The Montana Chapter of The Wildlife Society
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"Conservation Policy:
Getting Involved, Staying Engaged, and How TWS can Help"

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ABSTRACTS - ORAL AND POSTER PRESENTATIONS

Alphabetical by Presenter's Name

*Indicates Presenter
**Indicates Student Presentation

Integrating Multiple Data Sources for Long-Term BlackBear Monitoring, a Hierarchical Modeling Approach

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KristeBrzeski, Michigan Tech University
Tonya Chilton-Radandt, Montana Fish, Wildlife and Parks
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Large carnivores can be challenging to manage. In the mid-1990s, early evaluations of black bear life history established the initial management thresholds (based on harvest data) to evaluate the effect of harvest on black bear populations in Montana. These thresholds were applied to management of black bears in Montana beginning in 1996. After a large-scale population density and demography study in the 2000s, Montana Fish, Wildlife & Parks is developing a black bear monitoring program that uses historical and contemporary data from field studies and harvest statistics to advance monitoring methods. Our approach includes 1) using spatial capture-recapture (SCR) with noninvasive genetic sampling (NGS) to estimate population density and abundance, and 2) extrapolate density estimates from local study areas to surrounding bear management units and the larger ecoregions using SCR population estimates and resource selection function models (RSF). This effort will be replicated across 5 ecoregions in the state and each ecoregion will be revisited every 5 years to produce population indices and evaluate harvest effects. Our first 2 years of NGS was successful with nearly 1,500 samples collected across 2 study areas in western Montana. We used GPS locations from 362 black bears (228M, 134F) radiomarked during 2000-2022 from 8 different study areas in Montana, Idaho, and Wyoming to train and validate RSF models. This approach to hierarchical modelling provides insight on the feasibility of monitoring black bears at large spatial scales on mixed use landscapes where managers seek robust tools for regulated harvest.

Montana's Hidden Crisis: Nitrates in Rock Creek (Poster)

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Exurban expansion can degrade significantly stream water quality. This study was conducted on Rock Creek of the Clark's Fork of the Yellowstone River in southcentral Montana, USA. The impact from recent exurban expansion was evaluated by a baseline study measuring total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and nitrites (NO_2) and nitrates(NO_3) together. This was part of a larger study by Montana Department of Environmental Quality to assess water quality, identify sources of pollution and develop total maximum daily loads (TMDL). Water samples were measured for these analytes at nine (2022) and 11 (2023) locations with different land-uses over seven periods (both years). Seasonal spikes, corresponding to runoff (2022, late May), occurred in TSS, TP and TN. Data from 2023 showed similar but reduced levels occurring in June for TSS and TP. Total suspended solids, TP, NO_2 and NO_3 concentrations increased by location year over year, 2022 to 2023. The high relative concentrations of NO_2 and NO_3 in Rock Creek are primarily associated with exurban expansion, a significant threat to stream quality and wildlife habitat in Montana. The results will assist county planners in land use decisions.

Leveraging Conservation Status Assessments to Highlight Threats, Trends, and Information Needs of Montana's Species of Concern

Dan Bachen, Montana State Library Natural Heritage Program, Helena

Since the late 1980s the Montana Natural Heritage Program has maintained a list of Species Of Concern (SOC) to highlight rare and imperiled species within the State. This list is used by management agencies and in project planning and environmental review to mitigate impacts tothese species and focus research and conservation. Ranking currently uses a standardized assessment following guidance from NatureServe that scores species on their rarity, threats, and trends. Recently the program has aggregated this information in a relational database framework that allows greater access to these data and comparison of ran factors across species and allows analysis of common threats and negative trends as well as highlighting information needs for highly threatened species or those that are undergoing rapid decline. In this analysis we found that the top three threats of moderate to high severity were impacts ofclimate change, habitat loss through conversion to agriculture, and impacts of invasive species or disease. Across vertebrate SOC species 46% had trends from slight declines to stable or increasing, 11% were undergoing moderate to significant declines, and 43% had no trend data available. Taxonomic groups with broad structured monitoring programs such as birds and fish had higher numbers of species with current trend data while mammals and reptiles generally lacked such data. Many species with high threats were actively monitored, but the current status of other species remains uncertain as trend data are unavailable. Through this analysis we were able to identify species most at risk of unrecorded declines.

Insight from Four Years of Structured Acoustic Monitoring of Bat Species

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Emily Almberg, Montana Fish Wildlife and Parks, Bozeman
Alexis McEwan, Montana Natural Heritage Program of the Montana State Library, Helena

In 2020, a partnership of state and federal entities initiated annual surveys of bats across the state using acoustic detector-recorders, primarily to assess the impacts of the fungal disease White-Nose Syndrome (WNS). Through 2024 this effort has resulted in the collection of 4,173,501 bat calls from 1,879 sites. Analyses of these data provide insight into the status of many of Montana's species at both the state and federal level. Spotted Bat (*Euderma maculatum*) was once considered among the rarest mammal species in North America. Recordings have confirmed the species' rarity, however, the species is more widely distributed and recorded near potential roost types that differ from typical large cliff roosts. Hoary Bat (*Lasiurus cinereus*) is vulnerable to collisions at wind turbines and analysis of these data demonstrate declining occupancy within Montana. Little Brown Myotis are vulnerable to WNS and have suffered catastrophic declines across central and eastern regions of North America. Occupancy for the species has remained stable across Montana, but roost and capture data support widespread declines in abundance. Previous analysis of acoustic data infer WNS impacts on the number of calls recorded per night on acoustic detectors across *Myotis* species. Acoustic monitoring data collected within the state have been submitted to the North AmericanBat Monitoring Program and are being used in ongoing assessments of WNS and wind-energy impacts at the continental scale, ensuring Montana's representation in national efforts to understand and mitigate these threats.

**A Framework for Prioritizing Attractants to Reduce Black and Grizzly Bear Conflicts (Poster)

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Human-wildlife conflict is a growing challenge worldwide, particularly in regions where species must navigate fragmented landscapes and increasing interactions with people. For grizzly and black bears, unsecured attractants such as food, garbage, and livestock carcasses can bring bears into close proximity to humans, leading to increased conflicts and undesired outcomes for people and bears alike. However, securing attractants often requires significant financial ortime investments, leading to gaps in mitigation efforts. This study aims to develop a prioritization framework to identify attractant reduction efforts with the greatest potential for reducing human-bear conflict at the community level. Drawing from a community-based social marketing model, we adapt a behavior ranking methodology to the context of wildlife management. This adapted framework will help communities identify priority attractants to target by considering the likelihood of behavior change among residents, current rates of securement, and the extent to which each attractant contributes to overall human-bear conflict. To test this framework, we focus on the Bitterroot Valley in Western Montana, a regioncurrently home to black bears but without an established grizzly bear population. This will allow us to evaluate the framework in managing black bear conflicts while preparing for the potential recovery of grizzly bears

in the area. Ultimately, this framework is designed to inform mitigation efforts in regions facing conflicts with black or grizzly bears, offering a guide for resource allocation among agencies and organizations.

Elk Respond to Differential Hunter Access Management and Harvest Regulations in a Mixed Public and Private Landscape

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Wildlife managers across the western U.S. are increasingly tasked with managing elk populations that exceed population goals and strain public and landowner tolerance with problematic distributions. Reducing these populations through hunter harvest and achieving desirable distributions can be challenging on mixed landscapes of public and private lands where hunter access management decisions vary among landowners. We used GPS data from 58 female elk in the Devil's Kitchen elk population in central Montana, USA to evaluate how hunter access management, harvest regulation, and other landscape factors influence elk movements and habitat selection during hunting season. We fit Bayesian multistate models to evaluate factors influencing the daily probability of an elk transitioning between hunter access strategies, then constructed resource selection functions describing female elk habitat selection in relation to hunter access management, harvest regulation, and other landscape factors in four distinct periods during the hunting season. Our results indicate that female elk generally selected for less hunter access and more restrictive harvest regulations. Female elk were almostalways more likely to remain in areas with the same hunter access strategy, but movements between different hunter access strategies were most likely during the general rifle season. During the early shoulder and archery seasons, hunter access management appeared to primarily drive female elk habitat selection and elk were more likely to transition from openaccess lands to less accessible private lands. During the general and late shoulder seasons, harvest regulation appeared to primarily drive female elk habitat selection and movements between hunter access strategies.

Using Machine Learning and Remotely Sensed Data ToImprove Models of Elk and Mule Deer Nutritional Landscapes in Western Montana

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The availability of nutritional resources for elk and mule deer is one of the defining characteristics of their habitat in Montana, representing a key bottom-up factor that drives individual- and population-level responses. Elk and mule deer conservation and management decision-making is therefore improved by quantifying the environmental characteristics that drive spatial and temporal heterogeneity in nutritional abundance and quality at landscape scales. Much of the existing work modeling nutritional landscapes has relied on intensive field surveys. While those efforts have yielded useful insight, it is not clear how well they can be used to generalize over larger scales and across time. Further, while many studies have incorporated remotely sensed data products to improve predictions of forage quality, direct vegetation indices (e.g., NDVI) may not accurately reflect biologically relevant changes, especially

where dense forest cover occludes accessible forage. Instead, it is likely that the best nutritional landscape models will couple directly observable phenomena with ancillary environmental characteristics. In this study, we modeled elk and mule deer forage quality usingon-the-ground measurements of forage quality from multiple studies across western Montana as training data predicted by a combination of metrics of land cover, topography, weather, soil chemistry and texture, climatic water balance, and disturbance by fire and timber harvest. We report on the data acquisition and spatial modeling techniques that have contributed to model accuracy across the region, including maps of interannual variability that may improve our understanding of dynamic nutritional landscapes and inform further efforts in elk and mule deer management.

**Identifying Migration Routes and Stopover Sites on the Blackfeet Reservation (Montana, USA) and the Surrounding Landscape

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Elk (*Cervus canadensis*) are important economically, culturally, and provide an important sourceof sustenance for many communities. Studies of elk migrations during spring and fall improve our understanding of elk ecology and provide managers with valuable information, however there is limited published literature about how both traditional ecological knowledge (TEK) and western science are used to identify migration routes. We used global positioning system (GPS) telemetry-collar data collected on adult female elk around the Blackfeet Nation Indian Reservation in northwestern Montana, USA, to identify migration routes and stopover sites using Migration Mapper. In addition, we include maps of known elk migration routes based on Blackfeet traditional ecological knowledge. Both methods of identifying migration routes for elk are consistent in our results. Our results could help managers identify locations in and around the Blackfeet reservation where anthropogenic activities may conflict with elk during migrationto and from critical winter range.

