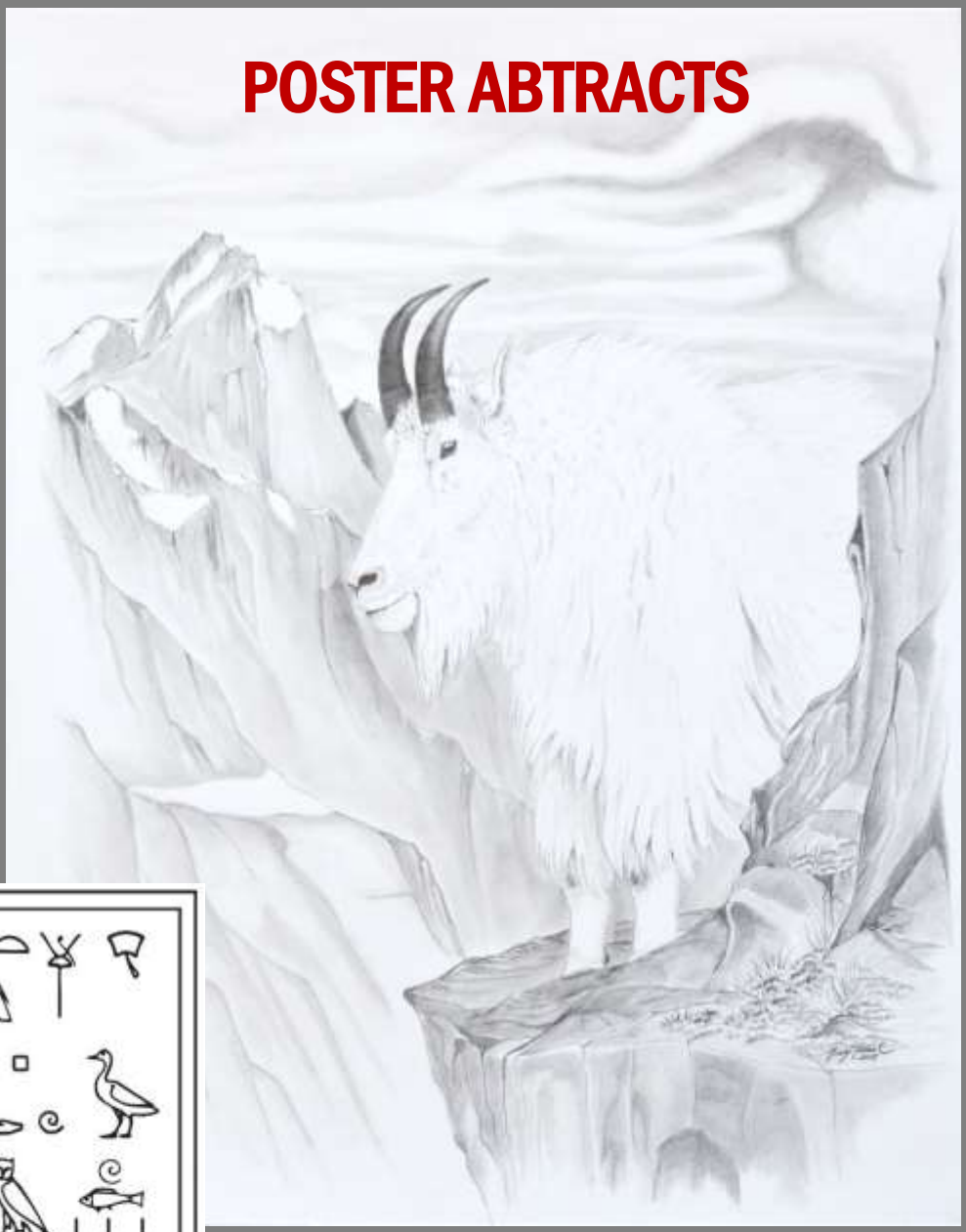
Wyoming Chapter of The Wildlife Society



THE WILDLIFE SOCIETY
WYOMING CHAPTER

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TUESDAY, DECEMBER 5th

Poster Session and Social

THERMOREGULATORY BEHAVIOR OF FRINGED MYOTIS (*MYOTIS THYSANODES*) AND ITS IMPLICATIONS FOR BAT CONSERVATION.

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Ambient thermal conditions influence the onset and duration of torpor, which bats and other small mammals employ to conserve energy. Generally, roost selection is assumed to be driven by thermal conditions conducive to torpor, but this has not been tested empirically. If this is true, a warmer climate will likely alter how, when, and where bats select roosts. To better understand how thermal conditions influence roost selection, we are tracking fringed myotis (*Myotis thysanodes*) to roosts at Jewel Cave National Monument and Black Hills National Forest. We are combining data on skin temperature (to delineate bouts of torpor) and thermal conditions within roosts to model the influence of external environmental conditions to thermal conditions within roosts and daily torpor duration. Our work will help determine how a warmer future will result in shifting patterns of roost selection, thereby informing which resources are key to bat conservation.

