

The Montana Chapter of the Wildlife Society  
58th Annual Conference

# Private Lands Conservation: Where it has gone and where it is going



Erika Nunlist

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**THE MONTANA CHAPTER OF THE WILDLIFE SOCIETY**  
**58<sup>TH</sup> ANNUAL CONFERENCE, 2020**

*“Private lands conservation: Where it has gone and where it is going”*

*February 3 - 7, 2020*

**COPPER KING HOTEL & CONVENTION CENTER**  
**BUTTE, MONTANA**

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# ABOUT THE WILDLIFE SOCIETY AND THE MONTANA CHAPTER

Founded in 1937, The Wildlife Society's mission is "To inspire, empower, and enable wildlife professionals to sustain wildlife populations and habitats through science-based management and conservation." The Society's membership of nearly 10,000 includes research scientists, educators, communications specialists, managers, conservation law enforcement officers, administrators and students in more than 60 countries.

## The principle objectives of The Wildlife Society are:

1. To develop and promote sound stewardship of wildlife resources and of the environments upon which wildlife and humans depend;
2. To undertake a role in preventing human-induced environmental degradation;
3. To increase awareness and appreciation of wildlife values; and
4. To seek the highest standards in all activities of the wildlife profession.

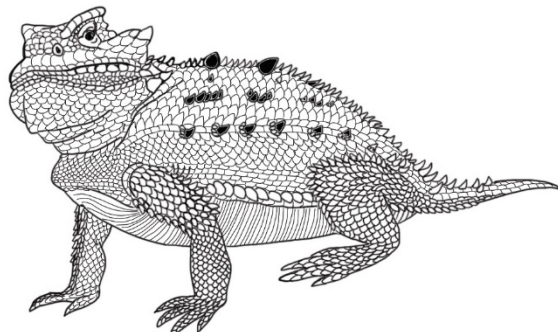
The Montana Chapter of The Wildlife Society was chartered in 1962 and formally organized with the election of its first officers in 1963. Adoption of chapter bylaws occurred in 1964. The mission of the Montana Chapter of The Wildlife Society is to encourage and support effective wildlife management in Montana by fostering development of current and future wildlife professionals, providing science based information for policy and education, and communicating and collaborating with conservation organizations and the public.

## Core Values of the Montana Wildlife Society include:

1. Sound stewardship of wildlife and habitat including the North American Model of Wildlife Conservation;
2. Dedicated, passionate, and responsible wildlife professionals;
3. A diversity of perspectives, backgrounds, and individuals unified behind our core mission;
4. Integrity and ethical conduct; and
5. A land ethic influenced by informed public input.

**Our chapter is only as strong as our members and participation. We have numerous committees that need active participation from members. We encourage member nominations to fill our elected positions, and presentations from both researchers and managers are always needed to continue communication between agencies and the various wildlife organizations in the state!** Please see the Committees Page to find out more about the various committees in your chapter as well as chairperson contacts.

The Montana Chapter of the Wildlife Society has been a primary sponsor of the Intermountain Journal of Sciences (ISSN 1081-3519) since its inception in 1995. This is the official publication for the printed proceedings of our annual meetings and submission of multidisciplinary scientific manuscripts for review and publication.



## 2019 - 2020 MONTANA TWS CHAPTER OFFICERS

**President:** Liz Bradley (Montana Fish, Wildlife & Parks)

**Past-President:** Kelvin Johnson (Montana Fish, Wildlife & Parks)

**President-Elect:** Brett Dorak (Montana Fish, Wildlife & Parks)

**Secretary:** Rebecca Mowry (Montana Fish, Wildlife & Parks)

**Treasurer:** Lorelle Berkeley (Montana Fish, Wildlife & Parks)

**Montana State University Student Chapter President:** Carl Young V

**University of Montana Student Chapter President:** Jonathan Karlen

## 2019 - 2020 MONTANA TWS COMMITTEE CHAIRS

**Programs:** Brett Dorak

**Awards:** Brendan Moynahan

**Education/Information:** Brent Lonner

**Financial Management:** Lorelle Berkeley

**Membership:** Lorelle Berkeley

**Nominating and Elections:** Liz Bradley

**Resolutions/Public Statements:** Executive Board

**Scholarships:** Bob Garrott – MSU

Chad Bishop – UM

**Species of Concern Committee (Ad hoc):** Bryce Maxell

**Effects of Recreation (Ad hoc):** Bryce Maxell

**Grants (Ad hoc):** Claire Gower

**Conservation Action (Ad hoc):** Kris Boyd and Steve Gniadek

**Intermountain Journal of Sciences (Ad Hoc):** Terry Lonner and Rick Douglass

### THE MONTANA CHAPTER OF THE WILDLIFE SOCIETY

#### PROFESSIONAL CONDUCT DISCLAIMER

2020

Conference attendees are expected to conduct themselves in a safe, appropriate and professional manner. The Montana Chapter of The Wildlife Society (MTTWS) accepts no liability for harm done by individuals that fail to conduct themselves in a such a manner during formal conference activities. MTTWS is dedicated to providing a safe, professional and harassment-free conference experience for everyone. We do not tolerate harassment of conference participants in any form. Conference participants violating these rules may be sanctioned or expelled from the conference, without a refund, at the discretion of the conference organizers.

# WELCOME TO THE 58<sup>TH</sup> ANNUAL CONFERENCE OF THE MONTANA CHAPTER OF THE WILDLIFE SOCIETY

## *“Private lands conservation: Where it has gone and where it is going”*

### **Greetings everyone and welcome back to Butte America!**

It seems every year time goes by more quickly, but this year was especially fast. I feel we were just fighting the winter weather to get to the conference last year in Helena, and now we find ourselves enjoying another conference back at the Copper King. It has been an honor and privilege to serve as your president-elect over the past year and work with the Executive Board to put together our annual conference. This is the one time of year where many of us get to be together and celebrate another year's worth of research, knowledge gained while managing habitat and wildlife in the field, and discuss any trials and tribulations that we have overcome while conserving Montana's resources. I hope that the conference provides you with the platform needed to expand on your knowledge and that you walk away from here with some additional tools or ideas on how to improve on wildlife conservation in your respective location in Montana.

### **Private Lands Conservation: Where it has gone and where it is going**

Our theme for this year's conference takes a look at what is going on across the state on private lands and how landowners are working with different agencies, NGOs, developing grass root programs, and utilizing other avenues to improve and conserve the resources right here in our backyard. Approximately two thirds of Montana is privately owned, and without private lands conservation, many of the flora and fauna that call this place home would not be as abundant as they are now. For the most part, wildlife does not understand anthropogenic lines drawn on a map, but the mosaic of landownership across the state requires everyone to do their part to conserve not only the wildlife, but also the way of life and traditions that have been associated with these lands for centuries.

### **Plenary Session**

The conference will start off this year with a plenary session that brings together many of the state's leading individuals who work day in and day out with private landowners to help move the conservation needle forward. We have six panelists who will share their experiences, successes and failures, and what they have learned and look to expand on in the future. The panelists share their different perspectives on private lands conservation and come from state and federal agencies, NGOs, a rancher-led organization, and an independent non-profit organization.

### **Workshops**

There are three workshops taking place this year. One looks at mineral rights and the role they play with certain conservation programs. Another looks into the current non-lead ammunition efforts in Montana and recent research being conducted. And our third workshop comes back full circle from two years ago and provides a refresher on how to utilize conservation programs on private lands.

### **Posters and Presentations**

We are once again honored to have so many papers being presented during our conference. This year we have 48 presentations and 10 posters!

### **Banquet**

Our keynote speaker for this year's banquet is Ryan “Cal” Callaghan who is the Director of Conservation at MeatEater and host of the weekly Podcast *Cal's Week in Review*.

# ACKNOWLEDGMENTS

The MT TWS conference is not something that comes together overnight. It takes an entire year of dedication from the Executive Board, members, volunteers, sponsors, and everyone else involved to work diligently to produce such a great event. Throughout the past year there have been numerous people who have come forward to help in many facets. I will do my best to mention and thank everyone, but I do realize that there is a chance I may miss some individuals. So, to everyone, I want to say THANK YOU and know that your time, energy, and dedication to the MT Chapter and the conference is greatly appreciated.

First, to the state and national members of The Wildlife Society, I thank you for being a part of such a great organization and helping promote the organization's mission "To inspire, empower, and enable wildlife professionals to sustain wildlife populations and habitats through science-based management and conservation."

To the Executive Board: Kelvin Johnson, Liz Bradley, Lorelle Berkeley, and Rebecca Mowry – it has been a great time working with you all and the hard work and dedication you have shown have been second to none.

To all the attendees that have submitted abstracts to share your research and experiences through presentations and posters, thank you. It is through the sharing of these findings that makes the conference one to remember every year.

To the plenary session presenters: Bob Sanders, Brian Martin, Leo Barthelmess, Rick Northrup, Greg Neudecker, and Damien Austin, I cannot thank you enough for taking a break from your busy schedules to come to the conference and not only share your experiences on the panel, but also interact with students and professionals while you are here.

To the keynote speaker, Ryan "Cal" Callaghan, for finding time in your busy schedule to come share your perspective on wildlife conservation, thank you.

Thanks to Abby Dresser, Catherine Wightman, Zachary Zipfel, Bill Schenk, Kate Stone, and Mike McTee who were responsible for putting on the incredible workshops that were offered this year. Providing the information you did in the three workshops helped increase the knowledge and ability of the wildlife professionals who attended, and will no doubt have a positive impact on future management.

To all the chairs, members, and volunteers in the different committees and working groups – thanks for the dedication to the conference and all the work associated with such incredible commitments.

To all the volunteers that helped throughout the conference by moderating, judging, filling in at the registration table and helping with any of the million random tasks that came up, thank you! I know I may miss some individuals here, but I will try my best and want to thank Ray Vinkey, Kimberly Szkodronski, Kristina Smucker, Mike McTee, Teagan Hayes, Drew Henry, Ken Plourde, Heather Harris, Abby Dresser, Paul Santavy, Jason Hanlon, Bob Garrott, Kate Stone, Jake Doggett, Lewis Young, Dan Bachen, Lauri Hanauska-Brown, Vanna Boccadori, Hannah Specht, Dan Harrell, Brent Lonner, Leah Breidinger, Ethan Lula, Dan Gibson and anyone else who filled in where needed.

To Brandi Skone and Torrey Ritter – for putting together the Pub Trivia event, thank you!

To Erika Nunlist – for designing the perfect image to represent this year's theme, thank you!

One last major THANK YOU to everyone for being here, and it is my honor to welcome you to the 58<sup>th</sup> Annual Conference of the Montana Chapter of The Wildlife Society!

Brett Dorak



2019-2020 MTTWS President-Elect

# 2020 NOMINEES FOR EXECUTIVE BOARD OFFICERS

## PRESIDENT-ELECT CANDIDATES



**ANDREW JAKES**



**Andrew Jakes** is the regional wildlife biologist for National Wildlife Federation, based out of Missoula, MT.

Andrew received his B.S. from James Madison University, VA (1998), and his M.S. at Towson University, MD (2001), where he studied beaver habitat selection at the Savannah River Ecology Lab, SC.

While working seasonally in Yellowstone NP in 1998, he was told of a place in MT named the Crazy Mountains. Upon driving to and camping in this mountain range, he realized that he had found his calling - Montana is where he needed to be. Andrew moved out West and worked several years for federal (NPS – Port Alsworth, AK) and state agencies (MT FWP, MT DEQ – Helena) on a variety of species and systems until starting his PhD on pronghorn movement ecology at University of Calgary, AB, which he completed in 2015. He was a post-doctoral researcher at University of Montana from 2015-2017, using multi-species approaches to study the effects of fencing on wildlife movement and habitat selection.

He seeks to use science and collaborative approaches to guide implementation of on-the-ground efforts for wildlife. Andrew enjoys hiking & camping, hunting, playing the guitar and laughing with his family & friends.





## PAUL SANTAVY



**Paul Santavy** is the Refuge Manager at the Charles M. Russell National Wildlife Refuge Complex for the U.S. Fish & Wildlife Service. As the Refuge Manager, he oversees all aspects of wildlife and habitat management, conservation planning, and refuge operations and maintenance. Paul has been with the USFWS since 2005 and has previously held positions as the Deputy Regional Refuge Chief for the Mountain-Prairie Region headquartered in Colorado; Deputy Refuge Manager at the National Elk Refuge in Wyoming; and Complex

Manager for the Maine Fisheries Program Complex. Prior to coming to the USFWS, Paul worked with Montana FWP, Prince William Sound Aquaculture Corporation in Alaska, and Oregon Department of Fish and Wildlife.

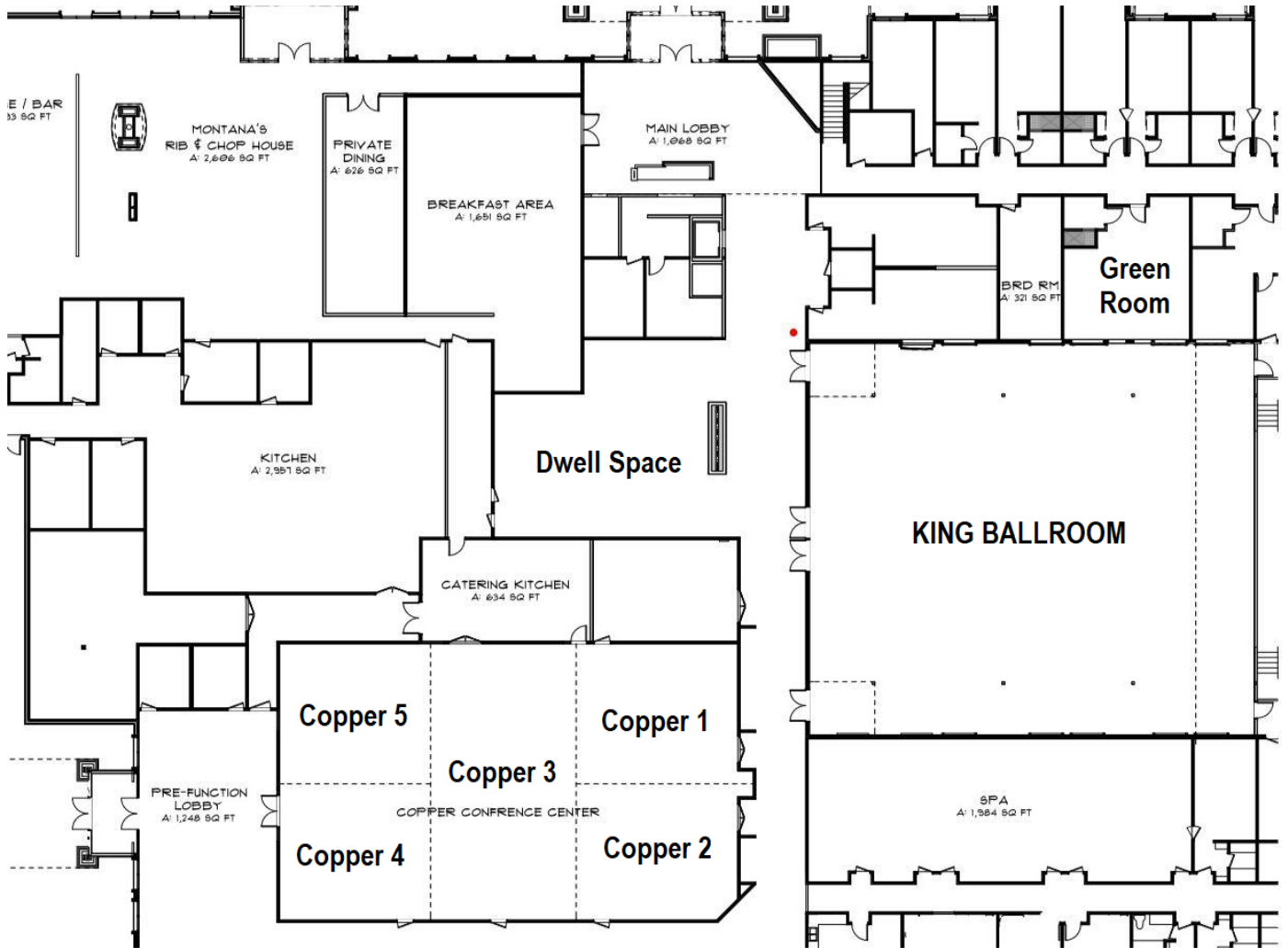
Paul has been a member of TWS since 2007 and is a Certified Wildlife Biologist®. He's been a member of the MT Chapter since 2015 and holds membership in numerous TWS working groups. He served a term as Chair of the Wildlife and Habitat Restoration Working Group, where he organized and moderated the symposium "A New Day for Bison? – Ecological Restoration in the 21st Century at the 2017 National TWS Conference."

