Montana Cooperative Wildlife Research Unit

Annual Report 2022

Coordinating Committee Meeting

April 13, 2022

Montana Cooperative Wildlife Research Unit

Report of Activities for the Coordinating Committee Meeting

April 13, 2022

Cooperating Agencies
U. S. Geological Survey
Montana Fish, Wildlife and Parks
The University of Montana
Wildlife Management Institute
U. S. Fish and Wildlife Service

Project and fiscal information included in this report:
01 April 2021 through 30 April 2022

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Table of Contents

Birds

Mammals

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Brandon Kittson
Peter Mumford
Sarah Sells, Postdoctoral Associate

Tom Martin

Timothy Forrester, PhD Candidate
Holly Jackson, MSc Candidate
Adam Mitchell, PhD Candidate
Elise Zarri, PhD Candidate

Unit Faculty on Graduate Students' Committees

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Jennifer Feltner, PhD Candidate*
Ellen Pero, PhD Candidate*
Hans Martin, PhD Candidate*
Kaitlyn Reintsma, PhD Candidate
Molly McDevitt, PhD Candidate*
Brenna Cassidy, PhD Candidate
Daniel Bird, PhD Candidate*

Tom Martin

* Graduated
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Dustin Brewster
Ryan Makena Carlsberg
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Christian Cormier
Christian Dupree
Carl Engstrom
Amelia Evavold
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Samuel Hathcock
Emma Hense
Adam Hensley
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Cuyler Shannon
Jonathan Shaw
Sarah Sriraman
Ashley Sinclair
Emilee Smith
Jan Sostre-Cortes
Brenna Stahl
Jocelyn Stansberry
Kile Stumbo
Kailie Todd
Charles Weber
Candace Wiedemann
Douglas Yoder

DIRECTION STATEMENT

The Montana Cooperative Wildlife Research Unit performs research designed to address the needs of cooperators, bridging the gap between applied and basic wildlife science. Our studies provide new insights useful to management and conservation, based on understanding the ecological mechanisms that underlie habitat requirements and demography of individual and coexisting wildlife species. Research emphases within the Unit include ecology and management of carnivores, applied landscape ecology, management of large game, interactions between forest management and wildlife, environmental influences (predators, habitat, ungulates) on demography and diversity of birds, habitat requirements and community ecology of birds, and comparative demography and life history strategies of birds in differing environmental and geographical contexts. Other research topics are addressed as needed, in keeping with the Cooperative Research Program's mission to best meet the needs of the Cooperators by remaining flexible and open to new areas of inquiry. When Cooperator's needs occur outside Unit expertise, the assistance of appropriate University faculty will be recruited.

Unit staff will advance the training and education of graduate students at the University of Montana by teaching up to one graduate-level course per year in wildlife science, chairing graduate committees of Unit students, and serving on graduate committees of non-Unit students. Technical support and training will be provided to Cooperators and other agencies as the need exists.