RETURNING AN ENDANGERED SPECIES HOME – THE STATUS OF BLACK-FOOTED FERRETS ONE YEAR POST REINTRODUCTION IN MEETEETSE

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In 2016, a collaborative effort between the Wyoming Game and Fish Department and multiple wildlife agencies was initiated to re-establish a population of black-footed ferrets (*Mustela nigripes*) at the same location the species was historically rediscovered, near Meeteetse, Wyoming. Last year 35 captive-bred ferrets were released on the prairie ecosystem of two private ranches. In the fall of 2017, the Department led surveys at the site to determine the success of the reintroduction efforts after one year in the wild. In accordance standard procedure at new reintroduction sites for black-footed ferrets, 23 new captive animals were released to help bolster the population. Following these releases, 800 surveys hours were completed over nearly 10,000 acres. During this effort, 10 of the 35 ferrets released in 2016 were located, having survived their first year in the wild. In addition, an important reintroduction milestone was achieved in just one year, as 7-8 wild-born kits were detected from 3-4 litters, signifying the wild reproduction had occurred within the newly-released population. One year post reintroduction, our results suggested that a population of ferrets is well on their way to becoming established in Meeteetse for the first time in decades.

LINKING ENVIRONMENTAL DRIVERS AND ENERGY DEVELOPMENT TO THE ABUNDANCE AND DISTRIBUTION OF THE WYOMING POCKET GOPHER

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Habitat fragmentation has resulted in negative and irreversible impacts on many wildlife populations. For example, infrastructure related to energy development—including well pads, access roads and pipelines—fragments habitat and may negatively impact populations by reducing mating success and gene flow. Effects of habitat fragmentation often are compounded in species with limited distributions, resulting in increased sensitivity to disturbances. The Wyoming pocket gopher (*Thomomys clusius*) is regarded as sensitive to habitat fragmentation because of its limited distribution. Therefore, energy development and other human activities have potential to limit dispersal, thereby influencing demographic rates. A paucity of information regarding the general ecology and the potential impacts of energy development impedes conservation action for this species. To address this problem, my thesis research will: (1) quantify the effect of energy development on gopher demography, and (2) assess if energy development promotes hybridization between Wyoming pocket gophers and northern pocket gophers (*T. talpoides*). From June – October 2017, we live-trapped gophers along a gradient of natural-gas development in the Red Desert ecosystem in south central Wyoming. Each gopher was marked with a Passive Integrated Transponder (PIT) tag to monitor survival and a tissue sample (tail snip) was collected to evaluate if and how hybridization is occurring. By understanding the influence of disturbance on the demography and population genetics of Wyoming pocket gophers, our research will provide information needed to conserve this species.

INVESTIGATING POTENTIAL EFFECTS OF WIND TURBINE COLOR ON ATTRACTING POLLINATING INSECTS

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Due to the growing demand for renewable energy in the United States, wind power is among one of the fastest growing clean energy sources. Despite the push for renewable wind energy, there is currently a limited understanding of the impact wind turbines may have on an ecosystem. Some research has investigated the impacts of birds and bats at wind farms, but we are not aware of any studies investigating insects and plants. Birds may be attracted to wind farms due to an abundance of insects at these locations because of turbine color, heat produced by turbines or landscape characteristics (e.g., ridges). We addressed if insects are attracted to turbine color using wind turbine mimics of nine colors (violet, blue, green, yellow, orange, red, white, light grey, and dark grey) and placed them on a hill with characteristics similar to a wind farm. The most insects were attracted to the white and blue wind turbine mimics, and the least insects were attracted to the green, orange, yellow, light grey, and dark grey turbine mimics. The results suggest that white is one of the most attractive colors to insects, which may attract insects to wind farms in the United States where most wind turbines are painted white. European wind turbines are often painted light and dark grey and our results indicate that insects are much less attracted to these colors.

INTEGRATING NUTRITION, RESOURCE USE, AND POPULATION DEMOGRAPHICS TO INFORM CONSERVATION OF ENDANGERED SPECIES

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Nutrition underpins growth, survival, and reproduction and ultimately, is the fundamental building block of populations. Generally, implications of nutrition to conservation of wildlife have not been realized because data needed to establish cause-and-effect links between nutrition and population trajectory either are underappreciated or only exist conceptually. We aim to bridge the fields of nutrition and population ecology to generate innovative tools to quantify the fundamental building block of populations and assess explicitly, potential benefits (e.g., population growth) of conservation actions that manipulate food supplies. By combining information on available food supplies, empirically validated measures of nutritional condition (i.e., body fat), GPS locations, and demographic rates (e.g., survival, reproduction) for 14 herds of a federally endangered subspecies of bighorn sheep, the Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*), we will: (1) evaluate the capacity of available food supplies to meet nutritional requirements and support population growth; (2) map animal-centric foodscapes (nutritional landscapes) and assess habitat selection across these foodscapes; (3) evaluate nutritional condition of an endangered species, and link nutritional condition to foodscapes and demographic rates; and (4) unite these data in an integrated population model (developed from population-specific demographic rates) to understand how habitat and associated food supplies influence population trajectories. Foodscapes generated in this study will transcend limitations of conventional habitat maps, allow for the identification of nutritionally valuable habitats, provide the basis for understanding population-level consequences of habitat change, give biological relevancy to numerical recovery goals, and can be used as a model in the recovery and conservation of other species. Our work will identify cause-and-effect relationships among food supplies, nutrition, demography, and population growth that can guide on-the-ground recovery efforts for an endangered species.