Paul is also a longtime member of the American Fisheries Society, and is a Certified Fisheries Professional.

Paul is originally from Michigan where he grew up on his family's farm. There he developed an interest in nature, conservation, land management, and hunting and fishing. These interests lead Paul to complete a B.S. degree in Wildlife Biology and Fisheries Management at Michigan State University in 1993. Paul spends his free time hunting, working his GSP, shooting skeet, and enjoying nature with his wife Rebecca.



# COPPER KING INN & CONVENTION CENTER MAP



# GENERAL CONFERENCE SCHEDULE

## 2020 MTTWS Conference Schedule - Includes Leaders/Volunteers

*01/17/20 version*

|                  | 7:00   | 8:00   | 9:00   | 10:00   | 11:00                                 | 12:00  | 1:00   | 2:00  | 3:00 | 4:00   | 5:00 | 6:00  | 7:00   | 8:00  | 9:00 |  |
|------------------|--|--|--|---|---------------------------------------|--|--|---|------|--|------|---|--|---|------|--|
| <b>Monday</b>    |  |  |  |   |                                       |  | <b>Conference Preparations</b><br>Volunteers are welcome to help prepare for the conference.<br>Contact an executive board member for details. |   |      |  |      |   |  |   |      |  |
| <b>Tuesday</b>   | Montana Bird Conservation Partnership and Harlequin Duck Working Group<br><br>8:00 - 12:00pm<br><i>Copper 4 &amp; 5</i><br><br><i>Allison Begley and Chris Hammond</i> |  |  |   |                                       |  | Mineral Rights Workshop<br><br>1:00 - 5:00pm<br><i>Copper 1 &amp; 2</i><br><i>Zachary Zipfel</i>   |   |      |  |      |   | MTTWS Welcome Reception<br>6:00 - 9:00pm<br><br>Popcorn & Movie<br>9:00 - 10:00pm<br>"Deer 139"<br><i>King Ballroom</i>  |   |      |  |
| <b>Wednesday</b> | Conservation Programs Training<br>8:00 - 12:00pm<br><i>Copper 1 &amp; 2</i><br><i>Catherine Wightman and Abby Dresser</i>  |  |  |   |                                       |  | Plenary Session<br><br>1:00 - 5:00pm<br><br><i>King Ballroom</i>   |   |      | MAFWB Meeting<br><br>5:15 - 6:15pm<br><br><i>Copper 1</i>                        |      |   | Student - Professional Mixer<br>6:00 - 9:00pm<br><i>Torrey Ritter, Brandi Skone</i><br><br>Movie Night<br>9:00 - 10:00pm<br>"On the Shoulders of Giants"<br>"Stars in the Sky"<br><i>King Ballroom</i> |   |      |  |
|                  |  |  | Getting the Lead Out<br>10:00 - 12:00pm<br><i>Copper 3</i><br><i>Kate Stone &amp; Mike McTee</i> |   |                                       |  |  |   |      |  |      |   |  |   |      |  |
| <b>Thursday</b>  | Business Meeting<br>7:00 - 9:30am<br><br>Green Room  | Concurrent Session A<br>8:20 - 10:00am<br><i>Copper 3</i><br><i>Abby Dresser</i>           |  | Concurrent Session A<br>10:20 - 12:00pm<br><i>Copper 3</i><br><i>Mike McTee</i>         |                                       | Lunch  |  | Concurrent Session A<br>1:20 - 3:00pm<br><i>Copper 3</i><br><i>Teagan Hayes</i>             |      | Concurrent Session A<br>3:20 - 4:40pm<br><i>Copper 3</i><br><i>Paul Stantavy</i> |      | Poster Session<br>5:00 - 6:00pm<br><i>Dwell Space</i> |  | Banquet Dinner<br>6:00 - 9:00pm<br><br><i>King Ballroom</i><br><br>Awards: Brendan Moynahan |      |  |
|                  |  | Concurrent Session B<br>8:20 - 10:00am<br><i>Copper 4 &amp; 5</i><br><i>Robert Garrott</i> |  | Concurrent Session B<br>10:20 - 12:00pm<br><i>Copper 4 &amp; 5</i><br><i>Kate Stone</i> |                                       | Concurrent Session B<br>1:20 - 3:00pm<br><i>Copper 4 &amp; 5</i><br><i>Kim Szkodronski</i> |  | Concurrent Session B<br>3:20 - 4:40pm<br><i>Copper 4 &amp; 5</i><br><i>Kristina Smucker</i> |      | Partners of the Americas Restart<br>5:00 - 5:30pm<br><i>Copper 1</i>             |      |   |  |   |      |  |
| <b>Friday</b>    | Concurrent Session A<br>8:20 - 10:00am<br><i>Copper 3</i><br><i>Ray Vinkey</i>   |  |  |   | Conference Adjourned<br>Safe Travels! |  |  |   |      |  |      |   |  |   |      |  |
|                  |  | Concurrent Session B<br>8:20 - 10:00am<br><i>Copper 4 &amp; 5</i><br><i>Drew Henry</i>     |  |   |                                       |  |  |   |      |  |      |   |  |   |      |  |

# 2020 CONFERENCE DAILY SCHEDULE

## Tuesday, February 4

- **Workshop**
  - **Mineral Rights & Private Lands Conservation:** 1:00pm – 5:00pm (Copper 1 & 2)
- **Meetings**
  - **Montana Bird Conservation Partnership and Harlequin Duck Working Group:** 8:00am – 12:00pm (Copper 4 & 5)
  - **Bat Working Group:** 1:00pm – 5:00pm (Copper 4)
- **Montana TWS Conference Welcome Reception:**  
6:00pm – 9:00pm (King Ballroom)
- **Popcorn and Movie!!!:** 9:00pm – 10:00pm (King Ballroom)

## Wednesday, February 5

- **Workshop**
  - **Conservation Programs Training:** 8:00am – 12:00pm (Copper 1 & 2)
  - **Getting the Lead Out:** 10:00am – 12:00pm (Copper 3)
- **Plenary Session:** 1:00pm – 5:00pm (King Ballroom)
  - **Welcome & State of the Chapter Address** (MT Chapter President Liz Bradley)
  - **Plenary Session & Panel Discussion: “*Private lands conservation: Where it has gone and where it is going*”** (Introduction by MT Chapter President-Elect Brett Dorak)
  - **Panelists:**
    - Bob Sanders - Ducks Unlimited (Manager of Conservation Programs for Montana)
    - Brian Martin – The Nature Conservancy (Montana Grasslands Conservation Director)
    - Leo Barthelmess – Rancher Stewardship Alliance (President)
    - Rick Northrup – Montana Fish, Wildlife and Parks (Wildlife Habitat Bureau Chief)
    - Greg Neudecker – U.S. Fish and Wildlife Service/Partners for Fish and Wildlife Program (MT State Coordinator)
    - Damien Austin - VP and Reserve Superintendent of American Prairie Reserve
- **Evening Meetings**
  - **Montana Association of Fish & Wildlife Biologists:** 5:15pm – 6:15pm (Copper 1)
- **Student Professional Mixer:** 6:00pm – 9:00pm (King Ballroom)
- **Movie Night!!!:**

## Thursday, February 6

- **Business Meeting:** 7:00am – 9:30am (Green Room)
- **Concurrent Session A:** 8:20am – 12:00pm and 1:20pm – 4:40pm (Copper 3)
- **Concurrent Session B:** 8:20am – 12:00pm and 1:20pm – 4:40pm (Copper 4 & 5)
- **Lunch provided by MT TWS:** 12:00pm – 1:20pm
- **Partners of the Americas Restart Meeting:** 5:00 – 5:30pm (Copper 1)
- **Poster Session:** 5:00pm – 6:00pm (Dwell Space)
- **Awards Banquet & Silent Auction** 6:00pm – 9:00pm (King Ballroom)

## Friday, March 7

- **Concurrent Session A:** 8:20am – 10:00am (Copper 3)
- **Concurrent Session B:** 8:20am – 10:00am (Copper 4 & 5)

### CONFERENCE LOGO ARTIST

### **AND WINNER OF THE 2020 STUDENT ARTWORK CONTEST**



**ERIKA NUNLIST**



Erika is a fourth generation Montanan with a deep-rooted appreciation for wildlife, the outdoors, and working landscapes. She received a bachelor's degree in Conservation Biology and Ecology with a minor in GIS from Montana State University. She is currently a candidate for a master's degree in Animal and Range Sciences with an emphasis in biology at Montana State University.

**About the cover:** *"Wildlife in Working Landscapes" by Erika Nunlist*

*"Partnership between managers and private land owners is principal to creating contiguous landscapes for wildlife. I wanted to capture a Montana scene exemplifying partnership on a working landscape. Only so many conservation techniques fit on one cover, so I focused on one: fence modification benefitting pronghorn and sage-grouse." -Erika*

# PROFESSIONAL DEVELOPMENT WORKSHOPS

We have three workshops available this year. One workshop will look into surface and subsurface mineral rights and the complexities that they may add when working on easements or habitat projects on private lands. Our second workshop looks at non-lead products in hunting and fishing. Our third workshop continues the foundation we built a few years ago and will provide a refreshing overview of how to utilize conservation programs with private landowners and provide new updates on existing programs as well as what has been rolled out over the last two years.

## **Mineral Rights and Private Lands Conservation**

**Instructor:** Zachary Zipfel (Montana FWP)

**Date and Location:** Tuesday, February 4, 1:00pm – 5:00pm (Copper 1 & 2)

**Cost and participant limits:** Free, NA

While we are all aware of the issues and opportunities surrounding land conservation, mineral ownership and mineral development are often overlooked. Join us as we describe what the mineral estate is, how it came to be, and the implications for habitat conservation. Developing land and habitat conservation strategies without considering the mineral estate is truly only addressing half of the landscape. We will provide a basic overview of the Montana Mineral estate and familiarize participants with some basic tools for identifying mineral owners and participants.

## **Getting the Lead Out**

**Instructors:** Kate Stone and Mike McTee (MPG Ranch)

**Date and Location:** Wednesday, February 5, 10:00am – 12:00pm (Copper 3)

**Cost and participant limits:** Free, NA

Are you curious about the movement toward non-lead products in hunting and fishing? Would you like to do more personally and professionally to forward this concept?

Mike McTee and Kate Stone from MPG Ranch will facilitate a workshop to discuss current non-lead educational efforts in Montana, highlight recent research, and brainstorm how we might boost capacity for this effort as members of The Wildlife Society. Mike and Kate have both spent the past few years working on educational and research efforts to promote the voluntary switch to non-lead materials for hunting and fishing. They urge TWS members to refer to our very strong position statement that includes advocating for the replacement of lead-based ammunition and fishing tackle with less toxic products wherever possible.

The main purpose of this workshop is to network, provide information, and define action items. The format will include a broad discussion and potentially break-outs groups to discuss ideas. Please bring questions and action items you would like to work on in the next year. Maybe you'd like to see all game wardens using non-lead to dispatch animals? Or, you'd like to increase the availability and visibility of non-lead fishing tackle at sporting goods stores? Perhaps you'd like to organize a "day at the range" to demonstrate the performance and characteristics of lead vs. non-lead in big game hunting. All ideas are on the table.

We will also dedicate a portion of time to tackling the use of lead in prairie dog and "gopher" shooting.

## Conservation Programs Training

**Instructors:** Cathernine Wightman (Montana FWP), Abby Dresser (Ducks Unlimited)

**Date and Location:** Wednesday, February 5, 8:00 – 12:00pm (Copper 1 & 2)

**Cost and participant limits:** Free, NA

This workshop continues on the foundation it built a few years ago and will provide a refreshing overview of how to utilize conservation programs with private landowners and provide new updates on existing programs as well as what has been rolled out over the last two years. In association with the Montana TWS annual meeting Montana Fish Wildlife & Parks and Ducks Unlimited are once again partnering to offer a workshop for natural resource professionals working with private landowners. Join us for a ½ day refresher that will include presentations from state, federal and non-profit agencies delivering conservation programs on private lands. This year's focus will be on new and improved conservation opportunities.

## BANQUET SPEAKER



**RYAN "CAL" CALLAGHAN**



Ryan "Cal" Callaghan is Director of Conservation at MeatEater and host of the weekly podcast *Cal's Week in Review*. Callaghan studied history and anthropology at the University of Montana before becoming a hunting and fishing guide on the outskirts of Glacier National Park, the Missouri breaks, the Frank Church and Bob Marshall wilderness areas. Callaghan was the first employee of the now MeatEater-owned technical hunting apparel company First Lite, where he established the brand's conservation ethos which they are known for today. Callaghan is a member and national board member of Backcountry Hunters & Anglers.

## PLENARY SESSION SPEAKERS



**LEO BARTHELMESS**



**Leo Barthelmess** is a member of a third-generation family ranch. Leo and his wife Darla, have three adult children, two married. The other members of their ranch management team include Leo's brother Chris, and his son Eric. The ranch produces cattle, hay, grass seed and forage. They raise sheep, guard dogs, and have a custom harvest

business that specializes in grass seed harvesting.

Leo currently serves as president of the Ranchers Stewardship Alliance in Montana. He has served on the advisory council of the Northern Agriculture Research Station in Havre Montana and is the past director of the Montana Stockgrowers Association. He currently serves as a trustee on The Nature Conservancy's Montana Chapter. He also has the pleasure of working with the World Wildlife Fund on sustainable ranching projects that they hope will help secure the future of grasslands on the Northern Great Plains.

Leo has been a long-time student of Holistic Resource Management and continues to invest in education through programs such as Ranching for Profit and Bud Williams Marketing and Stockmanship schools. In 2003, the Barthelmess Ranch was the recipient of the Montana Stockgrowers Environmental Stewardship award. The ranch went on to represent Montana nationally as the region five Environmental Stewardship Award recipients. The ranch continues to look for new profitable stewardship ideas that can be implemented on the ranch that will provide long-term sustainability for our family, ranches, landscapes, and wildlife.



**RICK NORTHRUP**



Rick has worked for Montana Fish, Wildlife & Parks for 29 years. During the first half of his career, he worked out of Townsend, Plentywood, and Malta with a focus on habitat conservation, primarily on private lands. He moved to Helena in 2005 to serve as the state game bird, Pacific Flyway, and farm bill biologist before working his current

position as Chief of the Wildlife Habitat Bureau for the past 7 years. Over his career, Rick has served on a variety of national, regional, and state boards and committees related to wildlife conservation. He is particularly fond of habitat conservation work that involves sustainable working lands that also provide public access. Rick earned a master's degree in Fish and Wildlife Management from Montana State University and a BS degree in Wildlife and Fisheries Sciences and Environmental Management from South Dakota State University.



## BRIAN MARTIN



**Brian Martin** is the Montana grasslands conservation director and currently manages The Nature Conservancy's conservation work in eastern Montana. In a little over a decade, the program has partnered with private and public land managers to annually influence management on over 300,000 acres of the highest priority grassland habitat in the state and secured over 85,000 acres of permanent protection of grasslands. Brian works with a diverse partnership to develop and implement science with universities, agencies, and landowners to enhance grassland function for people and wildlife. Brian received an M.S. and B.S. in Range Science from New Mexico State and North Dakota State universities, respectively. He lives in Red Lodge with his wife, Kathy.



## BOB SANDERS



**Bob Sanders** is Ducks Unlimited's Manager of Conservation Programs in Montana. Bob has been with Ducks Unlimited for 23 years having served in both Colorado (1995-2006) and Montana. He handles all aspects of DU's Montana conservation program including wetland restoration, grassland and wetland protection and public policy work. Bob's background includes a B.S. in Wildlife from the University of Wisconsin – Stevens Point and an M.S. in Wildlife and Fisheries from the University of Missouri – Columbia. Bob has over 28 years of experience in wetland and waterfowl ecology throughout the Rocky Mountain region. He believes strongly in working with ranchers, farmers and other landowners to find common-sense approaches to deliver on-the-ground conservation objectives.



## GREG NEUDECKER



**Greg Neudecker** is currently the state coordinator for the Montana Partners for Fish and Wildlife Program with the U.S. Fish and Wildlife Service and is located in Ovando, MT. Greg has a BS in Fish and Wildlife Management that he received from South Dakota State University in 1988. He has 32 years of experience working on private lands habitat conservation for the FWS in Minnesota and Montana. His positions have ranged from Work Study Student, Biological Technician, Biologist, and Assistant State Coordinator to State Coordinator. His professional interests include Community Based Landscape Scale Conservation and linking on-the-ground accomplishments to biological outcomes. Greg enjoys outdoors activities such as bird watching, hiking, biking, running, golfing, hunting and fishing. He has two young kids at home: Land is 8 and Loryn is 7. His wife Ryen works for Trout Unlimited so their personal interests have become their professional interests as well!