Montana Chapter of The Wildlife Society's Efforts to Inform Conservation Policy

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The Conservation Affairs Committee (CAC) of Montana TWS works to: 1) review and comment on conservation-related legislative proposals and regulations, 2) prepare white papers, 3) coordinate/review proposed position statements from MT TWS membership, and 4) interface with TWS Governmental Affairs leadership. Montana TWS frequently contracts with a conservation partner during Montana legislative sessions to assist the Chapter with legislative bill tracking, review and comment. During 2024, we (MT TWS CAC and Executive Board) workedcollaboratively with TWS and western US chapters/sections to review and comment on: 1) BLM's Draft Programmatic Environmental Impact Statement for Utility-Scale Solar Energy Development and 2) BLM's Draft Resource Management Plan Amendment and EIS for Greater Sage-Grouse Range-wide Planning. We additionally advanced Montana-specific policy priorities to TWS as they constructed a list of policy priorities that were subsequently sent to all TWS member units for input/ranking. We then facilitated a process for Montana Chapter members to provide input on TWS Policy Priorities to inform national policy strategy. During 2025, we have been tracking draft bills during the Montana legislative session and providing comments in

coordination with conservation partners. At time of this writing, we opposed a bill to set hunting seasons in statute and supported a bill expanding legal protections for wildlife relative to the unlawful use of aircraft for hunting. We welcome your involvement as we strengthen Montana TWS policy efforts.

Why Biological Recovery has not Been Enough to Successfully Delist the Grizzly Bear

Sabrina Bradford, Graduated with a PhD from the University of Colorado in December 2024

Many institutionally driven wildlife recovery programs around the world struggle as a result of a disconnect between ecological definitions of recovery and social realities surrounding conservation. In North America's Greater Yellowstone Ecosystem, tensions have erupted due to the Yellowstone grizzly bear remaining a federally protected population despite meeting scientific recovery targets for over twenty years. In order to explore the similarities and differences between the biological criteria and the social constructs of recovery, I interviewed both local stakeholders and federal and state wildlife agency representatives within the Greater Yellowstone Ecosystem. In addition, I analyzed the public response to the 2017 removal of federal protection from the Greater Yellowstone Ecosystem grizzly bear. Results of this researchindicate that there is tension between the biological and social aspects of endangered species recovery and that policy marketing rather than biological monitoring largely shapes the development of the recovery discourse. In other words, the judicial rulings which have reinstated federal protection for the Greater Yellowstone Ecosystem grizzly bear population have had a transformative effect on the way the public understands the criteria necessary for aspecies to be considered recovered, a key component of the delisting process. As countries around the world develop policies and programs to support the recovery of large carnivore species, it is critical that programs identify both biological and social components in order for a species to be identified as recovered.

**Fission-Fusion Movement Dynamics of Semi-Free RoamingBison in North-Central Montana

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Plains bison (*Bison bison bison*), a keystone species in North American grasslands, exhibit fission-fusion dynamics in which they break into smaller groups and coalesce into bigger groupsover time. However, it is unclear what social and environmental factors drive these dynamics. We used both fine-scale behavioral observations and movement data from GPS ear tags to construct social networks and examine fission and fusion events for two bison herds over multiple years at American Prairie in northcentral Montana. These bison herds are semi-free roaming and graze year-round in 32.4 and 111.6 km^2 fenced pastures with minimal internal fencing. While the bison in our study did exhibit fission-fusion behavior, we did not observe stable sub-groups in time-aggregated social networks at the scales of months or growing seasons (eigenvector modularity ranged from -0.008 to 0.027). We used Mantel tests to assess the relationships between association strength and relatedness, age, and place of origin. We found that only first-order relatives were more likely to associate with one another, and therewas no significant impact of shared age or place of origin. The observed lack of stable sub- groups challenges prevailing assumptions and highlights the need for future research into the mechanisms of fission-fusion dynamics in bison under different management conditions.

**Interspecific Interactions - Exploring the Reproductive Phenology of Feral Horses and Their Interaction with Native Ungulates in Alberta, Canada (Poster)

Mattie Budine, Wildlife Biology, University of Montana, Missoula

Feral horses (*Equus ferus caballus*) are a prolific species in western North America. Due to their history of domestication, it is believed they have an extended foaling period compared to native ungulates, such as elk (*Cervus canadensis*) and mule deer (*Odocoileus hemionus*), yet there are few (or no) studies examining this assumption. I will examine this assumption using photos from one year of a multi-species oriented camera trap grid, using a subset of a ~65 camera trap array located in Alberta, Canada where the feral horse population is abundant andgrowing. I will examine overlap in the presence of offspring to compare the feral horse foaling season to the native species. Depending on the overlap of birthing seasons, I will be able to generate hypotheses regarding potential species interactions between feral horses and other ungulates. This will hopefully help inform future studies and add to our understanding of feralhorses in the west.

Relative Risk of Waterbird Species on the Berkeley Pit - AMortality Assessment of 18 Taxa

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Acute and chronic health effects of various chemical contaminants to wildlife are well- documented across numerous laboratory and in-field studies. For waterbird species, the impacts of acid metalliferous water (AMW) are a particular focus in which dermal exposure and ingestion have been identified to cause direct mortality and may reduce long-term fitness (Isanhart et al. 2011). Acid mine waterbodies, known as 'pit lakes,' are a result of historical and ongoing open-pit mining that can be hot spots for exposure to metals and other contaminants, especially for waterbird species that may use these waterbodies as stop-overs or staging areas along migration routes. The Berkeley Pit, in Butte, Montana, is likely one of the most intensively monitored pit lakes on the planet, especially for waterbird activity. The unique, geochemistry and extensive size of the Pit, in addition to its geographic location along the eastern edge of thePacific Flyway, make this acid mine waterbody a novel, in-field laboratory for scientists and resource managers to quantify waterbird populations and evaluate risks and mitigation strategies. As a result of systematic waterbird observations on the Pit over a six-year period (2018 – 2023), we identified 54 taxa, 18 of which have at least species had at least one known mortality on the Pit. This study examined the annual distribution of the different species and assessed which ones were most at risk of mortality when exposed to AMW. These results provide baseline information essential for effective management and conservation of species exposed to anthropogenic landscapes and associated contaminants.

**Songbird Telomere Length Reflects Prey Loss More Than Metal Exposure from Mine-Waste Contamination

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Mining contamination is a widespread ecological disturbance with disproportionate effects on

riparian ecosystems that host diverse breeding songbird populations. Riparian songbirds rely heavily on insects to fuel energetically expensive breeding activities and emergent aquatic insects are superior fuel due to their high polyunsaturated fatty acid content. Elevated metals cause mortality during insect metamorphosis which can limit prey availability, especially aquaticinsects. However, surviving adult insects, larval terrestrial insects and spiders pose a threat of toxic metal exposure. Thus, in mine-waste contaminated habitats, birds are at risk of metal exposure and nutritional stress but the relative importance of these two stressors is not well understood. Telomeres (protective DNA capping chromosomes) can shorten in response to metals and nutritional stress and telomere length during development predicts lifespan in songbirds, making telomeres a good biomarker of health and fitness in nestling songbirds. We assessed body condition, telomere length (qPCR), diet (DNA metabarcoding), and blood metals (Pb, As, Cd, Cu, Zn, Se; ICP-MS) in nestlings from six songbird species in the heavily contaminated Upper Clark Fork watershed. We find significant elevation in blood concentrations of lead, arsenic, cadmium and selenium at the most contaminated sites, but dietis a much stronger predictor of body condition and telomere length than any direct relationships with metals. A higher proportion of aquatic insects in diet correlates with better body condition and longer telomeres, underscoring the critical importance of aquatic prey for breeding songbirds and the complex mechanisms by which songbirds are affected by mine- waste contamination.

Moose Population Dynamics in Montana

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In 2013, Montana Fish, Wildlife and Parks (MFWP) began a 10-year moose study that included a detailed assessment of population growth rates, vital rates, and limiting factors in three focal study areas. We will discuss the results of this study, including detailed assessment of adult female survival, calf survival, recruitment (pregnancy * litter size), what drives these vital rates(and doesn't), and their relative roles in ultimate rates of population growth.

Pronghorn Movement and Population Ecology

Jesse DeVoe*, Montana Fish, Wildlife and Parks, Bozeman
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Joshua Millspaugh, Wildlife Biology (and Department of Environmental Biology), University ofMontana, Missoula (and State University of New York), Syracuse, NY

The Montana Pronghorn Movement and Population Ecology Project was initiated in 2019 to collect information on pronghorn movements, seasonal habitat use, and demographics in 8 study areas that included the Big Hole, Paradise, Madison, Musselshell, Fergus-Petroleum, South Philips, Garfield-Rosebud, and Powder River-Carter areas. The primary objectives of the project were to: 1) create and distribute maps of pronghorn seasonal range and movement areas; 2) use fence mapping and pronghorn movement data to identify potential barriers to movements, inform management decisions, and prioritize locations for habitat improvement projects; and 3) develop population models to identify important vital rates affecting population growth rates. During winters 2019 - 2022, we captured and collared 702 adult female pronghorn. A total of 373 pronghorn died during the monitoring period, and the leading cause of mortality was predation. Movement patterns of individuals were diverse, with the majority of animals demonstrating non-migratory behaviors. To facilitate the identification of potential barriers to

pronghorn movements, we developed 2 tools including an ArcGIS Online project and interactive maps displaying fence permeabilities. Conservation organizations have used these tools to inform efforts to remediate movement barriers. In total, 30 projects have been completed totaling 70 miles of fence remediation, 5 projects totaling 22 miles are ongoing, and 12 projects totaling 33 miles are in development. We developed integrated population models for each of the 8 populations in this study, which will provide information towards developing more focused investigations into ecological and/or anthropogenic factors influencing pronghorn populations in Montana.

**A Framework for Using Cort as a PhysiologicalBiomarker

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Corticosterone (CORT) is an increasingly utilized biomarker in wildlife conservation yet debates over the most relevant measures often cloud its utility. This study employs structural equation modeling (SEM) to evaluate relationships between CORT physiology, energetic variables, and environmental factors within the total hormone, free hormone, and corticosteroid-binding globulin (CBG) profile hypotheses using a 14-year dataset on mountain white-crowned sparrows. The Total Hormone model showed limited power in correlating environmental and energetic variables with CORT levels. In contrast, the Free Hormone model demonstrated strong relationships between free CORT and the El Niño-Southern Oscillation (ENSO), suggesting that sparrows modulate hormone availability contextually. The CBG Profile model provided the most nuanced understanding, uncovering sex-specific strategies in hormone regulation, with males and females exhibiting different mechanisms for altering free CORT. While sex-specific patterns are complex, higher energy stores generally lower baseline and totalCORT, but also lower CBG, so free CORT levels increase with increasing energy stores. Additionally, wetter years (higher ENSO values) either lower baseline CORT or increase CBG (depending on the sex), so wetter years lower free CORT in both sexes. This research offers a framework for more accurate interpretations of physiological responses to environmental changes and demonstrates the importance of selecting appropriate CORT measures. These insights can improve wildlife health assessments and inform conservation strategies, advancingthe integration of physiological tools into conservation practice.