FLAMMULATED OWL OCCURRENCE IN WESTERN WYOMING

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The Flammulated Owl is a small, nocturnal, migratory owl whose populations in Wyoming are unknown. No nesting records exist for this state sensitive species in western Wyoming, but recent studies have located calling owls nearby in eastern Idaho. In 2016 and 2017, we conducted nocturnal call-back surveys for Flammulated Owls in Teton County, Wyoming. In 2016, we surveyed 160 locations and detected 14 different Flammulated Owls. We used remote sensing data from 2016 detection locations to create a preliminary habitat model to inform 2017 survey locations. We continued surveys in 2017, with an additional nine detections to date. We classified habitat within 100m and found high use of coniferous forest, followed by mixed coniferous and aspen stands. Our results indicate that this species is likely a regular breeder in western Wyoming and regular surveys for this species need to be conducted to assess the species range.

REDUCED SPEED LIMIT: AN EFFECTIVE WAY TO REDUCE WILDLIFE-VEHICLE COLLISIONS?

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Collisions between large mammals and vehicles pose a significant risk to wildlife and to human safety. Ever year, more than 6,000 deer, pronghorn, elk and moose are killed by vehicles in Wyoming. Highway over- and under-passes have been installed in several locations in Wyoming and have been ~80% effective in reducing wildlife-vehicle collisions (WVC) in those areas. However, these crossing structures are expensive and, in some cases, impractical — prompting transportation managers to seek less costly, easier-to-implement alternatives. Among the general public, there is high support for reducing speed limits in high WVC risk zones as an alternative to crossing structures. However, there has been almost no research on the effectiveness of reducing speed limits as a way to reduce WVCs, and studies of driver behavior in general suggest that reducing the posted speed limit is not sufficient to slow drivers down. In order to inform this debate and future transportation management practices, we are working with the Wyoming Department of Transportation (WYDOT) to assess the effectiveness of reduced nighttime speed limits in six WVC hotspots in southwestern Wyoming. In each of these locations, WYDOT is reducing the posted speed limit from 70 or 65 mph (daytime) to 55 mph (nighttime) during peak WVC seasons. Using a before-after-control-impact design, we are measuring the effects of these speed limit reductions on vehicle speeds and traffic dynamics using radar recorders; deer road-crossing behavior using infrared video cameras; and deer-vehicle collision rates using carcass counts. We will share preliminary results of this ongoing study. This study is unique in scope and will be important in determining whether reduced speed limits are adopted more widely in Wyoming and the West and as well as what type of conditions may be most conducive to this measure.

SUMMARY OF WILDLIFE PROJECTS SUPPORTED BY TETON CONSERVATION DISTRICT

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Teton Conservation District (TCD) was created in 1946. In the past 71 years, TCD has participated in a wide range of projects focused on the conservation of soil, water, farmland, rangeland, and wildlife. With the official creation of a Wildlife Program in 2015, TCD generated a five year strategic plan. Primary goals include support of wildlife research as well as education and outreach efforts. This presentation provides a summary of wildlife projects that TCD has supported in the past, and discusses mechanisms for requesting support for future wildlife related projects.

DISENTANGLING DRIVERS OF POCKET MOUSE OCCUPANCY IN THE SAGEBRUSH SEA

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Relative to other mid-latitude ecosystems, the sagebrush “sea” is often considered homogenous with little variation in vegetation structure and community composition. Nonetheless, soil composition, water, and nutrient availability can create variation on a local scale. Local variation may lead to diverse small mammal communities within the perceived homogeneous sagebrush sea. Habitat structure plays a crucial role in the composition and stability of small mammal communities. However, a vast body of literature, accumulated over decades, documents

the effects of biotic interactions (largely competition) on community composition, diversity, and species abundance. Thus, the diversity of small mammal communities in the sagebrush sea may be higher than expected based on habitat alone and may affect the distribution and detectability of rare species such as pocket mice (e.g., olive-backed pocket mouse [*Perognathus fasciatus*], Great Basin pocket mouse [*P. parvus*], and silky pocket mouse [*P. flavus*]). Over the course of the study we surveyed 99 sites across the basins of Wyoming and measured soil characteristics (percent sand), vegetation structure, plant diversity, small mammal community composition, and ant colony density. Using occupancy modeling approaches we evaluate the relative importance of these variables in determining detectability and distribution of pocket mice. Because small mammal abundance changed dramatically between 2015 and 2016 across Wyoming, the potential effects of competition could be disentangled from those of habitat structure using our data.