OPERATING BUDGET 2021

Unit and Administrative Operating Funds		
University of Montana - Full-time Accounting Manager	$ 53,458	
SPABA – returned to Unit in FY20/FY21	28,330	
Subtotal		**$ 81,778**
FY 2021 – Research Projects Funding		
Montana Fish, Wildlife and Parks - Operating Funds		**$ 40,000**
T. Martin – PI		
Continued Funding:		
UM Research Administration – Graduate Support	37,717	
USDI BLM – Effects conifer removal – songbirds	481,132	
USDI FWS – Effects conifer removal – songbirds	24,591	
USDI USGS– Quantifying Sage Brush Birds	181,198	
NSF – Songbirds in Tropical Rainforests	824,336	
Subtotal		**$ 1,548,974**
M. Mitchell – PI or Co-PI		
New Funding:		
Subtotal		**$ 0**
Continued Funding:		
USDI - Reliability of Management Recommend	$ 33,694	
USDI – Structuring Governance	60,500	
BLM - Lower Blackfoot Bear Stress Study	10,000	
USDI – Grizzly Bear Recovery: Modeling Movement, home ranges Range expansion & Population Connectivity	82,000	
USDI/FWS – Native American Support	160,990	
USDI – Sage-grouse Synergies N. Great Plains	84,951	
MTFWP – Migratory songbirds – grazing	658,364	
MTFWP – Statewide mule deer study	241,537	
IDFG – Cougars - Population Dynamics and Modeling	52,952	
MTFWP – Sage grouse & grazing study	169,278	
MTFWP – Predictive Spactial Layer Insect Biomass Sage Grouse & Song Bird Study Area	300,033	
IDFG – Predator/prey	83,104	
MTFWP – Kootenai river trout study	10,000	
MTFWP – Sage grouse grazing	169,278	
MTFWP – Fisher occupancy habitat needs	245,955	
MTFWP – Blackfoot Clearwater Elk Project	255,108	
MTFWP – Grizzly Bear Social Survey: HD Bear	25,307	
MTFWP – Pronghorn Movement	1,429,530	
MTFWP – Westslope in Rock Creek Montana	48,200	
IDFG – Predator use of prey	66,968	
MTFWP – Mandatory Reporting and Harvest Surveys Evaluation	10,000	
MTFWP – Elk Recreation Study	346,000	
MTFWP – Grizzly Connectivity Modeling	63,213	
MTFWP – Bat Call Analysis	50,000	
MTFWP – Assessing Habitat Conservation Enhancement/Nongame	194,390	
IDFG – Camera Trap Analysis	23,198	

Panthera – Preventing predation	152,876	
Panthera – Puma Density and Distribution	47,374	
USDI – Linking Exposure to Sub-Lethal Stressors	92,299	
USDI - Linking Exposure to Sub-Lethal Stressors to Vital Rates	129,997	
MTFWP – Wolverine Monitoring	27,500	
MTFWP – North Sapphire Research	155,000	
	Subtotal	**$ 5,479,596**
	Total Budget	**$ 7,028,570**

Completed Projects – 1 January 2021 – 31 December 2021

End Date	Student	Funding Agency	Title
June 2021	Hans Martin	Idaho Fish & Game	Predator/Prey
December 2021	Sarah Sells	USGS	Grizzly Bear Recovery: Modeling Movement, home ranges, range expansion & population connectivity
December 2021	Jessica Krohner	Montana Fish Wildlife and Parks	Fisher Occupancy Habitat Needs
September 2021	Brian Tornabene	USGS	Linking Exposure to Sub Lethal Stressors
December 2021	Adam Mitchell	NSF	Songbirds in Tropical Rainforests

MTCWRU – Federal and State Vehicles

Description	Tag number	Odometer as of 4/05/2021
2006 Ford F250 Crew Cab Pickup, 4 x 4	FED 430965	103,383
2010 Ford Expedition 4 x 4	FED 433441	79,561
2011 Ford F250 Crew Cab Pickup, 4 x 4	FED 433440	59,488
2011 Ford F250 Crew Cab Pickup, 4 x 4	FED 433610	70,931
2012 Dodge 1500 Crew Cab 4 x 4	FED 433621	60,584
2017 Ford F150 Crew Cab Pickup, 4 x 4	FED 434302	5,811
2019 Ford F250 Crew Cab Pickup, 4 x 4	FED 434679	945
2020 Ford F250 Crew Cab Pickup 4 x 4	FED 434679	972
2005 Ford Explorer, 4 x 4	UM 3787	155,047

BIRDS

Photo by Tim Forrester

Photo by Holly Jackson

Effects of conifer invasion and removal on sagebrush and conifer songbird demography in Montana

Obligated funding: $541,743

Principal Investigator: Thomas E. Martin

Project Duration: 2019-2024

UM Affiliation: Montana Cooperative Wildlife Resea

Graduate Students: Elise Zarri, Ph.D., Holly Jackson, M.S.