**Developing a Resource Selection Function Model to Predict Moose Habitat Selection on the Flathead Indian Reservation (Poster)

Kaylie Durglo*, Wildlife Department, University of Montana, Missoula
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Nicholas DeCesare, Research Wildlife Biologist, Montana Fish, Wildlife and Parks, Missoula

Moose (*Alces alces*) are central to the cultural and ecological fabric of the Confederated Salish and Kootenai Tribes (CSKT) of the Flathead Indian Reservation (FIR). Moose play a key role in maintaining ecosystem health and food sovereignty for the Tribes. However, the spatial ecology of moose across the landscape is not fully understood, presenting a challenge for effective management and conservation. We aim to develop habitat models to predict moose habitat selection and distribution within the FIR, using data from 34 female moose collared by MontanaFish, Wildlife and Parks in the nearby Cabinet-Salish Mountain Range from 2013 – 2022. Our study will identify environmental factors influencing moose

habitat selection, predict moose distribution across the study area, and assess the model's accuracy through validation with cameras. The outcomes of this research will provide the CSKT with valuable tools to inform conservation strategies that help mitigate threats to moose populations due to land-use changes, habitat fragmentation, and climate shifts. Ultimately, this study will contribute to thelong-term sustainability of moose populations and conservation of the Tribes' natural resources.

**Dispersal Movements and Habitat Selection of Sharp-Tailed Grouse Reintroduced to Western Montana

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Sharp-tailed grouse (*Tympanuchus phasianellus*) historically occupied intermountain grasslands west of the Continental Divide in Montana but were likely extirpated by the early 2000s.
Montana Fish, Wildlife and Parks began reintroducing sharp-tailed grouse to western Montana in fall 2021. We monitored the movements of 94 female sharp-tailed grouse captured in east- central Montana, fitted with GPS transmitters, and translocated to the Blackfoot and BitterrootValleys in April – May 2023 and 2024. Of the female grouse released with GPS transmitters, 38% in the Bitterroot and 55% in the Blackfoot eventually settled and established a home range. Dispersal movements differed between the 2 sites: grouse in the Bitterroot traveled an average of 130.5 km over 27 days and settled 29.4 km from the release site, while grouse in theBlackfoot traveled an average of 55.2 km over 16.9 days and settled 12.2 km from the release site. Despite increased lek sizes near some release sites in 2024, dispersal movement patterns did not differ between the 2 years of the study. Dispersing grouse selected areas with intermediate elevations, lower slopes, less tree cover, and more shrub cover. Grouse were more likely to transition from the exploratory to the encamped behavioral state when in an area with high topographic position index and greater perennial grass and forb cover. Most mortalities for translocated grouse occurred during the month following release, when grousewere dispersing, so understanding the factors motivating dispersal movements may aid in the release site selection for ongoing sharp-tailed grouse translocations in western Montana.

Range Distribution and Occupied Towns of Chimney Swifts in Montana (Poster)

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Chimney swifts (*Chaetura pelagica*) are aerial insectivores and a Species of Greatest Inventory Need in Montana. Historically, they inhabited hollow mature trees and cave walls. With European settlement beginning in the 1600s, they shifted predominantly to man-made structures, expanding their range west with the growing availability of suitable nesting habitat, such as chimneys. Prior to 2017, the Montana Natural Heritage Program database contained just 23 breeding records for chimney swifts in eastern Montana. Four of which dated back to the 1800s. In 2017, Montana Fish, Wildlife, and Parks (FWP) and the Montana Audubon Societydeveloped a survey protocol to define their breeding range and

create a baseline for occupied towns in Montana. Between 2017 and 2024, FWP, MT Audubon, and citizen scientists surveyed67 towns across central and eastern Montana. Twenty-three towns were confirmed occupied by breeding chimney swifts, with Harlowton observed as the furthest west. These data reveal a much broader distribution of chimney swifts in Montana than previously recognized. Currently, FWP is using these data to help identify potential threats and conservation actions for chimney swifts in the State Wildlife Action Plan where the species listing will change to a Species of Greatest Conservation Need, which is scheduled to be completed by October 2025.

Managing Wild Horse Herds with Limited Resources

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One of the challenges of controlling a wild horse (*Equus caballus*) herd, on public and private lands, is the lack of resources whether it be personnel, time, or budget. Wild horses can be found on lands managed by the Bureau of Land Management (BLM), Forest Service (USFS), National Park Service (NPS) and State-owned public lands or a mixture of those listed. Wild horses can also be found on private land owned or managed by a non-profit organization. A form of fertility management is PZP (porcine zona pellucida) immunocontraception which when injected into mares causes antibodies which interfere with fertilization and prevents pregnancy. The vaccine can be delivered remotely by a dart once it is mixed with an adjuvant. This process is done by trained government personnel or trained volunteers. We present here successful partnerships between volunteers from non-governmental organizations (NGOs) working collaboratively with federal and state governmental agencies. NGOs are often non-profit groupsalready advocating for a herd in the area and a few examples are Little Book Cliffs Wild Horse Range, Colorado; McCullough Peaks Wild Horse Range, Wyoming; Pryor Mountain Wild Horse Range, Montana; Sand Wash Basin, Colorado; Spring Creek Basin, Colorado; Onaqui Mountain, Utah; and Salt River Herd, Arizona. These collaborations are successful because local groups have a strong interest in wild horses, the wildlife, and/or the health of the rangeland.

Evaluating Nest Success and Migratory Behavior of Intermountain Grassland Species

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Grassland bird populations in North America, particularly those dependent on intermountain grasslands in the Rocky Mountain region, are rapidly declining due to habitat loss, climate shifts, and invasive species. Nest success and migratory behavior are vital indicators of habitatquality and species health, yet little research has focused on these factors in intermountain grasslands. This study aims to evaluate the nest success and migratory patterns of three grassland bird species—Western Meadowlark (*Sturnella neglecta*), Vesper Sparrow (*Pooecetes gramineus*), and Grasshopper Sparrow (*Ammodramus savannarum)*—in western Montana's Bitterroot Valley. We monitored 386 nests across three breeding seasons, estimating daily survival rates and overall nest success using logistic exposure models. Preliminary results indicated that daily survival rates overall decreased throughout the season, with Western Meadowlarks exhibiting the highest nest success and lowest variability. Migratory behavior wastracked using Motus-compatible tags, with 50 Western Meadowlarks, 41 Grasshopper Sparrows, and 30 Vesper Sparrows tagged. Western Meadowlarks were detected during migration and wintering across four states, utilizing the Pacific Flyway and wintering in central California, diverging from the

typical Central Flyway. Grasshopper and Vesper sparrows were not detected outside the study area. These findings underscore the influence of nesting timing on success and highlight the need for further research on migratory routes and habitat use across the full life cycle of these species. Understanding these patterns is critical for developing targeted conservation strategies to preserve intermountain grassland ecosystems and the birds that rely on them.

**Ecological Consequences of Selective Logging: - Insights from the Chiquibul Forest Reserve (Poster)

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Selective logging is a forestry practice designed to extract timber while maintaining biodiversity and ecosystem function. However, there is still much to learn about its impacts on surrounding ecosystem structure and composition, particularly in tropical regions. In this study, we investigated how changes to vegetation structure at logged and unlogged sites impact wildlife abundance in the Chiquibul Forest Reserve (CFR) in southwestern Belize. Using data collected from remote camera traps deployed at 9 unlogged sites and 13 logged sites (i.e., one-year post-harvest), we employed random effects Poisson modeling to analyze the relationship between logging status and wildlife abundance. We found there was a significant difference in wildlife abundance between logged and unlogged areas, with a mean abundance of 53.9 individuals in logged regions compared to 28.1 individuals in unlogged areas ($p < 0.00046$). Some species, such as Baird's tapir (*Tapirus bairdii*) were more abundant at logged sites, while others, including the common paraque, were less abundant. These results underscore the complex dynamics between logging practices and wildlife species composition, highlighting the ecological implications for wildlife management and conservation strategies. We recommend examining the long-term impacts of logging on vegetation structure and associated impacts on wildlife abundance and diversity to better understand the ecological implications of sustainablelogging practices on tropical wildlife.

Floral Selection and Value to Bumble Bees in Montana and the Dakotas (Poster)

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As conservation efforts to create and manage pollinator habitat escalate to address widespread pollinator declines, identifying regionally appropriate plants that adequately support imperiled pollinators is important to ensure effective conservation action. Anecdotal evidence and traditional pollinator visitation counts do not necessarily reflect floral value; thus, more objective measures of valuable floral resources are needed. We conducted bumble bee and flowering plant surveys in Montana, North Dakota, and South Dakota. We implement an objective, repeatable approach to quantify the relative value of floral resources to bumble beesacross the study area, which we call flower value scores. Flower value scores reflect a flower's relative contribution to bee nutrition by integrating bumble bee use, selection, and richness, as well as bloom duration. We evaluated overall selection and also considered ecoregion, sex, and season to support the regional needs of land managers. Selections for plant species were consistent across subset datasets, suggesting overall bumble bee preferences were consistent across this

multi-state study area. Floral use varied by bumble bee species, however, implying that diverse plantings are needed to support the forage needs of diverse pollinators. Selection did not correlate with traditional visitation counts. We identify *Chamerion angustifolium*, *Geranium viscosissimum*, and *Penstemon confertus* as important species for bumble bees in early- and mid-season, *Monarda fistulosa* in mid-season, and *Lupinus sp.* and *Campanula rotundifolia* in early-, mid-, and late-season. Nonnative *Centaurea stoebe* and *Melilotus officinalis* also had high flower value scores, suggesting pollinator support requires pairing nonnative plant removal with native plant revegetation.

Drivers of Variation in Pronghorn Population Dynamics in Montana

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Conserving pronghorn populations is a high management priority in Montana, given the important ecosystem functions they perform and recreational opportunities they provide. Pronghorn populations in the early 2000s were generally at or above objective across Montana;however, population declines in recent decades have left many populations below objective. Our goal was to identify the vital rates most associated with pronghorn population change to inform management decisions and facilitate recovery of pronghorn across the state. We developed integrated population models (IPMs) for each of 9 hunting districts to estimate pronghorn abundance and vital rates, and to identify the vital rates most associated with population change from 2004 - 2022. Variability in 4-month recruitment explained the most variation in pronghorn population growth; however, adult female survival had the largest proportional impacts. Populations usually increased when adult female survival was >0.75 and 4-month recruitment was >0.72, but these associations were largely mediated by one another. There was considerable uncertainty in the factors affecting vital rates; however, increased snowdepth was associated with reduced adult survival, and increased NPP was associated with increases in adult survival and 4-month recruitment in some hunting districts. Our results suggest pronghorn management should prioritize manipulation of adult female survival rates to achieve population objectives. IPM results were highly sensitive to assumptions regarding knowledge and confidence in aerial counts and harvest; thus, we recommend assessing the survey and inventory program to assess confidence in aerial counts and reduce uncertainties in results.