RED FOX ECOLOGY AND THE HUMAN-FOX INTERFACE IN GRAND TETON NATIONAL PARK

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The red fox (*Vulpes vulpes*) population in Grand Teton National Park has experienced a potential increase in the last 10-15 years. Park biologists and managers have observed more foxes in developed areas, more den sites associated with human structures, and more reports of interactions with humans, including intentional feeding. Along with these increases comes an increased concern about harm to foxes that ingest processed foods, traffic hazards for foxes and humans, and health and safety concerns related to aggression and disease transmission. In winter 2016/17, we began a 3-year study to better understand the basic ecology of habituated and wild foxes in order to make informed decisions regarding management of the human-fox interface. Using box traps, we are capturing, collaring, marking, and sampling foxes from at least four developed areas within the park. The objectives of the study are 1) understand movement and foraging ecology, disease prevalence, and genetic lineage of park foxes; 2) determine the degree to which natural and anthropogenic foods are being utilized; 3) identify where and when human-fox interactions are likely to occur; and 4) ascertain whether and why aversive conditioning techniques may be effective. To date, we have captured 13 individual foxes and deployed 3 GPS and 6 VHF collars. Preliminary data include dispersal distances and seasonal movements, den locations, temporal, behavioral and diet patterns of adults attending kits, and patterns of individual foxes involved in human interactions. Our increased ecological understanding of foxes along with enhanced outreach and education efforts will reduce human-fox conflicts and provide a template for addressing this emerging wildlife management issue.

UNDERSTANDING THE RELATIVE ROLES OF NUTRITION AND PREDATION FOR TWO SYMPATRIC HERBIVORES IN A HIGH-DESERT ECOSYSTEM

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Demography of large ungulates is typified by relatively high and invariable survival of adults. Consequently, survival of young is the demographic that often underpins population trajectories. In systems where ungulates co-occur with predators, predation is commonly the leading cause of mortality among neonates. Moreover, predator avoidance by females during parturition is common among ungulates to minimize risk of predation to newborns; this behavior often involves increased use of habitat that provides adequate cover. Such behavior may conflict with the need for females to acquire adequate forage to meet the energetic demands of lactation if habitats that minimize predation risk are not consistent with those that offer energetic gain. Behaviors in response to forage acquisition and predation risk can have important consequences for fitness; therefore, we aim to link behavior,

nutrition, and predation to survival and reproduction in mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*), two species that differ both in body size and behavioral strategies during parturition. We expect the sensitivity of habitat selection to predation risk from a mid-sized carnivore (i.e., coyote; *Canis latrans*) to vary as a function of body size and time post-parturition. Further, we expect that nutritional condition at the end of winter will influence whether parturient females adopt a risk-prone or risk-averse strategy of habitat use, and such behavior should be related to neonate survival. Behavior is one of the primary mechanisms by which females cope with constraints on survival and reproduction which highlights the importance of behavior as a mechanism of population dynamics. High-desert ecosystems are ubiquitous across the West, thus, elucidating the contributions of predation, habitat, nutrition, and behavior on dynamics of thriving elk herds alongside of stagnant populations of mule deer is key to maintaining robust herds of elk and enhancing population growth of mule deer.

DOES THE PETAL FALL FROM THE ROSE? REVEALING THE ONTOGENY AND POPULATION CONSEQUENCES OF UNGULATE MIGRATION

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Seasonal migration often provides fitness benefits by allowing animals to secure access to high-quality forage, reduce predation risk, and ameliorate severe environmental conditions. For terrestrial migrants, the ontogeny of migration is poorly understood, but has implications for understanding why some species exhibit strong fidelity to their migration routes and seasonal ranges. One hypothesis is that migration routes and aspects of the mother's seasonal ranges are inherited behaviorally from mother to offspring, resulting in surviving female offspring establishing summer ranges in close proximity to their natal range. The rose petal hypothesis was formulated to describe these matrilineal clusters of related females. As expected from the rose petal hypothesis, matrilineal clusters will result in fine-scale genetic clustering, which may have implications for how biologists and managers understand behavioral constraints on the occupancy of seasonal ranges. Nevertheless, the mechanisms underpinning how this behavior develops, and whether landscape-scale population consequences follow, remain largely unknown. By building upon the framework of the behavioral inheritance and rose petal hypotheses, we propose to test whether migratory patterns are inherited behaviorally from mother to daughter and assess the population-level consequences of this behavior. We will test the prediction that mothers pass their migratory routes and seasonal ranges to their daughters, resulting in matrilineal clusters that will form as a function of historical performance of the lineage and the seasonal ranges they occupy. We will characterize how mother-daughter pairs of deer (*Odocoileus hemionus*) in western Wyoming come to establish and occupy their seasonal ranges. To reveal how this behavior influences population dynamics, we will use genetic mark-recapture to understand historical performance of matrilines. The development and transmission of migration routes and seasonal ranges across generations may influence the occupancy and spatial distribution of migratory animals and, consequently, has implications for harvest management and conserving migration.