Collaborators: Anna Noson, University of Montana Bird Ecology

Funding Sources:

- Bureau of Land Management
- US Fish and Wildlife Service
- Montana Fish, Wildlife, and Parks

Objectives

Conifer removal is a core practice in sage-steppe restoration, with potential to benefit Greater Sage-grouse (*Centrocercus urophasianus*) as well as other sagebrush species of management concern. The impacts of conifer encroachment on Sage-grouse is well documented, but research to identify the demographic impacts on sagebrush obligate birds, as well as conifer-dependent species, is lacking. Demographic impacts of habitat change are particularly poorly known in the sagebrush communities where conifer encroachment is occurring in Montana. Previous studies have focused on sagebrush habitats dominated by stands of Wyoming big sagebrush, and invaded by juniper (*Juniperus spp*.), while in Montana conifer encroachment is primarily occurring at higher elevations in stands dominated by mountain big sagebrush invaded by Douglas fir (*Pseudotsuga menziesii*). The latter habitat includes bird species of management concern, including Brewer's sparrow (*Spizella breweri*) and Sage Thrasher (*Oreoscoptes montanus*) in sage habitat, and Green-tailed Towhee (*Pipilo chlorurus*), Cassin's Finch (*Haemorhous cassinii*), and Clark's Nutcracker (*Nucifraga Columbiana*) in the conifer habitat.

Understanding the consequences of conifer removal for abundance and reproductive output of songbirds using both conifer and sagebrush habitats in high elevation Montana is needed to understand best practices for enhancing populations. Mountain sagebrush landscapes include other woody habitat like riparian stringers and denser conifer stands at the periphery of conifer removal areas. Conifer removal can create artificial 'hard' edges that might yield high predation near the edges both inside and outside the conifer. This could even create ecological traps, where abundances are high but breeding productivity creates population sinks.

Collaborative projects spearheaded by Montana Conservation Corps, Red Rock Lakes National Wildlife Refuge, The Nature Conservancy of Montana, Bureau of Land Management-Dillon, Montana Fish, Wildlife, & Parks, and Montana Department of Natural Resources and Conservation are underway to remove encroaching conifers from up to 10,000 acres of mountain big sagebrush habitat on state and federally-owned lands.

We are examining: 1) abundance and reproductive output of sagebrush-obligate songbirds in sagebrush habitat in Sage-grouse core areas and including some active leks without versus with conifer removal, 2) abundance and reproductive output of conifer-dependent songbirds in adjacent conifer stands, 3) the change in songbird species composition from conifer to sagebrush habitats, 4) impacts of distance from woody vegetation on nesting success and population trajectories (i.e., lambda) of songbirds, and 5) temperature sensitivities and constraints on reproduction. This information will inform the management removal of conifer trees located in stands of mountain big sagebrush habitats, and provide specific recommendations on the landscape contexts and distances from woody cover that will benefit songbirds the most.

Results

Results presented under students Zarri and Jackson descriptions.

Impacts of conifer removal on sagebrush songbirds

Student: **Elise Zarri**

Degree: PhD Candidate

Advisor: Thomas Martin

Project Duration: 2018 – 2023

UM Affiliation: Wildlife Biology Program
Montana Cooperative Wildlife Research Unit

Funding Sources:

- Bureau of Land Management
- U.S. Fish and Wildlife Service
- University of Montana

Objectives

Across the western United States, conifers have encroached into sagebrush habitats due to fire suppression, grazing practices and climate change. Sagebrush is one of the most imperiled ecosystems in North America and is home to many declining sagebrush-obligate species. Removal of conifers is a common restoration practice that has been shown to benefit Greater Sage-grouse. However, impacts to other sagebrush species are not well understood. Sagebrush songbirds, such as Brewer's Sparrows and Sage Thrashers have been shown to have increased abundance with reduced conifer cover, but reproductive responses of these species to conifer removal have not been quantified. Conifer removal could lead to ecological traps, where sagebrush songbird abundance is high, but reproductive success is low in removal areas due to increased predation through predator spillover from conifer forest. If ecological traps occur when conifers are removed, then mitigating these negative impacts will be important for managing sagebrush songbird populations.

Removal of conifers significantly alters the landscape, so understanding how songbirds respond to these changes is vital in predicting responses on a population-level scale. Therefore, this work seeks to understand how songbirds select habitat and how predation rates differ relative to distance from woody vegetation. I am studying the habitat selection, abundance and fitness responses of sagebrush songbirds to conifer removal and modelling responses across broader spatial scales of conifer removal in the western United States.