Restoring Western Montana's Sharp-Tailed Grouse - Progress Report

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Sharp-tailed grouse (***Tympanuchus Phasianellus***) have been a Montana Fish, Wildlife and Parks priority for 35 years. Through the second half of the 1900s, sharp-tailed grouse populations west of the Continental Divide were considered isolated and extremely small and became essentially extirpated by the

early 2000s. FWP's State Wildlife Action Plan and the Wildlife Mitigation Program identified "increase abundance and distribution of sharp-tailed grouse with a reintroduction program to western Montana" as a conservation action for sharp-tailed grouse. Sharp-tailed grouse translocations from eastern Montana to the Bitterroot, Blackfoot and Drummond Valleys began in the fall of 2021 with 75 males. The following spring our efforts were shortened due to avian influenza with 22 birds translocated. In 2023 and 2024, 144 and 212 birds were translocated respectively. Translocated females were fitted with GPS or VHF transmitters and monitored during the summer nesting season to assess demography and population viability of the reintroduced populations. Most female mortalities occurred in the first 3–4 weeks following release, and survival during the 120 days following translocation was 0.33 (95% CI = 0.22 – 0.50) in the Bitterroot and 0.45 (0.36 – 0.56) in the Blackfoot. Nest survival (0.40, 95% CI = 0.27 – 0.53) and brood success at 14 days post-hatch (74%) at both sites were similar to resident sharp-tailed grouse populations. In 2024, we observed 4 newly established leks at reintroduction sites attended by 64 sharp-tailed grouse. Translocations will occur through 2026 with monitoring continuing 5-years post-translocation.

**A Bit of a Brome Problem - Proposed Work Investigating Interactions Between Declining Grassland Songbird Demographics and InvasivePlants in Central Montana

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Grassland birds are the fastest-declining avian guild in North America, having declined by over 50% since 1970 (Rosenburg et al. 2019, Sauer et al. 2017). Among this guild are Chestnut- collared and Thick-billed Longspur (CCLO and TBLO hereafter), two species of grassland songbird that have experienced long-term population declines of 87% and 94% respectively since 1970 (Sauer et al. 2017). A primary driver of this decline is habitat degradation (Somershoe 2018) through mechanisms like fragmentation of existing grassland, unsustainable grazing practices, and the spread of invasive plants such as Smooth Brome and Kentucky Bluegrass. To better understand these declines and develop effective conservation strategies, research is needed to understand how current landscape attributes, such as invasive plants, areimpacting demographics of these two longspur species. We propose a study in central Montana, a relatively understudied area in the CCLO and TBLO breeding ranges, to investigate how invasive plant abundance affects longspur demographics (abundance and nesting metrics).This work will be conducted over the next two years in Wheatland and Golden Valley Counties, MT. Our goal is to determine the tolerance CCLO and TBLO have to exotic plants on their breeding grounds and identify landscape attributes that maximize longspur abundance. These findings will help prioritize conservation actions in the region aimed at supporting these imperiled species.

Standardized Broad-Scale Mapping of Sage Grouse Habitat Suitability Across Montana and the Dakotas

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Efforts to conserve imperiled sagebrush (*Artemisia spp.)* ecosystems and associated organisms often prioritize population characteristics of landscape species like the greater sage-grouse (*Centrocercus urophasianus*). Distribution, and spatial juxtaposition of environments supporting remaining sage-grouse populations are key to delineating habitats to inform management decisions. Sage-grouse exhibit seasonal movements and use habitats that are heterogeneously distributed across 11 states, so standardized sage-grouse habitat maps are needed across large extents for multiple phenological stages. Our primary goal was to map seasonal habitats of sage-grouse relevant to management across Montana and the Dakotas using methods complementary to past and current efforts. We compiled a dataset from 16 sage-grouse research projects collected from 2001–2021, ranging from single-season VHF studies to year-round GPS studies. We fitted patch-scale resource selection functions based on correspondencebetween heavy use areas and 8 coarse-scale landscape conditions. We generated habitat suitability maps for conventional sage-grouse seasons for comparison to models of more detailed behavior-seasons. We frame our preliminary results in context of other mapping projects including local studies that evaluate habitat relationships at finer scales and a range- wide project that includes Montana and the Dakotas.

**Confronting Challenges in Distribution Modeling for Marten in Western Montana

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Species distribution models are a popular tool for wildlife management and can be used to identify habitat, guide survey efforts, and predict range shifts under future conditions. Their popularity stems from increased access to occurrence data from public repositories and citizen science platforms. These data present challenges, however, because we often lack information about sampling design and accessible areas are oversampled, potentially leading to biased insights. Mitigating these challenges is rarely straightforward, causing researchers to rely on black-box algorithms that can lead to complex models with poor predictive ability. We incorporated several techniques to address these challenges into distribution models designed to predict habitat for marten (*Martes spp.*) in western Montana. Marten are a charismatic forest carnivore and an important furbearer species, yet knowledge gaps exist regarding their status and distribution in Montana. We used lasso regression to compare environmental covariates at occurrence records with those at available points. We explored two techniques to address sampling biases: down-weighting occurrence records in regions with high sampling intensity and selecting available locations to reflect the sampling bias in the occurrence records (hereafter, targeted background). Additionally, we used spatially explicit cross-validation to evaluate the model's predictive performance. The model with down-weighted occurrence records had higher out-of-sample predictive ability than the targeted background approach andpredicted values of relative probability of use showed a strong correlation with occurrences. With their growing use for guiding management actions, distribution models require carefulconsideration of objectives and data limitations to ensure they are effective for wildlife managers.

Summer Colony Count Efforts for Bats in Montana

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White-nose syndrome (WNS), the disease caused by the cold-adapted fungus, (*Pseudogymnoascus destructans*) (Pd), has killed millions of North American bats since its detection in New York in 2006. To assess spread and impact on Montana's bat populations, partners in Montana began collaborating on a project in 2019 involving annual, statewide surveillance for Pd and WNS to estimate the distribution of the fungus and disease, coupledwith annual acoustic monitoring and colony counts to assess bat occupancy and activity. Although winter colony counts allow us to monitor population trends in relation to WNS, theyare not feasible at a statewide scale in Montana due to logistical constraints around identifying and accessing hibernacula. Therefore, FWP expanded a pilot project in 2023 to conduct summer colony counts at maternity roosts, including bat boxes, buildings, and bridges. This effort involved agency staff, partners, and volunteers who were asked to conduct at least two colony counts during each sampling period at a given roost. Over 60 people participated at 22 maternity roosts across the state. Results from 2023 and 2024 provide baseline data on accessible maternity roosts in Montana and will be used to bolster existing models. Summer colony count data will be used in tandem with those collected via acoustic and disease monitoring to identify areas of highest conservation value for bat management efforts in the state. Future efforts include identifying maternity roosts in eastern Montana, where known batroosts are sparse, and using DNA metabarcoding to confirm species present at each roost.

**Where are all The Ducks - Predicting Harlequin Duck Occupancy in Western Montana and Northern Idaho

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The Harlequin Duck (HADU), a sea duck that breeds on whitewater streams in the mountains, is listed as imperiled in Montana due to low and potentially declining population numbers.
Biologists and land managers across the Northern Rockies (Montana, Idaho, Wyoming, and Alberta) have collaborated to identify information needs pertaining to HADU. One objective is to identify important breeding streams for HADU to better estimate population status and trends. To address this objective, we are building a predictive occupancy model across western Montana and northern Idaho using an integrated spatial distribution model which allows us to combine data from the last 15 years of structured surveys, incidental sightings, environmental DNA, and citizen science. We will consider several habitat covariates representing stream characteristics and surrounding landscape features. This model will provide a predictive map of spatial distribution which can be used as a tool to help managers identify streams to survey forHADU to most efficiently use limited resources and better estimate population trends.

On the Search for Lizards - Finding a Cryptic Critter on a Varied Landscape (Poster)

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Greater short-horned lizards (*Phryosoma hernandesi*) are a Species of Greatest Inventory Need (SGIN) in Montana. Since 2016, Montana Fish, Wildlife, and Parks (MTFWP) has conducted structured surveys and public outreach campaigns seeking to fill an information need for this species. Prior to this effort, the Montana Natural Heritage Program (MNHP) database included 1669 records for the species, however, about 80% (1341) came from a single study conducted in Carbon and Stillwater Counties from 2004 – 2013. These study sites are in unique habitats inMontana which do not represent the species range throughout the rest of the state. Understanding where lizards are found and how they utilize their habitat throughout the rest oftheir range in Montana is important for assessing threats to the species and observing population trends. MTFWP's efforts have met mixed success. Detectability has been low during structured surveys, though incidental observations reported by members of the public have proven valuable in increasing observations statewide. Here we discuss our efforts to refine structured survey methodology to increase detectability, report on successes with our public outreach campaigns, and discuss future directions for research.

**Evaluating the Effect of Sensory Misinformation on Mesocarnivore Foraging Activity (Poster)

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The variable effectiveness and ethical concerns of using predator removal to support ground-nesting birds have motivated increased interest in less-invasive alternatives for predator management. One promising avenue is the manipulation of predator foraging habits by using misleading sensory information (e.g., sense of taste, smell). To assess the potential utility of thisstyle of technique for reducing predation on game birds, we evaluated the response of mesocarnivores (e.g., badgers, coyotes, raccoons, and red foxes) to repeated exposure to galliform odors in a northern mixed-grass prairie ecosystem in north-central Montana, during May–July 2024. We quantified the response of mesopredators to 4 treatment types: 1) domestic chicken preen-oil, 2) domestic turkey preen-oil, 3) a commercial trapping lure, and 4) unscented petroleum jelly as a control odor. Odor treatments were monitored using motion- activated camera-traps at 669 sites (72–264 sites per odor type), for a total of 4,625 trap-days. We hypothesized that bird odor treatments would be more attractive to predators than commercial or control treatments, and that mesocarnivores would become habituated to the odors and show decreasing interest during the study period. We found that the mesocarnivore response to odor treatments was similar between types and did not wane during the study. Theproportion of mesocarnivore detections per trap-day (0.033) may not have been high enough to influence foraging behavior. Overall, the response to odor treatments and the lack of habituation effect suggest that this style of predator manipulation may not be effective in this ecosystem.

Pygmy Rabbit Occupancy and Habitat Relationships in Southwestern Montana Through Participation in Collaborative Research

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Pygmy rabbits are the smallest leporid in North America and are tied to sagebrush steppe ecosystems. Sagebrush comprises most of their diet throughout the year and offers concealment from predators. In Montana their range is limited to the southwestern corner of the state where they depend on relatively contiguous stretches of sagebrush, leading to their status as a species of greatest conservation need. Montana Fish, Wildlife and Parks (FWP) has joined a multi-partner project led by University of Idaho (U of I) researchers that are studying pygmy rabbit occupancy and habitat requirements across their range in Idaho and Montana. The U of I led project is incorporating genetic analysis of scat to improve certainty of species ID and a winter-based survey method to improve efficiency. Current pygmy rabbit research in Montana expands on prior work completed by FWP, Montana Natural Heritage Program, and Uof I, and it aims to develop a well distributed set of study sites to allow for surveys to be repeated in future years to detect changes in occupancy and distribution. Developing a better understanding of the current distribution and habitat use of pygmy rabbits in Montana will improve FWP's ability to manage for the species. Contributing to a project that involves multiple agencies and partners increases the potential for project results to inform management at broader scales. This research will yield information that FWP and partners will use to formulate clear objectives for managing a sagebrush specialist.

