

BIOLOGICAL SCIENCES - TERRESTRIAL

WEST NILE VIRUS EMERGENCE IN MONTANA, 2002^{TWS}

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Since it first emerged in North America (New York, 1999), 44 states and 5 provinces have detected West Nile Virus (WNV) in humans, birds, mosquitoes, horses, or other animals. Anticipating its emergence in Montana, five state agencies stepped up surveillance, improved laboratory capabilities, and increased educational efforts related to WNV. The first clinical case of WNV in Montana was initially reported 22 August 2002 in a horse near Shepherd and subsequently confirmed by supplemental laboratory testing 28 August 2002. Since then, WNV infection was confirmed in Montana among an additional 134 horses, one human, (two other Montana resident acquired the disease while visiting out of state) and two birds. Onset of clinical illness in the first human case was in mid-September. Although not isolated from any mosquitoes trapped at various sites across Montana, WNV has been reported in 26 counties in central and eastern Montana and is expected to reach across western Montana next year. West Nile virus is normally transmitted between birds and mosquitoes. Birds act as the reservoir and amplifying host. Of 51 birds tested among 14 species to date, we have detected West Nile virus in only 2 birds—a red-tailed hawk and a black-billed magpie. Different bird species respond differently when exposed to the virus, some becoming viremic and carrying the virus while not becoming sick (e.g. chickens); others, such as Corvids (crows, blue jays, and ravens), are very susceptible to the virus, readily developing an often-fatal clinical disease. Mosquitoes become infected by feeding upon viremic birds and subsequently infect other birds, humans, or horses. Although WNV has been detected in several species of mosquitoes in Montana, *Culex* spp. (i.e., *C. pipiens*), *Aedes* spp., and *Ochlerotatus* spp. are the principle agents WNV transmission. Once infected, mammals are considered to be “dead-end” hosts, as they typically do not develop a level of viremia capable of being infective. Some evidence also suggests possible direct bird-to-bird transmission. We attribute early recognition of emergence of WNV in Montana to increased public awareness. With several hundred documented cases in neighboring states (North Dakota, South Dakota, and Wyoming), Montana anticipated introduction of the disease and was not “taken by surprise.” Implications of the presence of WNV in Montana and future surveillance activity are discussed.

WINTER MOVEMENT PATTERNS OF A RECOLONIZING WOLF POPULATION^{TWS}

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A largely unanswered question concerning the ecology of wolves (*Canis lupus*) centers around what habitat and landscape factors substantially influence their movement patterns. To address this question, we are studying fine-scale movements and broader-scale habitat use of wolves in a Yellowstone prey system. By focusing on the winter ranges of Yellowstone's non-migratory Madison-Firehole elk herd and Central bison herd, we hope to use intensively studied ungulate populations as well as other environmental features to tease apart the influential drivers of wolf movement. Wolf spatial data were collected on multiple scales over the past four winters. At the broadest scale, wolf core-use areas have been delineated based on 522 ground-based telemetry locations. At a finer scale, snow tracking resulted in 1287 km of data that are being used to model wolf movement patterns across a heterogeneous landscape of terrain, vegetation, and prey availability. At the finest scale, 272 wolf-kill sites were visited to gain insight into locations of concentrated wolf hunting efforts and sites of higher elk vulnerability. We present preliminary conclusions in the context of potential management implications as well as possible affects on predator-prey models in large mammal systems.

BEAVER AND MAN – THEY CAN CO-EXIST^{TWS}

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Beaver (*Castor Canadensis*) have been considered a nuisance as populations re-establish on much of the former range they were extirpated from in the mid 1800s. Society is slowly becoming informed of the role beaver play in establishing and maintaining fully functioning riparian ecosystems. Some values in having beaver dams, such as for flood control and improved fishery habitat, will be explored. Understanding beaver habits and working with them can minimize confrontations and build valuable partnerships. Examples of man working with beaver to protect roads, trees, and adjacent uplands will also be explored.

