality is human-caused, the interagency recovery program focuses its efforts on addressing the concerns of people who live near wolves to increase human tolerance. Wolves restored important ecological processes to several large wild areas in Montana, Idaho, and Wyoming. The program has been widely and internationally publicized and is generally viewed as highly successful.

Wildlife Issues Related to the Reconstruction of U.S. Highway 93 on the Flathead Indian Reservation [TWS]

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Planning for the reconstruction of U. S. Highway 93 through the Flathead Indian Reservation resulted in substantial consideration regarding wildlife and wildlife habitat issues. After years of negotiation, the Confederated Salish and Kootenai Tribes, the Montana Department of Transportation and the Federal Highways Administration reached agreement on most aspects of the project in 2000. Still to be finalized are reconstruction plans for a ten-mile portion of the highway that passes through the Ninepipe-Kicking Horse wetland complex. The Memorandum of Agreement between the three governments includes provision for the construction of 42 wildlife crossing structures and other design features to enhance wildlife habitat features and maintain habitat linkages. In addition, wetland habitat mitigation will be aimed at avoidance of wetland habitat to the extent possible and acquisition, restoration and ongoing management of wetland habitat. The logic included in planning for these design features and the details of the reconstruction plans, as they apply to wildlife and habitat concerns are presented, as are details of the anticipated designs for wildlife crossings and other mitigation plans.

Trumpeter Swan Reintroduction of the Flathead Indian Reservation [TWS]

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The Confederated Salish and Kootenai Tribes, in a cooperative project with Montana Fish,Wildlife and Parks, the U. S. Fish and Wildlife Service, and the Mission Valley Community Foundation, commenced a project to reintroduce Trumpeter Swans (*Cygnus buccinator*) on the Flathead Indian Reservation in 1995. The initial effort involved translocation of 19 Trumpeter Swans from Summer Lake, Oregon to Pablo National Wildlife Refuge. Those swans proved that suitable summer habitat existed on the Reservation, but they returned to Canada after migrating from the area. A second effort in 1998, using 10 Trumpeter Swan cygnets from Grand Prairie, Alberta, again proved the suitability of the habitat at the refuge. To date, only one swan has returned to the area. Due to problems in obtaining suitable swans suitable for reintroduction, the Tribes acquired a 22 captive trumpeter swans in 1999 and entered into an agreement with the Trumpeter Swan Fund to captively-propagate Trumpeter swans for the project. The captive propagation project resulted in production of 15 and 20 cygnets in 2000 and 2001, respectively. These birds will be released on the Flathead Reservation during the summer of 2002. Fifteen of the swans will be instrumented with satellite transmitters to monitor their migratory movements and survival. Current and future efforts involve continuing with the captive propagation and

reintroduction efforts, with the goal of re-establishment of a viable wild population on the Reservation.

Large-Scale Sampling of Cougar Populations and One of Their Pathogens: Working with Cougar Hunters in Montana ™

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Cougars (*Felis concolor*) in the Rocky Mountains are commonly infected with a cougar-specific form of feline immunodeficiency virus (FIV). Contrary to its name, data available do not indicate that this virus causes any disease in infected cougars. Genetic analysis shows that most cats in a given area are infected with highly related viruses but that cougars from different regions have genetically distinct viruses. Because transmission of a virus type from one area to another requires movement of an infected cougar, evaluation of virus genetics will give important insights into how well cougar populations are connected. With the assistance of outfitters, hunters, and houndsmen, we have undertaken a study on the large-scale distribution of FIV types across all of western Montana. Small amounts of fresh blood samples are being collected from harvested animals using a sampling kit we distribute to interested hunters. In addition, we work with agencies and taxidermists to obtain samples of tissues that are likely to contain virus. Through this collaborative effort we are hoping to get a better understanding of movement and connectivity for cougar populations in Montana.

Zoology at the Montana Natural Heritage Program: Past, Present and Future ™

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The zoology program of the Montana Natural Heritage Program has been collecting data on the status and distribution of Montana's animals since 1985. I will discuss the nature of the data we collect, past projects and current projects. I will also discuss current collaborations with various agencies to bolster data submission to Heritage databases and the collaboration with Montana Fish, Wildlife and Parks to produce the unified Montana Animal Species of Concern list. In addition, I will discuss ongoing efforts to increase the availability of this data for users through the internet.

An Evaluation of Genetic Diversity and Population Genetic Structure in Rocky Mountain Wolverines[TWS]

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The range of wolverines (*Gulo gulo*) has contracted substantially within North America and includes small, remnant populations within the conterminous United States in Colorado, California, Idaho, Oregon, Washington, Wyoming and Montana. The population size and trend of each of these populations and the connectivity to other populations in the conterminous United States is poorly known. I examined levels of genetic diversity and population genetic structure in three states (Idaho, Wyoming, and Montana) and two Canadian provinces (Alberta and British Columbia) using both mitochondrial (mtDNA) and nuclear microsatellite DNA. A Bayesian clustering analysis suggested that there were three distinct subpopulations in Montana: Rocky Mountain Front (RMF), Crazybelts (CB), and Gallatin (GA). Restricted levels of gene flow were measured among these subpopulations for both mitochondrial and nuclear DNA. However, the Rocky Mountain Front and Wyoming subpopulations displayed minimal nuclear genetic differentiation. Nuclear DNA diversity for these two subpopulations also was comparable to levels previously reported in North America. The other subpopulations exhibited significantly lower levels of nuclear diversity. The Idaho subpopulation had the lowest levels of mitochondrial and nuclear genetic diversity, and was more isolated than the other subpopulations. Based upon these data, I suggest the designation of three separate management units: Idaho, Crazybelts, and the Rocky Mountain Front/ Gallatin/ Wyoming units. The subpopulations in the conterminous United States have lower levels of gene flow and are much more fragmented than Northern populations in Alaska and Canada. Corridors for movement should be established among the fragmented subpopulations and may be incorporated into a large carnivore conservation strategy.