## DAMIEN AUSTIN



**Damien Austin**, VP and Reserve Superintendent of American Prairie Reserve, joined the organization in 2010. He is thrilled to live and work on the largest conservation project in the lower forty-eight states. Damien was born and raised outside of Billings, MT then attended Washington State University, earning a BS in Biology. Prior to joining American Prairie Reserve staff, he worked as Director of Research for an invention company specializing in water reclamation, as a zookeeper, and as a volunteer bison handler for American Prairie Reserve.

# PLENARY SESSION ABSTRACTS

## Ranching, Conservation, And Community; A Winning Team

**Leo Barthelmess, The Rancher's Stewardship Alliance**

The Ranchers Stewardship Alliance (RSA) works in the northern great plains focusing on the highlighted area of the state of Montana, Blaine Phillips and Valley counties. As our capacity to help other communities grow, we are reaching across the Missouri River to help other areas develop community-based conservation. The Rancher's Stewardship Alliance works with many different partners. Our partners from the conservation community include NGOs, wildlife agencies, state and federal conservation/management agencies, as well as contributions from livestock organizations and livestock businesses.

What is the value of community-based conservation, who should participate and what components will lead to success of local efforts to preserve grasslands and local communities? There are many components that lead to successful communities and conservation, many of these components are overlooked or undervalued. I will discuss successful strategies for community-based conservation. This discussion will include identifying positive programs and or skill sets that create success as well as behaviors that detract from positive outcomes.

I will be using the evolution of RSA as an example of a community led organization that tries to preserve local culture and implement landscape scale conservation. As with any start up organization growth and change are difficult.

## An Overview of FWP's Wildlife Habitat Program

**Rick Northrup, Habitat Bureau Chief, Montana Fish, Wildlife & Parks**

The state of Montana Fish and Game purchased the Judith River Game Range in 1940 in response to wintering elk conflicts on private rangeland. Additional acquisitions over subsequent decades set a direction for the agency to invest in habitat conservation as an alternative to artificially-feeding wild ungulates. Habitat acquisitions focused on big game winter range, river-bottom riparian, and wetland habitats. With the establishment of new programs in the late 1980s, Montana Fish, Wildlife & Parks (FWP) has integrated a palette of incentive-based habitat protection and enhancement options for private landowners. These options involve both perpetual and term agreements. Habitat conservation emphasis has also broadened and now includes key threatened habitats for game and species of concern and connectivity habitats for terrestrial wildlife. The strengths of FWP's habitat program are its supporting partners, the agency's extensive field-level interaction with private landowners, dedicated staff and funding, emphasis on working lands and public access, strategic implementation, and an extensive history of landscape-scale conservation successes.

## The Nature Conservancy Work on the Northern Great Plains

**Brian Martin, Montana Grasslands Conservation Director, The Nature Conservancy**

The Nature Conservancy is working across the Northern Great Plains to retain functioning grasslands and other natural habitats that provide habitat for wildlife and economic and cultural values for human communities. Working with and respecting the needs and interest of local communities is one of the Conservancy's organizational values, and we have strived to implement strategies that benefit both people and nature. Using the best available science, we recognize that ranch operations are compatible with maintaining habitat. In Montana, we have permanently conserved over 100,000 acres of private land through purchase and ownership of land and use of conservation easements. The protection efforts have contributed toward

maintaining the continuity of over 250,000 acres, when public lands are also considered. Easements have created opportunities for multi-generation ranches to grow their operations to allow family members to stay on the ranch or facilitate transfer between generations. Our Matador Ranch Grassbank has facilitated best management practices for wildlife and habitat on 295,000 acres, and we are also supporting planning and enhanced management through our Candidate Conservation Agreement with Assurances for sage-grouse and four species of grassland songbirds. The challenge in private lands conservation is to continue to work with people to create a virtuous cycle where conserving grasslands and wildlife is a recognized and widely adopted element of sustainable ranch operations and those efforts are supported by the public at-large.

## **Ducks Unlimited Collaboration and Partnerships on Montana's Landscape**

**Bob Sanders, Manager of Conservation Programs – Montana, Ducks Unlimited, Inc.**

Ducks Unlimited, in collaboration with its many federal, state, NGO and private partners has delivered over 200,000 acres of habitat conservation in Montana since 1984. As most of these acres have been and will continue to be on private lands, being able to work with private landowners is paramount. Delivering private land conservation involves four basic components: 1) knowing the landscape and the needs of the wildlife species you are targeting, 2) having the technical skills to deliver projects that create, restore and protect those habitat values, 3) understanding and connecting with the human communities and the individuals that make up those landscapes and, 4) having the leadership, funding sources and inspired dedication to drive yourself and others to achieve mutually beneficial conservation goals.

## **Communities, Economics, and Conservation**

**Greg Neudecker, State Coordinator, MT Partners for Fish and Wildlife Program, U.S. Fish and Wildlife Service**

Private lands conservation in Montana has progressed from a mindset of buying isolated parcels of private lands and micro managing each individual tract to one that focuses on high priority landscapes using conservation easements and stewardship practices. This change has also included adjustments for agencies and conservation groups to move a single individual or agency approach to one that is partnership centric focusing on both the natural and human components of conservation. As the science of private lands wildlife biology has evolved, the picture being painted is one of fish and wildlife species population's dependence on large intact landscapes. With over sixty percent of Montana in private ownership it is incumbent upon biologists to look beyond public lands and build relationships with private landowners. The biology requires us not just work with individual private landowners but linking multiple private landowners across a large landscape that often includes a mixture of public lands. As conservationists we would do well to embed ourselves in local rural communities and adopt a "neighboring up" mentality in high priority landscapes that focuses on the triple bottom line (communities, economics and conservation) if we are going to be successful.

## **American Prairie Reserve's Land Conservation Project**

**Damien Austin, VP and Reserve Superintendent of American Prairie Reserve**

Damien will be discussing what American Prairie Reserve is and how they are building the largest land conservation project in the lower forty-eight states. Leveraging philanthropy and utilizing private property rights to construct a 21st Century protected area, to preserve an ecosystem and expand public access.

# CONCURRENT SESSION SCHEDULES

| <b>Thursday Morning, February 6th</b> |   |  |
|---------------------------------------|---|--|
|                                       | <b>CONCURRENT SESSION A: Copper 3</b><br><b>Moderator: Abby Dresser</b>   | <b>CONCURRENT SESSION B: Copper 4&amp;5</b><br><b>Moderator: Robert Garrott</b>  |
| 8:20                                  | C. Meny - Integrated Monitoring in Bird Conservation Regions (IMBCR) - Avian Monitoring for Management and Conservation         | **E. Flesch - Evaluating Bighorn Sheep Restoration Using Genomics  |
| 8:40                                  |   | **T. Hayes - Effects of Wildfire and Logging on Forage Availability and Mule Deer Habitat Selection                        |
| 9:00                                  | H. Specht - An Interactive Web Tool for Deciding Between Possible Occupancy Study Designs for Rare and Cryptic Species          | ** C. Peterson - Predator Avoidance by Partially Migratory Mule Deer   |
| 9:20                                  | T. Graves - Western Bumble-Bee Declines in U.S. and Sample Design for Filling Range-Wide Information Gaps                       | **E. Pero - Polygyny, Parturition, and Calf Survival in a Translocated Eastern Elk ( <i>Cervus canadensis</i> ) Population |
| 9:40                                  | E. Berman - Performance and Trend of Remotely-Sensed Forage Phenology and Productivity Metrics Across the Western United States | **S. Pannoni - Microbiome Analysis Enables Future Non-Invasive Wildlife Monitoring of Rocky Mountain Elk Populations       |
| <b>10:00</b>                          | <b>BREAK</b><br><b>Moderator: Mike McTee</b>  | <b>BREAK</b><br><b>Moderator: Kate Stone</b>   |
| 10:20                                 | J. Coltrane - Fisher Occupancy Twenty-Five Years After Translocation in the Rocky Mountains of Montana                          | M. Yarnall - Quantifying Elk Aggregation from GPS, Satellite, and UAS Data on the National Elk Refuge                      |
| 10:40                                 | ** J. Krohner - Finding Fishers: Factors Affecting Fisher Distribution in the Northern Rocky Mountains                          | W. Janousek - Drivers of Elk Aggregation on the National Elk Refuge  |
| 11:00                                 | **N. Bowersock - Do American Black Bears Track Resource Waves in Yellowstone National Park?                                     | B. Lowrey - Behavior-Specific Habitat Models as a Tool to Inform Ungulate Restoration                                      |
| 11:20                                 | **K. Eneas - Influence of Livestock on Grizzly Bear Habitat Selection   | J. DeVoe - A Home on the Prairie? Restoration Potential of Bighorn Sheep in Montana's Prairie Region                       |
| 11:40                                 | **E. Nunlist - Grizzly Bear and Human Use at Moth Aggregation Sites, Wyoming  | W. Sarmiento - Seeking Snow and Breathing Hard: Behavioral Tactics in Mountain Goats to Combat Warming Temperatures        |
| <b>12:00PM</b>                        | <b>LUNCH</b>  | <b>LUNCH</b>   |

**\*\* Student Presenter**

## CONCURRENT SESSION SCHEDULES – CONTINUED

| <b>Thursday Afternoon, February 6th</b> |   |   |
|---|---|---|
|   | <b>CONCURRENT SESSION A: Copper 3</b><br><b>Moderator: Teagan Hayes</b>                                 | <b>CONCURRENT SESSION B: Copper 4&amp;5</b><br><b>Moderator: Kim Szcodronski</b>  |
| 1:20                                    | R. Newbury - Seasonality of Bobcat Resource Selection   | **E. Leipold - Estimating Abundance of Dusky Grouse for Population Monitoring   |
| 1:40                                    | J. Kuntz - Grassland Ghosts: Keeping an Eye on the Reintroduced Swift Fox 2018 International Census     | **E. Gelling - Microhabitat Selection by Reproductive State in Greater Sage-Grouse  |
| 2:00                                    | S. Sells - Gray Wolves Select Territories Economically  | **J. Helm - Modeling the Effects of Habitat, Livestock Grazing, and Climate on Greater Sage-Grouse Population Dynamics in Central Montana |
| 2:20                                    | S. Sells - Mechanisms Influencing Pack Size in Gray Wolves  | **L. Macon - Using Ecological Site Condition to Evaluate Habitat Selection by Sharp-Tailed Grouse Broods                                  |
| 2:40                                    | W. Kasworm - Grizzly Bear Population Augmentation in the Cabinet Mountains of Northwest Montana         | J. Smith - Sage-Grouse: Fine-Scale Specialist or Shrub-Steppe Generalist?   |
| <b>3:00</b>                             | <b>BREAK</b><br><b>Moderator: Paul Santavy</b>  | <b>BREAK</b><br><b>Moderator: Kristina Smucker</b>  |
| 3:20                                    | K. Szcodronski - Scavengers of Southwest Montana and their Potential Impact on Brucellosis Transmission | **A. Eleftheriou - Interspecific Competition and Seasonality Correlate with Determinants of Hantavirus Transmission in Deermice           |
| 3:40                                    | M. McTee - The Continental-Scale Implications of Point-Source Lead Exposure in Golden Eagles            | **B. Tornabene - Stress Hormones Mediate Tradeoffs Between Survival and Growth for Amphibians Exposed to Increased Salinity               |
| 4:00                                    | K. Stone - Bring Me a Carcass! The Gift of Reciprocal Giving on Private Lands in the Bitterroot Valley  | **R. Robinett - Assessment of Sympatric Turtle Populations and Movements in Relation to an Irrigation Barrier on Pryor Creek              |
| 4:20                                    | K. Stone - Straight From the Horse's Mouth (Landowner Panel)  | **S. Hilty - Characterizing Summer Roosts of Male Little Brown Myotis in Lodgepole Pine-Dominated Forests                                 |
| <b>4:40</b>                             | <b>ADJOURN</b>  | <b>ADJOURN</b>  |

**\*\* Student Presenter**

## CONCURRENT SESSION SCHEDULES – CONTINUED

| <b>Friday, February 7th</b> |  |   |
|-----------------------------|--|---|
|                             | <b>CONCURRENT SESSION A: Copper 3</b><br><b>Moderator: Ray Vinkey</b>  | <b>CONCURRENT SESSION B: Copper 4&amp;5</b><br><b>Moderator: Drew Henry</b>   |
| 8:20                        | S. Barta - Montana Rangeland Resources Program   | R. Williamson - Looking Back at 19 Years of Mule Deer Adaptive Management in FWP Region 6   |
| 8:40                        | A. Wood - Learning From Your Mistakes: A New Approach to Conservation Partnerships                                     | K. Plourde - CRP and FWP: The Past, Present, and Future of FWP Collaboration with the Conservation Reserve Program                          |
| 9:00                        | K. Tempel - The Flathead River to Lake Initiative: Diverse Partners Effectively Collaborating to Save a River Corridor | T. Ritter - To Beaver or Not To Beaver: Strategies for Beaver Management on Private Lands   |
| 9:20                        | W. Schwab - Mount Dean Stone Planning for Growth and Balancing Use at the Edge of the City                             | B. Lowrey - The Montana Big Game Migration and Seasonal Range Mapping and Research Initiative   |
| 9:40                        | C. Sime - By Thinking Outside the Box, Mitigation Conserves Working Private Lands                                      | L. Hanauska-Brown - Bison Conservation and Management in Montana, What FWP's Decision on the Final Statewide EIS Means and What it Does Not |
| <b>10:00</b>                | <b>ADJOURN</b>   | <b>ADJOURN</b>  |



# CONCURRENT SESSION AND POSTER ABSTRACTS

## Alphabetical by Presenter's Name

\*Indicates Presenter

\*\*Indicates Student Presentation

### **MONTANA BRAT: AN ONLINE TOOL FOR ASSESSING BEAVER DAM CAPACITY AND SUITABILITY IN MONTANA STREAMS (POSTER)**

Heidi Anderson\*, Montana Natural Heritage Program, Spatial Analysis Lab, University of Montana, Missoula, MT

Braden Burkholder, Montana Natural Heritage Program, University of Montana, Helena, MT

Claudine Tobalske, Montana Natural Heritage Program, Spatial Analysis Lab, University of Montana, Missoula, MT

Linda Vance, Montana Natural Heritage Program, University of Montana, Missoula, MT

The Beaver Restoration Assessment Tool, originally developed by the Wheaton Lab at Utah State University, is a planning tool designed to evaluate a stream's potential to support beaver dams, whether build by beavers or by humans in the form of beaver dam analogs (BDAs). It operates at a drainage network level to assess dam capacity and the potential risks that dams might pose to infrastructure (e.g., roads, bridges) or natural and human resources. The Montana Natural Heritage Program has adapted the USU BRAT model to run with Montana-specific data sets, and has turned it into an ArcGIS Onlone interactive tool for easy use by managers and planners. The poster presents the background and assumptions of BRAT, and demonstrates how it can be used to identify opportunities and risks associated with beaver conservation and restoration or BDA installation.

### **MONTANA RANGELAND RESOURCES PROGRAM**

Stacey Barta\*, Conservation and Resource Development Division, DNRC, Manhattan, MT

1977 legislation created the Rangeland Resources Program (RRP) MCA 76-14-102. The purpose is to establish a program of whereby; the importance of Montana's rangeland with respect to livestock, forage, wildlife habitat, high-quality water production, pollution control, erosion control, recreation, and the natural beauty of the state is recognized; cooperation and coordination of range management activities between persons and organizations charged with or having the management of rangeland, whether private or public, can be promoted and developed; and those who are doing exceptional work in range management can receive appropriate recognition. The program is guided by 6 ranchers from across Montana whom serve at the pleasure of the Governor. The Coordinator has specific roles outlined in 76-14-105, to serve as an advisor, counselor, and coordinator for and between persons and agencies involved in range management; strive to create understanding and compatibility between the many users of rangeland, including sportsmen, recreationists, ranchers, and others; promote and coordinate the

adoption and implementation of sound range management plans to minimize conflicts between governmental agencies and private landowners; participate in zoning and planning studies to insure that native ranges are adequately represented at sessions for development of zoning and planning regulations; and coordinate range management research to help prevent duplication and overlap of effort in this area.

Rangeland Resources Program serves as a credible source of information, unbiased, and non-political. RRP fosters understanding and creates collaborative partnerships to sustain healthy rangelands by building relationships with diverse groups and creating positive relationships proactively working together.