ASSESSING THE FEASIBILTY OF A DECISION SUPPORT SOFTWARE (DSS) TOOL IN THE POPO AGIE WATERSHED

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With the goal of better understanding the potential tradeoffs between the flow benefits of water-use efficiency projects (agricultural irrigation conversions) and potential wetland/wildlife impacts in the Popo Agie watershed of Wyoming, the feasibility of a decision support software (DSS) tool was investigated. Ideally, a watershed-specific DSS tool would help land managers conceptualize different scenarios of instream flow, crop yield, and wetland ecosystem impact before decisions are made. Though many of these Popo Agie wetlands are irrigation-dependent, they still provide unique habitat important to many wildlife species in Wyoming. To assess feasibility, an extensive literature review was conducted, data needs were evaluated, and existing datasets were analyzed for appropriateness and utility. Of the main needs identified, two major datasets will need to be created or updated – the wetland and ditch system datasets. Additionally, it would be recommended, but not necessary, to update a comprehensive water budget and crop consumptive use analysis for the Popo Agie prior to any model development. Lastly, as a part of the feasibility scoping process, a theoretical model for the Popo Agie watershed was conceptualized and cross-checked by regional experts. Currently, an in-depth feasibility report is being prepared for The Nature Conservancy, Wyoming and will be completed by 2018.

EARLY SIGNS OF A FIRE REGIME SHIFT: MODERN STAND-REPLACING WILDFIRES BURNING AT MORE THAN TWICE THE RATE OF HISTORICAL FIRES IN THE GRAND TETON REGION, WYOMING, USA

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In recent years, shifts in fire regimes in frequent-fire, dry forest have been identified and attributed to both human management and climate warming. Similar shifts in fire regimes for moist forests, such as those in the Greater Yellowstone Ecosystem, have been projected to result from increasing aridity and fire frequency in the coming century, but evidence for these projections is currently lacking. We hypothesize that one key early sign of this transition will be an increase in the annual area burned over time, resulting in the long in shorter fire intervals overall. Here we present a novel method to test this hypothesis and better understand if and how stand-replacing fire dynamics have changed in the last 170 years in the Grand Teton region comprising 505,000 hectares within Grand Teton National Park and much of the North Zone of the Bridger Teton National Forest. We used an historical U.S. Geological Survey map of burned patches from the late 1800s (Brandegee 1898) combined with dendroecological methods to: 1) test the accuracy of a late-19th century fire perimeter map for use as an historical account of fire spatial patterns in the late 19th century, 2) reconstruct fire history in a variety of forest and site types, and 3) compare modern (after 1984) annual burned area and burn severity to these same metrics for the latter half of the 1800's. We find substantial support for increased area burned in stand replacing fire in the last 31 years compared to the period from 1855-1895 – in fact, the modern rate of stand-replacing fire is more than double its depiction more than a century ago. Opportunities and challenges for both ecological and adaptive resilience in the face of fire regime shifts in the GYE will be discussed.

LANDSCAPE GENOMICS AND POPULATION HEALTH IN WYOMING MULE DEER

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The expansion of road infrastructure and natural resource extraction operations have substantially altered the landscape used by wildlife across Wyoming. Elimination or degradation of habitat can fragment populations, which can cause demographic and genetic problems for wildlife. In addition to the threat of landscape changes, chronic wasting disease (CWD) has emerged as a significant management concern for Wyoming mule deer (*Odocoileus hemionus*) with implications of population-level impacts. CWD is a fatal prion disease that can be transmitted through direct contact with an infected individual, or through contact with infectious prions shed in the environment, making disease management challenging. Some mule deer, however, have a genetic mutation in the prion protein gene (*Prnp*) that result in slower disease progression, allowing individuals with the "slow" allele to live longer and reproduce more than individuals without it. Selection acting on the *Prnp* gene may play a central role in population longevity for mule deer populations faced with CWD and other growing threats. In collaboration with the Wyoming Game and Fish Department CWD Surveillance Program, we are sequencing the *Prnp* gene in mule deer across the state to evaluate the relationship between CWD prevalence and frequency of the "slow progression" genotype. Additionally, we are performing a state-wide investigation of mule deer genetic connectivity and diversity using genotyping-by-sequencing. We will use these genomic data to delineate genetic population units and characterize the impact of landscape alterations on genetic connectivity, which will aid in both genetic and disease management for Wyoming mule deer.

ARE LOCAL POLLINATORS AND PLANT SEED SET AFFECTED BY LARAMIE'S MOSQUITO CONTROL PROGRAM?