Sage Grouse Movements in Southwestern Montana [1]

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Sage grouse (*Centrocercus urophasianus*) populations have declined throughout the western United States and in southwestern Montana since the 1970s. Conservation efforts rely on knowledge of seasonal habitat distribution and sage grouse movement patterns between these habitats. Both of these factors are poorly understood and undocumented in southwestern Montana. An ongoing, cooperative study was initiated in 1999 to radio-track sage grouse in southwestern Montana. The objective is to identify resident and migratory populations, key habitat areas, and movement patterns that would be relevant to local sagebrush and sage grouse conservation. Thirty-six sage grouse have been fitted with radio-transmitters and individually tracked for up to 24 months in the Horse Prairie/Bannack area, Sweetwater Basin, and Big Sheep Creek Basin, in Beaverhead and Madison County, near Dillon, Montana. Monitoring has been conducted aerially, with some ground locations made between flights. Relocations indicate that some groups of sage grouse are basically resident within a particular habitat complex, while others are traveling significantly greater distances to utilize suitable breeding, summer, and winter habitat. Interstate movement of sage grouse between southeastern Idaho and southwestern Montana has been confirmed. Some locally important brood rearing and summer habitats have been identified through this study. Mortality of radio-tracked birds has averaged 40-60 percent over three years. This study will also serve as a basis for expanded research.

The Bozeman Pass Wildlife Linkage and Human Safety Study [TWS]

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Highways and railways are sources of road mortality that threaten wildlife populations through direct mortality, habitat loss, and habitat fragmentation. High volumes of traffic along transportation corridors can block, deflect, or delay daily, seasonal, and lifetime movements. Animal-vehicle collisions also threaten human safety. The transportation corridor along I-90 over Bozeman Pass contains an interstate highway, frontage road and railroad and is likely one of the major barriers for animal movement in the region. At this point, there is strong evidence that the highway acts as a barrier to normal animal movements. The Craighead Environmental Research Institute (CERI), based in Bozeman, has completed the first year of a study to further determine the current extent of this problem and where it can best be mitigated. A total of 127 medium-to-large sized animal road-kills were recorded in 2001 along I-90 over Bozeman Pass. The greatest number of road-kills occurred between milepost 313 and 314 near the Bear Canyon exit and the MRL overpass. Two probable areas of wildlife 'connectivity habitat' were mapped on Bozeman Pass in collaboration with American Wildlands' GIS lab using habitat characteristics and least-cost-path analysis, which correspond closely with the locations of road-kills. In 2002 the study will collaborate with the Western Transportation Institute and Montana Department of Transportation in the design and possible installation of highway fences, cattle guards, and vehicle barriers to improve human safety and wildlife connectivity across the highway.

Testing Spatial Independence of Radio-Collared Bighorn Sheep [TWS]

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A common assumption in the analysis of wildlife radio-tracking data is that marked individuals move and select resources independently. This assumption can significantly affect results especially if animals are highly social or territorial. In the case of bighorn sheep, social groups are prevalent throughout the year, and this often results in single locations with multiple radio-collared individuals. Nearest-neighbor analyses have been used to test avoidance behavior by carnivores. We used this method and data from three small herds of bighorn sheep in western Montana to conduct a test of the spatial independence of individual animals. This issue can be important in a posteriori analysis and interpretation of data, as well a priori consideration of necessary sample sizes.

Management of a Rapidly Expanding Urban Goose Population ™

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Great Falls, like many urban areas throughout North America, is home to a rapidly expanding resident Canada goose population. Concerns about goose damage and safety issues have been expressed from city and state parks, golf courses, private landowners, and the Great Falls Airport. Canada geese have become a popular attraction at city parks during the summer when goslings are present. Management strategies will be discussed in relation to two different sub-populations of Canada geese in Great Falls, including hunting, trapping and moving, and deterrents.

Using Climatic Data in Wildlife Studies ™

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Twenty to 30 years of daily climatic data is now available from foothill and mountain locations at approximately 90 SNOTEL sites in Montana. Historic and near real-time data from these SNOTEL sites is now available on the web. By combining the SNOTEL data with that collected at valley Climatological stations, it is possible to develop profiles of temperature, precipitation and snow water equivalent (SWE) for most areas in the state.. Additional parameters such as growing degree-days, soil moisture deficits (using Keetch Byram Drought Index) can be generated from the original data. Relationships developed in recent years using these data will be presented. These include Winter Severity Index for elk, bison, moose, pronghorn, mule deer and white-tailed deer. Migration and distribution of elk have been related to SWE and snow models developed to relate distribution of elk over time to the forage available on winter range. Production of forage, whitebark pine cones, Western larch cones, and huckleberries have been related to these climatic variables. Phenology of plants and trees has been related to growing degree-days. Dates of spring emergence for bears, date of emergence for salmon flies, date of nesting initiation, hatching success, and clutch size of American pipits, have all been related to snowpack and climatic variables. Streamflow, reservoir levels and outflows have been predicted using winter snowpack and spring precipitation variables. Climatic and snow data has also been used to identify long-term trends and variability of mountain climate. Examples of these and other relationships will be presented.

Coal Bed Methane: Boom for Industry, Bane for Wildlife [TWS]

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Associated with coal seams in southeast Montana is natural gas referred to as coal bed methane (CBM), held there by water pressure. To get the gas, the water must first be removed. There is great interest by industry and state and federal administrations to pump and use this resource. It will take only 10-20 years of boom and bust development to drain Montana of its methane resource. This will have severe impacts to wildlife in perpetuity. CBM development will negatively affect Montana's water and lands forever, regardless of "reclamation." Aquifers, springs and seeps depended upon by farmers, ranchers and wildlife will be dried up. Water pumped from these aquifers, although drinkable by humans and wildlife, is very salty and kills vegetation. This water will be sprinkled across the land and pumped to leaking discharge pits killing vegetation and soil. Surface destruction by this industry will be massive. Thousands of miles of powerlines, pipelines, and access roads will lace sagebrush-grasslands of southeast Montana supporting pronghorn, mule deer and white-tailed deer and dwindling populations of sage grouse. Huge noisy compressors will drown the calls of many bird species including sage and sharp-tailed grouse. Well pads with access roads will dot the countryside, and trucks of every size will careen down dusty roads 24 hours a day. Fragmentation of wildlife habitat will occur from this resource development at levels never before experienced in Montana. Tens of thousands of acres of sagebrush-grassland habitats will be destroyed. It is unlikely any will be reclaimed in kind or function. There will be soil compaction, weed encroachment, and the cut-and-run philosophy will once again leave Montana citizens holding the reclamation bag, and wildlife populations the victims of lost and fragmented habitat.