## **PERFORMANCE AND TREND OF REMOTELY SENSED FORAGE PHENOLOGY AND PRODUCTIVITY METRICS ACROSS THE WESTERN UNITED STATES**

Ethan Berman\*, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Tabitha Graves, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Nate Mickle, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Jerod Merkle, Department of Zoology and Physiology, University of Wyoming, Cheyenne, WY  
Aaron Johnston, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT  
Geneva Chong, Northern Rocky Mountain Science Center, U.S. Geological Survey, Jackson Hole, WY

Forage drives many important wildlife habitat, movement, and demographic processes, yet few studies assess the best remote sensing datasets for use in wildlife research and management. We compare phenology and productivity metrics from 10 leading remote sensing datasets against a network of PhenoCam near-surface cameras throughout the Western United States from 2002-2014 to guide users in dataset selection. Overall correlations and mean bias varied substantially by dataset, metric, and land cover. The best performing phenology metrics calculated a date rather than a duration (length of season, duration of spring greenup) with  $R^2$  ranging from 0.04-0.69. Datasets performed best in shrubland, grassland, and deciduous/broadleaf forest land cover types, and weakest in evergreen forests. Productivity metrics performed worse overall than phenology metrics, though some datasets showed strong results in deciduous/broadleaf forests. Using the two best performing datasets with a long historical record, we analyzed changes to growing seasons from 1982-2016 and compared results of the competing datasets. The direction of trend generally agreed but the strength of the trends differed. This study provides the first comprehensive comparison of remote sensing datasets across many important phenology and productivity metrics. We discuss considerations for users to make informed decisions about their data choices.



## **\*\* DO AMERICAN BLACK BEARS TRACK RESOURCE WAVES IN YELLOWSTONE NATIONAL PARK?**

Nathaniel R. Bowersock\*, Department of Ecology , Montana State University, Bozeman, MT  
Andrea R. Litt, Department of Ecology, Montana State University, Bozeman, MT  
Kerry A. Gunther, Yellowstone Bear Management Office, National Park Service, Yellowstone National Park, WY  
Jerod A. Merkle, Wyoming Coop Unit, University of Wyoming, Laramie, WY  
Frank T. van Manen, Interagency Grizzly Bear Study Team, United States Geological Survey, Bozeman, MT

American black bears (*Ursus americanus*) are opportunistic omnivores that consume diverse foods, allowing them to maintain a macronutrient diet and optimize body mass gains. During the spring in the Northern Range of Yellowstone National Park, black bears may synchronize their daily movements to resource waves, including when green vegetation reaches peak foraging quality (green wave) and a pulse of neonate elk (*Cervus canadensis*, calving wave). To understand how resource waves might influence black bear movements in spring, we instrumented 8 black bears with GPS collars in 2017 and 2018 and estimated fine-scale resource selection based on used and available locations with integrated step-selection functions. Our findings indicate that black bears selected areas with high forage quality, suggesting they followed the green wave during spring. Although the calving wave was an important covariate associated with black bear resource selection, bears avoided elk calving areas, suggesting that they instead consumed elk calves opportunistically. Due to their smaller body size and lower metabolic needs, black bears might be able to capitalize on the green wave, potentially providing an advantage if grizzly bears (*Ursus arctos*) are better competitors for neonate elk. Given that the distribution of foods may change due to variation in climatic patterns, understanding how black bears use resource waves may be vital, especially if nutrient-rich foods become limited, which could impact the growth and expansion of bear populations in the region.

## **FISHER OCCUPANCY TWENTY-FIVE YEARS AFTER TRANSLOCATION IN THE ROCKY MOUNTAINS OF MONTANA**

Jessy Coltrane\*, Wildlife Division, Montana Fish Wildlife and Parks, Kalispell, MT  
Robert Inman, Wildlife Division, Montana Fish Wildlife and Parks, Helena, MT

The historical distribution of fisher throughout Montana and the northern Rocky Mountains of the United States is uncertain, and most fishers in Montana appear to be descendants from translocated animals originating from the midwestern United States and British Columbia; however, a genotype that is unique and native to the Northern Rockies of Idaho and Montana exists in west-central Montana. Predictions based on Idaho models depict potential suitable habitat for fishers throughout the Cabinet Mountains of northwest Montana, yet distribution, occupancy and population status is currently unknown for these fishers. We conducted the first comprehensive monitoring of fishers in the Cabinet Mountains of Montana using baited camera/DNA stations. We detected fishers at 7 out of 21 cells, which resulted in a 0.43 probability that fishers occupied a grid cell. Detection probability was low, but increased slightly throughout the sampling periods. Genetic analysis revealed a minimum population count of 4-6 individual fishers in the study area, but all individuals successfully identified were males and of

midwestern genetic origin. The low number of fisher detections may indeed reflect low abundance of fisher, yet these results also raise questions about our study design and sampling regime. We recommend future monitoring to increase precision of the occupancy estimate and determine the reason for a lack of female detections. We also recommend maintaining a closed trapping season on fisher, until data exists to indicate a population large enough to sustain harvest.

## **EXPERIMENTAL MAPPING OF GREAT BLUE HERON COLONIES IN IMPORTANT BIRD AREAS USING SATELLITE IMAGERY (POSTER)**

Boaz Crees\*, Montana Audubon, 1515 6<sup>th</sup> Ave., Helena, MT 59601

Amy Seaman, Montana Audubon, P.O. Box 595, Helena, MT 59624

Bryce Maxell, Montana Natural Heritage Program, 1515 6<sup>th</sup> Ave., Helena, MT 59601

The Great Blue Heron is a species of concern in Montana that has seen significant population decline of 2.2% per year between 1966 and 2010 and is vulnerable to human disturbance and habitat loss. They are an important indicator species as they rely on healthy, productive riparian systems for foraging and nesting. Great Blue Herons are colonial nesters that typically nest in mature cottonwood galleries along major river and stream corridors. They prefer to nest in areas with little human disturbance and low road density, and often abandon colonies when disturbed during the egg laying and incubation stages. Colonies are also sometimes abandoned as a result of tree mortality. Since Great Blue Herons establish nesting colonies in relatively remote areas, often dozens of miles apart, it can be logistically challenging and costly to survey them. We wanted to determine whether it is possible to effectively survey colonies in Montana using high-resolution satellite imagery. We used Google Earth to systematically survey 4 Important Bird Areas and found that many colonies are clearly visible and relatively easy to detect using this method. To assess search efficacy, we conducted a “blind” search and then compared the findings to known colony locations. In a short time, we were able to identify nearly all known colonies. Additionally, we documented several unreported colonies using this simple, accessible method. This demonstrates that using imagery to survey remotely may be a viable alternative to costly aerial surveys and a reliable way to monitor long-term population trends.

## **A HOME ON THE PRAIRIE? RESTORATION POTENTIAL OF BIGHORN SHEEP IN MONTANA’S PRAIRIE REGION**

Jesse DeVoe\*, Ecology Department, Montana State University, Bozeman, MT

Blake Lowrey, Ecology Department, Montana State University, Bozeman, MT

Kelly Proffitt, Wildlife Division, Montana Fish, Wildlife and Parks, Bozeman, MT

Robert Garrott, Ecology Department, Montana State University, Bozeman, MT

Efforts to recover Montana’s bighorn sheep (*Ovis canadensis*) have focused primarily in the mountainous western region; however, rugged areas in the eastern prairie region were historically occupied by bighorn sheep. Currently, only 4 populations exist in this region and are some of the state’s most abundant and stable populations. We predicted that potential habitat and restoration

opportunity likely exists in the prairie. We used GPS collar data collected during 2014--2018 from 2 bighorn sheep populations located along the Missouri River in Montana to estimate a resource selection model. We first extrapolated model predictions across Montana's prairie region to understand the spatial distribution of predicted habitat and restoration potential of bighorn sheep. Second, within an estimate of bighorn sheep historic range, we estimated the abundance of bighorn sheep that the predicted habitat could potentially support. Resource selection was most strongly associated with terrain slope and ruggedness, canopy cover, and an NDVI metric. Within currently unoccupied areas of the historic range, the model predicted 7,211 km<sup>2</sup> of habitat, with about half (55%) managed by public land agencies. We estimated that these unoccupied areas of habitat could support 1,327--3,457 bighorn sheep, an increase in the abundance of Montana's prairie bighorn sheep of 1.9--3.2 times. Our results demonstrate substantial potential for restoration opportunities of bighorn sheep in eastern Montana. Broad restoration of bighorn sheep across the prairie region would likely require strong collaboration among and between public resource managers and private landowners given the heterogeneous landownership patterns.

## **\*\* INTERSPECIFIC COMPETITION AND SEASONALITY CORRELATE WITH DETERMINANTS OF HANTAVIRUS TRANSMISSION IN DEERMICE**

Andreas Eleftheriou \*, Wildlife Biology Program, University of Montana, Missoula, MT

Amy J Kuenzi, Biology, Montana Tech, Butte, MT

Angela D Luis, Ecosystem and Conservation Sciences, University of Montana, Missoula, MT

Infectious wildlife diseases are becoming more common, causing population declines and species extinctions. Ecological and environmental factors can influence disease spread in wildlife, through effects on parasite transmissibility (regulated by host immunity), and contact rates. These factors can induce chronic stress, which can depress host immunity, and thus influence disease spread. Glucocorticoids are hormones, which are called fecal corticosterone metabolites (FCMs) when excreted in feces, and are typically used to measure chronic stress. Sin Nombre virus (SNV) is carried by deermice (*Peromyscus maniculatus*), and in western Montana grasslands, deermice compete with voles (*Microtus* spp.) and shrews (*Sorex* spp.). Because voles are dominant over deermice, they could increase SNV prevalence in deermice via stress-induced immunosuppression and/or alteration in contact rates, while shrews may have a lesser effect. Seasonal changes in these same measures may explain higher SNV transmission typically observed in spring/summer. We live-trapped small mammals over 2 years in western Montana grasslands and evaluated deermice for scar numbers (proxy for contact rates), demography, and body condition scores (BCSs; another measure of chronic stress). Deermouse blood was evaluated for white blood cell (WBC) counts/differentials, and SNV antibodies, and feces for FCMs to measure stress (baseline and stress-induced). Using mixed effect regression trees, we found that higher vole density was correlated with lower BCSs and scar numbers. Higher shrew density was correlated with lower stress-induced FCMs, lower BCSs, and higher scar numbers. Neutrophil/lymphocyte (N/L) ratios (another measure of chronic stress) were highest in spring/summer and WBC counts (a measure of immunity) were lowest during the summer. Due to low SNV prevalence, we could not evaluate effects on infection. Interspecific competition may influence SNV spread via effects on chronic stress (i.e. lower stress-induced FCMs and BCSs), and scar numbers. Higher N/L ratios in spring/summer, suggestive of chronic stress, and lower WBC counts in summer, suggestive of immunosuppression, may provide an ideal time for SNV transmission. Our findings may extend to other directly-transmitted wildlife diseases.

## **\*\* INFLUENCE OF LIVESTOCK ON GRIZZLY BEAR HABITAT SELECTION**

Kari Eneas\*, Wildlife Biology Program, University of Montana; Confederated Salish Kootenai Tribes Wildlife Management Program, Polson, MT

When encounters between carnivores, livestock and humans result in conflict or livestock depredation, the safety of both wildlife and humans are at risk. Reducing livestock depredation by grizzly bears (*Ursos arctos*) is crucial to the continued recovery of the species. We used 5 years of grizzly bear location data in the Mission Valley, Montana, to analyze habitat selection. Bear use indicated preference to areas in closer proximity to streams and wetlands than to livestock sites. Bears also showed a positive association with the density of homes. Our results showed that livestock were not being selected as a resource by grizzly bears, but also highlighted the importance of protecting livestock near riparian habitats to prevent depredation. These mapping methods can be used to identify how and where electric fencing, bear resistant garbage bins and other conflict mitigation efforts should be focused.

## **\*\* EVALUATING BIGHORN SHEEP RESTORATION USING GENOMICS**

Elizabeth Flesch\*, Ecology Department, Montana State University, Bozeman, MT  
Tabitha Graves, Glacier Field Station, U.S. Geological Survey, West Glacier, MT  
Jennifer Thomson, Animal and Range Sciences Department, Montana State University, Bozeman, MT  
Kelly Proffitt, Wildlife Division, Montana Fish, Wildlife and Parks, Bozeman, MT  
P.J. White, Yellowstone Center for Resources, Yellowstone National Park, Mammoth, WY  
Thomas Stephenson, Sierra Nevada Bighorn Sheep Recovery Program, Bishop, CA  
Robert Garrott, Ecology Department, Montana State University, Bozeman, MT

Wildlife restoration often involves translocation efforts to reintroduce species and enhance genetic diversity of small, fragmented populations. We examined the genomic consequences of bighorn sheep (*Ovis canadensis*) translocations and population isolation, to enhance understanding of evolutionary processes that affect population genetics and inform future restoration strategies. We conducted a population genomic analysis of 511 bighorn sheep from 17 areas, including native and reintroduced populations with contrasting translocation histories. Using the High Density Ovine array, we generated datasets of 6,155 to 33,289 single nucleotide polymorphisms and completed clustering, phylogenetic, and kinship analyses. Our study design maximized insight by employing standardized sampling of bighorn sheep herds, a standardized set of genomic markers, and a suite of contemporary analytical tools. Our analyses determined that most examined populations were isolated from recent, unassisted gene flow, including two pairs of native herds that had past connectivity but were recently fragmented. To identify which augmentation and reintroduction efforts made a genetic contribution, we synthesized genomic evidence across analyses to evaluate 24 different translocation events. We detected five successful augmentations and eight successful reintroductions based on genetic similarity with the source populations. A single native population founded most of the reintroduced herds, suggesting that genetic diversity of founders may have been more important to successful reintroduction than matching environmental conditions. Our results provide insight on genomic distinctiveness of native and reintroduced herds, the relative success of reintroduction/augmentation efforts and their associated attributes, and guidance for genetic rescue augmentations and reintroductions to aid in bighorn sheep restoration.

## **EVALUATING TWO MONITORING METHODS DURING AUTUMN SONGBIRD MIGRATION (POSTER)**

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Margaret M. Blake, Bird Ecology Lab, University of Montana, Missoula, MT  
Debbie S. Leick, Avian Sciences Dept., MPG Ranch, Florence, MT  
Tricia M. Rodriguez, Bird Ecology Lab, University of Montana, Missoula, MT  
Kate R. Stone, Avian Sciences Dept., MPG Ranch, Florence, MT

Migration is an important part of avian life cycles that is not well understood, particularly in the West. Understanding how factors like climate change and habitat condition are affecting migrating populations is limited by our ability to monitor them. We compared two widely used migration monitoring tools to see if they are comparable for detecting apparent abundance. This study evaluated how standard effort mist-netting detections compared to automated recording unit detections. For the 24 species that were detected by both methods, relative abundance was correlated ( $r = 0.60$ ;  $SE\ 0.17$ ). While there is some ability to estimate apparent abundance based on the correlative nature of one method, the target species or project goal may dictate which monitoring method should be applied. Ideally, combining these methods will provide a better and more complementary representation of trends in migrating songbirds.

## **\*\* SNAPPING TURTLE (*CHELYDRA SERPENTINA*) NESTING HABITAT ON A TRIBUTARY OF THE YELLOWSTONE RIVER (POSTER)**

Miranda Gallagher\*, Environmental Science, Rocky Mountain College, Billings, MT

Snapping turtles (*Chelydra serpentina*) are considered a “Species Of Concern” in Montana due to the lack of knowledge of their life history and distribution. Information on turtle home ranges, adult survival, and female nesting locations are critical for understanding the viability of snapping turtle populations. We used geospatial data about snapping turtle movement along Razor Creek (a tributary of the Yellowstone River) and environmental factors (slope, aspect, land use, proximity to water) to map linear home ranges and identify suitable nesting habitat. The study area is at the northwestern-most range edge of the species distribution, where no previous studies have occurred.

Snapping turtle location data and attributes were collected with standardized trapping to document movements, and randomly selected turtles of both sexes were fitted with radio-telemetry tags to facilitate a more comprehensive analysis of habitat use and linear home range sizes. For nest habitat modeling we selected adult female locations during the nesting season (May - June). The resulting datasets were processed using ArcMap 10.5 GIS software. Geoprocessing workflows were then used to identify potential nesting areas based on the following factors known to influence nesting habitat: distance from water, land use, aspect, and slope. Average linear home ranges were longer for females (3,079 m) ( $n = 6$ ) when compared to males (2,914 m) ( $n = 6$ ) but not significantly different. Of the total accessible nesting habitat in our study area, 40% was deemed as “suitable nesting habitat”. Of the total “suitable nesting habitat” area, 58% was located on private lands. This refined area will guide nest searches next spring and hopefully lead to the documentation of the first snapping turtle nests in Montana, a better understanding of nesting habitat, and improved efforts to conserve this species.