Progress and status

I have completed three field seasons of this project and am preparing for the fourth and final season. I completed comprehensive exams in April 2021 and completed a third successful field season in August 2021. I am currently working on data analysis and writing of my first chapter with the goal of submitting for publication by September 2022. I will continue to work on data analysis and writing for the remaining three chapters, with the goal of completing and defending my dissertation by spring 2023.

Field work is being conducted at a high elevation sagebrush site, where conifers were removed in 2017-2019. I am comparing plots where conifers have been removed to control plots where conifers remain. Seven technicians assist with nest searching for sagebrush songbirds, as well as territory mapping and vegetation monitoring. I am quantifying territory and nest site use in relation to shrub cover, height and density, as well as distance to conifer edge, density, and distance to nearest tree. This will allow me to understand habitat use in conifer removal and non-removal sites. I will also quantify successful nest sites using the same vegetation characteristics to understand how fitness correlates with habitat use.

Understanding thermal constraints on reproductive effort

Student: **Holly R. Jackson**

Degree: MS Student

Advisor: Thomas Martin

Project Duration: 2019-2022

UM Affiliation: Ecology & Evolution Program
Montana Cooperative Wildlife Research Unit

Funding Sources:

- Montana Cooperative Wildlife Research Unit
- National Science Foundation (NSF)

Objectives

Heat production resulting from activity and exposure to warm ambient temperatures can constrain reproductive effort and negatively impact fitness in parental endotherms. Species vary in activity and climate regime such that heat impacts may differ across species. However, research of heat restrictions on reproductive effort has been confined to studies on short-lived temperate taxa that have wide thermoneutral zones and high reproductive activity. Tests are lacking in long-lived tropical endotherms that on the one hand, may be constrained by heat due to their narrower thermal tolerances, but alternatively, may avoid heat impacts due to comparatively lower activity and reproductive investment.

Characteristics of the nest environment may also influence parent body temperature, reproductive effort, and ultimately offspring growth. On the one hand, more exposed nests with higher solar radiation and warmer temperatures may increase parent body temperature and reduce reproductive effort due to heat dissipation constraints. Such conditions could lead to reduced offspring growth rates or size at fledge. On the other hand, warmer nest sites may help keep young at more favorable temperatures for growth, reducing brooding requirements for parents and freeing up time for offspring provisioning. The direct and indirect effects of nest site characteristics on parent body temperature, reproductive effort, and offspring growth have seldom been explored together, presenting a gap in our understanding of how temperature influences fitness.

My first chapter examines whether improving heat dissipation capabilities, by means of a feather clipping experiment, will alter reproductive effort in a long-lived tropical songbird. I am assessing the effects that my clipping treatment has on parental body temperature, nest attentiveness, and provisioning rates. My second chapter explores the direct and indirect effects of nest site characteristics on parent body temperature, reproductive effort, and nestling growth rates via an observational study. The quantity and quality of reproductive effort provided from parents to offspring can have large impacts on offspring growth and development, which influence survivorship and fitness as adults. Taken at a population level, these processes influence demography and population viability. Given current global warming projections, it is increasingly important to understand how temperature may limit reproductive effort and offspring growth, and if some taxa regions are more predisposed to temperature impingements on rearing young.

Progress and status

I completed the field work to address the question presented in my first chapter (timeframe Feb. – Jun. 2020) studying nesting songbirds in tropical Borneo. I have also finished data analysis and am currently finishing writing this chapter. I also completed two seasons of field work for my second chapter (timeframe Jun. – Aug. 2020 and 2021) in the sagebrush ecosystem near Dillon, MT. I have organized and prepared my sagebrush data and plan to begin analyzing it shortly, upon completion of my first chapter.