Spatial and Temporal Analysis of Grizzly Bear Movements in Relation to Motorized Trail Use in Portions of the Lewis and Clark National Forest: Preliminary Analysis [TWS]

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Understanding the possible impact of motorized ORV use on grizzly bear movements and habitat use would be valuable to land managers as they seek to balance human uses with wildlife needs. To assess this question, I studied grizzly bear movements and quantified recreational use in the Badger-Two Medicine area of the Lewis and Clark National Forest. Grizzly bear locations were collected using GPS collars collecting data at 1-hour intervals from early June to late October of 1999, 2000, and 2001. Detailed temporal and spatial recreation use data on backcountry trails was simultaneously collected in the same area. Preliminary analysis of these data uses motion metrics to attempt to quantify and relate bear movements to motorized recreational use in this area.

Population Dynamics of Snowshoe Hares in the Seeley-Swan Region [TWS]

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We present mark-recapture based snowshoe hare densities from 20 sites, where we observed a decline in snowshoe hare populations since 1998. Snowshoe hares are found in multiple habitats, and can reach high densities in forest stands with a component of saplings and shrubs near ground level. Mature stands with complex structure may provide important winter habitat. We present estimates of survival from radio-telemetry, suggesting that survival is high in the summer and winter, but lower in the spring and fall. Lowest survival rates were in spring and fall in forest stands with open-canopies and few saplings in the understory. We present preliminary results from an experiment examining the short-term effects of pre-commercial thinning on snowshoe hare densities. We find roughly a four-fold decrease in winter hare densities after stands are thinned to standard industry prescription. A modified thinning treatment, with 20 percent of the stand retained in unthinned patches, shows some promise in retaining hares.

Initial Site Evaluation for Wind Resource Development in Montana: An Index Relative to Potential Impacts on Vertebrate Wildlife [TWS]

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Windpower technology has advanced significantly in recent years, and demand for development has stimulated concern over the impact of hastily developed wind farms on vertebrate wildlife. Furthermore, legal responsibilities of developers pertinent to risk posed by wind farms are elucidated in the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and the Endangered Species Act. We present a process to determine geographic appropriateness of wind farm siting relative to potential impact on vertebrate wildlife by developing initial site evaluation criteria, and evaluating the potential impacts on aerial wildlife resources (birds and bats) from a collision risk perspective. A Physical

Attribute checklist considers topographic, meteorological, and site characteristics that may influence bird/bat occurrence and movements. A Species Occurrence and Status checklist includes all endangered, threatened and candidate species that occur in Montana, but only bird and bat species of Special Concern listed by the Montana Natural Heritage Program. An Ecological Attractiveness checklist evaluates the presence and influence of ecological magnets and other conditions that would draw birds and bats to the site or vicinity. The Site Suitability Index is derived from checklist totals of each site evaluated. Cumulative totals are adjusted for disproportionate numbers of criteria in each checklist. Adjusted checklist totals are added to produce the Site Suitability Index. A less suitable site evaluation does not preclude development, nor does a more suitable site evaluation eliminate the need to verify the appropriateness of the development with regard to impact on vertebrate wildlife. Rather, this method ranks sites among one another, and identifies focal areas for further investigations or mitigating measures as development proceeds

Conservation of Piping Plovers in the U.S. Alkali Lakes Core Area [TWS]

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The northern Great Plains population of piping plovers has been listed as Threatened in the U. S. and Endangered in Canada since 1985. The current population decline and poor prognosis is thought to be due to inadequate reproductive success stemming from significant alteration of the prairie landscape and predator community during the last century. Planted trees, increased woody cover, rockpiles, junkpiles, and abandoned buildings now offer denning, nesting, and roosting habitat for a variety of egg and chick predators that were once uncommon on northern prairies, e.g. great-horned owl, striped skunk, raccoon, American crow. Also, in many areas, once extensive native grasslands are now reduced to small remnants that may be more efficiently searched by predators. About two-thirds of the U.S. Great Plains population breeds annually on our eight county study area, which extends from northwest North Dakota through northeast Montana. Over the past decade, we have documented size, distribution, habitat selection, and vital rates for this population. We have also identified and implemented a rigorous predator exclusion program that has boosted piping plover reproductive rates into the range necessary to stabilize the population decline. Currently we are evaluating landscape influences on plover productivity to determine whether habitat preservation and restoration, e.g. removal of unnatural landscape features that may house predators of facilitate predation, can contribute measurably to piping plover recovery

A New Capture Pen for Caribbean Feral Dog Packs ™

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The Turks and Caicos Islands, in the British West Indies, have a history of feral dog problems as do many other Caribbean island nations. These problems include attacks on tourists, presence on airport runways, and threats to residents. Previous efforts to resolve these problems included trapping, shooting, and a government proposal to introduce canine distemper. As an alternative, Global Wildlife Resources received a contract to capture feral dogs as part of a long-term multi-faceted program integrating animal capture, spay/neutering of community dogs, euthanasia of feral dogs, public education, training of local personnel, development of an animal shelter, and legislative changes. To address this unique challenge, GWR developed a unique portable capture pen for entire feral dog packs. Boxtraps also captured individual dogs near capture pens. The capture pens consisted of 2.4 m (8 ft) by 2.4 m (8 ft) chainlink panels assembled into a 4.8 m (16 ft) wide box. One panel contained a guillotine gate (www.kenneldoor.com) and a second panel contained a guillotine gate and human gate. Capture pens were pre-baited for 1-4 days. Gate controls were modified toy airplane rotor controls. The remote control consisted of a receiver, rotor, batteries with an on-off switch and a remote hand-held transmitter. When the rotor was activated, a pin pulled out of the guiding track dropping the gate. In three weeks, 370 dogs were captured: 117 by capture pen, 173 by boxtraps, and 80 by hand. Seventy community dogs were neutered and 300 feral dogs were anesthetized and then euthanized. The capture pen can be applied directly, or modified, to capture a variety of wildlife species, especially urban canids.