## **ESTIMATING POPULATION SIZE OF GRAND CANYON BIGHORN SHEEP WITH SCR (POSTER)**

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Tabitha A. Graves, U.S. Geological Survey, Northern Rocky Mountain Science Center, Glacier Field Station, West Glacier, MT

Brandon Holton, National Park Service, Grand Canyon National Park, Grand Canyon, AZ

Clinton Epps, Oregon State University, Department of Fisheries and Wildlife, Corvallis, OR

Rachel Crowhurst, Oregon State University, Department of Fisheries and Wildlife, Corvallis, OR

Ryan Monello, National Park Service Inventory and Monitoring Network, Pacific Island Network, Hawaii Volcanoes National Park, HI

Desert bighorn sheep are a species of conservation concern and management importance for their symbolism, role as the only ungulate in the desert nutrient cycle, and as a prey and carrion source. The bighorn population in the Grand Canyon (GRCA) represents the largest population managed by the National Park Service on the largest protected habitat on the Colorado Plateau. Bighorn sheep are highly susceptible to pneumonia from contacts with domestic sheep and the occurrence of epizootic pneumonia in GRCA was associated with a significant decline in survey counts between 2011 and 2014. The disease outbreak occurred during a large-scale, multi-year study of bighorn sheep movement and connectivity by sampling fecal pellets. This created an opportunity to conduct the first estimate of bighorn abundance and disease impacts for the entire GRCA. Thirteen hundred samples from five years were genotyped and analyzed with spatial capture-recapture models to estimate abundance while modeling detection and incorporating environmental constraints. We will discuss top models for detection and density, and describe our approaches for accounting for a linear sample design in this population, reducing the size of confidence intervals with auxiliary data, and estimating movement through the system.

## **\*\* MICROHABITAT SELECTION BY REPRODUCTIVE STATE IN GREATER SAGE-GROUSE**

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Aaron C. Pratt, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY

Jeffrey L. Beck, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY

Greater sage-grouse (*Centrocercus urophasianus*; hereafter “sage-grouse”) are the focus of much research and conservation efforts owing to their obligate relationship with sagebrush (*Artemisia* spp.) and dramatic population declines over the last 50 years. Research suggests female survival and chick survival are two of the most important demographic parameters for sage-grouse. In addition, recent research has shown habitat partitioning occurs between broodless (i.e., females without a brood) and brood-rearing females and that broodless females have lower mortality risk than females with chicks. Thus, habitat used by both reproductive states must be considered in management plans. Our study was initiated in spring 2018 in Carbon County, Montana to identify seasonal habitat use and compare landscape and microhabitat characteristics between brood-rearing and broodless females. Identifying differences in habitat use between reproductive states can inform better management to account for all life stages of sage-grouse. We monitored 39 and 43 females captured at 7 leks in 2018 and 2019, respectively, with the use of GPS

transmitters. We monitored 17 broods in 2018 and 21 broods in 2019 until 5 weeks post-hatch. We examined 5-minute locations for females to focus vegetation surveys during different behaviors--day and night roosts and active day locations. We measured vegetation characteristics (e.g., shrub, grass, forb, and ground cover) at 66 early brood-rearing (0--2 weeks post-hatch), 72 late brood-rearing (3--5 weeks post-hatch), 75 broodless locations, and 123 random locations. Understanding female sage-grouse habitat use during both reproductive states will better inform wildlife practitioners to manage habitat for all sage-grouse life stages.

## **\*\* NEST ATTENTIVENESS IN NORTH AMERICA'S LARGEST GROUSE (POSTER)**

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Jeffrey Beck, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY

Understanding nest attentiveness (i.e., amount of time spent incubating) of North America's largest grouse, greater sage-grouse (*Centrocercus urophasianus*, hereafter "sage-grouse"), can be important for conserving populations, as reproductive costs can reduce survival of parents and nest attentiveness can influence nest success. When nesting, parents must allocate their time between incubating and maintenance activities, such as foraging to meet their nutritional demands. Previous research has shown female sage-grouse sustain long stretches of incubation interrupted by relatively short recesses from their nests, but incubation patterns likely differ among females. We initiated our study in 2018 with two objectives: 1) to evaluate what factors influence nest attentiveness, and 2) how nest attentiveness influences nest success by examining duration, number, and timing of recesses, and time spent incubating for successful and unsuccessful nests. We monitored female sage-grouse with GPS transmitters collecting locations every 5 minutes from 0300-2300 MST in Carbon County, Montana in 2018 and 2019 and in Carbon County, Wyoming in 2019. In Montana, we monitored 40 sage-grouse nests (17 hatched, 23 failed) in 2018, and 46 nests (21 hatched, 25 failed) in 2019. In Wyoming, we monitored 50 nests (12 hatched, 38 failed) in 2019. We measured microhabitat vegetation at 81 nests in Montana and 50 nests in Wyoming to determine habitat influences on nest attentiveness. Understanding factors that influence nest attentiveness throughout the incubation period and therefore nest success will add important and novel information to basic sage-grouse nesting ecology.

## **WESTERN BUMBLE BEE DECLINES IN US AND SAMPLE DESIGN FOR FILLING RANGE-WIDE INFORMATION GAPS**

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William Janousek, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Sarah Gaulke, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Amy Nicholas, ES, U.S. Fish and Wildlife Service, Cheyenne, WY  
Doug Keinath, ES, U.S. Fish and Wildlife Service, Cheyenne, WY

In recent decades many bumble bee species have declined due to changes in habitat, climate, and pressures from pathogens, pesticides, and introduced species. The western bumble bee (*Bombus occidentalis*), once common throughout western North America is a species of concern and will be considered for listing by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA). We attempt here to improve the alignment of data collection and

research with USFWS needs to consider redundancy, resiliency, and representation in the upcoming species status assessment. We reviewed existing data and literature on *B. occidentalis*, highlighting priority topics for research. We used existing data to model changes in *B. occidentalis* occupancy from 1998 to 2018. The probability of local occupancy in the continental United States declined by 93% over 21 years from 0.81(95%CRI = 0.43, 0.98) in 1998 to 0.06 (95%CRI = 0.02, 0.16) in 2018. The decline in occupancy varied spatially by landcover and other environmental factors. However, we found considerable spatial gaps in recent sampling, with limited sampling in many regions, including most of Alaska, northwestern Canada, and the southwestern U.S. We therefore propose a sampling design to address these gaps to best inform the ESA species status assessment through improved assessment of the spatial drivers of occupancy changes. Finally, we request involvement via data sharing, participation in occupancy sampling with repeated visits to distributed survey sites, and complementary research to address priorities outlined in this paper.

## **BISON CONSERVATION AND MANAGEMENT IN MONTANA, WHAT FWP'S DECISION ON THE FINAL STATEWIDE EIS MEANS AND WHAT IT DOES NOT**

Lauri Hanauska-Brown, Wildlife Division, Montana Fish, Wildlife and Parks

In 2012, Montana Fish, Wildlife and Parks (FWP) began a process to evaluate opportunities for restoring bison through development of a Programmatic Environmental Impact Statement (EIS). The purpose of this EIS was to determine if bison restoration is appropriate and if so, what opportunities are feasible and consistent within Montana's laws, policies, and regulations. A formal public scoping process identified concerns, opportunities, and stakeholders around the issue of bison as wildlife. Passionate support for and against bison was expressed during public hearings and the working group meetings where sideboards for any restoration effort were developed. FWP finalized a draft EIS in 2015 and in January 2020 released a decision that supports the idea of bison restoration somewhere on the landscape. The decision does not choose any one of the action alternatives over another rather it says bison restoration may be appropriate within well thought out project specific guidelines and with lots of stakeholder involvement. The decision does not select any particular site for a restoration effort rather it provides FWP with great flexibility and lays the framework for future discussions of specific project ideas at specific sites. Completion of the necessary steps to implement any restoration project as required by FWP process will take considerable time for even the smallest of test projects. The decision on the EIS has been misinterpreted, misrepresented and misunderstood much like bison and their status in Montana overall. This talk hopes to clear up at least some of the confusion.



## **\*\* MAMMAL COMMUNITY RESPONSE TO CATTLE GRAZING (POSTER)**

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Joshua Millsbaugh, Department of Ecosystems and Conservation Science, University of Montana, Missoula, MT

Roland Kays, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC

The impacts of cattle (*Bos taurus*) grazing on the environment are complex. Chronic overgrazing may inhibit primary productivity and alter vegetation structure and composition, while moderate grazing may increase the quality of vegetation by stimulating new growth and net primary productivity. Numerous studies have estimated the effects of grazing on wildlife demography and behavior, but few have evaluated the effects of grazing on multitrophic communities. Our objective is to identify how squirrel-sized and larger mammals interact with cattle at varying grazing intensities and how cattle affect the structure of the mammal community. Specifically, we aim to determine whether species richness, occurrence, and behavior of mammal species is influenced by the number of cattle, and whether these potential influences cause changes in interspecific interactions among sympatric mammal species. To answer these questions, we set trail cameras 40-50 cm high, unbaited, at random sites within cattle ranches in western Montana representative of the variation in grazing management practices. Throughout spring, summer, and fall, we set trail cameras for at least 21 days at 75 sites per ranch. We will estimate co-occurrence of all potentially interacting mammal species, using a multispecies occupancy model that accounts for imperfect detection, and evaluate how the presence of cattle affects these interactions. We will also monitor species changes in temporal activity patterns in the presence of cattle. Results will identify how mammal communities respond to cattle grazing, which may offer insight into sustainable coexistence among wild and domestic species.

## **\*\* EFFECTS OF WILDFIRE AND LOGGING ON FORAGE AVAILABILITY AND MULE DEER HABITAT SELECTION**

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Michael S. Mitchell, MT Cooperative Wildlife Research Unit, US Geological Survey, Missoula, MT

In many western forests, anthropogenic disturbance has increasingly replaced wildfire as the predominant source of landscape alteration. Recent declines in mule deer (*Odocoileus hemionus*) population estimates and hunter harvests have been linked to changes in the availability and distribution of nutritional resources in northwest Montana. However, the relationship between the spatial configuration of disturbances and resource selection is not fully understood, particularly for lesser-studied mule deer populations in Montana's northern forests. We conducted a 3-year study to quantify selection of mule deer for forest disturbances from wildfire and logging in the southern Rocky Mountain Front, Cabinet-Salish Mountains, and Whitefish Mountains. We predicted that forage availability would vary with disturbance age and configuration at individual and population scales. We evaluated movements of 131 GPS radio-

collared adult female mule deer and documented forage composition and quantity in disturbed and undisturbed forests in all three study areas. Abundance and configuration of wildfire and harvest varied between study areas, and deer resource selection was influenced by the age and type of disturbance and associated forage response. Determining the factors driving mule deer use of disturbances can help managers identify potential strategies for land management and to identify treatment sizes and configurations that are accessible and beneficial for mule deer.

## **\*\* MODELING THE EFFECTS OF HABITAT, LIVESTOCK GRAZING, AND CLIMATE ON GREATER SAGE-GROUSE POPULATION DYNAMICS IN CENTRAL MONTANA**

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Lorelle Berkeley, Wildlife Division, Montana Fish, Wildlife and Parks, Helena, MT  
Victoria Dreitz, Wildlife Biology Program, University of Montana, Missoula, MT

Access to quality habitat is a key driver of population dynamics for many wildlife species. To direct habitat conservation efforts and to determine if these efforts are successful, habitat models should be linked with population models at local scales. This project addresses this need by providing information about relationships among greater sage-grouse habitat, livestock grazing, and demographic rates in central Montana. This work is based on a collaborative, decade-long effort among multiple resource agencies and private landowners in central Montana. It is led by Montana Fish, Wildlife & Parks and the University of Montana, and data collection is nearly complete. First, we will establish the habitat components that sage-grouse select at each life stage in a local population. We will include both livestock grazing and climate variables that affect greater sage-grouse habitat. Second, we will use a population model to relate habitat components to demographic rates that are known to influence greater sage-grouse population dynamics. We will examine these relationships during multiple life stages and across spatial scales. We will also examine the relationship between demographic rates and lek-based abundance estimates to evaluate lek counts as an indicator of population health. Our effort will identify components of the sagebrush steppe ecosystem in central Montana that are important to the persistence of sage-grouse in this region, and how livestock grazing affects these components. Our findings will be used to evaluate and update sage-grouse habitat conservation strategies and management plans in central Montana.

## **\*\* CHARACTERIZING SUMMER ROOSTS OF MALE LITTLE BROWN MYOTIS IN LODGEPOLE PINE-DOMINATED FORESTS**

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Andrea Litt, Ecology Department, Montana State University, Bozeman, MT  
Bryce Maxell, Program Management, Montana Natural Heritage Program, Helena, MT  
Robert Garrott, Ecology Department, Montana State University, Bozeman, MT  
Claire Gower, Wildlife Division, Montana Fish, Wildlife and Parks, Bozeman, MT  
Lauri Hanauska-Brown, Wildlife Division, Montana Fish, Wildlife and Parks, Helena, MT

Although bat roosts have been well-studied in the eastern United States, we know less about roosts in the west. Western bats may make use of trees and snags, as in the east. However, the topography of the Rocky Mountains provides more exposed rock, and western bat species likely use different roosting features compared to the eastern US. Some western bats use rock features

as autumn and winter roosts, but we know little about use as summer roosts. Additionally, roost studies often focus on maternity colonies, and information on roosts used by male bats is limited. Given that roosting sites may be limiting, we aimed to quantify characteristics of male roosts in lodgepole pine-dominated forests during the summer. We mist-netted for bats during summer 2017 and 2018 and attached transmitters to 34 male little brown myotis (*Myotis lucifugus*). We located at least 1 roost for 20 individuals (average = 1.6 roosts/bat; range = 1 - 5). Although snags were available, most bats roosted in rock features (15% in snags, 85% in rocks). Rock-roosting bats mainly used crevices (85%) instead of rock cavities (15%) and were more likely to select roosts with less canopy cover that were closer to water. They were also more likely to select roosts with wider entrances that provide access to a skyward-facing crevice. These results suggest that rock features may provide important summer habitat for male little brown myotis roosting in lodgepole-dominated forests. Understanding roost selection in these forests will help inform management decisions for conserving western bats.

## **DRIVERS OF ELK AGGREGATION ON THE NATIONAL ELK REFUGE, WY**

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Tabitha Graves, Northern Rocky Mountain Science Center, U.S. Geological Survey, West Glacier, MT  
Aaron Johnston, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT  
Eric Cole, National Elk Refuge, U.S. Fish & Wildlife Service, Jackson, WY  
Sarah Dewey, Grand Teton National Park, National Park Service, Moose, WY  
Geneva Chong, Northern Rocky Mountain Science Center, U.S. Geological Survey, Jackson, WY  
Paul Cross, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT

In North America, diseases in ungulates have elicited increased attention due to direct impact on populations and indirect effects on outdoor recreational industries. Chronic wasting disease (CWD) has been found in 21 US states and 2 Canadian provinces over the last 40 years and is rapidly spreading in Montana. Degree of sociality and aggregation can drive disease spread and transmission. In Wyoming, supplemental feeding of elk during winter occurs on 22 feed grounds, including the National Elk Refuge (NER), and concern that feeding increases elk aggregation and thus disease spread has been rising. However, the comparison of feeding to other factors, including abiotic drivers of aggregation, such as snow levels has been underexplored. The winter of 2017-2018 had relatively high forage and little snow, which led to a rare non-feeding year on the NER, providing a unique opportunity to evaluate the role of feeding in aggregation relative to other conditions. We examined data from 2016 to 2019 for 68 elk fitted with GPS collars resulting in 223,526 elk relocations. We used a proximity index to assess daily joint space use of elk and modeled proximity using beta regression as a function of 13 variables including abiotic weather-related effects, biotic effects such as supplemental feeding and hunting pressure, and aggregation from the prior day. This approach may be useful for assessing management implemented with the intent of reducing aggregation. Mean daily elk aggregation was 1.7 times larger during winters with feeding but was also strongly regulated by snow cover and hunting pressure.