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Laramie and many other cities in the western United States use broad scale application of insecticides to control mosquitos in the spring and summer. These practices may affect pollinator communities; several commonly used pesticides are toxic to bees. Bees and other pollinating insects are vital for seed-set and pollination of both wild and domestic plants. Our study examined insects and seed-set within the city of Laramie, where insecticide is applied several times weekly during mosquito season, and at a control site outside the city where insecticides are not used. We compared insect abundance and richness by using bee cups and vane traps at the control site within the city of Laramie during the summer of 2017. We also hand-netted bees in the city on 6 occasions. Overall insect mass was similar between bee genera observed at both sites, but the control site had greater bee abundance and diversity. We compared seed-set in hand pollinated, bagged and ambient blossoms on hollyhock plants at control and Laramie sites. More seeds were observed at in Laramie, possibly due to differences in plant cultivars or soil, but mass was similar at both sites. Self-pollinated seeds were smaller for both sites. Our results show differences in the bee community between the control site and within the city, which may indicate that fogging, as well as other urban practices, are affecting Laramie's native bee population.

POPULATION GENOMICS OF GREAT GRAY OWLS ON THE RANGE EDGE

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The Great Gray Owls (*Strix nebulosa*) in northwest Wyoming are at the edge of the species' range. Breeding philopatry and dependence on boreal habitat limits their distribution, despite their vagility. Populations on the periphery of the range can be susceptible to environmental stressors (e.g. habitat degradation, climate change) and lose genetic diversity, causing lower adaptive potential. Recent research from our lab has shown that fragmented populations of Great Gray Owls in western North America have experienced population bottlenecks resulting in low genetic diversity, small effective population sizes, and inbreeding. We applied next-generation sequencing to analyze thousands of DNA markers across the whole genome. We found differentiation among 5 geographically distinct populations of Great Gray Owls, from California, Oregon, Idaho and Wyoming. Geographic distance and historical habitat connectivity contribute to the genetic differences. For the Jackson Hole area, we combined genetic data with location data to detect relatedness between breeding individuals to start detecting dispersal patterns. Understanding genetic population health and dispersal helps predict the species' resilience to habitat and environmental changes. Our results demonstrate the value of integrating genomic techniques into long term field ecology studies on raptors to better understand dispersal strategy, kinship, reproductive success, future population health and ultimately management strategy.

UNDERSTANDING THE MAINTENANCE OF PARTIAL MIGRATION: A TEST OF THE FITNESS-BALANCING HYPOTHESIS WITH MULE DEER

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Although migration is the most profitable foraging strategy in numerous systems, many migratory populations contain individuals that do not migrate – a phenomena known as partial migration. According to the fitness balancing hypothesis (FBH), partial migration is maintained when certain tradeoffs in life-history characteristics (higher adults winter survival vs. increased survival of young) result in equivalent demographic fitness among migrants and residents. Environmental variability can then annually shift fitness benefits among different migration strategies. Our goal is to test the FBH in a partially migratory herd of mule deer that share a common winter range in the Red Desert of south-central Wyoming. Three migratory strategies have been observed in the Sublette Mule Deer Herd, including long-distance migrants that travel 150 miles to Hoback Basin for the summer, medium-distance migrants that migrate nearly 70 miles to the southern Wind River Range for the summer, and short-distance migrants that either travel less than 30 miles north or remain year-round as residents in the Red Desert. Our research will include existing movement data from 60 female mule deer (collared in 2011 and 2012) in conjunction with data from 80 female mule deer currently radio-collared (2014 – present). We will evaluate and compare fat dynamics, birth rates, fawn recruitment, and adult survival among migratory tactics. From March 2014-March 2017, long-distance migrants had higher percent body fat than short- and medium-distance migrants,

most noticeably after summer months. We will also evaluate how annual variability in environmental conditions and foraging success may alter relative benefits of migration and migration timing. Based on recent data, long-distance migrants initiate fall migration at later dates. Mechanisms driving partial migration have been unclear and understudied. Testing the FBH in mule deer is an important step in understanding factors maintaining variability in migration behavior and will aid in future conservation and management efforts.

COMPARISON OF AVIAN AND MAMMALIAN PREDATORS IN SAGE GROUSE CORE AND NON-CORE AREAS: ASSESSING PREDATOR ABUNDANCE AND RESPONSES TO ANTHROPOGENIC FEATURES

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Greater sage-grouse (*Centrocercus urophasianus*: hereafter sage-grouse) abundance and distribution in western North America has declined over the last century. Many factors have contributed to this decline, including habitat loss and fragmentation from human development with an associated potential for increased predation rates from avian and/or mammalian predators. In addition, sage-grouse avoid areas with higher avian predator densities. While human development influences sage-grouse demographic rates and habitat selection, development also provides an increased number of perch and nesting structures used by avian predators—including ravens that can negatively influence sage-grouse nest success. Wyoming's Sage-grouse Core Areas were developed to add protections to important habitat for sage-grouse by reducing human development within Core Areas. Core Areas have maintained higher sage-grouse trends compared to Non-Core Areas, which could be explained by reduced predation rates. However, we lack a study comparing predator abundance within and outside Core Areas. We performed avian point counts along 5-mi transects throughout the Wyoming Basin during the 2017 summer. Transects were stratified between sage-grouse Core and Non-Core Areas. Human structures were noted at each point count location. This information will be added to BBS data and human disturbance data previously calculated. We plan to survey coyotes and potentially other mammalian predators during the 2017-2018 winter and 2018 summer by performing line transect surveys with fixed-wing flights or other survey techniques. Our study will determine (1) what habitat or structural factors are associated with higher predator abundance and (2) if avian and mammalian predator abundance differs between Core and Non-Core Areas.