Photo Routes -Monitoring ORV Use on Public Lands: Implications for Wildlife Habitat ™

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Recreational motorized travel on public lands influences the ability of wildlife to effectively use habitat, to move along historic pathways, to maximize seasonal use areas, and to facilitate movement of genetic material along biological corridors. Impacts of motorized recreation upon the landscape can be minimized by implementing clearly defined allowable activities for motorized travel, or be exacerbated through a casual approach. The effectiveness of National Forest travel plans cannot be quantified without on-site monitoring information. Quantitative information about the efficacy of the existing travel management plans did not exist on the Helena National Forest, so it was determined that objective and compelling information could be gathered by photographing conditions along predetermined routes. Eight photo routes were conducted by MFWP personnel and a volunteer citizens group. Routes ranged from approximately 2 miles to 10 miles in length and followed existing off-highway motorized routes, designated hiking trails (no vehicle use), undesignated routes, and proposed motorized routes. Conditions along each route were

quantified using digital photographs. A GPS location and an azmuth reading for each photo point was noted, along with ground conditions such as wetland incursions, depth of trail erosion, trail width; any off-route use of motor vehicles and its effects, such as crushed vegetation, hill climbs, dead animals; and whether signs of wildlife use were present in the immediate vicinity of such activities (droppings, tracks, rolled rocks, trees marked by bears or ungulates, mountain lion scrapes, etc.). The information gathered was assembled in digital and hard copy format. This effort demonstrates that citizen volunteers can be a valuable resource in meeting forest plan travel management objectives through positive feedback loops that can result from a systematic monitoring approach.

Common Loon: Past, Present and Future [TWS]

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National concern for common loons (*Gavia immer*) began in the 1970's following increased awareness about the effect of DDT on water birds. Early loon research helped define nesting and nursery habitat requirements, clutch and brood sizes, pair bond establishment, and general dates of spring arrival, nest initiation, and hatch. Between 1980-1986, Montana researchers and volunteers defined the breeding range and breeding lake characteristics of loons. In 1986, the Montana Loon Society established the first systematic breeding survey or "Loon Day". Results showed that Montana supported a total of 180-220 common loons, including 35-40 chicks each summer. Between 1986 and 1992, researchers determined that human disturbances during the nesting season had a detrimental effect on breeding success of loons. MLS soon implemented a management program that relied on nest area closures using floating signs and public education at high use areas. Later, banding efforts determined that loons nesting in Montana wintered on the Pacific Coast and that blood-mercury levels in captured birds were minimal. The increase of human recreational and development activities on loon breeding lakes soon outpaced voluntary public education efforts. In response, recent management efforts include establishing a second loon survey in May, creating a statewide, standardized database, and funding Loon Ranger positions. In 2001, Montana produced the highest number of loon chicks since 1981. Future statewide priorities will focus on completing the statewide database, procuring secure funding for the Loon Ranger program, and establishing a common loon population and contaminant/ mortality research program.

Swift Fox Reintroduction on the Blackfeet Indian Reservation ™s

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The swift fox (*Vulpes velox*) was declared extirpated from Montana in 1969 after 16 years of Montana fur harvest data with no record of a swift fox. A 1991 review of historical swift fox observations and specimens found that the best documentation of the swift fox in Montana prior to extirpation came from the Blackfeet Indian Reservation. From 1901 to 1906, 43 swift fox specimens were collected between Cutbank and Browning, and in 1918, the swift fox was still considered common on the Reservation east of Glacier National Park. An aerial survey of Montana grasslands in 1993, identified the Blackfeet Indian Reservation as containing large grassland blocks suitable for swift fox reintroduction. In February 1998, the concept of swift fox reintroduction on the Reservation was discussed and later formally proposed. Defenders of Wildlife would provide funding for the reintroduction effort and the Cochrane Ecological Institute (CEI) would provide 20-30 captive-raised juvenile foxes for reintroduction each year for 5 years. In July 1998, a pre-release survey identified Richardson's ground squirrel (*Spermophilus richardsoni*) colonies on a Tribal ranch located 30 km east of Browning as suitable swift fox habitat. Twenty-eight foxes were released in this area in August 1998 using a modified soft release technique developed by the CEI. Four swift fox dens were found the following spring indicating at least some survival and reproduction. Releases have been made each year in late August, and from 1998-2001, a total of 101 foxes have been released. In 2001, 9 swift fox dens were documented on the Reservation with denning foxes being located up to 45 km from the release site.

The Rocky Mountain Population of Trumpeter Swans: Update and Current Issues ™s

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The Rocky Mountain Population (RMP) of Trumpeter Swans (*Cygnus buccinator*) is comprised of two breeding "groups". One breeds throughout western Canada, and the other in the "Tristate" region (southwestern Montana, western Wyoming, and eastern Idaho).

These swans overwinter primarily in the Tristate area. Canadian birds, and some local breeding swans, migrate along the East Front or through the Flathead valley in Montana. Total numbers and annual production are estimated during biannual surveys in the Tristate region. A September survey estimates the size and age ratio of the Tristate segment, and a February survey allows managers to estimate Canadian flock size and annual production. Over the past three decades Canadian flocks have increased. One hundred and eighty-six Canadian Trumpeter Swans were present in February 1975, and 3494 were counted in February 2001. Although considerable variation occurred between years, the Tristate segment increased from 70 birds in 1932 to 641 in 1958. It has since declined to 481 Trumpeter Swans in 2001. Management issues have remained basically the same since the 1980s. There is some question as to how genetically distinct the two population segments are and if any interbreeding occurs. Extensive banding from the 1960s-1980s did not document any interchange of breeders, but this *may* have changed with increased flock size. Concentration of about 40 percent of the RMP on 1-2 primary wintering sites has led to habitat degradation and high risk of mortality due to disease or extreme weather events. Since 1990 considerable effort has been made to haze or translocate swans away from these major sites with limited success. Current management efforts are centered on a diverse group of stakeholders developing a Trumpeter Swan Implementation Plan (TSIP). The TSIP will concentrate on defining tasks designed to improve water management on Henry's Fork of the Snake River, manage winter distribution, improve U.S. nesting habitat and recruitment, and refine population monitoring. Conflicts with Tundra Swan hunting in Utah remains a major impediment to solving current RMP Trumpeter Swan management problems, and has implications for Trumpeter Swan restoration elsewhere.