## **GRIZZLY BEAR POPULATION AUGMENTATION IN THE CABINET MOUNTAINS OF NORTHWEST MONTANA**

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Timothy Manley, Wildlife Division, Montana Fish, Wildlife, and Parks, Kalispell, MT  
Kimberly Annis, Wildlife Division, Montana Fish, Wildlife, and Parks, Libby, MT  
Thomas Radandt, Grizzly Bear Recovery, US Fish and Wildlife Service, Libby, MT  
Justin Teisberg, Grizzly Bear Recovery, US Fish and Wildlife Service, Libby, MT  
Hilary Cooley, Grizzly Bear Recovery, US Fish and Wildlife Service, Missoula, MT

The Cabinet Mountains grizzly bear population was estimated at 15 or fewer individuals in 1988 and believed to be declining toward extinction. In response to this decline, a test of population augmentation techniques was conducted during 1990-1994 when four subadult female grizzly bears were transplanted to the area from southeast British Columbia. Two criteria were identified as measures of success: bears must remain in the target area for one year, and bears should ultimately breed with native male grizzly bears and reproduce. Reproductive success of any of the remaining individuals could not be established until 2005 when genetic analysis of hair snag samples collected from 2002-2005 indicated that one of the transplanted bears remained in the Cabinet Mountains and had reproduced. Success of the grizzly bear augmentation test prompted continuation of this effort. The Northern Continental Divide Ecosystem area of north central Montana has been the source of an additional 10 female and 8 male bears transplanted to the Cabinet Mountains during 2005-19. Genetic analysis has determined that two females and one male have produced at least 14 first generation offspring, 19 second generation offspring and 3 third generation offspring. Seven bears are known to have left the target area but two have returned. Six augmentation bears are known dead. Fates and movements of these bears are discussed. The augmentation effort appears to be the principal reason that grizzly bears remain in the Cabinet Mountains today.

## **FINDING FISHERS: FACTORS AFFECTING FISHER DISTRIBUTION IN THE NORTHERN ROCKY MOUNTAINS**

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Joshua Millsbaugh, Boone and Crockett Professor of Wildlife Conservation, Wildlife Biology Program, University of Montana, Missoula, MT  
Paul Lukacs, Wildlife Biology Program, University of Montana, Missoula, MT  
Bob Inman, Wildlife Division, Montana Fish, Wildlife and Parks, Helena, MT  
Joel Sauder, Diversity Biologist, Idaho Department of Fish and Game, Lewiston, ID  
Mike Mitchell, Unit Leader, Montana Cooperative Wildlife Research Unit, Missoula, MT  
Justin Gude, Wildlife Division, Montana Fish, Wildlife and Parks, Helena, MT

The Northern Rocky Mountain (NRM) fisher population (*Pekania pennanti*) is of special concern to conservation and management professionals and has been petitioned for listing as threatened under the Endangered Species Act. In partnership with Montana Fish, Wildlife & Parks and the Idaho Department of Fish and Game, we assessed the current distribution of fishers across their Northern Rocky Mountain range through a large-scale, multi-state baited camera and hair snare study. In the winter of 2018/19 we deployed baited remote cameras and hair snare stations in randomly selected grid cells containing plausible fisher habitat throughout Washington, Idaho and Montana, spanning the purported geographic range of the NRM fisher population. We used

single-species, single-season occupancy modelling while considering several covariates that might contribute to their distribution such as existing fisher habitat models, site-level habitat characteristics, distance from population centers, the influence of past translocation sites and the effect of harvest, to estimate occupancy and detection probabilities of fishers across their NRM range. By incorporating our understanding of fisher habitat with contemporary analytical techniques, we estimated the current distribution of fishers in the northern Rockies and addressed the primary uncertainties about drivers of fisher distribution. The results of our project will help Idaho and Montana effectively prioritize areas for future fisher conservation in the hopes of maintaining the distribution of fishers across suitable habitat in the Northern Rocky Mountains.

## **GRASSLAND GHOSTS KEEPING AN EYE ON THE REINTRODUCED SWIFT FOX 2018 INTERNATIONAL CENSUS**

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Axel Moehrensclager, Center for Conservation Research, Calgary Zoological Society, Calgary, Canada  
Heather Harris, Wildlife Division, Montana Fish, Wildlife and Parks, Glasgow, MT

Swift Fox (*Vulpes velox*) were extirpated from Canada in 1938 and in Montana in 1969, largely due to federal eradication campaigns in the 1930s targeting coyotes and wolves. Reintroduction efforts in Canada occurred from 1983 until 1997. By 2001, swift fox were thought to be established in Northern Montana. In Montana, survey efforts began in 2000/2001, then repeated in 2005/2006, 2014/2015, and most recently the summer of 2018. Surveys in the winter of 2014/2015 consisted of two methods, live trapping and camera trapping. The goal was to determine changes in demography and distribution, but also to assess the feasibility of switching exclusively to camera traps for future survey efforts. There was little difference in detection probability between the two methods suggesting camera trapping is an effective alternative to live trapping. This resulted in only camera trapping being used for the 2018 census. Analysis comparing occupancy between 14/15 and 2018 showed that swift fox populations in the sampling area remained stable and relatively unchanged despite the harsh winter of 2017/2018. Through a finer scope, the Montana populations seem to have experienced a slight increase. The swift fox population in Canada and northern Montana is interdependent and continued collaboration for monitoring across jurisdiction and boundaries is important. Management of swift fox in Montana will continue to follow the Swift Fox Conservation Strategy.

## **\*\* ESTIMATING ABUNDANCE OF DUSKY GROUSE FOR POPULATION MONITORING**

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Claire Gower, Wildlife Division, Montana Fish, Wildlife and Parks, Bozeman, MT  
Lance McNew, Department of Animal and Range Sciences, Montana State University, Bozeman, MT

Dusky grouse (*Dendragapus obscurus*), are a forest grouse species found throughout mountainous regions of western Montana. Despite being a game species, population monitoring has been inconsistent in recent years. Our objective is to develop, test, and evaluate sampling and statistical methods for unbiased population monitoring to inform management. We developed a spatially explicit model of dusky grouse relative habitat suitability in Montana to

identify suitable survey sites for population monitoring. Prior to sampling in the field, we conducted statistical simulations to evaluate efficacy of potential survey protocols. Results from the simulations suggested that a minimum of 100 independent sites surveyed three times within a period of closure had the potential to yield unbiased and reasonably precise estimates for regional population abundance. During a pilot study in 2019, we conducted surveys during two sampling periods, spring and summer, within Montana, Fish, Wildlife, and Parks administrative region 3. Field methods included point counts with and without the use of electronic playback and walking transect surveys. We used N-mixture models and distance sampling to estimate abundance, density, and detection for each of the survey methods in each sampling period. We observed significantly more grouse during spring surveys than summer surveys, which yielded more precise estimates of abundance and density. The use of electronic playback calls increased detection probability during spring surveys but had no effect on summer detectability. Future work includes evaluating current and other potential survey protocols using simulations and estimates produced from the pilot study.

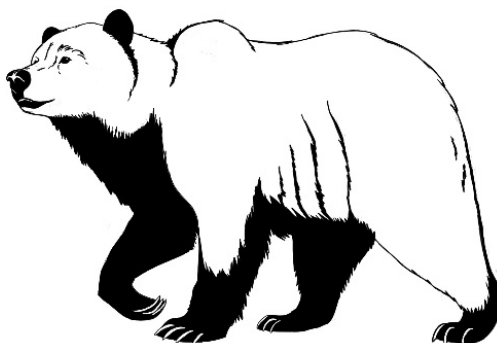
**\*\* HELP WANTED: VOLUNTEER OBSERVERS NEEDED FOR MOUNTAIN GROUSE POPULATION STUDY (POSTER)**

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Lance McNew, Department of Animal and Range Sciences, Montana State University, Bozeman, MT

Montana State University in conjunction with Montana, Fish, Wildlife, and Parks is developing a population monitoring program for mountain grouse. Species of interest include dusky and ruffed grouse, which are found in montane conifer forests throughout western Montana. Males of both species engage in courtship displays during spring that increase the probability of detecting an individual. Dusky grouse produce a hooting noise that can be heard within 50-100 meters and ruffed grouse produce a drumming noise that is audible up to 200 meters. We are looking for volunteers interested in assisting with surveys during the sampling period. Surveys will occur between 25 April-25 May during early morning hours. Survey methods may include point counts and walking transect routes that occur along forest service roads or trails. Point counts will consist of going to multiple locations (5) along a survey route and recording all grouse detections within a 4-minute time period. If interested in spending a few mornings this spring hiking and looking or listening for mountain grouse, please let us know!



## **THE MONTANA BIG GAME MIGRATION AND SEASONAL RANGE MAPPING AND RESEARCH INITIATIVE**

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Kelly Proffitt, Wildlife Division, Montana Fish, Wildlife and Parks, Bozeman, MT  
Nick DeCesare, Wildlife Division, Montana Fish, Wildlife and Parks, Missoula, MT  
Justin Gude, Wildlife Division, Montana Fish, Wildlife and Parks, Helena, MT

For the last 15 years, Montana Fish Wildlife and Parks and collaborators have been deploying GPS collars across the state to help address local and regional management and research objectives. The continuous capture and instrumentation efforts have resulted in large and ever-growing spatial data sets for elk, mule deer and pronghorn. For elk in particular, the aggregated datasets now include over 850 individuals sampled from over 20 populations and nearly 10 million GPS locations. Montana Fish, Wildlife and Parks recently prioritized a broad effort to delineate migration routes and seasonal ranges of elk, mule deer and pronghorn using rigorous methodologies that account for varied terrain, habitat, and big game migration behaviors across the state. This effort has been bolstered by Secretarial Order 3362, which mandated that Department of Interior bureaus work with state wildlife agencies to enhance and improve habitat quality of big game winter range and migration corridors. The broad mapping effort and associated new research will help fulfill local information needs as well as contribute towards regional coordinated mapping efforts across the western US. Spatial files and maps from the mapping effort will be made available to Fish, Wildlife and Parks staff and the public. Our talk will provide an overview of the aggregated data sets to be used in the mapping effort, initial data summaries of migratory behaviors and land ownership use, and the planned methods to delineate migratory corridors and seasonal ranges.

## **BEHAVIOR-SPECIFIC HABITAT MODELS AS A TOOL TO INFORM UNGULATE RESTORATION**

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GPS data is broadly used in wildlife research and management to construct habitat models and can help to inform translocation efforts. However, for species with both resident and migratory behaviors, a single population habitat model may not predict the varying selection patterns of residents and migrants as well as separate resident and migrant habitat models. Moreover, through developing behavior-specific habitat models managers can strategically target source populations with the behaviors that best match the landscape attributes of the areas being restored. Such targeted translocations may increase translocation success and help to build diverse migratory portfolios in restored populations. We used resource selection functions to develop an annual resident model as well as summer and winter migrant models using GPS locations from female bighorn sheep in eight (resident = 2, migrant = 6) populations that were broadly distributed across western Montana. We extrapolated each model with the purpose of generating broad spatial predictions of bighorn sheep habitat and informing future translocations. Terrain and landscape covariates most strongly influenced resource selection for both behaviors in all seasons. The habitat predictions from the annual resident and winter migrant model strongly overlapped on rugged and steep slopes at low to

mid elevations across western Montana. The habitat predictions from the summer migrant model were largely nonoverlapping with residents and broadly distributed across high elevations. Our behavior-specific habitat extrapolations across western Montana serve as a tool to inform future translocations into new areas or expand the distribution and migratory portfolio of existing populations.

## **\*\* USING ECOLOGICAL SITE CONDITION TO EVALUATE HABITAT SELECTION BY SHARP-TAILED GROUSE BROODS**

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Brood survival, an important vital rate affecting population viability of sharp-tailed grouse, is largely determined by the selection of brood-rearing habitats by females. The abundance and quality of brood-rearing habitat is often influenced by land management decisions. Thus, improper rangeland management may lead to habitat degradation and impair sharp-tailed grouse populations. Many rangeland management decisions affecting brood habitats (e.g., livestock grazing, prescribed burning) are based on the type and condition of ecological sites in rangelands. However, associations between brood habitat use and ecological site condition have not been evaluated. We examined habitat selection of brood-rearing females in eastern Montana using radio-marked hens. We stratified our field sampling based on pre-existing ecological site maps prepared by the USDA-NRCS. We assessed the condition of each ecological site polygon by comparing the current plant community composition to the historic climax plant community composition (i.e., similarity index) across our study area. We then evaluated selection ratios of radio-marked brood hens in relation to ecological sites and their similarity index. We found that when selecting a home range, the interaction between ecological site type and similarity index was important. When selecting habitat within their home ranges, females selected for sites with a lower similarity index. We found little evidence that ecological site type was a driver of habitat selection once females had selected a home range. Our results provide useful information on brood habitat selection relative to habitat assessment frameworks used by rangeland managers and have implications for the management of sharp-tailed grouse brood habitats.

## **THE CONTINENTAL-SCALE IMPLICATIONS OF POINT SOURCE LEAD EXPOSURE IN GOLDEN EAGLES**

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Lead poisoning threatens many species of raptors, including golden eagles (*Aquila chrysaetos*). Much of this lead likely comes from bullet fragments that remain in carrion after hunting. The likelihood of lead exposure in golden eagles may peak when migratory and nonmigratory birds congregate in the fall and winter. From 2011 to 2018 in western Montana, we captured 91 golden eagles in the winter, tested their blood lead levels (BLL), and outfitted a subset of birds (n = 30)

with GPS transmitters to determine their migratory status. Nearly all golden eagles (94.5%) had elevated BLL ( $\geq 10 \mu\text{g dL}^{-1}$ ), and eight of them had BLL at or above concentrations expected to cause clinical lead poisoning. Blood lead levels decreased as the winter progressed because hatch-year and juvenile birds tended to have lower BLL later in the season. At least two-thirds of the golden eagles equipped with GPS transmitters migrated northward, spending the summer throughout Alaska and northwestern Canada. Blood lead levels did not differ between migratory and nonmigratory golden eagles. Overall, we show that elevated BLL are widespread among golden eagles overwintering in western Montana, regardless of sex, age, and whether they migrate.

## **INTEGRATED MONITORING IN BIRD CONSERVATION REGIONS (IMBCR)- AVIAN MONITORING FOR MANAGEMENT AND CONSERVATION**

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The 2019 field season marks the 10th consecutive year of statewide implementation of the Integrated Monitoring in Bird Conservation Regions program (IMBCR) in the state of Montana. Today, the IMBCR program represents the second largest breeding landbird monitoring program in the US. IMBCR is made possible via a broad partnership of government and non-government agencies from the Great Plains to the Intermountain West. The randomized, hierarchical sampling design allows for sampling on private and public lands and within all vegetation types. The sampling framework allows for inference about avian populations at multiple scales, from a National Forest or Bureau of Land Management field office, up to the regional level. Using a spatially-balanced, hierarchical study design, the IMBCR program provides density and occupancy estimates for bird species at various spatial extents across the western U.S. Managers can use these baseline estimates and habitat-specific information for project-level planning and environmental assessments. The IMBCR program also provides context for targeted monitoring in project areas to evaluate impacts of land-use change or conservation actions. We highlight several case studies where short-term monitoring efforts leverage the long-term IMBCR data to evaluate avian response to land management practices.

## **SEASONALITY OF BOBCAT RESOURCE SELECTION**

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Home range size of bobcats varies by sex, season, and latitude, with bobcats reducing home range size in winter. Additionally, bobcats may shift habitats seasonally, but may also reduce movements to conserve energy in winter. We found that bobcats on the Flathead National Forest, Montana seasonal home ranges did not change size significantly for all bobcats pooled; thus, bobcats did not reduce winter home range size as compared to other seasons. For all bobcats combined, winter home ranges ( $N = 3$ ) were  $65.3 \pm 37.5 \text{ km}^2$ , spring home ranges ( $N = 5$ )

were  $74.2 \pm 16.7 \text{ km}^2$ , summer home range ( $N = 4$ ) were  $81.4 \pm 13.9 \text{ km}^2$ , and fall home ranges ( $N = 4$ ) were  $72.0 \pm 10.9 \text{ km}^2$ . Bobcats significantly reduced daily movement distances dependent on season, specifically reducing movement distances in winter and increasing movements summer. Habitat selection differed significantly for both 2nd order (home range to study area) and for 3rd order habitat selection (GPS locations to home range), but did not differ across seasons, or for the interaction of 2nd and 3rd order selection\*season. Specifically, habitat selection differed with burned and wetland habitats being avoided, and lodgepole and dry site mixed species coniferous stands being preferred. Bobcats on the Flathead exhibited seasonal movements comparable to Canada lynx. If bobcats were typical of the broader population, bobcats in northwest Montana may demonstrate a mixture of behaviors characteristic of both bobcats and lynx that allow them to be successful in deep winter snows of this region.

## **\*\* GRIZZLY BEAR AND HUMAN USE AT MOTH AGGREGATION SITES, WYOMING**

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The objective of our study was to quantify human-bear interactions associated with moth aggregation sites in the greater Yellowstone ecosystem. Our field work was conducted during the summers of 2017 and 2018, and focused on two of the most human-accessible sites within the Shoshone National Forest, Wyoming. Occupancy surveys of grizzly bears (*Ursus arctos horribilis*) were conducted and evaluated using a resource selection function to quantify bear use patterns. Human use was quantified through trailhead monitoring, peak log entries, and opportunistic documentation. Interactions were documented through written or verbal surveys at peaks and trailheads. GPS tracking units were distributed at trailheads to quantify human use patterns. Bear and human use patterns were analyzed in ArcMap to identify areas of overlap. We documented 84 and 182 bears and 37 and 39 human use groups in 2017 and 2018, respectively. Bear use was most strongly associated with landcover and temperature, and to a lesser degree terrain ruggedness and curvature, slope, and moisture. Human use was largely concentrated on published routes from internet resources that overlapped predicted high-use bear areas. We documented 18 bear-human interactions, 12 of which were within predicted high-use bear areas. All interactions resulted in bear displacement with no aggressive behavior toward humans. Human use and bear-human interactions appear to be relatively low but will continue to increase with human use, particularly in high-use bear areas. In the future, managers may consider measures to educate visitors or manage human access to promote human safety and minimize disturbance of grizzly bears.