APPROPRIATE MANAGEMENT LEVELS FOR WILD HORSES: SETTING SCIENCE-BASED LIMITED IN THE PRYOR MOUNTAINS, MT^{TWS}

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The Bureau of Land Management (BLM) responds to regulations whereby it manages wild horses on public lands as self-sustaining, healthy populations in balance with other uses and the productive capacity of their environment. By definition, this requires BLM to manage herds for long-term successful production of viable offspring, but not to the detriment of supporting rangeland. The BLM must also consider terminology such as "Appropriate Management Level" (AML) for herd size, and "Thriving Natural Ecological Balance" (TNEB) for the supporting system in order to evaluate management options. Vagueness in interpretation and changing definitions over the years have contributed to confusion on the part of both BLM managers and public alike. This paper reports efforts from the Pryor Mountain Wild Horse Range, Montana, to consider AML as a range with both a scientific-established minimum and maximum threshold size. Eight years of cooperative agency and university-supported research generated these results. Genetic studies of the herd are used to set a minimum population size beneath which limited animal numbers might be detrimental to long-term herd genetic viability. Spatial Ecosystem Modeling is used to set an upper threshold size beyond which population numbers might have a detrimental impact on the health of multiple ecosystem components.

CHANGING STATUS OF MONTANA'S WOLVERINE POPULATION WITH THE PAST CENTURY IN REVIEW^{TWS}

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In the early 1900s wolverine (*Gulo luscus*) were considered to be a vanishing species in the western U.S. and near extinction in Montana. Changes in wildlife management philosophies and a reduction in predator control programs are believed to have allowed wolverine to re-colonize parts of Montana during the next 50 years. Population expansion continued through the 1970s when the state gave wolverine protection as a furbearer with a regulated harvest and a requirement to collect harvest data. Species distribution data accumulated since 1977 indicated that wolverine now occupy >35,000 mi² of montane forest habitat in the western portion of the state. Harvest distribution has remained relatively stable over the past 25 years with evidence that population expansions have occurred into central and southwest mountain ranges. Harvest data also indicate a stable annual average harvest of 10 wolverine, stable to increasing species distribution, a 50/50 sex ratio, and an

appropriate age distribution of over 50 percent juveniles and yearlings represented in the harvest sample. Since 1990-1991, FWP has supplemented harvest information with snow track survey based data and collection of species occurrence records to monitor long-term trends in distribution and population size. The harvest sample continues to provide accurate sex and age data, distribution, reproductive data, food habits information, and genetic samples. Based on harvest-generated data, new wolverine management strategies may be considered in the future.

SPATIAL AND TEMPORAL RESPONSE OF GRIZZLY BEARS TO RECREATIONAL USE ON TRAILS^{TWS}

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Many human activities affect how bears use habitat, but effects of motorized recreational vehicle use on trails have not been formally assessed. We used hourly locations from four GPS-collared female bears in the Lewis and Clark National Forest to assess spatial and temporal distributions of bears relative to trail locations and to recreational use on trails. When availability was defined as circles equal to 95 percent of move distances around the previous bear location, all bears used areas near trails less than expected. We iteratively reclassified trail habitat versus non-trail habitat as increasing buffers in 50-m increments around trails until we reached a buffer-width at which bears used areas near trails in proportion to availability. Compositional analysis results showed that bears selected against areas within 250-900 m from ATV trails and within 450-600 m from single-track trails, which had some motorbike use. The distance from trails at which bear use approximated availability varied by individual bear, time of day, season, and type of trail. We assessed selection characteristics based on the nearest motorized route with logistic regression. Although explanatory power was low, two patterns of selection emerged. Three bears selected against areas near trails with high levels of motorized use and were more likely to use areas further from trails. One bear used areas closer to trails extensively in the spring and somewhat in the summer. Selection against areas near highways was stronger than selection against areas near ATV and single-track trails.

ASSESSING ELK GROUP SIZE AND DISTRIBUTIONAL RESPONSES TO WOLVES IN WINTER^{TWS}

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As the gray wolf (*Canis lupus*) population expands outward from Yellowstone National Park, wolves may potentially induce changes in behavior of wintering elk populations. Certain anti-predator responses to wolves, such as changes in mean group size and animal distribution, are of interest due to their relationship to resource management policies, procedures, and objectives on private and public lands that compose wintering areas. Specifically this research attempts to quantify the effects of a wolf pack on mean elk group size and distribution on a winter range. Ground-based telemetry and tracking techniques were used to estimate wolf movements in the area and resulted in 267 wolf locations and 23 wolf kill locations in the first of what will be two field seasons of data collection. Data on elk group size and distribution was gathered via 257 surveys of km² units around wolf locations, wolf kill locations, and in areas without recent wolf presence. To analyze these data, hypotheses of elk group size and distributional responses to predation pressure are being constructed in the form of statistical models grouped into 3 categories for comparison using Akaike's Information Criterion: (1) no response, (2) behavioral response independent of frequency of exposure to wolves (typical prey response), and (3) behavioral response dependent on frequency of exposure to wolves (risk- allocation). We discuss results of preliminary analyses in the context of wolf and elk management and potential implications on population dynamics of these two species.