Understanding Relationships Between Greater Sage-Grouse Habitat and Population Dynamics in Eastern Montana [TWS]

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The long-term decline of greater sage grouse (*Centrocercus urophasianus*) over much of their historic range is of concern to managers of sagebrush (*Artemisia* spp.) habitats. A petition has been submitted to list the Washington population of sage grouse under the Endangered Species Act (ESA) and a range-wide listing petition is expected in the near future. That habitat quality is related to demographics of populations is a fundamental assumption of the practice of managing species via managing habitat. However, few studies explicitly acknowledge this relationship, and still fewer explicitly attempt to define this relationship on a species-specific basis. There currently is no way to reliably determine the

nature of the interaction between sage grouse population status (as indicated by estimated vital rates) and habitat condition. This research will use a combination of well-established population demography tools and state-of-the-art analysis methods to elucidate relationships between Sage-Grouse populations and habitat at 6 sites in eastern Montana. Mark-resight and radio telemetry methods will be employed to estimate vital rates of sage grouse populations. Sensitivity analysis will identify which rate(s) has the greatest influence on population growth rate (λ) under different habitat conditions. Habitat condition at each site will be assessed by several critical habitat characteristics. A regression approach will quantify the relationship between individual vital rates and each of the measured habitat characteristics. The research will provide crucial information to federal and state wildlife professionals charged with managing for sage grouse and will be of particular use in the event of a petition to list sage grouse under the ESA.

WILDLIFE RESURRECTION ™

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The use of the wildlife resource for the settlement of Montana produced a catastrophe by the end of the 19th century. But by the end of the 20th century wildlife were more abundant than at any time during the previous 130 years. The passage of protective laws during the late 19th and early 20th century coupled with the gradually increasing efforts to enforce them accounts for a portion of this resource rebirth. The remainder of the story is largely untold and is the subject of this presentation. Game bird resources were heavily affected by the "cow and the plow". The new agricultural lands provided new habitats unsuited for native species. Pheasant introduction began before 1895, by private individuals, and became a state game farm program in 1929. Over 1 million were planted by the time the state program was discontinued in the late 1960s. In 1910, elk were considered to occur in numbers only in the Sun River-South Fork of the Flathead and Yellowstone National Park areas. Rod and Gun clubs held fund raising events and paid $5 per elk to have the Northern Pacific Railroad deliver rail car loads of 40 elk to their towns from Gardiner. The plants began in 1910 near Butte, Hamilton and in the Glacier Park area. Elk continued to be transplanted until 1972 when the last of the 7458 animals were released. Similar programs for other species were developed after the Pitman-Robertson act was accepted in 1939 and the Wildlife Restoration Division of the State Fish and Game Department was established. Harvest of the biological surplus and habitat preservation programs became prominent in the last third of the century. This resurrection of Montana's wildlife resource was an epic effort extending through 5 generations of citizens, 2 World Wars, 3 other major wars, an economic collapse and a 3-fold increase in human population. The effort encompassed many classic human and wildlife adventures.

Grizzly Bear Denning and Potential Conflict Areas in the Greater Yellowstone Ecosystem [tws]

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Increasing winter use of steep, high elevation terrain by backcountry recreationists has elevated concern about disturbance of denning grizzly bears (*Ursus arctos*) in the Greater Yellowstone Ecosystem (GYE). To help identify areas where such conflicts might occur, we developed a spatially explicit model to predict potential denning areas in the GYE. Using a scan area of 630 m around each location, we assigned site characteristics, or attributes, to 344 den locations of telemetered grizzly bears from 1975-99. Attributes identified as predictors for the analysis included elevation, slope, an index of solar radiation, and forest cover. We used the Mahalanobis distance statistic to model the similarity between sites used by denning bears and each cell in the data layers. We used the final Mahalanobis distance model to produce maps of the study area. Suitable denning habitat, based upon the model, is abundant within the GYE. Our results can be used by land management agencies to identify potential conflict sites and minimize effects of regulated activities on denning grizzly bears. We illustrate how the Gallatin National Forest (GNF) used the model to examine the extent of overlap between potential snowmobile use areas and suitable denning habitat as part of a Biological Assessment submitted to the USDI Fish and Wildlife Service.

The Presence and Distribution of Lynx in Yellowstone National Park™

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During 2000, the U.S. Fish and Wildlife Service listed the lynx (*Lynx canadensis*) as a threatened species. Despite evidence that lynx were historically and are still found in Yellowstone National Park (YNP), no rigorous effort has been made to document their presence. This 3-year survey is providing important baseline information necessary to assess the status of the lynx and to manage human influences that are potentially adverse. We used a GIS-based analysis of YNP topography to identify prime lynx habitats and are conducting intensive surveys in prime habitats using ground-based and aircraft-based snow tracking during winter, hair snares to obtain DNA samples during the summer. During winter 2000-2001, we found 1 possible and 1 probable lynx track in YNP. During summer 2001, we installed a 32-transect hair snare grid in east central YNP and obtained 155 hair samples (results pending lab analysis). Basic information on lynx numbers and distribution is required by park policy and by the Lynx Conservation and Assessment Strategy, a guiding document for federal land management agencies. In addition, knowledge of lynx presence and distribution in YNP may further assist neighboring federal and state land management agencies in insuring that land management is conducive to lynx recovery efforts.