## **\*\* MICROBIOME ANALYSIS ENABLES FUTURE NON-INVASIVE WILDLIFE MONITORING OF ROCKY MOUNTAIN ELK POPULATIONS**

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William E. Holben, Cellular, Molecular and Microbial Biology Department, University of Montana, Missoula, MT

Rocky Mountain Elk (*Cervus canadensis*) seasonal migration, body-condition and sex ratios are important parameters for characterizing populations at high risk of disease or population decline but, so far, have been outside the scope of currently available non-invasive methods. Fecal microbiomes can be surveyed non-invasively and model systems indicate that microbiome compositional differences are associated with changes in diet, stress, disease and physical condition of the host. With this in mind, we set out to examine the host-microbiome connection in scat samples from 4 populations of elk in western Montana. The elk sampled, varied geographically (i.e. by population/herd), by body condition and by sex. We built a supervised-machine learning classifier on bacterial taxa with cross validation (CV) to predict each fecal microbiome's affiliation to known host categories. The microbiome classifier predicted host population, sex, and body-condition measurements with promising CV results for each classifier. The fecal microbiome classifier developed here may be useful for detecting the sex and relative body condition of elk from other populations or tracking variations within the sampled populations across years. Monitoring wildlife fecal microbiomes would represent a breakthrough for non-invasive conservation biology, and we provide proof of concept for obtaining low cost, fine scale, management-relevant information from scat samples that can be expanded to non-invasive applications and other animal species in the future. Future efforts may also explore training new classifiers to detect wildlife diseases such as Brucella, Anthrax, Tuberculosis or Chronic Wasting Disease that may also be associated with microbiome composition.

## **\*\* POLYGYNY, PARTURITION, AND CALF SURVIVAL IN A TRANSLOCATED EASTERN ELK POPULATION**

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Barbara Keller, Fish and Wildlife, Minnesota Department of Natural Resources, St Paul, MN  
Aaron Hildreth, Research Science, Missouri Department of Conservation, Columbia, MO  
Leah Berkman, Research Science, Missouri Department of Conservation, Columbia, MO  
Chelsea Titus, Research Science, Missouri Department of Conservation, Columbia, MO  
Joshua Millspaugh, Wildlife Biology Program, University of Montana, Missoula, MT

Translocated populations may undergo exceptional changes in physiology, behavior, genetics, and demography following release into their new environment. Understanding implications of translocation on population processes remains increasingly relevant as number and type of conservation translocation activities increase worldwide. We reintroduced a population of elk (*Cervus canadensis*) to the Missouri Ozarks over the years 2011-2013 by translocating 106 individuals from Kentucky. Following translocation efforts we investigated changes in sire structure and consequences on male reproductive success and calf survival. All translocated individuals were fitted with GPS-radio collars and tissue-sampled for DNA analysis. Subsequently, we captured and processed Missouri-born calves, took calf tissue samples for paternity

analysis, and monitored calf survival. Results indicated increasing levels of polygeny in the face of advancing sire age structure across years following translocation. We found a positive effect of sire age on male reproductive success, but observed a significant year interaction signifying a decreasing effect of age across years following translocation as the population both aged and expanded. While we found increased calf mortality associated with later birth dates, we found limited evidence for increased calf mortality hazard associated with younger aged sires. Change in breeding structure is a little considered aspect of wildlife translocation that holds potential population genetic and demographic ramifications. Understanding how wildlife populations respond to translocation events across varied ecological metrics is crucial for increasing project success, improving subsequent management, and, ultimately, ensuring persistence of translocation populations.

## **\*\* PREDATOR AVOIDANCE BY PARTIALLY MIGRATORY MULE DEER**

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Teagan Hayes, Wildlife Biology Program, University of Montana, Missoula, MT  
Chad Bishop, Wildlife Biology Program, University of Montana, Missoula, MT  
Mike Mitchell, Montana Cooperative Wildlife Research Unit, USGS, Missoula, MT  
Nick Decesare, Wildlife Division, Montana Fish, Wildlife and Parks, Missoula, MT

Within partially migratory ungulate populations, selection of forage and security may vary greatly between migrants versus residents, and with spatial scale. Predation risk and forage limitation may be limiting the growth of mule deer (*Odocoileus hemionus*) populations in northwest Montana, which appear to be in decline. We asked how avoidance of mountain lions (*Puma concolor*) and wolves (*Canis lupus*) varies between migrant versus resident deer in 3 partially migratory populations throughout western Montana. We used GPS collar locations of 113 mule deer collared from summers 2017-2019 and developed resource selection functions (RSFs) to assess the effect of predation risk (estimated using mountain lion and wolf RSFs) on home range (2nd order) and within-home range (3rd order) selection by mule deer. Across study areas and migratory strategies, mule deer avoided wolves more strongly at the 3rd order than at the 2nd order. Migrants were indifferent to wolves at the 2nd order, whereas 2nd order selection by residents was more variable. Mule deer in each study area and strategy avoided lion risk at least one scale, though lion avoidance strategies were highly variable. We hypothesize that mule deer's indifference to predation risk at a given scales was a result of prioritization of forage at that scale. Our findings highlight the ability of partially migratory ungulates to adjust scale-specific predator avoidance strategies based on local conditions. By incorporating forage quality estimates, we may be able to understand how scale-specific forage/risk tradeoffs vary between migrant and resident mule deer in different ecotypes.



## **CRP AND FWP: THE PAST, PRESENT, AND FUTURE OF FWP COLLABORATION WITH THE CONSERVATION RESERVE PROGRAM**

Kenneth Plourde\*, Upland Game Bird Enhancement Program, Montana Fish, Wildlife and Parks, Flaxville, MT

The Conservation Reserve Program (CRP) is the largest private farmland conservation program in the US, with over 22 million acres currently enrolled nationwide and about \$1.8 billion spent in annual rental payments. Since the program's inception in 1985 the positive impacts of CRP on many wildlife species have been documented in Montana and across the country. Montana Fish, Wildlife and Parks has partnered with CRP since 1990 by providing additional cost-share and lease programs specifically for private landowners enrolled in CRP, with the goal of increasing landowner participation and the resulting wildlife benefits of the program. However, over the last 30 years changing rules and implementation of both CRP and FWP programs have led to varying landowner enrollment and fewer benefits to wildlife over time. Discussion of the challenges and successes of both CRP and FWP programs in Montana may provide insight into improving future FWP programs to help keep CRP providing strong positive impacts on Montana's wildlife and private landowners.

## **TO BEAVER OR NOT TO BEAVER, STRATEGIES FOR BEAVER MANAGEMENT ON PRIVATE LANDS**

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The activity of beavers on streams in the western United States can lead to landscape-scale benefits for natural water storage and fish and wildlife habitat. There is increasing interest in using beavers and beaver mimicry as stream and riparian habitat restoration tools, and to mitigate the impacts of drought and rapidly changing annual water regimes on rangelands. Private landowners may benefit from beaver activity through increased water availability and greater production of green vegetation in floodplains during dry portions of the year. However, beavers can also cause rapid and significant damage to human infrastructure and desired streamside vegetation when they settle down in an inappropriate area. The purpose of this presentation is to outline strategies for evaluating situations where landowners want beavers to colonize their property, as well as situations where landowners want to thwart or preclude beaver-related property damage. Strategies for encouraging colonization include GIS and field-based habitat evaluations, habitat modification to encourage settlement, evaluating the local beaver population for dispersal potential, and communicating realistic expectations of colonization potential and expected benefits based on stream conditions. Strategies for discouraging beavers include tree fencing and painting, culvert fencing, pond levelers, dam destruction, translocation, and lethal trapping. Beaver management on private lands will be a key issue in the coming decades as private landowners are faced with challenges related to long-term environmental changes, and biologists, land managers, and other entities are uniquely situated to help private landowners navigate the complexities of beaver colonization and associated impacts.

## **\*\* ASSESSMENT OF SYMPATRIC TURTLE POPULATIONS AND MOVEMENTS IN RELATION TO AN IRRIGATION BARRIER ON PRYOR CREEK**

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Habitat loss and fragmentation due to dams is one of the most significant threats to turtles worldwide. Barriers can isolate populations and reduce gene flow, increasing vulnerability to extinction-level events. Pryor Creek (Huntley, Montana) features a sympatric population of spiny softshell turtles (*Apalone spinifera*) and snapping turtles (*Chelydra serpentina*), and a 3-meter tall irrigation barrier. Populations of both species live on either side of the barrier, but connectivity between these populations is unknown. We hypothesized that movements of both species would be restricted by the barrier. We also expected possible differences in population demographic structures of each species above and below the barrier due to habitat differences and population isolation. Mark-recapture and radio-telemetry techniques were used to gather movement data on 150 individual turtles over four years. To date no snapping turtles have been documented bypassing the barrier, but four spiny softshell turtles have passed the barrier. Demographics of both species were found to be significantly different above and below the barrier. No female snapping turtles were caught below the barrier, and no juvenile spiny softshell turtles were caught above the barrier. Mean weight of spiny softshell turtles above and below the dam were significantly different. These differences may indicate differences in survival, reproduction, and possibly food availability. This is the first study looking at the ability of turtles to navigate around an aquatic barrier, which has significant long-term implications for population health and management efforts.

## **SEEKING SNOW AND BREATHING HARD: BEHAVIORAL TACTICS IN MOUNTAIN GOATS TO COMBAT WARMING TEMPERATURES**

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Mark Biel, Natural Resources, Glacier National Park, West Glacier, MT

Joel Berger, Fish, Wildlife and Conservation Biology, Colorado State University, Fort Collins, CO

The world glaciers and persistent summer snowpack are being lost due to warming temperatures. For cold-adapted species, habitat features may offer opportunities for cooling during summer heat yet the loss of snow and ice may compromise derived thermoregulatory benefits. Herein we offer insights about habitat selection for snow and the extent to which other behavioral adjustments reduce thermal debt among high elevation mammals. Specifically, we concentrate on mountain goats (*Oreamnos americanus*), a species whose native distribution is tied to areas where large patches of persistent summer snow are declining, and which became extinct during geologically warmer epochs. To examine sensitivity to possible thermal stressors and use of summer snow cover, we tracked marked and unmarked mountain goats in Glacier National Park, Montana, USA, to test hypotheses about selection for cold microclimates including shade and snow during periods of relatively high temperature. To understand functional responses of habitat choices, we measured microhabitat temperatures and a component of goat physiology -breaths per minute- as an index for metabolic expenditure. Individuals 1) selected areas closer to snow on warmer summer days, and 2) on snow had a 15% mean reduction in respiration when accounting for other factors, which suggests remnant snow plays an important role in mediating effects of air temperature. The use of shade was not as an important variable in models explaining respiration. Despite the loss of 85% of glaciers in Glacier National Park, summer's remnant snow patches are an important reservoir by which animals reduce heat stress and potential hyperthermia.

## **THE BITTERROOT VALLEY WINTER EAGLE PROJECT (POSTER)**

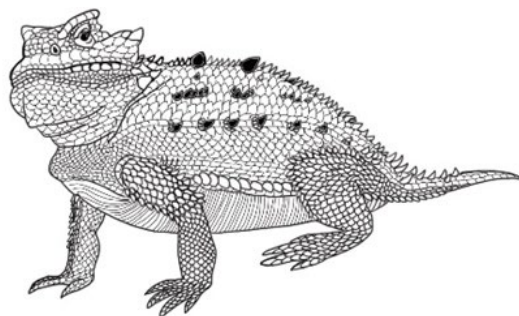
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Kate Stone, Ecology, MPG Ranch, Missoula, MT

Golden and Bald Eagles commonly scavenge on carrion while overwintering in Montana. This behavior may expose them to conflict with other scavengers, including other eagles. The availability of carrion is generally ephemeral, suggesting overwintering eagles must possess behavioral adaptations to successfully find food and potentially compete with other scavengers. We documented the occurrence and behavior of marked eagles at camera traps set on roadkill deer on private lands in the Bitterroot Valley of western Montana. Our re-sightings included over 25 eagles individually identifiable by wing tag, colored and numbered leg band, or satellite transmitter. We also had re-sightings of at least 10 eagles with metal USGS leg bands, allowing us to look at visitation length and behavior without individual identification. With few exceptions, most eagles visited a carcass just one day and over half of these eagles fed on the carcass once that day. The length of time a Bald Eagle feeds at the carcass increases with the number of other Bald Eagles present and reduces when Golden Eagles are present. Golden Eagles have more consistent feeding lengths regardless of the other eagles present. We also compared eagle re-sightings to movement data from eagles with transmitters to investigate whether or not persistent food availability influences the movements or behavior of Bald or Golden Eagles. Our results suggest that even with a consistent food resource, eagles generally feed then move on. This behavior may result from an adaptation to ephemeral winter food resources.

## **MOUNT DEAN STONE: PLANNING FOR GROWTH AND BALANCING USE AT THE EDGE OF THE CITY**

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Missoula's Mount Dean Stone community open space project is a 4,200 acre proposed complex located on the wildland-urban interface of the city's fast growing south side. The Mount Dean Stone Committee, comprised of community partners including organizations, agencies, businesses and individuals, have worked together since the inception of the overall proposed complex in 2016 to help understand how to best meet the recreation needs of a growing Missoula area and to leverage these recreational opportunities into broad and engaged community support for conservation of community open space and wildlife habitat. This session aims to share about the role of a community land trust in private lands conservation to meet the conservation values of publicly accessible community open space and protection of wildlife habitat along the wildland-urban interface.



## **MECHANISMS INFLUENCING PACK SIZE IN GRAY WOLVES**

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Estimates of the abundance of gray wolves (*Canis lupus*) are important to the Montana Fish, Wildlife and Parks (MFWP) Wolf Program. MFWP uses a Patch Occupancy Model (POM) to estimate area occupied, from which they estimate abundance based on average territory and pack size. Accordingly, abundance estimates depend on intensive field monitoring to estimate pack sizes. Pack size is driven by births, deaths, and the social decisions of group members, including if and when to disperse. Like many cooperatively breeding canids, gray wolves exhibit flexible and diverse dispersal behaviors. We aimed to better understand mechanisms influencing pack size and dispersal, and to develop a predictive tool for estimating pack size for wolves in Montana, absent data directly related to births and dispersals because these data will be unavailable to wildlife managers. We hypothesized that group sizes of cooperatively-breeding canids would be influenced by conditions related to prey, competition, and mortality risk. We found that wolf pack sizes in Montana were positively related to local densities of prey and packs, and negatively related to terrain ruggedness, local mortalities, and intensity of harvest management. A predictive model for pack sizes reliably estimated the mean annual pack sizes observed from 2005--2018 (adjusted R-squared = 0.58,  $P < 0.002$ ) and illuminated possible underlying mechanisms influencing variation in pack sizes over space and time. Alongside a mechanistic territory model we developed for POM, our pack size model will help keep abundance estimates from POM calibrated into the future, absent intensive monitoring effort.

## **GRAY WOLVES SELECT TERRITORIES ECONOMICALLY**

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Estimating wolf (*Canis lupus*) abundance is a key component of wolf management in Montana. Montana Fish, Wildlife and Parks uses a Patch Occupancy Model (POM) to estimate area occupied, from which they estimate abundance based on average territory and pack size. Abundance estimates thus depend on assumptions that territory size is fixed and consistent statewide. In reality, territories vary spatiotemporally, which will affect precision and accuracy of abundance estimates. We developed a mechanistic model of territory selection to better understand territorial behavior and improve abundance estimates from POM. We hypothesized that wolves select territories economically based on the benefits of food resources and costs of

competition, travel, and predation risk. Using only simple behavioral rules and limited, readily-available data for food resources, terrain ruggedness, and human density, the model predicted wolf distribution in Montana and the territory sizes and locations for specific packs. It accomplished this without using empirical data for wolves. The model provided evidence for the mechanisms driving empirically-observed patterns in space use by wolves. It demonstrated, for example, how economical behavior will cause territory size to decrease and overlap to increase with greater densities of prey and competitors. Results are consistent with the hypothesis that wolves select territories economically based on the benefits and costs of territory ownership. The mechanistic nature of the model makes it reliable for predicting territorial behavior under a full range of conditions wolves might encounter. This information will help keep abundance estimates from POM calibrated, absent intensive monitoring effort.