MEMORANDA OF UNDERSTANDING AND ITS USE TO REDUCE LOSS OF MIGRATORY BIRDS BY COLLISION AND ELECTROCUTION FROM UTILITY TRANSMISSION LINES^{TWS}

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Significant numbers of migratory birds and eagles in Montana are lost each year due to collision and electrocution from transmission lines. Increased energy-related development may result in increased avian mortality across the state. The Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act and Endangered Species Act prohibit the taking of migratory birds, eagles or listed species, respectively. Utility companies may be discouraged from monitoring bird losses on their transmission lines due to the threat of prosecution. Memoranda of Understanding (MOU) between utility companies, state game agencies and the USDI Fish and Wildlife Service are a cooperative, non-adversarial endeavor. The Service can exercise its discretionary authority not to submit for prosecution the unlawful take of migratory birds that occur on company properties of those companies that make a good faith effort to eliminate the take of migratory birds. Under the MOU, companies will develop a comprehensive Avian Protection Plan to monitor avian losses and take reasonable steps to resolve any situations occurring on company property, which may pose a threat to migratory birds. The first MOU between a utility company in Montana, Montana Fish, Wildlife and Parks and the USDI Fish and Wildlife Service should be signed in 2003.

PATTERNS IN BLACK BEAR CUB ORPHANING IN WEST-CENTRAL MONTANA^{TWS}

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Montana Fish, Wildlife and Parks wardens and biologists in west-central Montana (Region 2) reported 29 instances of orphaned black bear (*Ursus americanus*) cubs for the 5-year period of 1997-2001. In the 10,650-mi² study area, 1147 black bears (768 males, 379 females) were reported harvested by hunters during the same period. No instance of orphaned grizzly bear (*U. arctos horribilis*) cubs was reported. In the 29 instances, wardens and biologists found and retrieved 43 black bear cubs. Frequency of orphaning varied from 1 to 12 cases/year, averaging 5.8 cases annually. Seventy-nine percent (23) of orphaning occurred in just 2 of the 5 years. Most orphaning (12) occurred in 2000 when western Montana experienced severe drought and numerous large wildfires. In 1998 FWP personnel reported almost as many orphan bear cases (11) when severe shortages of wild berry crops occurred across western Montana and northern Idaho. The direct cause of orphaning was not determined in 45 percent of the cases. In 16 cases for which cause was determined, hunting accounted for 6 (38%) of orphaning, 3 during the spring hunting seasons and 3 during fall hunting seasons. Other causes were motor vehicle collisions (25%), wildfires (19%), early emergence (6%), dogs (6%), and trapping of nuisance bears (6%). Orphaning occurred from March through December. July (1 case), August (7 cases), September (10 cases) and October (6 cases) accounted for 79 percent of orphaning during the 5 years. Timing (late summer/fall) of most orphaning and known causes (motor vehicles, wildfires, hunters, dogs, nuisance bear trapping) suggested that environmental factors contributed prominently to orphaning. In two years with the most orphaning, physiological stress induced by poor berry crops, drought, and wildfires, probably disrupted mother/cub social bonds and forced bears to forage in low-elevation (and human-occupied) habitats where females and cubs experienced higher mortality rates.

INSECT ABUNDANCE IN RELATION TO PEROMYSCUS MANICULATUS ABUNDANCE AND POPULATION GROWTH RATE IN WESTERN AND CENTRAL MONTANA^{TWS}

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We have monitored deer mouse (*Peromyscus maniculatus*) populations on 18 trapping grids at 6 study sites in western and central Montana for the last 8 years. For the last 3 years we used pitfall traps to monitor insect abundance on 6 grids (one at each study site) to investigate the relationship between deer mouse abundance/population growth rate and insect abundance. We present some preliminary results from our study and discuss implications related to management and monitoring of Hantavirus and other zoonotic diseases.