A Comparison of GPS Programs DNRGarmin and Waypoint+/ AVGarmin and Conversion of GPS Data to ArcView Shapes ™

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Interface between Global Positioning System (GPS) and Geographical Information Systems (GIS) has historically required expensive equipment and extensive training. The need for quick and reliable interface between these technologies has lead to the development of many GPS/GIS interface (shareware and commercial) programs. I evaluated two shareware programs that simplify the transfer of data from Garmin GPS units to ArcView. Waypoint+ and DNRGarmin may be used as standalone programs, however, DNRGarmin may be launched directly from ArcView. Waypoint+ requires the intermediary ArcView extension AVGarmin to convert GPS data into ArcView shapefiles. Both programs incorporate multiple projections and datums. Both programs will convert waypoints to point shapefiles and track logs to line and polygon shapefiles from track log data. GPS attributes vary by program and by shape. Only DNRGarmin will allow the conversion of both waypoint and track log data to ArcView graphics. Waypoint+ generates new waypoints from entered text. DNRGarmin originates new waypoints and track logs from graphics created in an ArcView View or from ArcView shapefiles. Waypoint+ stores GPS data as comma

delimited text files with a descriptive header, thereby allowing the storing of coordinate information in several projections and datums. DNRGarmin also stores GPS data as comma delimited text files however, coordinate information is recorded only as geographical decimal degrees. Coordinates of waypoints did not vary between the two programs.

Conservation Under the Endangered Species Act: Expenditures Versus Recovery Priorities [TWS]

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Budget constraints require the USDI Fish and Wildlife Service to prioritize species for recovery spending. Each listed species is ranked according to the degree of threat it faces, recovery potential, and taxonomic distinctness. We analyzed the most recent state and federal government expenditures for recovery of threatened and endangered terrestrial vertebrates (n = 179 species) to determine if the priority system was being followed. Although recovery spending correlated with priority rank, priority rank explained <4 percent of the variation in spending. Species with high recovery potential, recovery programs that conflict with economic development, and wide distributions received the most funding and relatively more funding than their priority ranks dictated. Degree of threat and taxonomic distinctness did not affect the allocation of recovery spending. Island species received significantly less funding than expected based on priority rank compared to wide ranging mainland species. To improve the relationship between recovery spending on threatened and endangered species and priority rank, we believe significant changes are necessary within the private sector (less litigation, special interest lobbying), U.S. Congress (reduced earmarking, increased budget), and the USDI Fish and Wildlife Service (restructuring of regional offices, increased accountability).

On Ecological Assessments and Conservation Planning [TWS]

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Strategies that influence environmental use are often broad in scale and are rarely spatially explicit or focused on individual species because of the unfeasibility and cost of implementation. In reality, broad-scale information in concert with the conservation of individual species must be used in a way to develop conservation priorities, a more integrated ecosystem protection strategy, and to satisfy legal and policy requirements. Moreover, failure in conservation action whether in ecological assessments or conservation planning may be attributed to this lack of ecological understanding, organizational dysfunction, or to appreciate the human sense of place. In this session, needs for (1) an

ecological assessment are reviewed, (2) major agency and organizational approaches to ecological assessments and conservation planning are compared, and (3) their place in biodiversity conservation is outlined. Practical solutions to improve ecological assessments and conservation planning regardless of location are offered.

Modelling Golden Eagle Power Pole Electrocutions [TWS]

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We identified power poles owned and operated by Montana Power Company having electrocuted golden eagles (*Aquila chrysaetos*) to provide information on reducing the number of golden eagle electrocutions. Montana Power Company has begun implementing resolutions for minimizing golden eagle electrocutions by retrofitting power poles to be raptor safe. A model identifying power poles requiring retrofitting based on pole design and pole location would improve the economic feasibility and effectiveness of remediation. We developed a habitat map from Landsat 7 spectral data for determining habitat characteristics surrounding individual power poles at 3 spatial scales. A total of 178 power poles causing 198 golden electrocutions were found during 2 field seasons in the Roundup study area of eastern Montana. The estimated probability of a power pole in the study area electrocuting a golden eagle

Managing Montana's Recovered Grey Wolf Population: Who, What, When, Where, Why, and How [TWS]

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The Montana Wolf Management Advisory Council was appointed in April 2000 by former Gov. Marc Racicot to advise Montana Fish Wildlife & Parks (FWP) as it prepares a management plan for the gray wolf (*Canis lupus*) upon federal delisting. The Council was a diverse group, representing the interests of conservationists, hunters, landowners, livestock producers, outfitters, educators, and others. The Council completed their deliberations and presented their *Report to the Governor* to newly-elected Gov. Judy Martz early in 2001. Gov. Martz directed FWP to draft a planning document based on the Council's recommendations. The *Montana Wolf Conservation and Management Planning Document*, now available to the public, follows the Council's goal to develop a management approach and framework that is biologically possible, socially acceptable, and economically feasible. Major issues identified in the planning document address wolf conservation and management, human safety, livestock predation, compensation for livestock losses, funding,

and maintaining Montana's deer, elk and moose populations. The overall approach recognizes the gray wolf as a native species in Montana and as a valuable part of our wildlife heritage. It further seeks to integrate and sustain wolves in suitable habitats within a complex management setting and to responsively address conflicts where and when they develop. The Council's *Report to the Governor and the Montana Wolf Conservation and Management Planning Document* may be downloaded from FWP's website (www.fwp.state.mt.us). In March 2002, FWP begins a nine-month process to formally prepare an environmental impact statement for a final Montana wolf management plan. Comments may be submitted by mail, on–line, or in person at one of the upcoming public open houses. The deadline for comment during the scooping phase of the EIS process is April 30th 2002.