Demography and survival of songbirds in west-central Montana, with special reference to Chickadees and weather effects

Obligated funding: None

Principal Investigator: Thomas E. Martin

Project Duration: 2019-until I drop…

UM Affiliation: Montana Cooperative Wildlife life Research Unit

Graduate Students: Timothy Forrester

Funding Sources:

- None and none sought

Objectives

This work has three elements: 1) the primary study is of hybrid breakdown and demography in two chickadee species and effects of weather on reproduction, 2) adult survival among several year-round resident species for which survival has been un-estimated, and 3) demography of the two chickadee species and house wrens.

Hybridization between Black-capped (*Poecile atricapillus*) and Mountain Chickadees (*Poecile gambeli*) may impact one or both populations such that understanding the extent and population impacts of hybridization is critically needed. Population monitoring in Montana by the Integrated Monitoring in Bird Conservation Regions (IMBCR) over the four years 2010-2013 indicated that Black-capped Chickadees exhibited a significant population decline over this period (Janousek et al. 2015). In contrast, Mountain Chickadees exhibited a population increase (Janousek et al. 2015). The extent to which hybridization may influence these population trends is unknown, as are the demographies of these two species. I established 100 boxes in the Butler Creek Drainage to study their demographies and collect blood to assess hybridization. In addition, a major goal is to assess the effects of weather, particularly rain, on both reproduction and survival. Effects of rain are poorly studied on populations and growth of young.

Red-breasted Nuthatch (*Sitta canadensis*) have had limited study of their demography and no estimates of adult survival have been reported (Birds of North America Online). These nuthatches excavate cavities that can be subsequently used by chickadees (TEM, pers. obs.), but have shown strong population declines in Montana (Janousek et al. 2015). Adult survival can have a major impact on demographic trends (Clark and Martin 2007). We are capturing and banding them to study adult survival as one possible influence on their population declines. Finally, Steller's Jay (*Cyanocitta stelleri*) is an important predator of nests of songbirds, but little is reported on their demographies (Birds of North America Online). Again, no estimates of adult survival are available. We are capturing and color-band Steller's Jays visiting winter feeders to study annual adult survival to facilitate better understanding of causes of their population trends.

Progress and status

A few hundred birds were bled and banded in the past three years and detailed data on number and growth of young were obtained from both species to assess relative to weather conditions. Rain caused mortality of young in some nests and impinged on growth in others.

Acquiring food, avoiding predation, and raising young: Causes and consequences of songbird activity strategies

Student: **Timothy R. Forrester**

Degree: PhD Candidate

Advisor: Thomas Martin

Project Duration: 2018 – Current

UM Affiliation: Ecology & Evolution Program
Montana Cooperative Wildlife Research Unit

Funding Sources:

- Montana Cooperative Wildlife Research Unit
- National Science Foundation (NSF)
- American Ornithological Society
- American Museum of Natural History
- University of Montana Division of Biological Sciences

Objectives

Examining how and why species vary in behavior, physiology, and life history strategies is a fundamental part of diverse ecological and evolutionary fields. Much effort has been focused on determining the causes of variation in traits such as body size, metabolism, longevity, number of offspring, and range limits. Yet, such a focus on traits like this has led to other traits being neglected, particularly those relating to behavior. As such, we still know surprisingly little about how species spend their time and energy on a daily basis and why differences between species occur. In my thesis, I am interested in why we see such a large diversity in how species behave as they go about their normal daily tasks such as foraging and reproduction. I am examining how intrinsic life-history traits (e.g., longevity) and extrinsic environmental conditions (e.g., temperature) influence how species partition their daily patterns of activity (e.g., foraging vs. resting, use of different foraging maneuvers, temporal patterns in offspring provisioning). I am also addressing the historic question of why species lose mass during reproduction using a novel experiment with two box-nesting temperate songbirds. My research involves observational studies of avian behavior in the wild, analyzes of existing databases of avian parental care, and a novel experiment to manipulate reproductive effort in wild birds. My overriding objective is to describe and test for the causes of variation in neglected aspects of species' behavioral ecology and reproductive investment to improve our understanding of how selective pressures influence behavior and life history strategies. My research also seeks to understand how environmental temperature influences behavior and reproductive strategies, which will be critical to understand as global temperatures continue to rise.