Note: Results from this study were published in the Int. J. Sci. 9(2/3):78-86.

SCIENCE DESIGN FOR PROPOSED NORTHERN DIVIDE GRIZZLY BEAR POPULATION ESTIMATE^{TWS}

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Baseline information on the status of the grizzly bear (*Ursus arctos horribilis*) population in northwestern Montana is needed to assess management measures designed to recover this threatened population. Planning has begun for a proposed study to estimate population size in the Northern Continental Divide Ecosystem using hair snag stations and DNA identification of individuals. Here we will report on the results of a September 2002 workshop in which a group of experts met to discuss science design issues related to this proposed project. The study area boundary will include most, but not all of the 32,000 km² of occupied habitat. Hair snags will be distributed on a 5X5-km grid for a total of almost 1300 snag sites. Sampling will be conducted during each of five 14-day snag sessions. Concurrent with sampling at baited hair snag sites, we will collect hair from unbaited bear rub trees along trails. We will use results from the two types of sampling in a mark-recapture estimate of population size.

**THE OPEN LANDS DILEMMA: THE CHALLENGES OF BIG GAME
MANAGEMENT AND TRANSPORTATION PLANNING IN OPEN
LANDSCAPES—
A CASE STUDY OF THE MISSOURI BREAKS NATIONAL MONUMENT^{TWS}**

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Significant attention has been paid recently to the effect of road densities and spatial arrangement on big game habitat security, hunter opportunity, and ethical hunting environments. However, the vast majority of research has been performed in forested environments, and the applicability of big game habitat security standards and guidelines to open landscapes, such as the Northern High Plains, is questionable due to significant differences in vegetation cover and topography. At the same time these landscapes are often heavily roaded and are becoming increasingly popular with hunters and recreationists. In addition, open landscapes are more conducive to off-road vehicle (ORV) travel, and impacts of this growing use on big game vulnerability and on ethical hunting are not fully understood. The open-landscape challenges facing public lands managers trying to balance management mandates with big game habitat security, hunter and recreational opportunity, and ethical hunting environments are illustrated using the newly created Missouri Breaks National Monument. The need for creating science-based recommendations to help address these issues in development of current public land management plans, as well as the need for more research into habitat security standards for these environments, are proposed.

MOVEMENTS AND MORTALITY OF AMERICAN WHITE PELICANS BREEDING AT MEDICINE LAKE NATIONAL WILDLIFE REFUGE^{TWS}

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Status of American white pelicans (*Pelecanus erythrorhynchos*) has been of conservation concern because the species nests in large colonies vulnerable to disturbance and habitat loss. Improved protection and greater public awareness are credited with arresting population decline after the 1960s. During recent decades, populations have increased to levels where they are now considered a nuisance on some wintering grounds, e.g., depredation on fish farms. Knowledge of colony dynamics and migratory movements from the northern Great Plains may help alleviate human-pelican conflicts in the Mississippi Delta region. We analyzed encounter data from pelicans banded at Medicine Lake National Wildlife Refuge (MLNWR) from 1957 to 1984 to determine long-range movements. MLNWR contains one of the largest nesting colonies in North America, with an average of 4000 nests counted annually the past decade. Band encounters ($n = 253$) revealed that pelicans from MLNWR use the Mississippi and Central flyways to reach wintering areas primarily along the Gulf of Mexico. Movements of five satellite-tagged pelicans in 2002 corroborate patterns inferred from banding data. Most band encounters were of dead birds with cause of death including shooting, electrocution/collision, and entanglement. To help guide proper management by USDI Fish and Wildlife Service, on-going research at MLNWR will focus on determining habitat use and foraging areas of breeding pelicans, assessing local population dynamics, and investigating factors influencing productivity and survival.