**Long-Term Impacts of Elk Browsing on Aspen Recruitment in the Greater Yellowstone Ecosystem (Poster)

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Quaking aspen (*Populus tremuloides*) stands are vital to ecosystem health and have a diversity of age and structural classes to provide wildlife habitat and natural fuel breaks. Rocky Mountainelk (*Cervus canadensis*) are the primary species that browse aspen suckers in the winter because they are palatable and available above the snow. The Northern Yellowstone Winter Range, hereafter referred to as the northern range, is the wintering ground for the largest elk herd in Yellowstone National Park (YNP) and extends outside YNP onto the Custer Gallatin National Forest (CGNF). The northern range elk population held approximately 19,000 individuals in 1994. During this time, aspen coverage on the northern range was reduced to 1% due to elk browsing and other environmental factors. As of 2024, the northern range elk herd has been reduced to approximately 6,000 individuals. St. John (1995) surveyed 341 aspen plots on the northern range outside YNP in 1990 to determine the relationship between elk browsingand aspen stand recruitment. In 2005, Kimble et al. (2011) surveyed 315 of the same aspen plots to determine if aspen recruitment had changed since 1990. St. John (1995) and Kimble et al. (2011) found that aspen stem recruitment was decreasing on a landscape scale. The objective of this study is to resurvey those 303 aspen plots to challenge earlier interpretations about aspen stand survival over time on the northern range. Using this information, we can identify aspen plots that would benefit from Forest Service management to insure aspen presence long-term in the GYE.

Exploring Trends in Human-Grizzly Bear Conflicts Amid Occupied Range Expansion (Poster)

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As grizzly bear populations expand across their historical range in Montana Fish, Wildlife & Parks Region 4, human-grizzly bear conflicts continue to be a concern. This project examines trends and correlations in grizzly bear range expansion and conflicts using Conrad bear management office data from 2018 to 2024. We analyzed our data using a principal components analysis. We found the number of reported conflicts in our study area remained near constant, increasing 0.5 percent on average, while grizzly bear range expansion was increasing yearly by 4 percent. We did not find that grizzly bear range expansion was strongly correlated with all types of conflicts. The number of complaints received related to grizzly bearsrose 4.6 percent during that same period, strongly correlated to grizzly bear range expansion.We found negative correlations among depredation conflicts, unnatural food conflicts, and average monthly precipitation (PC1 ℓij 0.257, 0.375, and 0.357, respectively). We also found thenumber of carcasses we removed to be positively correlated with the percent change of the grizzly bear estimated range expansion area, and negatively correlated with depredation and unnatural food conflicts (PC1 ℓij -0.492, -0.329, 0.257, and 0.375 respectively). Our carcass removal program coincides with a downward moving average trend in confirmed livestock depredations. Our results suggest that grizzly bear range expansion interacts with conflicts both spatially and temporally.

Canada Lynx Monitoring and the Plan for Conservation in the Western United States

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Canada lynx (*Lynx canadensis*) monitoring and conservation has been an ongoing challenge for forestry and wildlife managers throughout the western United States. There have been many independent efforts to monitor this cryptic species but in 2022, Montana Fish, Wildlife and Parks (FWP) initiated plans for a multi-state lynx monitoring program. From 1 December 2022 through 30 April 2023, FWP deployed 40 lynx monitoring stations as part of a pilot project to estimate lynx occupancy in high-quality modeled habitat versus marginal habitat in Montana. Lynx occupancy in the high-quality habitat of northwestern Montana was estimated at 0.77 (SE = 0.17) with a detection probability of 0.30 (SE = 0.077) while occupancy in marginal habitat, in the Greater Yellowstone Ecosystem (GYE) was functionally 0. This effort helped inform the U.S. Fish and Wildlife Services' redesignation of lynx critical habitat (CH) which resulted in a proposed elimination of the CH in the GYE in response to a lack of detections from the 2022– 2023 occupancy pilot in that area. These pilot results also informed the multi-state occupancy survey conducted over the winter of 2023–2024 in Montana, Idaho, and Wyoming. From 1 December 2023 through 30 April 2024, biologists collectively deployed 123 lynx monitoring stations (10 in Idaho, 90 in Montana, and 23 in Wyoming) throughout areas modeled as high- quality lynx habitat to estimate lynx occupancy across a major part of the West. Montana FWP detected lynx at 26 of the 90 stations deployed in Montana while no lynx were detected in Wyoming or Idaho. The analysis from this study is ongoing but will provide detailed guidance tothe USFWS during the implementation of their lynx recovery plan and future lynx monitoring and conservation efforts in the West.

**Assessing Bioacoustic Detection and Monitoring Methods and Habitat Use of Nesting Great Gray Owls in Southwest Montana (Poster)

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Great Gray Owls (*Strix nebulosa*), the largest owl species in North America, are one of the most understudied raptors on the continent. In 2015, the Montana State Wildlife Action Plan designated Great Gray Owls as a species of greatest inventory need, prompting Montana Fish, Wildlife & Parks (FWP) to conduct a survey effort spanning FWP Regions 1-4 from 2019 to 2022.Using a combination of callback and autonomous recording unit (ARU) surveys in the pre- nesting period, FWP evaluated occupancy throughout the species range in Montana. Though research in other parts of the species' range has demonstrated that ARUs are an effective tool for assessing occupancy, there remains a need to evaluate how ARUs can be used to locate and monitor Great Gray Owls beyond the pre-nesting period. Additionally, their habitat associations in Montana have not been empirically evaluated. This research aims to develop our understanding of Great Gray Owls in Montana and improve our ability to locate, manage, and conserve this elusive species. The objectives of this research are to assess methods to detect and monitor active nests using ARUs and to evaluate the habitat characteristics of Great GrayOwl nest sites in southwest Montana. A pilot season was conducted in 2024, and full field season is planned for 2025.

Bat Homes in the Big Sky– Habitat Characteristics of Northern Myotis in Northeastern Montana

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The northern myotis (*Myotis septentrionalis*) is one of 9 endangered species of bats in the United States but the only one to inhabit Montana. This species was initially documented in Montana in 1978, but not again until 2016. Identifying appropriate conservation efforts is hampered by the large gaps in our understanding about northern myotis in Montana. We sought to build our knowledge base by characterizing summer daytime roosts, which provide refuge for bats while they give birth, raise young, and prepare for hibernation or migration. Wemist-netted for bats from May-August in 2022 and 2023 and attached transmitters to 36 northern myotis. We located 76 roosts from 33 tagged individuals. We quantified characteristics of the roost trees and the surrounding patch and compared these with random locations. Bats roosted primarily in eastern cottonwood trees (Populus deltoides) (97% of roosts), which was the most available tree species on the landscape. Bats showed strong preferences for tall trees in patches with a relatively high basal area that also contained multiple trees similar to the roost tree. Bats also selected cottonwoods that were in early stages of decay with somewhat lower canopy cover. Most consecutive roosts were relatively close to previous roosts (range = 2-881 m) and each roost was used for 1.7 days on average. Our work supports the notion that northern myotis select areas that provide multiple possible roosts and facilitate social interactions. Improving our understanding of habitat preferences of northern myotis in Montana will inform strategies to conserve roosts and surrounding habitat.

**Long-Term Insights from Stable Isotope Analysis of Foraging Strategies of Grizzly Bears in a Dynamic Ecosystem (Poster)

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As opportunistic omnivores, grizzly bears (*Ursus arctos*) persist in a wide range of environments and alter their diet in response to differences in food availability. Diverse foraging strategies among individuals can buffer a population from environmental variation, yet what foraging strategies individuals deploy and the environmental factors that influence these strategiesremain largely unknown. Many landscape changes have occurred over the past 40 years in Yellowstone National Park, yet the annual rate at which bears gain body fat for hibernation has remained consistent. This outcome provides an opportunity to explore how individual bears change their foraging behavior in response to variation in the environment. We are using samples of grizzly bear hair collected during 1998–2022 by the Interagency Grizzly Bear Study Team and stable isotope analysis (15N, 13C) to estimate assimilated diet of bears. We are assessing how changes in resources influence the 1) degree of specialization of individual grizzly bears and 2) diet composition of bears across the decades. We will integrate these findings withmovement models to understand energetic tradeoffs bears make when responding to environmental change. Characterizing how bears alter their niche breadth and diet composition as a function of changing food resources will provide a more mechanistic understanding of how a long-lived, behaviorally plastic and individualistic species may respond to future changes in the environment.

**Grizzly Bears Change Their Behavior Near Trails in a Protected Area

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Outdoor recreation has grown in popularity, increasing the need to understand how animals respond to these activities. In Yellowstone National Park, areas identified as important to grizzly bears (*Ursus arctos*) have additional restrictions on human recreation for 2–7 months every year. These Bear Management Areas comprise about 21% of the national park and were established to protect bears and people. Using these seasonally restricted areas, we tested how low-intensity backcountry recreation (i.e., hiking) influenced the behavior of grizzly bears. We quantified how bears changed their speed and selection near trails based on restrictions to human access and time of day. We used GPS locations of 19 male and 16 female grizzly bears todevelop integrated step-selection models to test our hypotheses. Males moved faster near trails during all times and selected for trails during night and crepuscular hours. Females moved faster near trails in unrestricted areas and slower in restricted areas during night and crepuscular hours. Females avoided trails in restricted areas at night. Although individual bears differed in their responses, bears changed their speed and selection in response to low- intensity recreation, even within a protected area. Restricting recreation likely reduces human- bear conflict in areas with higher densities of bears and reduces displacement of bears from important food resources. Restricting trail use during certain times (i.e., crepuscular hours) would likely further reduce human-bear interactions.

Climate-Informed Disease Threat Assessment for Montana'sSpecies of Greatest Conservation Need

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State Wildlife Action Plans (SWAPs) identify threats and conservation actions for a state's species of greatest conservation need (SGCN). Revised every 10 years, SWAPs are instrumentalfor guiding management decisions and directing project funding. Historically, wildlife disease threats and influences from climate change have been minimally integrated in SWAPs. The 2025 revision of Montana's SWAP provides a timely opportunity to deliver actionable, locally relevant science on high-priority wildlife diseases, their relationship to climate change, and adaptation strategies. Our objective was to conduct a science synthesis assessing climate sensitivities and relative risks of diseases affecting Montana's SGCN for integration into the 2025 SWAP. We identified a list of high-priority candidate diseases (n=20) and conducted a targeted literature review and synthesis for each one. Literature synthesis focused on: (1) the relevance of each disease to Montana (2) the magnitude of potential impacts on wildlife (3) the sensitivity of each disease to climate, and (4) conservation actions for mitigating the disease. Additionally, we developed a database for project partners describing the estimated scope, severity, and timing of disease threats for Montana SGCN. Results from this effort will be integrated into Montana's revised SWAP and provides a potential framework for other states toinvestigate emerging disease threats.