IS THE GRASS GREENER ON THE OTHER SIDE OF I-80? PREDICTING MIGRATORY CORRIDORS BEFORE THE DEVELOPMENT OF INTERSTATE-80

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The completion of the Wyoming section of Interstate-80 in 1970 resulted in a major barrier to ungulate migrations in southern Wyoming. Today, movement data indicate that the interstate is largely an impermeable barrier to ungulates. While wildlife biologists widely assume that the interstate severed migratory corridors, we remain unable to assess which corridors were severed and where they were located. In part, this uncertainty stems from the fact that some migratory animals show high fidelity to historic corridors, while others are flexible from one year to the next. Previous studies have demonstrated success in conserving migratory corridors intersected by highways through the development of wildlife crossing structures, ie, under- and overpasses. This study seeks to evaluate the habitat characteristics of remaining migratory corridors that are influenced by Interstate 80. The goals of our study are: 1) evaluate the environmental and landscape attributes that are most commonly used by ungulates as migration corridors, 2) use this ecological information in a statistical modeling framework to identify

potential or historical corridors that are bisected by the interstate 3) extrapolate the model to identify the location of crossing structure that are most likely to reduce vehicle collisions and restore lost migrations. Our methods consist of utilizing GPS collar data of two different pronghorn herds (Kemmerer herd: N = 77, Bittercreek herd: N = 29) that use habitats near Interstate-80 perennially or seasonally. We intend to use remotely sensed data to compare the habitat attributes between the GPS points of empirical migratory corridors and those of hypothetical corridors randomly arranged along the interstate. We aim to parameterize a mixed effects linear model using the most significant habitat attributes, which we will then use to predict the areas most likely to be used as migratory corridors.

SAGEBRUSH SONGBIRDS MITIGATE NEST PREDATION RISK VIA PARENTAL CARE BEHAVIORS

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Nest attentiveness can have important fitness consequences for songbirds via the number and quality of successful young. Songbirds are highly susceptible to nest failure from predation given their use of sessile reproductive sites, and some species will alter their nesting behavior in response to perceived predation risk. We investigated the effect of parental care behaviors on two sagebrush-obligate songbirds: Brewer's sparrow (*Spizella breweri*) and sage thrasher (*Oreoscoptes montanus*). Specifically, we assessed 1) how parental care behaviors influenced predation risk for each sagebrush songbird species and 2) whether individuals exhibited behavioral syndromes in parental care between nest stages. We expected that the parental care strategies of these two species might differ, as they represent two extremes of the size spectrum for sagebrush birds and have different predator assemblages. We located nests in the field, monitored daily nest survival rates, and recorded videos of parental activity at the nest during both the incubation and nestling stages. Preliminary results from analysis of Brewer's sparrows during the nestling stage do not indicate any influence of parental care on nest survival. Sage thrashers that spend more total time on their nests experienced increased nest survival during the incubation stage, but not the nestling stage. Individual sage thrashers that were attentive during incubation were also attentive during brooding, despite there being no apparent benefit to attentiveness during the nestling stage. Understanding the potential ability of birds to mitigate nest predation risk via behavioral plasticity will facilitate a better understanding of how avian species proximately optimize reproductive success.

THE EFFECTS OF MULTIPLE FORMS OF HABITAT CHANGE ON SONGBIRD NEST SITE SELECTION AND REPRODUCTIVE SUCCESS

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Climatic regimes are changing at an unprecedented pace, and wildlife species in arid ecosystems such as the sagebrush steppe, are particularly vulnerable to such rapid changes. The sagebrush steppe has already been extensively altered and fragmented, and previous research in western Wyoming documented declines in the nest survival of sagebrush-obligate songbird nests in areas with increased habitat loss due to natural gas development. Yet, research focusing on the combined effects of physical habitat change and climatic variation has been rare. We are investigating the individual, additive, and/or synergistic effects of energy development and climate on sagebrush-obligate songbirds (Brewer's sparrow, *Spizella breweri*; sagebrush sparrow, *Artemisiospiza nevadensis*;

sage thrasher, *Oreoscoptes montanus*). Further, we are examining the extent to which songbirds can mitigate the proximate effects of temperature via nest site selection and parental care behaviors at the nest. Data are being collected at 12 long-term study sites (2008-present) in western Wyoming that span a gradient of habitat loss due to natural gas development. We measured reproductive fitness metrics including egg mass, nestling growth rates, and nest survival, at nests affixed with temperature loggers (n = 110) during the 2017 breeding season. Temperature profiles were assessed at nest shrubs along with paired but unused potential nest shrubs once the nests fledged or failed (n = 136). To quantify parental care, nests were filmed during incubation and nestling stages to assess variation in behavior in relation to temperature. Songbirds may be able to mitigate the effects of climate change via plasticity in parental behaviors, however, the extent to which this occurs remains unclear. A better understanding of how climatic variation, in conjunction with physical habitat conversion, affects songbird reproductive success will be critical for avian conservation and management plans.