BLACK-FOOTED FERRET RECOVERY IN MONTANA—WHERE DO WE GO FROM HERE?^{TWS}

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Black-footed ferret (*Mustela nigripes*) reintroductions to Montana began in 1994 on the UL Bend National Wildlife Refuge in southern Phillips County. Reintroductions continued each fall through 1999 and a total of 187 ferrets were released. At least 188 wild-born kits were observed from 1995 to 2002. The number of wild-born kits observed each fall increased steadily from 1995-2000. Habitat, i.e. extent and density of black-tailed prairie dog colonies, was presumed to be limiting population growth beyond the 20-30 breeding adults observed each spring from 1996 to 2001. The UL Bend ferret population began a

dramatic decline during summer 2001, and by November 2002, only four remained (3 males, 1 female). A total of 180 ferrets were released on the Fort Belknap Reservation from 1997 to 2000. At least eight kits were produced in the wild from 1998 to 2002. Spring surveys at Fort Belknap located 6 breeding adults each year and only a single male was observed during 2002. No ferrets are currently known alive at Fort Belknap. Forty-five ferrets have been released on USDI Bureau of Land Management lands, midway between UL Bend and Fort Belknap from 2001-2002. Two wild-born kits were observed and fall 2002 surveys found seven ferrets (5 male, 2 female). More than 600 ferrets have been input into Montana over the last 9 years. Today's total population numbers < 10. Causes for these declines, some manageable and others not, are discussed. Management plans for black-tailed prairie dogs are currently being developed and will likely determine if black-footed ferrets can exist in Montana.

HERPETOLOGY IN MONTANA: PAST, PRESENT, AND FUTURE^{TWS}

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We are pleased to announce the publication of our book on Herpetology in Montana, which summarizes the history of herpetology in Montana from Lewis and Clark's arrival in 1805 to the present. We summarize the current status of the state's herpetofauna. We give checklists of the 12 amphibian and 17 reptile species known to be native to the state. We provide dichotomous keys for amphibian eggs, larvae, and adults, and reptile adults. We present individual species accounts for native species that (1) map 4636 museum vouchers and 7003 observation records in distribution maps, (2) list the earliest literature and voucher records, (3) list the maximum elevation reported and maximum elevation documented with a voucher specimen, (4) list voucher specimens by county of collection, and (5) provide a bibliographic index for 508 abstracts, unpublished reports, theses, dissertations, and published articles that contain information on species in Montana and Yellowstone National Park. We also provide accounts that review information on the seven species or subspecies which are possibly native to the state, but for which we currently lack adequate

documentation, and the 13 species or subspecies that have been reported as exotic in the state. We briefly review highlights of the manuscript and discuss current issues of critical management concern and direction of inventory and monitoring programs designed to assess status of amphibians and reptiles in Montana.

SHOREBIRD SURVEY RESULTS AND MANAGEMENT ACTIVITIES AT BOWDOIN NATIONAL WILDLIFE REFUGE, MONTANA^{TWS}

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Shorebirds have always been an important component of the wildlife resource at Bowdoin National Wildlife Refuge (NWR) in northern Montana, but recent events have heightened interest. Listing of the piping plover (*Charadrius melodus*) as a threatened species in 1985 prompted intensive surveys for breeding pairs, nests and broods starting in 1986. Discovery of breeding pairs on the nearby USDI Bureau of Reclamation's (BR) Nelson Reservoir broadened the survey area. A second major event was the decision in 1996 to establish an International Shorebird Survey (ISS) route on the refuge and begin gathering population data for use in applying for designation as a Western Hemisphere Shorebird Reserve Network (WHSRN) regional site. Weekly surveys of the ISS route from early spring until freeze-up in fall were expanded to include nesting studies, and banding of incubating adults, and nestlings of willets (*Catoptrophorus semipalmatus*), marbled godwits (*Limosa fedoa*), long-billed curlews (*Numenius americanus*) and upland sandpipers (*Bartramia longicauda*). Apparent nest success was consistently high at 74 percent (range 63.2-78.9%, $n = 77$) during 1999-2002. One hundred and one shorebirds were banded with recapture of five adult birds in subsequent years. Four of eight adult willets banded in 1999 were recaptured, including two birds on the same nest bowls from which originally captured. Bowdoin NWR received its WHSRN designation in 2002 after documenting peak numbers of 38 shorebird species in the range of 45 to 58 thousand birds. Piping plover nests on Nelson Reservoir have been threatened by inundation from rising irrigation water since 1989. Techniques were developed to elevate or move nests to avoid inundation. Completed projects for improving nesting habitat on Nelson Reservoir in cooperation with BR included elevating two islands and grading or disking vegetation on two gravel beaches. A 200-ac diked subimpoundment on the Dry Lake Unit at Bowdoin was completed in 2002 with the intent of consistently providing an ideal water level for nesting plovers.