Mitigating the Effects of Kerr Dam on Wildlife Within the Flathead Indian Reservation [TWS]

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Kerr dam was initially licensed in the 1930s and began controlling the outflow of Flathead Lake in 1938. A new license was applied for and granted in 1985 contingent on mitigation measures to be determined. Impact studies, damage assessments and an initial mitigation plan were completed in 1990. The Federal Energy Regulation Commission approved a partial settlement in 1998 and a final settlement in January 2001. Documented losses include 1792 acres of wetland and riparian habitats along the shores of Flathead Lake and 985 acres of shoreline habitat along the lower Flathead River lost because of altered lake and river hydrographs, and 624 acres of riparian habitat along the lower Flathead River lost because of flood control. Half of the lost riparian acres (312) were attributable to operations at Hungry Horse Dam on the South Fork of the Flathead River and will not be mitigated under the Kerr settlement. A Fish and Wildlife Implementation Strategy was developed that covers program goals, specific mitigation activities, threatened and endangered species, monitoring methods, and an adaptive management strategy. A Habitat Acquisition and Restoration Plan was developed that outlines acquisition priority areas on the Flathead Reservation, criteria to prioritize individual parcels, an accounting system to measure habitat crediting and a structure for restoration and management activities. This paper will give an overview of the Confederated Salish and Kootenai Tribe's acquisition plans, management goals, restoration efforts and other activities planned as part of this mitigation effort.

Lynx Ecology in Northwestern Montana: an Ongoing Field Study at Seeley Lake ™

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Since 1998, we collared over 61 lynx (*Lunx canadensis*) near Seeley Lake, MT. To date, we documented 18 (11 males, 7 females) mortalities. Primary mortality factors include starvation (38%), predation by cougars (31%), and trapping/shooting (25%). We have located 13 dens from 7 females and we are quantifying den-site selection at multiple-spatial scales. Abundant woody debris was present at all 13 dens, usually in the form of large diameter logs, but smaller logs are used when in "jackstraw" stacks. We study demography to the extent possible given our sample. Preliminary data suggest litters are small and about 50 percent of kittens survive to independence. We spent considerable effort documenting habitat selection during winter and summer within forest stands and we are just beginning initial analysis of these data. As we complete small-scale studies, we will refocus research to address the following issues: habitat use within non-managed landscapes, habitat selection of den sites, and demography. We are also especially interested in understanding lynx movements relative to landscape and habitat features, including putative corridors and linkage zones.

Relationships Between Landscape Characteristics and Duck Nesting Success: the Fusion of Science and Management in the Prairies ™

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Natural resource managers are increasingly faced with the need to effectively manage populations with limited resources amid great uncertainty. In this challenging situation, strategic targeting of management coupled with integrated biological monitoring and evaluation is critical to achieving success. Here I present how Ducks Unlimited is using this approach to manage for duck production in the prairies of North and South Dakota. The foundation of this approach is a basic understanding of the population dynamics of the

species or group of interest. For prairie breeding ducks, critical habitat and landscape components consist of high densities of wetland amid large tracts of grassland. Basic relationships between the number of breeding pairs and the density of wetland have been established based on long-term survey information. Hypothesized relationships between nesting success and the amount of grassland present have been developed based on previous research. These relationships are then translated into GIS maps using remotely sensed information on landscape and habitat characteristics. By coupling these maps with a simple decision matrix of possible management prescriptions, spatially explicit management guidelines result which serve to strategically focus the appropriate management in the appropriate location. However, once these prescriptions are established and management action enacted, the process in far from complete. Because of large amounts of spatial and temporal variation in biological responses to habitat and landscape characteristics exist, a great deal of uncertainty exists with respect to the effectiveness and success of management actions. Therefore, monitoring of the biological responses is critical to ensure the continual refinement of the management actions. Additionally, the management prescriptions are only as the good as the assumptions on which they are based. Therefore, testing and refinement of critical assumptions is paramount. Preliminary results from monitoring efforts will be presented and based upon those results, potential changes to management efforts will be discussed.

North Central Montana Swift Fox Survey 2000/2001 [TWS]

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Swift fox (*Vulpes velox*) historically ranged throughout eastern Montana. However, their numbers were substantially reduced in the early part of the twentieth century. The swift fox was declared extinct in Montana in 1969. As part of a Canadian recovery effort, over 900 captive-raised and translocated wild-born foxes were released annually in the Alberta and Saskatchewan prairies adjacent to Montana from 1983 through 1997. A Montana graduate study in 1996 and 1997 documented wild-born swift fox breeding in Blaine County south of one of the release sites. During the winter of 1996/1997 Canadian researchers surveyed the swift fox populations on their reintroduction sites. A repeat survey was planned for 2000/2001 and FWP was asked to expand the effort into Montana. The Montana study area included 80 townships north of the Milk River extending from Havre to Opheim. Trapping began in November 2000 and ended on February 15, 2001 with 66 of the 80 townships sampled. A total of 1188 trapnights resulted in the capture of 38 different swift fox (3.2 foxes/100 trapnights). In addition, four foxes were seen in townships in which none were caught. Swift foxes were trapped or observed in 25 (38 percent) of the 66 surveyed townships. One fox had been previously tattooed and the rest were wild-born (one escaped prior to handling). The sex and age ratios of the handled foxes were, 18 adult/19 juvenile and 16 male/21 female. The total population occupying the Montana study area was estimated at 221 swift foxes based on an analysis of the capture results. The 2000/2001 survey confirmed that swift foxes had drifted south from Canada and were expanding throughout the native grasslands north of the Milk River in north central Montana.

Distribution of Forest Carnivores in the Pioneer, Flint, and Anaconda-Pintler Mountains, Montana [tws]

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This project was initiated in the winter of 2000-2001 by the Rocky Mountain Research Station in cooperation with the Western Federal Lands Highway Division (WFLHD) of the Federal Highway Administration. The primary goal of this 3-year study is to assess the direct and indirect impacts of the proposed Pioneer Scenic Byway improvement on lynx, wolverine, and other forest carnivores in the Pioneer and adjacent mountain ranges. We began an intensive survey effort directed at meeting 2 primary objectives; 1.) Determine the distribution of lynx, wolverine, and other forest carnivores in the Pioneer, Flint and Anaconda-Pintler Mountain Ranges, and 2.) Determine the location and relative frequency that lynx, wolverine, and other wildlife (forest carnivores, elk, deer, mountain lions, coyotes, and bobcats) cross the Byway. Last winter (2000-01), we surveyed 1,313 km of intensive survey routes and >5000 km of less data intensive reconnaissance routes. We documented one lynx track in the Anaconda-Pintler range on 12 February 2001. We frequently encountered tracks of coyote (n=1075), marten (n=205), and wolverine (n=36) throughout the survey area. Bobcat (n=10), mountain lion (n=5), and wolf (n=3) were uncommon and were rarely encountered. During the current field season (in progress), we have completed 350 km of intensive surveys and 825 kilometers of recon surveys. Distribution trends continue to be similar, with frequent wolverine tracks (n=15) and no lynx tracks to date. We have surveyed the closed portion of the Byway 10 times over the course of two field seasons. Martens and coyotes are the most common carnivores using the road. Wolverine crossings have been documented 8 times, with crossings in 2002 more widely distributed than in 2001. Trapping for wolverine began on 10 February 2002 in the Pioneers with two individuals captured and implanted to date.