Progress and status

In the 2021-2022 academic year, I passed both the written and oral portions of my comprehensive exams and advanced to candidacy. I presented initial results from my dissertation at the American Ornithological Society annual meeting and at the Ecology & Evolution noon seminar. I submitted proposals to and was awarded research funding by the American Museum of Natural History (Frank M. Chapman Memorial Fund) and the American Ornithological Society (Van Tyne Student Research Award). I submitted one first-authored paper (from my previous masters research), which was rejected and I am revising to submit to another journal. I am nearing the point where I will submit my first thesis chapter for publication.

In 2021 I completed a full field season of research studying the causes of mass loss during reproduction in songbirds in Montana (Mountain Chickadee, Black-capped Chickadee, House Wren). I developed and used a novel method of non-invasively measuring songbird mass across the nesting cycle, where birds land on a perch placed on top of a scale, and a camera records the mass. I also carried out a nest-box heating experiment to reduce the

time that parents spend brooding nesting to test effects on parental mass loss. I also wrote a comprehensive review article of this subject as part of my comprehensive exams, which I plan to publish. In 2022, I am planning another full field season in Montana.

MAMMALS

Photo by Brandon Kittson

Photo by Brandon Kittson

Modeling bison Movement on the Blackfeet Indian Reservation

Student: Brandon Kittson

Degree: M.S. Student

Advisor: Mike Mitchell

Project Duration: Fall 2020 – Spring 2022

UM Affiliation: Wildlife Biology Program
Montana Cooperative Wildlife Research Unit

Funding Sources:
American Indian Graduate Center
Sloan Indigenous Graduate Partnership
University of Montana
Hopa Moutian
Keepseagle Grant

Objectives:

Brandon is developing a project in cooperation with the Blackfeet Nation to model bison movement on the U.S. portion of the reservation. Other work on bison has shown that models of habitat quality can be predictive of both abundance and distribution of bison. It could potentially be useful in identifying areas of future conflict and be used to work on some preventative mitigation measures to avoid conflict with ranchers and agriculture. This information will be important to the Blackfeet Tribe as they reintroduce free-ranging bison to portions of their reservation. It could also be useful in identifying potential migration routes for bison once their established in their new home.

Progress:

Brandon is currently using a Habitat Suitability Index developed by the Wildlife Conservation Society to create different maps with altered attribute values in efforts to mimic anthropologic and natural changes on the landscape. As well as working on pathway model which looks at least cost pathway analysis (Circuitscape), in efforts to Identify how bison will traverse the reintroduction zone which will become their new home. He is currently work on writing his chapter 1 for his dissertation.

Responses of Elk to Changes in Travel Management, Hunter Access, and Hunting Risk in the Northern Sapphire Mountains, Montana

Student: **Peter Mumford**

Degree: M.S. student– Wildlife Biology

Advisors: Mike Mitchell and Kelly Proffitt

Project Duration: 2019 – 2023

UM Affiliation: Wildlife Biology Program

Montana Cooperative Wildlife Research Unit

Funding Sources:

- Montana Fish, Wildlife, and Parks
- Montana Cooperative Wildlife Research Unit
- MPG Ranch
- Rocky Mountain Elk Foundation
- Backcountry Hunters and Anglers, MT Chapter
- Montana Outdoor Life Foundation

Objectives

Elk (*Cervus canadensis*) are a charismatic species found throughout western Montana and primarily valued for hunting and wildlife viewing opportunities. A growing concern in many parts of elk range, including the Sapphire mountains in west-central, MT, is the trend of elk increasingly inhabiting private lands inaccessible to hunters. This is problematic for private land owners due to issues of depredation by elk, to hunters who can't access elk, and wildlife managers who use hunters to influence the abundance of elk through harvest. A study of elk population dynamics and spatial patterns in the northern Sapphires occurred from 2014 to 2016. A follow-up study was initiated in 2019 in response to large-scale changes to access of motorized routes and land to hunters made after the conclusion the last study.

I have two main objectives, each a chapter of my thesis. First, evaluate responses of elk to changes in travel management and hunter access during the rifle-hunting season. This chapter will help understand if and how effective limiting access to motorized routes and land is at influencing the resource selection of elk. Second, evaluate how differences in risk between land accessible and inaccessible to hunters influences the resource selection of male elk during the archery and rifle-hunting seasons. This chapter will build on the limited information on males of a highly valued species in Montana.