Connecting Habitat and Survival of a Dynamic Species - Exploring Landscape Drivers of Pronghorn Survival Applying a Novel Metric of Habitat Quality

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Pronghorn are a widely distributed and demographically dynamic species whose habitats are increasingly threatened by extreme winter weather and habitat conversion. Understanding demographic parameters (e.g., survival) and the mechanisms driving their variation is critical forwildlife conservation and population management. In this study, we use GPS location and survival data from over 1,100 GPS-collared pronghorn across Montana and South Dakota to evaluate pronghorn survival in the context of other North American ungulates and assess habitat quality by directly linking habitat use to survival outcomes. We apply the newly developed Survival Habitat Quality (SHQ) model, an analytical framework that quantifies the cumulative impact of habitat characteristics (e.g., nutritional availability, drought conditions, and shrubland cover) on pronghorn survival. Our findings indicate that habitat quality varies across years and environmental conditions, particularly between perennial versus annual forbsand grasses. Notably, we found that annual forbs and grasses provide poor habitat quality for pronghorn in some regions. By leveraging the SHQ model and a large-scale dataset of pronghorn habitat use and survival, we developed a tool that can inform data-driven habitat management and conservation strategies.

Examining Factors Potentially Affecting Spring and Fall Black Bear Harvest Rates, Absaroka/Beartooth Mountains, Montana

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Black bear harvest rates are highly variable between years. Here we examine factors influencing variability. Winter/spring weather could be a driver of black bear (*Ursus americanus*) harvest rates, yet we found no significant relationship between spring temperatures or winter/spring snowpack and spring bear harvest rates. Spring body condition, as influenced by food availability during the previous fall, could influence harvest. However, we found no significant relationship between whitebark pine (*Pinus albicaulis*) cone crops and bear harvest rate the following spring. There was a significant relationship between estimated male bear population size and spring harvest rate for male bears but not for females. Fall black bear harvest rates were marginally related to population size. More importantly fall harvest rates were strongly related to whitebark pine cone production. During years of good cone production, defined as trees averaging 20+ cones per tree, the rate of fall harvest averaged 0.36 bears harvested/day. During years when transect trees average less than 20 cones/tree the average fall bear harvest rate quadrupled to 1.42 bears/day. Further, in good cone production years the percent of females in the fall harvest averaged 35%, while in poor cone production years the average percent females in the fall harvest increased to 46%. It appears that in good cone production years many bears are utilizing highly secure high elevation whitebark stands where there is littleeffective hunting pressure. Alternatively, in poor whitebark cone production years bears remain at lower elevations where they are more vulnerable to harvest with potential for overharvest.

Winter Temperature – Not Grazing, Drought, or Breeding Season Weather - Impacts Dynamics of a Northern Great Plains Greater Sage Grouse Population

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High annual climatic variability and livestock grazing are ubiquitous across Greater sage-grouse range and may help shape population dynamics of this imperiled rangeland species. We investigated the role of annual variability in climate, vegetation productivity, grazing intensity, and conservation grazing program enrollment on the dynamics of a greater sage-grouse population occurring over a relatively intact a 1,500-km2 rangeland landscape in central Montana (2002-2022). We modeled annual population growth in a Gompertz density- dependent and found that annual dynamics were positively associated with winter temperatures, which explained 18% of the variation in annual dynamics. We did not detect evidence that annual dynamics were related to variation in the previous year's breeding seasonweather, drought indices, or remotely-sensed rangeland productivity metrics as has been documented in other parts of sage-grouse range (e.g., Great Basin). We found no compelling evidence that variation in grazing intensity or conservation grazing program enrollment impacted populations. Our results suggest that within relatively intact rangeland systems of thenorthern great plains, drought-sensitivity and grazing management may not be limiting factorsand the potential to mitigate winter severity impacts by protecting or improving winter habitatquality should be further evaluated.

Montana Swift Fox Occupancy Survey

Emily Mitchell, Montana Fish, Wildlife & Parks, Miles City

Swift fox (*Vulpes velox*) distribution and population viability is currently not well understood inmuch of central and eastern Montana. Montana Fish, Wildlife, and Parks is conducting a range wide camera survey to determine the distribution and connectivity of swift fox populations across Montana. This is a roving survey across four administrative regions in central and easternMontana. Camera surveys are conducted on a rotational basis with surveys conducted in Region 7 in 2023/24, Region 6 in 2024/25, and Regions 4 and 5 in 2025/26. From October 2023 through March 2024, staff surveyed portions of moderate and high-quality swift fox habitat in Region 7, southeastern Montana using a systematic camera survey. Data from two previous pilot studies was used to determine the best protocol: including lure type, number of cameras, and number of deployment days. Each survey grid had 4 cameras baited with a sent lure, one in each quadrant of the survey grid and were deployed for 14 days. A total of 656 cameras, equaling 164 survey grids, were set. Surveying a, roughly, proportionate amount of high-quality (44%) and moderate-quality (56%) habitat sample grids. This survey effort produced a total of 1,219,157 photos. These photos are currently being cataloged. So far there have been 18 cameras, equaling 13 survey grids, that have confirmed swift fox presence. By the time of thisconference there should be more data to discuss!

Applying the Resist-Accept-Direct Framework to Wildlife Health Management

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Wildlife diseases can have substantial impacts on wildlife health as well as human and domesticanimal health and well-being. As a result, many agencies share a goal of reducing wildlife disease spread and impacts. In practice, however, reducing wildlife disease burden is complicated by a scarcity of effective interventions, competition for funds, and conflicting priorities. Agencies are unlikely to successfully avoid the impacts of wildlife disease in all contexts and instead need to evaluate where resisting disease is most feasible and beneficial. The resist-accept-direct (RAD) framework is a tool that assists natural resource managers in exploring and communicating about management interventions, including in situations where resisting ecological changes may not be possible. The RAD framework has gained traction in climate adaptation planning but has not yet been applied to wildlife health management issues.Here, we illustrate how the RAD framework could be adapted to wildlife disease contexts to address several outstanding challenges in wildlife health management.

**Applying Dead-Reckoning Techniques to Monitor Movements and Map the Burrow Systems of a Fossorial Species, the Black-TailedPrairie Dog

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The black-tailed prairie dog (*Cynomys ludovicianus*) is a keystone species that promotes grassland biodiversity throughits foraging and burrowing behaviors. However, prairie dogs face significant threats from the sylvatic plague (*Yersinia pestis*). Plague can disrupt prairie dog behavior, movement patterns, and burrow system dynamics, ultimately compromising colony health and resilience. Understanding the movements and burrow systems of semi-fossorial animals, such as BTPD, poses significant challenges due to the difficulty of direct observation and the limitations of most tracking systems, which cannot collect location underground. This study explores the potential of combining 'Daily-Diary' tags with dead-reckoning techniques to map underground movement. The tags are equipped with accelerometers and magnetometers and collect data in3 axes at a rate of 40 times per second. We deployed 12 tags on prairie dogs in northeast Montana to test the efficacy of dead-reckoning for tracking underground activity. To validate dead-reckoning trajectory estimation, we conducted controlled trials in artificial burrows constructed from plastic tubing with known dimensions and layouts. This allowed us to test theaccuracy of movement reconstructions against a known reference. The 2D dead-reckoning process captured all turns in our plastic tunnel system with a mean error of 15.38 cm across tunnel lengths of up to 4 m. These findings offer a promising avenue for studying fossorial species where traditional tracking methods are not feasible. Building on this work, we are now applying tags to prairie dog colonies under different plague management schemes to evaluate how these practices influence prairie dog movement and burrow system complexity.

Validationexplorer - A Tool for Simulation-Based Investigations of Study Design Elements to Estimate Relative Activity Rates and Occurrence Probabilities for Bat Assemblages

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Bats in North America face emerging threats due to the spread of the bat disease white-nose-syndrome (WNS), the expanding footprint of the wind energy industry, and the effects of globalchange on suitable bat habitats. One goal of the North American Bat Monitoring Program (NABat) is to monitor status and trend indicators for bat species assemblages at varying spatial extents. Autonomous recording units can efficiently gather data from bats but also necessitate the use of auto-classifiers to assign species labels to large numbers of observations, which introduces misclassification error. Statistical models that account for misclassification error require additional information to estimate misclassification rates. For bat acoustic data, providing this information through human verification of a subset of observed machine- generated species labels can result in credible intervals for relative activity and occurrence that are more precise than those resulting from using auxiliary data or informative priors. We definea validation design as a mechanism for probabilistic selection of recordings from the populationof observed recordings (i.e., the design type), together with the level of validation effort (e.g., validation sample size, percentage of recordings). We present a statistical framework and associated software tool,

Validationexplorer, that — given a predetermined set of measurable objectives — affords comparisons of validation designs (and other study design elements) to provide insight into balancing validation costs with programmatic goals.

**Disease, Climate, and Abundance Impacts on Bighorn Sheep Lamb - Ewe Ratios in New Mexico

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Understanding the impacts of *Mycoplasma ovipneumoniae* on bighorn sheep populations is paramount to ensuring population persistence. In New Mexico, most bighorn sheep (*Ovis canadensis*) populations were thought to be free of this pathogen prior to 2017; however, infections in multiple herds since that time have raised concerns surrounding impacts to population size and lamb survival. We evaluated the impacts of *M. ovipneumoniae* infection, abundance, climate, and predation on bighorn sheep lamb:ewe ratios across New Mexican populations. We characterized these relationships using lamb:ewe ratios from aerial and ground surveys from 2000 to 2022 and *M. ovipneumoniae* testing data from 2007 to 2022 (n = 466 individuals) for both Rocky Mountain (*O.c. canadensis*) and desert bighorn sheep (*O.c. mexicana*). From 2007 to 2022, we sampled n = 466 bighorn sheep across 19 populations in New Mexico for *M. ovipneumoniae* exposure. While timing of initial herd infections varied across populations, one population sustained active infections for over 15 years. We found reduced juvenile:female ratios post *M. ovipneumoniae* exposure for both desert and Rocky Mountain bighorn sheep populations. Evaluation of the effects of population size and environmental conditions on lamb:ewe ratios indicated varying impacts for each subspecies. Notably, population size was negatively related to lamb:ewe ratios for Rocky Mountain bighornonly after populations were exposed to *M. ovipneumoniae*. Additionally, climatic conditions in the previous lambing season and pre-parturition timeframe were associated with lamb:ewe ratios for Rocky Mountain populations while lamb:ewe ratios of desert bighorn appeared to only be affected by pre-parturition climatic conditions.

A Decade of Habitat Change on the Spotted Dog WildlifeManagement Area

Jarrett Payne, Wildlife Division, Montana Fish, Wildlife & Parks, Dillon

The Spotted Dog Wildlife Management Area (WMA) is a 38,000-acre property northeast of Deer Lodge, MT. Lentic, lotic, and upland habitat conditions were evaluated across the WMA in 2011 and 2014 using the Ecological Health Assessment (EHA) methodologies developed by EcologicalSolutions Group. The 2011 and 2014 EHAs determined that many habitats were degraded from current and historical grazing practices, recent timber harvest, and noxious weeds. In 2014, grazing was removed from the WMA to allow recovery from habitat degradation. In 2018, Montana Fish, Wildlife and Parks started an exchange-of-use grazing system on a small portion of the WMA to evaluate the use of targeted grazing to enhance rough fescue grasslands for wildlife. Following five years of this grazing system and ten years from the last EHA, a subset of the 2011/2014 EHAs were assessed in 2023 to determine habitat trend and conditions. The results from the 2023 assessment determined that ecological health had significantly improved across all sampled habitats. Most notable was a 26% improvement in overall ecological health scores of riparian habitats. Wetland, forest, shrubland, and grassland habitat health scores improved by 6%, 23%, 12%, and 18%, respectively. Grazed and ungrazed rough fescue grasslands involved with the exchange-of-use grazing program on the WMA also significantly improved in ecological health. However,

no difference in overall ecological health scores were detected between grazed and ungrazed grasslands. This talk will present further details of thesehabitat improvements related to vegetation and soil stability, and management implications.