Understanding Variation in Singing Behavior: a Missing Link in the Analysis of Count Data for Shrub-Steppe Songbirds [tws]

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Count data, e.g., line transects, point counts, are widely used in avian research and monitoring programs. Although counts rely heavily on detections of singing males, our understanding of variation in the major factors influencing singing behavior is incomplete for many songbirds. I investigated factors influencing the detectability of Brewer's Sparrows in a population of color-banded males of known pairing status and nest stage in Washington state in 1998-1999. In Brewer's Sparrows (and other shrub-steppe songbirds), a

major source of variation in male singing rates, and therefore, in detectability, is male reproductive stage, i.e., pairing status and nest stage. The detectability of paired males (0.12-0.39) is dramatically lower than that of unpaired males (0.87-0.90) for counts 3-20 minutes long. Male parental care, including male incubation and brooding, is common and further reduces the detectability of paired males. Moreover, even when count protocols are fully standardized, substantial annual variation in female arrival date, via its effects on male pairing status, may bias count data by as much as 50 percent. Variation in female arrival date may explain previous reports of high temporal and geographic variation in abundance in this and other shrub-steppe species. Understanding the main sources of variation in singing, including the effects of pairing status, female arrival date, and male parental behavior, is prerequisite for proper interpretation of point count data based on vocal detections. I outline a method for using tape-recorded count data to monitor pairing success in shrub-steppe breeding birds.

The Effects of Cattle Grazing on Duck and Shorebird Production in the Aspen Parkland Ecoregion [TWS]

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The beef industry is growing rapidly throughout the Aspen Parkland of Canada. Increasing cattle numbers will affect the amount of pasture and potentially its value as duck and shorebird nesting and brood-rearing habitat. Increasing cattle herds will likely lead to higher stocking rates on pastures and use of previously idled areas. Conversely, conversion of cropland to pastureland may benefit upland nesting ducks and shorebirds by increasing the amount of perennial cover. We undertook the current study to evaluate the relationships of nest-site selection, nesting success, and brood abundance of upland nesting ducks and shorebirds to grazing intensity in tame and native/naturalized pastures of the Aspen Parkland. Nest searches occurred on 54 study sites in the western Aspen Parkland of Alberta. Vegetation physiognomy was quantified at each nest using Robel and Weins pole measurements. Within field vegetation physiognomy was similarly quantified at random points within pastures. Duck breeding pair and brood surveys were conducted in each pasture. Despite extensive drought, nest searches located 176 duck and 35 shorebird nests. Over half of the duck nests found were blue-winged teal; similarly, killdeer dominated the shorebird nests found. Density of duck nests on moderately grazed pastures was approximately half that of lightly grazed or idled pastures. Duck nest daily survival rates (dsr) show a trend toward greater success in native vs. tame pastures and in moderate vs. heavy or low grazing intensity sites. However, estimates have poor precision due to small sample size, and therefore are not statistically different. Shorebird nest selection favored heavily grazed treatments - 17 of 35 were found in this treatment. Shorebird nest dsr were higher in native pastures than in tame, but not significantly different. This was the first year of a multi-year study.

Status of Elk Project – M.A.P. Habitat™ Program ™s

Polly Winebrenner
RMEF GIS Staff

The Rocky Mountain Elk Foundation (RMEF) has been dedicated to improvement of the status of elk populations and elk habitat protection and enhancement since 1984. An important step in achieving this mission has been the thorough understanding of elk distribution, population trends and habitat distribution and condition. In 1997, the RMEF initiated the Status of Elk Project with the specific goal of gathering the most accurate population status and trend information on elk for the period of 1975-1995, from United States and Canadian elk experts. In addition, in 1997 the RMEF started the collection of occupied elk habitat information. This project is referred to and copyright under the name M.A.P. (Measure and Prioritize) Habitat™ and was sponsored by the Foundation and the USDA Forest Service. Habitat distribution information was mapped in meetings held with state, tribal, Federal, corporate and independent biologists or elk experts. Currently occupied winter range, crucial winter range, summer range, crucial summer range, parturition and movement areas were all mapped using consistent conventions, and was based on expert opinion rather than a rule based model. In addition to mapping occupied habitats, experts assigned "limiting factors" which were used to qualify the effectiveness of each habitat polygon. The RMEF generously makes the M.A.P. Habitat™ available for conservation purposes.

Remote Camera Surveys for Forest Carnivores ™s

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TrailMaster brand infrared camera stations have been used to detect and document the presence of forest carnivore species on the Bozeman Ranger District of the Gallatin National Forest since 1997. Target species for the project include Canada lynx (*Lynx canadensis*), wolverine (*Gulo gulo*), fisher (*Martes pennanti*) and American marten (*Martes americana*). The project is undertaken during the winter months to facilitate snow tracking of animals, avoid conflicts with bears, and take advantage of the winter food scarcity period to lure target species to the stations. Camera stations are baited with pieces of deer and/or beaver carcass and scented with a long distance commercial trapping lure. Chicken wings are suspended from a wire to provide a visual stimulus for attracting cats. The meat baits are hung from a wire so as to minimize the potential for providing a food reward to animals that visit the site. When an animal enters the site to inspect the lure and bait, an infrared beam is broken which triggers the camera to take a picture. Through this project, we have detected the presence of wolverine, marten, and possibly lynx, along with non-target species such as mountain lion, bobcat, coyote, red fox, red squirrel, snowshoe hare, moose and numerous bird species. A workshop will present the setup, maintenance and use of the camera stations.