WETLAND MITIGATION ISSUES RELATED TO THE RECONSTRUCTION OF U.S. HIGHWAY 93 ON THE FLATHEAD INDIAN RESERVATION^{TWS}

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U.S. Highway 93 traverses some of the most ecologically sensitive wetland, riparian, and aquatic habitat on the Flathead Indian Reservation. In December 2000, the Confederated Salish and Kootenai Tribes, the Montana Department of Transportation, and the Federal Highway Administration entered into a Memorandum of Agreement (MOA) for the U.S. Highway 93 Evaro-Polson Project. The MOA identifies the three entities' preferred conceptual roadway improvements including alignment, lane configuration, major design elements and mitigation concepts for 30.8 mi (49.6 km) of the project. The MOA also specifies a process for environmental and design phases of the Highway 93 project. This process, as it relates to wetlands, riparian, and aquatic issues, highway design details, mitigation designs, and the integration of the MOA with federal, state, and tribal environmental regulations, is presented. The MOA also commits the three entities to cooperate in preparing a Supplemental Environmental Impact Statement (SEIS) for 11.2 mi (18.1 km) of the highway that traverse the Ninepipe glacial pothole wetlands complex. I also present a summary of the current status of the U.S. Highway 93 Ninepipe SEIS and design alternatives being evaluated.

BLACK DEATH ON THE PRAIRIE: PLAGUE, PRAIRIE DOGS, AND BURROWING OWLS^{TWS}

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Sylvatic plague represents the biggest challenge to the conservation of black-tailed prairie dogs (*Cynomys ludovicianus*) and their habitat associates, such as the burrowing owl. Plague epizootics can decimate prairie dog populations by 95-100 percent. Decreases in prairie dogs may eventually lead to the loss of burrowing owls (*Athene cunicularia*) as nesting holes unattended by prairie dogs collapse. I studied the direct and indirect effects of plague on prairie dogs and burrowing owls from 1999 to 2002 on the Ft. Belknap Indian Reservation, Montana. A plague epizootic was detected on the reservation in autumn 1999. The epizootic reduced occupied prairie dog habitat by over 50 percent in two years. Plague also reduced mean colony size and increased colony edge. Owls nested among fewer prairie dogs at the local and landscape scales. Despite these apparent changes to owl habitat, the population size and productivity of nesting owls remained relatively constant. Density of prairie dogs rebounded to pre-plague levels after only 3 years, but overall range of prairie dogs has increased slowly. Long-term management of prairie dogs in Montana will be difficult because of the cyclic nature of plague.

FACTORS AFFECTING SURVIVAL AND RECRUITMENT IN FEMALE MERRIAM'S TURKEYS^{TWS}

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Merriam's turkeys (*Meleagris gallopavo merriami*) historically occurred in ponderosa pine (*Pinus ponderosa*) and Gambel's oak (*Quercus gambelli*) forests in the southwestern U.S. They have been successfully transplanted into a wide array of habitats outside their original range. Some introduced populations are more robust than those within the original range. Annual survival fluctuates widely, ranging from 30 to 76 percent for adults. Survival of subadult hens is typically lower. Predation is the primary mortality factor and coyotes are the most common predator. Percent of females attempting to nest (nesting rates) ranges from ~30 percent to >90 percent for adults. Yearling females nest at lower rates, but within the historic range of Merriam's turkeys, nesting by yearling hens may be almost nonexistent. Management that would increase nesting by yearlings probably has the greatest potential to influence populations given the existing biological limitations to Merriam's turkeys. Nesting rates of adult and yearling hens is likely related to habitat quality or productivity, possibly through nutrition. Survival of poults is low. High quality meadows with abundant herbaceous vegetation and invertebrates may contribute to increased survival of poults.

Note: Results of this study were published in the *Int. J. Sci.* 9(1):26-39.