**Dam It All! Using Remote Sensing Data to TrackPersistence of Beaver Dams in Prairie Streams

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Blake Hossack, USGS Northern Rocky Mountain Science Center, Missoula, MT
Lisa Eby, Wildlife Biology, University of Montana, Missoula

Numerous studies highlight the critical role of beaver dams in providing important habitat for many species and mitigating the impacts of drought and floods. As climate change intensifies the frequency and severity of hydrological disturbances, beaver-based restoration efforts, such as translocations of beaver and construction of beaver dam analogs (BDAs), have become increasingly common. However, the longevity and effectiveness of restoration projects likely depend on their placement within a tributary, making identifying environmental factors that influence dam persistence essential for prioritizing restoration efforts and maximizing their benefits. To address this need, we used NAIP satellite imagery to identify, geolocate, and track beaver dams across 10 watersheds (~11,214 km^2) in northeastern Montana, with observations taken every two years from 2017 to 2023. We identified 2,432 unique beaver dams (1,064 in 2017, 443 in 2019, 675 in 2021, and 250 in 2023), with only 146 (~6%) persisting from 2017 to 2023. Hazard rates, or the risk of failure for a dam during a specified period, were 62% in 2017–2019, 39% in 2019–2021, and 73% in 2021–2023. Future analysis will focus on the relative influence of flow-altering factors, including slope, catchment area, peak flow events, and upstream dam density, as well as availability of nearby woody vegetation on dam persistence. These findings will help refine expectations for long-term restoration success by improving predictions of dam persistence in these dynamic landscapes.

Assessing Sharp-Tailed Grouse Occupancy and AbundanceAcross Eastern Montana

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Sharp-tailed grouse (*Tympanuchus phasianellus*) are widely distributed across eastern Montana and are the most harvested native upland game bird in the state. The species was extirpated in Montana west of the continental divide in the early 2000s. While annual harvest suggests stablepopulations in eastern Montana, more information is needed to improve long-term management of the species in the state. The status of sharp-tailed grouse populations is generally based on annual lek surveys, but lek survey effort in Montana is non-random and spatial coverage is limited. Our objective was to develop and evaluate a survey method to estimate regional sharp-tailed grouse abundance and distribution, and investigate habitat-abundance relationships across their range in eastern Montana. In 2024 we conducted a pilot season survey using a distance sampling protocol for sharp-tailed grouse. Surveyors walked a U-shaped transect within a stratified-random selection of 2.56 km2 (1 mi2) Public Land Survey System sections and recorded all detections of lekking sharp-tailed grouse, the location of detected leks, and the number of grouse with visual and flush counts. Results of 47 completed surveys include detection of 26 sharp-tailed grouse leks with successful distance calculations and counts for 19 leks. Sample size for distance sampling is small but the probability of detecting a lek within 600 meters was high, suggesting the method is suitable for use

in occurrence models at the section scale with a single survey visit. Preliminary analysis remains underway and additional findings will be presented along with plans for a future full-scale survey effort.

Managing Chronic Wasting Disease in Deer Using a Split Hunting Season Structure

Ryan Rauscher, Montana Fish, Wildlife and Parks, Conrad

Chronic Wasting Disease (CWD) is a slow-moving, always fatal prion disease of cervids. Management of CWD focuses on several strategies including removal of those animals with a greater probability of infection. Among deer in Montana, bucks of both species have higher prevalence. CWD was first documented in north-central Montana in mule deer (*Odocoileus hemionus*) in 2017 and in white-tailed deer (*Odocoileus virginianus*) in 2018. In 2020, a split deer season, three weeks of a general deer season followed by two weeks of limited antlered buck permits, was implemented in four hunting districts in an effort to maintain low prevalence rates and reduce the potential for spread of the disease. Permit quotas were adjusted with the intent that permit harvest comprised 10 percent of the total buck harvest. For the five seasons since implementation, permit success averaged 53% and 47% for buck mule deer and buck white-tailed deer respectively. For the same period, permit harvest averaged 12% of the total buck mule deer harvest and 8% of the buck white-tailed deer harvest. Observed three-year CWD prevalence ranges from 0.06 to 0.03 for mule deer and 0.08 to 0.00 for white-tailed deer. Permit quotas have been increased where prevalence is above 0.05 for the 2025 season. Of those permit holders with an opinion, 76% approve or strongly approve of the season structure.

**Avian Radar Track Identification Using Machine Learning Models (Poster)

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Avian radar systems are increasingly used to understand bird movement and migration and prevent bird mortality from aircraft, wind turbines, and other anthropogenic sources. One limitation of avian radar systems is they do not automatically identify bird attributes, such as bird species or flock size, which would be useful for understanding spatial and temporal patterns of bird activity. Instead, radar collects information about tracked targets (i.e. shape, size, speed), which may allow identification of targets to different levels of classification basedon bird morphology or flock size. Using machine learning, we classified tracks recorded by MERLIN DeTect radar systems at Ellsworth Air Force Base to different levels of bird type and quantity. Through field observations, we created a dataset of 4,225 ground truthed tracks by identifying radar tracks to bird species and quantity, then assessed the accuracy of track classification from tracked target covariates. Initial results indicate we can classify radar tracks well of some bird groups (e.g., songbirds and columbids), and model structure is important to the accuracy of our predictions.

**Drones Outperform Dogs for Hazing Bears - A Comparison of Aversive Conditioning Tools

Wesley Sarmento, University of Montana, Valier

Human-wildlife conflicts can result in harm to people and their livelihoods, and frequently ends in reduced tolerance for species and/or removal of animals. Resolving and preventing conflict is essential for conserving carnivore populations. Here I conducted a six-year study of the efficacy of non-lethal hazing tools to deter grizzly bears (*Ursus arctos*) away from people on the prairies of North-Central Montana. I tested a new technology, drones, and traditional methods of hazing bears including dogs, projectiles, and vehicular pursuit. These various hazing techniques were successful at stopping undesirable bear behaviors and caused a significant increase in avoidance behavior and distance to human infrastructure. Results from these 163 hazing eventssuggest aversive conditioning may have occurred over longer time scales as older bears required less hazing and hazing events decreased over each calendar year. Drones outperformed other hazing techniques where the odds of a pursuit of a bear being possible increased 127% relative to vehicular chasing due to accessibility issues. Relative to vehicular pursuit, dogs required high maintenance and had an 86% reduction in the odds a hazing event would be successful relative to vehicular pursuit. Grizzlies fled to locations that were farther from roads and human development. Hazing tools were effective for immediately resolving complaints and preventing further conflicts.

Evolving Models for Evolving Conditions - Updating Montana's Wolf Group Size Model for iPOM (Integrated Patch Occupancy Model)

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Montana Fish, Wildlife and Parks uses iPOM (Integrated Patch Occupancy Model) to estimate wolf abundance in the state.This method involves several submodels, including a group size model that was developed in 2019 based on data from 2005–2018. However, substantial changes have occurred since 2018, including liberalized harvest regulations, additional covariate data, and five years of new pack size observations from monitoring efforts. These changes provided the opportunity to revisit the model, therefore we developed and tested a revised group size model. The new model integrates data on harvest regulations, mortalities, pup presence, and environmental features to better account for temporal and spatial variabilityin group sizes. The model provides good accuracy in predicted versus observed group sizes, regardless of count quality classifications from field observations, and appears to help correct for undercounts that are probable in poor quality observations. This updated approach provides a more robust understanding of wolf group size dynamics and their environmental andanthropogenic drivers, offering insights for adaptive management of wolf populations under evolving ecological and regulatory conditions.

EVALUATING THE PERFORMANCE OF OCCUPANCY MODELS FOR WOLFMANAGEMENT IN MONTANA THROUGH SIMULATION

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Occupancy models are a popular tool for understanding species distributions, providing insight into species ecology, and are often used to inform management decisions. In Montana, decisions about wolf harvest are based, in part, on the results from a false positive occupancy model that uses observation data from hunter surveys and FWP wolf specialists. We completeda simulation study to better understand performance of the occupancy model currently being used. Simulations tested model behavior under various scenarios, including: (1) performance across a distribution of parameter values, (2) performance when latent occupancy model parameters are based on previous occupancy estimates with variable detection probabilities, and (3) performance when the 'true' observation generating process differs from that which is being modeled. Resulting parameter estimates were examined using relative bias and root mean squared error across simulation scenarios. The outcome of this work provides rigorous information about the strengths and weaknesses of occupancy analysis for wolves in Montana, using currently available data. Broadly, we aim to show the benefits of using simulation to understand the ability of modeling tools and available data to provide unbiased and accurateparameter estimates that inform decisions.

Management Strategy Evaluation for Informing Decisions about Wolf Management and Conservation

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Decisions about wildlife conservation and management are often challenged by limited information about how potential actions will likely impact management goals. Adaptive management can reduce this uncertainty and lead to better outcomes by iteratively applying management, monitoring outcomes, updating models, and making management decisions based on the updated information. Management strategy evaluation (MSE) is a simulation approach for evaluating the efficacy of various management actions under different states of the world within an adaptive framework. This flexible approach can incorporate common features for wildlife management decisions that are challenging and complex (e.g., competing interests among stakeholder groups and various forms of uncertainty). Although fisheries management frequently uses MSE to inform adaptive management, there are few terrestrial

wildlife applications. We discuss the mechanics behind MSE and how it can be adapted to inform wildlife conservation decisions using a case study of the controversial and complex decision problem of wolf harvest and management in Montana. Our application shows how incorporating social and ecological aspects into a MSE framework, along with all relevant formsof uncertainty, can offer useful predictions about how management goals are likely to be influenced by various management actions over long time scales.

Effects of Metal Contamination on Bird Communities inWestern Montana

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A century of mining by milling and smelting in western Montana's Upper Clark Fork River Basin shaped the region economically, socially and politically, but also disturbed and contaminated riparian and uplands areas. Remedy for contamination of EPA designated superfund areas has been pursued to meet human health standards for clean air and water. We analyzed a decade of bird banding data collected from riparian sites both within and outside of the affected areasin effort to understand how these efforts have met needs of the songbird community and where they have fallen short. We found that songbird communities from a riparian area in the Mt. Haggin WMA exhibited poorer body condition and lower reproductive success, while songbird communities along the Upper Clark Fork were similar to reference sites, except during immediate post-restoration years. Differences observed plausibly result from either ingestion ofmetal(oid)s or impacts on invertebrate prey. However, as vegetation gradually matures in the areas impacted by remediation and restoration actions, there is evidence of songbird community changes reflective of the change in habitat, emphasizing the importance of work that continues to enhance riparian habitat.