Progress & Status

I am in my fifth semester and have completed my coursework requirements. I am waiting on final edits from my committee for the manuscript of my first chapter, and have a draft of my second chapter manuscript. I plan to defend my thesis 04/22/2022. Field work is limited, but involves coordinating and conducting necropsies on study animals and the retrieval of dropped Global Positioning System collars.

Grizzly Bear Habitat Selection & Predicted Movement Corridors

Student: **Sarah Sells**

Degree: Postdoctoral Research Scientist– Wildlife Biology

Advisor: Paul Lukacs

Project Duration: 2021 – 2022

UM Affiliation: Wildlife Biology Program
Montana Cooperative Wildlife Research Unit

Funding Sources:

- Montana Fish, Wildlife, and Parks
- US Geological Survey

Objectives

Once-contiguous grizzly bear populations remain largely isolated, and connectivity among federal recovery areas is a key concern for conservation efforts. Research is needed to assess potential corridors that could promote genetic and demographic connectivity for males and females among recovery ecosystems. Our objective is to model grizzly bear habitat use, movement, and population connectivity.

Progress & Status

We are employing an integrated step selection function approach and movement data from GPS-collared grizzly bears to test hypotheses of habitat selection and simulate movements. Initial results demonstrate highly individualistic behaviors, with some individuals avoiding and others preferring various features like forest edge, riparian areas, etc. Such individualism supports the need for an individual-based modeling approach to understand and predict grizzly bear behavior. We are accordingly first using each individual's model to simulate movements within and near the Northern Continental Divide Ecosystem (NCDE) using correlated random walks. We are then using each model to simulate pathways from the NCDE to nearby recovery areas using randomized shortest paths.

Our focus on modeling movements for grizzly bears is intended to improve on-the-ground grizzly bear conservation. Our results will contribute greater understanding of how grizzly bears interact with their environments and are influenced by natural and human-related features. A clear initial outcome of this work is demonstration of the individualistic nature of each grizzly bear's spatial behavior. Most importantly, our work will help predict important habitat and areas likely key to connectivity among recovery ecosystems. Once finalized, results can be used to predict movement pathways for grizzly bear populations, and habitat that may be essential to connectivity that could be protected, e.g., through conservation easements. These same areas could be targeted for increased efforts to prevent human-grizzly bear conflicts, and for potential mitigations such as highway and railroad crossing structures. Furthermore, our work will also provide guidance on where to focus monitoring and research efforts aimed at detecting expansion of grizzly bear range.

This work is ongoing through 2022. We will continue to conduct simulations to understand movements and habitat use. Our next goal is to build on this work by seeking to better understand and simulate home range behavior. This will improve understanding of how demographic connectivity may occur through female range expansion. To date, this research has produced an in-depth annual report to Montana Fish, Wildlife and Parks. Two manuscripts are underway and will soon be submitted for peer review.

AWARDS AND RECOGNITIONS

Forrester, T. Drollinger-Dial Research Travel Award - $1500

Sells, S. Research and Creative Scholarship Fund Travel Grant, University of Montana

Sells, S. PoND Fund Travel Grant, University of Montana.

Sells, S. John Richard Seiver Scholarship Award, University of Montana

Sells, S. George and Mildred Cirica Graduate Student Support Fund, University of Montana

Zarri, E. Montana Audubon Society - $500

PRESENTATIONS AND POSTERS

Sells, S. N., M. S. Mitchell, K. M. Podruzny, J. J. Nowak, J. A. Gude, and R. Inman. February 2021. A multi-model approach to estimating wolf abundance in Montana. Annual Meeting, Montana Chapter of The Wildlife Society, Virtual.

SCIENTIFIC PAPERS AND REPORTS

Oteyza, J. C., J. C. Mouton, and T. E. Martin. 2021. Adult survival probability and body size affect parental risk-taking across latitudes. Ecology Letters 24: 20-26.

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