THE INDIRECT EFFECTS OF FIRE ON BIRD SPECIES COMPOSITION AND DETECTIONS IN MIXED-GRASS PRAIRIE^{TWS}

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Fire is a common event in grassland habitats and is important in structuring habitat for many breeding bird species. Fire directly alters vegetation characteristics and indirectly affects breeding bird communities by making potential nest sites and territories suitable for some bird species and unsuitable for others. A fire on the Little Missouri National Grassland in western North Dakota provided an opportunity to study indirect effects of fire on the bird community. In 2001 and 2002 I conducted point count and transect surveys in burned and

unburned areas of the grassland and measured vegetation features. In 2002 I also searched for and monitored nests of Western Meadowlarks (*Sturnella neglecta*), Vesper Sparrows (*Pooecetes gramineus*), and Grasshopper Sparrow (*Ammodramus savannarum*). Litter depth and plant species composition differed between treatments both years, but vegetation density only differed in 2001. The proportions of survey points and transects with detections of common bird species did not differ significantly between treatments. Preliminary analyses suggest that most vegetation variables do not accurately predict the presence of bird common species. Nest success was low for the three bird species, i.e., western meadowlark, 14 percent; vesper sparrow, 37 percent; and Grasshopper Sparrow, 34 percent. Analysis of nest site vegetation characteristics may not indicate what features deter nest predation but may help us understand what habitat features these species select. The low severity of the fire may explain minimal differences in vegetation features and bird species composition. Grazing by cattle most likely had a confounding effect.

**MONTANA WOLF PLANNING: PROCESS, PROGRESS...MORE PROCESS
AND MORE PROGRESS...
THERE IS A LIGHT AT THE END OF THE TUNNEL!^{TWS}**

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Former Governor Racicot appointed the Montana Wolf Management Advisory Council in April 2000 by 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. Governor Martz directed FWP to use the work of the Council to frame the "Montana Wolf Conservation and Management Planning Document." While the planning document reflected what a state wolf management plan could be, FWP still needed to explore various alternatives before adopting a management plan in full compliance with the legal requirements of the Montana Environmental Policy Act. Using this document as a basis for discussion, FWP opened the "scoping" comment period for its wolf management environmental impact statement (EIS) in February 2002. FWP collected about 6700 individual comments. Because wolf recovery and eventual state management are issues of such great significance to Montana, Governor Martz reappointed the original Wolf Management Advisory Council. FWP consulted with the Council prior to finalizing the EIS alternatives. Ultimately, FWP crafted five alternatives that ranged from little to no management to aggressive management. The Council's work will be presented as one of the alternatives. FWP's Wolf Conservation and Management Draft EIS will be released in late winter, 2003. FWP will accept public comments on its draft EIS at a series of community work sessions, via written letters, or email. FWP expects to complete the EIS in summer, 2003. More information can be found at www.fwp.state.mt.us.

THE EFFECTS OF THE 2000 WILDFIRES ON BIRD ABUNDANCE AND SPECIES COMPOSITION IN THE BITTERROOT NATIONAL FOREST^{TWS}

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Disturbance events, such as windstorms, hurricanes, floods, and wildfires, maintain a range of successional stages with each offering habitat for a different suite of species. In the interior northwest, wildfire is the primary recurring disturbance that has maintained diversity in habitat types. During summer 2000 wildfires burned 13 transects that were part of the Landbird Monitoring Program's (LBMP) long-term monitoring effort in the Bitterroot National Forest. The Northern Region of the USDA Forest Service initiated the LBMP to assess bird habitat relationships and long-term population trends. As a result, one to five years of pre-fire data on bird abundance have been collected using 10-minute point counts. I conducted point counts on 13 burned and 13 unburned transects in the Bitterroot NF during summers 2001 and 2002. This represented the first opportunity to examine changes in bird abundance and species composition following stand-replacing wildfire. I compared relative bird abundance before and after wildfire for all species detected on at least 40 points. Post-fire changes in bird abundance were greatest at points that burned at high severity, where tree mortality was > 80 percent. Foliage-gleaning insectivores decreased following wildfire whereas aerial insectivores increased slightly.

BACKCOUNTRY RECREATION IMPACTS TO WILDLIFE: AN APPLICATION OF THE WILDLIFE SOCIETY'S ONLINE BIBLIOGRAPHY^{TWS}

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As part of the Leopold Institute's Linking Wilderness Research and Management series, we're developing an annotated reading list on the effects of backcountry recreation on wildlife. Within a national context, we're organizing the literature into a framework for assessing and managing these impacts. This includes describing the value of wilderness to wildlife, the value of wildlife to wilderness, impacts to individuals, populations or communities, and potential management approaches. The searchable database developed by the Montana Chapter of The Wildlife Society served as a valuable starting point for gathering literature on this topic. We will describe our experience accessing information in the database and review the types of information it did and did not contain. After clarifying differences between the TWS database and our reading list, we summarize the information we compiled. Impacts of recreation on wildlife include increased energetic demands during critical times, loss of habitat and exposure to predators as a result of human presence, and loss of habitat through vegetation alteration by recreational activities. Management