**Using Adaptive Management to Understand Elk Population Dynamics and Distributions in Northwest Montana

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State agencies and wildlife commissions manage wildlife populations using the best available information; however, efficacy of management prescriptions to meet goals can be hampered by uncertainty regarding drivers of population dynamics. In hunting district 121, declines in bull harvest since 2012 and uncertainties about population vital rates and distributions have led to concerns regarding the status of this elk population and potential effects of predators. To address these concerns, Fish, Wildlife & Parks developed the Integrated Elk, Carnivore, and Habitat Adaptive Management Project. To date, we have collared 101 adult elk and 111 calves (i.e., neonates and 6-month-olds). Based on elk survival estimates through 2024, adult female survival was 0.891 (95% CI = 0.832 – 0.954) and adult male

survival was 0.571 (95% CI = 0.301 – 0.1) with leading causes of all adult mortality including harvest (n = 5/15) and mountain lions (n = 3/15). Calf survival was 0.537 (95% CI = 0.377 – 0.764) with leading causes of mortality including mountain lions (n = 10/27) and black bears (n = 6/27). Additionally, during the 2023 rifle season, collared adults (n = 68) had a lower proportion of locations on public lands, compared to other seasons, however, 67% of females and 100% of males spent the majority oftime on public lands. While initial results provide information about vital rates and distributions, data collection is ongoing with captures scheduled through 2025. Ultimately, our goal is to better understand factors driving elk population dynamics and develop tools to facilitate elk and carnivore management.

Montana Bumble Bee Atlas - A Collaborative Effort to Conserve Bumble Bees Through Community Scientist Observations (Oral & Poster Presentation)

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The Montana Bumble Bee Atlas mobilizes hundreds of community scientists to help track and conserve the state's bumble bees. In its inaugural field season in 2024, participants submitted 2,412 observations, documenting 21 species across diverse landscapes. This effort is part of a broader initiative, with Bumble Bee Atlases currently active in 20 states. Each regional or statewide Atlas generates data on bumble bee distribution, phenology, and habitat associations. Participants are trained through workshops that provide foundational knowledge on bumble bee ecology, conservation strategies, and standardized sampling protocols. By engaging volunteers and addressing data gaps, the Atlas can supplement data in areas where recent survey effort is lacking. The standardized methodology ensures consistent data collection on habitat characteristics, land management, and non-detection, providing information for status assessments and conservation decision-making. The data can also informbest management practices, guide conservation practitioners and policy makers, and foster public awareness of pollinator conservation. This presentation will highlight the project's inception, design, and outcomes to date, while providing information on the upcoming field season.

**Drivers and Impacts of Mining Contaminants in Insectivorous Songbirds at the Mt Haggin Injured Area, Anaconda, MT

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Mining for precious metals contributes to habitat degradation and is a major driver of avian population declines. Mining yields a mosaic of waste products (unwanted heavy metals, metalloids, and minerals) that often remain unchecked in the environment. Exposure to these contaminants can severely impact organismal health and cascade through food webs, highlighting the complexity of contaminant transfer in polluted ecosystems. As avian populations across North America continue to decline, understanding how metal pollutants move through avian food webs and influence species persistence is critical. Western Montana ishome to the nation's largest Environmental Protection Agency Superfund complex, a legacy of Anaconda's extensive copper production. In 2012, Montana Fish, Wildlife, and Parks partnered with the University of Montana Bird Ecology Lab (UMBEL) to monitor songbird population trends at Anaconda's Mt Haggin Injured Area (MHIA). Data from >1,300 individuals across 50 species indicate that survival, diversity, and productivity have declined over the past decade.
Understanding the role of mining contamination is essential to explain these patterns in MHIAbird populations. This project addresses two questions: (1) How do soil metal concentrations and diet

composition near the Anaconda smelter influence blood metal concentrations in songbird nestlings? (2) Does blood metal concentration predict breeding success? This presentation will share preliminary data from soil metal samples across four study sites, summarize songbird nesting and blood metal data collected during the 2024 field season, and provide an outlook for the 2025 field season.

**Spatio-Temporal Response of Grizzly Bear Habitat Selection to Harvested Forests and Fire Disturbance in the Northern Continental Divide Ecosystem

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Forest disturbance can reinstate early successional vegetation, often providing abundant grizzly bear foods. However, uncertainty remains in factors influencing how grizzly bears respond to forest disturbance. We used GPS collar data from 91 individual grizzly bears between 2000 and 2022 to evaluate how disturbance from timber harvest and fire influenced habitat selection by grizzly bears in the Northern Continental Divide Ecosystem of northwest Montana. We hypothesized that grizzly bears select disturbance because it can provide important foods, but that selection would be influenced by season, anthropogenic factors, and the type, severity, age, and availability of disturbance sites because of their impacts on forage availability, vegetation regeneration, and human-caused mortality risk. We used resource selection analyses to examine whether spatio-temporal disturbance characteristics explained seasonal patterns of grizzly bear selection of disturbance. Grizzly bears generally selected unburned residual patches within burns and areas burned by low severity fire. When only sites with forest harvest were available, grizzly bears selected regenerative harvests in summer. Grizzly bears with both burns and harvest available generally avoided moderate harvest sites. Fine-scale siteswithin harvests and burns that experienced silvicultural treatments prior to and after the dominant disturbance source were generally avoided. Our findings have important management implications related to configuration of disturbance patches. Our results also support the prevailing hypothesis that grizzly bears show stronger selection for natural disturbance sources and that selection of harvested forests is influenced by availability of recent natural disturbance.

**Effects of Timber Harvest on Elk Summer Nutrition

Trevor Weeks*, Wildlife Biology Program, University of Montana, MissoulaKelly Proffitt, Montana Fish, Wildlife & Parks, Bozeman
Chad Bishop, Wildlife Biology Program, University of Montana, Missoula

As disturbance regimes change, it is vital that wildlife managers understand how different disturbances affect habitats and the wildlife that live in them. We conducted research in northwestern Montana to understand the role of timber harvest in altering the summer nutritional landscape available to elk (Cervus canadensis). We performed sampling during May-August of 2023 and 2024, which involved three main efforts. First, we performed vegetation surveys at random plots stratified across a heterogenous landscape of landcover type and, for forested landcover, timber harvest strategy and time-since-harvest. We estimated ground cover and phenological stage proportions of all understory plants at intervals along a 40m transect and clipped and dried herbaceous biomass to estimate forage biomass (kg/ha) at eachplot. Second, we collected elk fecal pellets and used DNA metabarcoding to develop a comprehensive summer forage species list. Lastly, we collected samples of each forage species in each

phenological stage and used sequential fiber analysis to estimate digestible energy (kcal/g). Using these data, we created nutritional landscape models predicting forage biomass and digestible energy. We found that harvested sites had higher digestible energy than unharvested sites, and under certain conditions provided some of the highest levels of forage biomass on the landscape. We found that combinations of landcover type and time-since- harvest informed predictions of both forage biomass and digestible energy. Harvest strategy informed predictions of forage biomass, but not digestible energy. Our research provides new insights into elk nutrition in an understudied region of Montana with implications for habitat manipulation and management.

Evaluating Contact Risk Factors Between Wild and Domestic Sheep in Montana

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Respiratory disease, specifically pneumonia caused by *Mycoplasma ovipneumoniae* (M. ovi), remains a limitation to bighorn sheep conservation success in Montana. M. ovi can be transmitted among all members of the Caprinae family, including domestic sheep and goats. This study aims to identify individual, herd-level, and environmental factors that contribute to a higher risk of contact, allowing managers to better predict when and where wild sheep are likely to interact with domestic sheep and goats and to focus effective separation efforts. To date, 125 domestic sheep and/or goat producers have been identified near 6 bighorn sheep study herds where 142 bighorn ewes and 56 rams are GPS-collared. In addition, GPS collars are deployed on 291 domestic sheep and 30 livestock guardian dogs across 5 operations near 3 bighorn study herds. During 2024, 132 close proximity events (<200 meters) were identified through GPS data and involved 18 individual bighorn sheep and 6 producers across 3 study herds. The close proximity rate was 0.06 events/sheep/month across all collared individuals andvaried from 0–2.9 events/sheep/month. Proximity events occurred throughout the year, ranging from <2 hours–7 days, with a minimum distance to domestic sheep averaging 92 meters. Data collection will continue for 2 more years. The products of this study and future work will be developed collaboratively among producers, woolgrowers, sportspeople, and wild sheep managers with a goal of optimizing separation tools that work for both production agriculture and wildlife conservation.

**Analyzing Grizzly Bear Movement Patterns – Insights for Identifying Females with Newborn Cubs using Telemetry Data (Poster and Oral Presentation)

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Grizzly bears (*Ursus arctos horribilis*) generally den in rugged, remote terrain during winter months. Females give birth to cubs in the den in mid to late winter and emerge in spring with highly vulnerable cubs. Detection of cub presence to date has generally relied on aerial surveys,which are costly and challenging, particularly in denning terrain. An understanding of the presence and survival of grizzly bear cubs after den emergence is thus generally limited. This information gap impedes an accurate

assessment of reproductive rates, an understanding of which is particularly important in the Cabinet-Yaak and Selkirk Recovery Ecosystems, where small populations can be particularly impacted by cub recruitment. Using post-den location data from 39 GPS-collared female grizzly bears in these populations, we aim to compare movement patterns using cumulative net displacement in an effort to differentiate females with newborn cubs, older young (1–2 years of age), and no offspring. We hypothesize that females with cubs will exhibit lower cumulative net displacement (a metric to quantify the totaldistance moved over a period of time) and reduced movements compared to females witholder young or no offspring, because more females who localize their space use can conserve energy and improve survival of their cubs. This ongoing research will improve an understandingof grizzly bear ecology in the Cabinet-Yaak and Selkirk Recovery Ecosystems.

**Intra-Seasonal Shifts in Summer Elk Diet Composition

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Dr. Chad Bishop, Wildlife Biology Program, University of Montana, Missoula

Elk (*Cervus canadensis*) require adequate forage to fulfill their seasonal nutritional requirements. Elk undergo their highest nutritional demands during summer to support criticallife functions such as late gestation, lactation, and juvenile growth. During this period, variations in plant phenology significantly influence the quality and quantity of forage on the landscape. Recent literature has concentrated on late summer due to it's limiting nature. Yet, growing evidence suggests that both early and late summer forage often fail to meet the nutritional demands of lactating and reproducing female elk. Further, there is limited knowledge surrounding the intra-seasonal dynamics of elk diet composition during summer. To address this, we utilized data from two elk populations in Montana, (i.e. Noxon and Blackfoot) and to examine the changes in elk diet composition between early and late summer. We determined diet composition using DNA metabarcoding of fecal samples, then used Principle Component Analyses (PCA) to examine the changes in elk diet over time. Our initial results indicate that late summer diets were more restricted than early summer diets in both study areas. In Noxon, elk primarily consumed shrubs, with forage species changing as summer progressed. Conversely, elk in the Blackfoot had diets comprised of forbs and showed little variation between early and late summer. Our findings enhance the understanding of elk forageuse through summer and can help inform habitat management approaches for elk in summer habitat.