RAPTOR MIGRATION AT COMMISSARY RIDGE: WHY IS IT IMPORTANT?

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HawkWatch International, Inc. (HWI) has been conducting fall season-long raptor migration counts at Commissary Ridge (CR), Wyoming for 16 years, with total counts averaging 3,588 raptors (17 species) over 480 hours of annual observation. We have also banded over 1,000 total raptors during 6 years of trapping operations. The discovery of CR as an important migration feature was not accidental, but rather occurred after scouting 26 potential ridge count sites spread across Wyoming in 2000, refinement to 3 candidate sites in 2001, and beginning of season-long operations at CR in 2002. The data collected at CR, when placed into context within the larger network of western and North American monitoring sites, helps inform understanding of raptor population trends and movement patterns. It also provides unique, relatively accessible opportunities for up close and hand-on public education about raptors. Recently added tablet data entry capabilities gives the public web access to species-specific running totals that are updated daily, which can be used in the classroom to complement learning experiences gained on the ridge, help visitors plan their visit, and more. We have leveraged the data collected at CR to inform siting of wind and electrical transmission projects, and to develop a Western Ridge Model of raptor migration potential. This model may be used in conjunction with other models and products currently under development, local knowledge, and expert opinion to help guide additional migration count exploration in Wyoming (e.g., HWI's 2015 efforts in the Medicine Bows) and/or proposed wind energy development near ridgelines. Recently, we have reinstated trapping operations at CR to gather samples in support of an American Kestrel genetic study. Come visit our poster to learn more about the important of CR in Wyoming and beyond!

COMMON LOONS IN WYOMING: AN ISOLATED POPULATION AT RISK

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With an observed population of 20 territorial pairs in northwest Wyoming in 2017, the Common Loon (*Gavia immer*), is Wyoming's rarest breeding bird. Historically, the observed population numbered around 21 territorial pairs, but declined to as low as 14 between 2006 and 2011. Located over 200 miles away from the nearest breeding loons in Montana, this population is at risk of extirpation due to its small size and isolation. A complete lack of immigration due to the species' intrinsic short-range, limited dispersal further compounds these risks. In 2012, Biodiversity Research Institute, in collaboration with the Wyoming Game and Fish Department, Yellowstone National Park, Caribou-Targhee National Forest, Bridger-Teton National Forest, and Grand Teton National Park, initiated a study investigating the decline in territorial pairs, assessing threats to survival and reproduction, and recommending and enacting management actions. Threats identified include suspected human disturbance, fluctuating water levels, bycatch in NPS gillnets on Yellowstone Lake as part of the Lake Trout management effort, and biotoxins from blue-green algae, particularly BMAA. Efforts to mitigate these disturbances include enactment of temporary closures and deployment of nest rafts. Capture and banding has improved our understanding of this

population, with geolocators identifying the sea of Cortez and waters off the Baja peninsula as a wintering location for a Wyoming loon. Recently, this population has experienced a higher rate of productivity, as measured by chick survival per number of territorial pairs, suggesting a possible increase in the number of breeding adults in Wyoming from 2016 - 2019. Resident loons have been observed in the Wind River Range, which offers nearby habitat for population expansion.

A YEAR IN REVIEW OF THE UW STUDENT CHAPTER OF THE WILDLIFE SOCIETY 2017

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This year, members of UW-TWS were busy with numerous educational and research activities:
Western ecosystems course to Yosemite, Sequoia & Kings Canyon, and Desert Valley NP: Students spent spring break traveling throughout the Western States including Wyoming, Utah, Nevada, California, and Arizona and three National Parks. We had a diverse crowd, which enabled us to learn about historical, geological, and cultural topics related to wildlife biology and management.
River otter survey in Rocky Mountain NP: This year we continued our bi-annual river otter survey in late April and September giving students hands on field experience surveying for wildlife. In 2016, the International Otter Survival Fund recognized us for our long-term efforts.
Chipmunk trapping in the Laramie Range: This year was an exciting year catching two individuals (a male and a female) that were 8 years old! This project provides students hands on experience with capture-recapture techniques and radio telemetry and prepares us for our careers.
Beast Feast fundraiser: We have teamed up with the Student Chapter of The American Fisheries Society for the past two years for Beast Feast: Surf 'n Turf Edition. We are grateful for the hundreds of community members who continue to support us.
Deer captures in Baggs, Wyoming: In January, we were able to assist Tony Mong in drop net trapping of mule deer. This was a very fun opportunity to gain experience and meet Game and Fish personnel.
Highway cleanup: We have continued to clean a 2-mile section of highway 287 south of Laramie every semester, which was adopted in 1999.
Wyoming science fair outreach: In April, we led an enrichment activity for the state science fair participants.