approaches include direct actions such as restricting visitor numbers, activities, or access to some areas, as well as the indirect management of visitors using techniques such as visitor education or the careful location and design of trails, trailheads, and adjacent roads and campgrounds. Our intent with this volume is to (1) promote improved understanding of backcountry recreation impacts on wildlife, (2) familiarize readers with current literature on various management approaches, and (3) facilitate access to references focused on this topic.

BROWSE CONDITION AND TREND ON MONTANA UNGULATE RANGES^{TWS}

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Ungulate impacts on woody vegetation have been a concern in Montana for a half-century. Enclosures were built on many areas of concern to determine if ungulates were affecting browse species. Most enclosures were built many decades ago, thus allowing impacts of long-term browsing to be realized. Our objective was to determine condition and trend of a variety of browse species. We achieved this by comparing browse species growing inside enclosures with browse species on environmentally similar areas outside. Thirty-two enclosures restricting the access of all ungulates were evaluated across many different environmental types. We used methods that evaluated short shrub species (< 2 m), tall shrub species (> 2 m), and trees and found browsing to have impacted browse species at 22 sites. In addition, five sites were considered areas of caution and were likely coming out of a period of intense browsing or entering a period of intense browsing. No browsing impacts were found at two sites. At the remaining three sites, we attributed differences in browse species inside and outside enclosures to factors other than browsing such as natural successional changes. Sites with no browsing effects were not related geographically within Montana. Impacts were found at both the oldest enclosure (57 yrs) and most recent enclosure (10 yrs). These findings imply browsing levels have been and remain a deterrent to development of browse communities throughout Montana.

THE EFFECTS OF THINNING AND PRESCRIBED FIRE ON FORAGING PATTERNS OF BARK-GLEANING BIRDS^{TWS}

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Fire suppression in western forests has changed the mosaic of successional stages of forest that once existed. In the western United States, recent large-scale, high-intensity fires have been attributed to the lack of fire in forest systems for the past century. The Montana

Department of Natural Resources (DNRC) is integrating ponderosa pine forest restoration into their timber harvest program with a commercial thin that is combined with a selective cut and followed by a prescribed burn. Many studies have considered the effects of forest management practices on nest availability for cavity nesters, but little published information exists on how thinning combined with prescribed fire affects their foraging patterns. Snags can provide important nesting habitat for cavity nesters, but it has been suggested that food availability may be the limiting factor for woodpeckers. In this project, I examined the foraging patterns of bark-gleaning birds on sites treated by the DNRC versus untreated sites. I determined which tree characteristics are important in the selection of forage trees for five different species: red-breasted nuthatches, white-breasted nuthatches, mountain chickadees, hairy woodpeckers, and black-backed woodpeckers. Treated and untreated sites were analyzed separately to determine if the same tree characteristics were important on both sites. Selection of forage trees with certain characteristics occurred on both sites for most species.

MOLECULAR CELLULAR BIOLOGY AND NEUROSCIENCES

ADAPTATION TO A CHOLESTEROL FREE ENVIRONMENT BY *TRICHOLPLUSIA NI* (TN) INSECT CELLS^{MAS}

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For many years, researchers have known that cholesterol is an integral component of eukaryotic cell membranes. Cholesterol is found in the bilayer membrane and helps to maintain cellular membrane structure and fluidity. Recent research has found that a specific invertebrate cell line can be grown in cell culture without any cholesterol contained in the cells. Insect cells are not capable of synthesizing cholesterol and therefore require supplementation in their media. Surprisingly, withdrawal of exogenous cholesterol from a *Trichoplusia ni* cell line is not lethal for these cells. This suggests that sterols are not essential for the viability of certain animal cells. This brings up worthwhile questions. How do these cells maintain membrane structure and fluidity without cholesterol? Is there a structural change in the fatty acids of the membrane lipids or does some other lipid take cholesterol's place in the bilayer membrane? Utilizing analytical gas chromatography the composition of membrane lipids from cholesterol depleted *Trichoplusia ni* cells was analyzed and characterized.