## **BY THINKING OUTSIDE THE BOX, MITIGATION CONSERVES WORKING PRIVATE LANDS INTERMINGLED WITH PUBLIC LANDS IN KEY SAGEBRUSH-GRASSLAND AREAS**

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Graham Neale, USDA Forest Service, Bozeman, MT [was formerly with SG Prg]  
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Erin Reather, Montana Sage Grouse Habitat Conservation Program, DNRC, Helena, MT  
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Montana's efforts to conserve Greater Sage-grouse (GRSG) and GRSG habitats have been long-standing and significant. Most of Montana's highest priority GRSG habitats are found on working private lands managed for livestock. BLM lands comprise 30% of the total, but addressing all threats across a checkerboard ownership in ecologically meaningful ways and at a landscape scale requires outside-the-box tools. Alongside voluntary private land stewardship, developers must mitigate direct and indirect impacts on state, federal, and private lands in designated GRSG habitats for which state or federal permits are required. Mitigation motivates developers to avoid, minimize, reclaim, and compensate for impacts by siting and implementing projects in ways that are least impactful and keep mitigation obligations/costs low. Mitigation motivates private landowners to continue stewarding their lands through the overt acknowledgment and explicit rewards reaped by providing ecosystem services that sustain a host of wildlife species. Developers can satisfy obligations through permittee-responsible projects implemented on state, federal, or private land or by contributing to Montana's Stewardship Account. The Account funds grants to implement projects offsetting development, similar to an in-lieu fee approach. The state will have spent almost \$6.8 million to conserve 77,233 acres through perpetual easements and term leases targeted at private lands from 2016-2020. These projects are strategically located adjacent to and intermingled with BLM lands. State funds were matched with at least \$6.86 million in NRCS and private funds. Developers themselves placed a perpetual easement on private land, permanently plugged and abandoned an oil and gas field on BLM land, and removed and buried overhead electrical distribution lines crossing private and BLM lands. Montana's approach to implementing mitigation across all lands is a novel way to conserve remaining habitats using market forces.

## **SAGE-GROUSE: FINE-SCALE SPECIALIST OR SHRUB-STEPPE GENERALIST?**

Joseph Smith\*, Wildlife Biology Program, University of Montana, Missoula, MT

Sage-grouse (*Centrocercus* spp.) are driving rapidly-evolving land management policy in the western United States. Management objectives for fine-scale vegetation characteristics have been widely adopted by land management agencies based on resource selection or relationships with fitness proxies reported among numerous habitat studies. However, some managers have questioned the appropriateness of these objectives. Moreover, it remains untested whether habitat-fitness relationships documented at fine scales (i.e., among individual nests within a study area) also apply at scales of management units (e.g., pastures or grazing allotments), which are many orders of magnitude larger. We employ meta-analyses to help resolve the role of fine-scale vegetation structure in nest site selection and nest success across the geographic range of greater sage-grouse (*C. urophasianus*) and evaluate the validity of established habitat management objectives. Importantly, our approach tests habitat relationships at a range-wide extent and a grain size closely matching scales at which agencies make management decisions. We found moderate, but context-dependent, effects of shrub characteristics and weak effects of herbaceous vegetation on nest site selection. None of the tested vegetation characteristics were related to variation in nest success, suggesting nesting habitat-fitness relationships have been inappropriately extrapolated in developing range-wide habitat management objectives. Our findings reveal surprising flexibility in fine-scale habitat use for a species often depicted as having very particular fine-scale habitat requirements, and cast doubt on the practice of adopting precise management objectives for vegetation structure based on findings of individual small-scale field studies.

## **\*\* EVALUATING HABITAT SUITABILITY FOR LESSER PRAIRIE-CHICKEN REINTRODUCTION (POSTER)**

Morgan Solomon\*, Animal and Range Sciences, Montana State University, Bozeman, MT  
Lance B. McNew, Animal and Range Sciences, Montana State University, Bozeman, MT

Large-scale patterns of land-use and habitat fragmentation have significantly reduced the range and numbers of lesser prairie-chickens in the southern Great Plains. Because lesser prairie-chickens are generally a residential species with limited dispersal abilities, increasing the size and connectivity of sub-populations and restoring habitat in areas previously occupied is essential for species' recovery. To guide future management practices for lesser prairie-chicken recovery, we will use locations of stable leks collected from lek survey data from 2010 -2019 to develop resource selection models for the species' current distribution in the mixed-grass prairie ecoregion. We will extrapolate our best resource selection model to the historic range of lesser prairie-chickens to identify and quantify potential habitat patches for reintroduction, as well as to evaluate the relative connectivity of potential habitat patches to existing lesser prairie-chicken populations using a least-cost path analysis. We will then use our resource selection model with habitat-based ratio estimators to estimate population sizes at potential habitat patches. Habitat patches will be prioritized for lesser prairie-chicken reintroduction based on habitat patch size, total available lesser prairie-chicken habitat, and relative connectivity of potential habitat patches to existing populations. Finally, we will use our resource selection model to quantify the relative improvement in available lesser prairie-chicken habitat for areas that recently participated in restorative management actions by comparing

current habitat conditions to habitat conditions prior to management actions. Our resource selection models will assist future reintroduction and habitat restoration plans by identifying habitat conditions that predict the presence of stable lesser prairie-chicken leks, and the highest quality, most connected habitat patches in the mixed-grass prairie ecoregion.

## **AN INTERACTIVE WEB TOOL FOR DECIDING BETWEEN POSSIBLE OCCUPANCY STUDY DESIGNS FOR RARE AND CRYPTIC SPECIES**

Hannah Specht\*, Montana Cooperative Wildlife Research Unit and UM Boone & Crockett Wildlife Conservation Program, University of Montana, Missoula, MT

Occupancy-based monitoring has become a valuable tool for studying rare and cryptic wildlife species. The growth of popularity of occupancy studies has been accompanied by the development of many adaptations to the original standard occupancy design, aiming to improve efficiency and to address cases where model assumptions cannot be met. For example, removal & conditional designs were developed for efficient distribution of effort between initial site visits versus repeat surveys based on how common a species is. The robust design is another adaptation that accounts for cases where the focal species may leave the study site between survey occasions. Given many options, it is not always clear which survey design will be most effective for the multiple constraints of a specific case. Yet, choosing an effective study design is critical, particularly when seeking to obtain information for rare and cryptic species, for which standard approaches are often less effective. We used case studies of Montana non-game “Species of Greatest Inventory Need” to guide development of an interactive, web-based tool that provides recommendations on occupancy study design based on study objectives and focal species characteristics. These recommendations are based on a synthesis of existing research into occupancy study design and accompanying power analyses. Simple power analyses provide users a visual sense of the effort required to obtain information related to covariates or detect trends when using an occupancy study approach under different circumstances. We will demonstrate the app using Montana Species of Greatest Inventory Need as an example.

## **STICKING THEIR NOSES IN IT.... UNGULATES INVESTIGATING CARRION IN A CWD WORLD (POSTER)**

Katharine Stone\*, Ecology , MPG Ranch, Florence, MT  
Eric Rasmussen, Ecology , MPG Ranch, Florence, MT  
Mike McTee, Environmental Science, MPG Ranch, Florence, MT  
Erik Samsoe, Technology Transfer, MPG Ranch, Florence, MT

The recent arrival and spread of chronic wasting disease (CWD) in Montana permeates the thoughts of the hunting public and wildlife managers. Both communities share a concern for how hunters might play a role in either facilitating or limiting disease spread; live ungulates may contact infected carrion, either in the field post harvest or after transport and disposal by a hunter. We operate two camera-trap projects involving dead ungulates to study scavenger ecology. From winter of 2015 to present we have placed cameras on over 400 roadkill deer on private lands in the Bitterroot Valley to document marked eagles and other scavengers. We’ve

also worked with hunters for two years placing cameras on gut piles in the field in many parts of Montana as well as Colorado and Wyoming. In addition to scavengers, we incidentally noticed a surprising number of ungulates investigating the carrion involved in both projects. This poster will share camera footage and documentation of how often this behavior occurs. We'll discuss our results in the context of potential CWD transmission and spread and managing hunter behavior in disposal of gut piles, carcasses, and butchering scraps.

## **STRAIGHT FROM THE HORSE'S MOUTH**

Kate Stone\*, Ecology, MPG Ranch, Florence, MT  
Eric Rasmussen, Ecology, MPG Ranch, Florence, MT

What prompts a private landowner to decide that "opening the gate" for scientists or wildlife managers is a good idea? In this presentation, we will hear from several private landowners in the Bitterroot Valley who've embraced research and inventory projects. Why do they participate? What have they learned? How do they see these types of collaborations supporting conservation efforts in the Bitterroot Valley and elsewhere? Please join us in celebrating a few people brave enough to venture to Butte to visit with you. We'll allow ample time for discussion.

## **BRING ME A CARCASS! THE GIFT OF RECIPROCAL GIVING ON PRIVATE LANDS IN THE BITTERROOT VALLEY**

Kate Stone\*, Ecology, MPG Ranch, Florence, MT  
Eric Rasmussen, Ecology, MPG Ranch, Florence, MT  
Debbie Leick, Ecology, MPG Ranch, Florence, MT  
William Blake, Ecology, MPG Ranch, Florence, MT

The Bitterroot Valley contains diverse stakeholders. We've experienced rapid growth in recent years, but agricultural activities and private parcels with minimal development still dominate much of the landscape. Conservation groups work on voluntary efforts to protect wildlife, working lands, and water in our community. However, like agricultural communities in many areas, our working lands and their stewards are often under-appreciated for the habitat services they provide to all community members. Our neighbors and friends host some of the best habitats for non-game wildlife, from Long-billed Curlews to Lewis's Woodpeckers. The decision to let scientists come on your land and collect data or record observations could instigate fear, skepticism, or hesitancy. Over the past ten years, the bird scientists at MPG Ranch have alleviated some of these reactions, expanding their research area to include thousands of acres of private land, blanketing the landscape with hundreds of thousands of observation points. What kind of data have we collected? How do we apply it? From moth nights to carcass-camera traps to the peeps of millions of passerine migrants, we've expanded our knowledge of ecosystems, engaged the general public, and leveraged information for positive conservation outcomes. Come hear some tales from the field.

## **SCAVENGERS OF SOUTHWEST MONTANA AND THEIR POTENTIAL IMPACT ON BRUCELLOSIS TRANSMISSION**

Kimberly Szcodronski\*, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT  
Paul Cross, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT

Brucellosis, a bacterial disease caused by *Brucella abortus*, is a major concern in the Greater Yellowstone Ecosystem due to potential transmission from elk (*Cervus elaphus*) to livestock. *B. abortus* can lead to abortion in infected animals and is primarily transmitted between elk and livestock when individuals contact infected abortion materials. Therefore, the risk of transmission is likely a function of how long abortion materials remain on the landscape. To investigate removal rates of abortion materials by scavengers in southwest Montana, we placed bovine fetuses and placentas at 266 sites within suitable elk habitat during the brucellosis transmission risk period from February--June, 2017 and 2018. We used remote cameras to quantify the removal rate and conducted parametric survival analysis to test for covariate effects. Abortion materials were removed by scavengers at an average rate of 84 hours ( $\pm 8.5$  SE) across all study sites. The top model suggested time to removal decreased in grassland habitats in comparison to sagebrush steppe and forest. Additionally, preliminary analyses suggest that mammalian predator removal practices on private ranches are correlated with time to removal. Abortion materials were consumed by a variety of avian and terrestrial scavengers with golden and bald eagles, coyotes, foxes, and turkey vultures being responsible for scavenging most of the abortion materials. Our results suggest scavengers play a vital role in reducing the persistence of *B. abortus* on the landscape, and that the rate of fetus removal varies across habitat and management types.

## **THE FLATHEAD RIVER TO LAKE INITIATIVE - DIVERSE PARTNERS EFFECTIVELY COLLABORATING TO SAVE A RIVER CORRIDOR**

Kris Tempel\*, Wildlife Division, Montana Fish, Wildlife and Parks, Kalispell, MT

Twenty years ago, agencies, NGOs, tribes, and landowners came together to protect the natural heritage of Flathead River and Lake: excellent water quality, abundant fish and wildlife and their habitat, outstanding scenic and recreation values, and prime farmland. In the early 2000s, the Flathead Valley was experiencing rapid growth and development. Farms throughout the valley, but especially along the river and lake, were being sold and subdivided threatening this important natural heritage. Using the power of partnerships and leveraging multiple funding sources, the River to Lake Initiative has successfully knitted together a patchwork of relatively small private ownerships into an ecologically functional unit. Landscape-scale habitat protection is often the focus of conservation efforts, but small-scale, focused conservation can also play a critical role preventing wildlife conflicts and providing for movement corridors. This presentation highlights how long-term, collaborative partnerships can achieve meaningful conservation and are essential to weathering the ups and downs inherent in any conservation effort.

## **\*\* STRESS HORMONES MEDIATE TRADEOFFS BETWEEN SURVIVAL AND GROWTH FOR AMPHIBIANS EXPOSED TO INCREASED SALINITY**

Brian Tornabene\*, Wildlife Biology Program, University of Montana, Missoula, Montana  
Creagh Breuner, Organismal Biology, Ecology, and Evolution, University of Montana, Missoula, MT  
Blake Hossack, Northern Rocky Mountain Science Center, U.S. Geological Survey, Missoula, MT

Salinity has increased in many freshwater ecosystems in the last century. Despite this, limited information exists on its effects on freshwater vertebrates. Amphibians are sensitive to salinity because of their porous skin and primarily-aquatic lifecycle. Wildlife managers often seek biomarkers to gauge the influence of contaminants on population health; one marker may be changes in stress hormones (e.g., corticosterone; CORT). We investigated the influence of increased salinity on growth, CORT, and survival of larval leopard frogs (*Rana pipiens*) in a controlled experiment. We exposed larvae to one of three environmentally-relevant salt concentrations, and compared them against controls. For half of the larvae, we also blocked actions of CORT (using RU486) to determine if it mediates effects of salinity. We used novel, noninvasive techniques to collect waterborne CORT samples from larvae every 4 d for 24 d (baseline and stress-induced). Larval size, development, and survival decreased with exposure to increasing salinity. Survival decreased faster when CORT was also blocked. However, size and development did not decrease compared to controls when CORT was blocked. Baseline and stress-induced CORT were positively related to survival. Our results demonstrate that CORT may mediate life history tradeoffs of larvae exposed to increased salinity by diverting energy from growth and development towards survival. However, by blocking CORT, the opposite occurred. We detected some differences in CORT among treatments during the experiment, but CORT responses were not different after 3 weeks of exposure. Therefore, CORT may not be a suitable biomarker for monitoring influences of salinity on amphibians.

## **LOOKING BACK AT 19 YEARS OF MULE DEER ADAPTIVE HARVEST MANAGEMENT IN FWP REGION 6**

Ryan M Williamson\*, Wildlife Division, Montana Fish, Wildlife and Parks, Outlook Express, MT

The FWP adapted the Mule Deer Adaptive Harvest Management plan in 2001 and since then, mule deer densities within FWP Administrative Region 6 have increased significantly over the last two decades, as estimated through 11 deer trend areas across the region. Due to increasing densities, increased hunting pressure, new disease threats and potential game damage concerns on private lands, the FWP has steadily increased harvest through available antlerless b-licenses. The majority of the region is either-sex, general hunting opportunity for both deer species with liberal b-licenses but available b-licenses have fluctuated in the last 19 years, as low as no b-licenses available for two years, to over 6,000 offered across the region in 2019. In recent years, the demand from both landowners and sportsman for increased harvest opportunity and the need to reduce higher concentrations of deer has also increased. Mule deer numbers have thrived under AHM since its inception and the FWP's objective to maintain deer densities at a more tolerable and closer to average level provides mostly liberal hunting seasons across the region while minimizing landowner conflicts with mule deer and maintaining a healthy population.

## **LEARNING FROM YOUR MISTAKES - A NEW APPROACH TO CONSERVATION PARTNERSHIPS**

Alan Wood\*, Wildlife Division, Montana Fish, Wildlife and Parks, Kalispell, MT

Wildlife habitat conservation projects are often complicated, and they become increasingly so when working with a variety of funding partners. In addition, these projects can be politically charged when government agencies are involved. Montana Fish, Wildlife & Parks has a variety of funding sources that are dedicated to wildlife habitat conservation, including the funding for mitigating wildlife impacts caused by construction of Libby and Hungry Horse dams in northwest Montana. After years of struggling to complete conservation projects, we developed a new approach relying on partners to help us achieve our goals. This new focus on partnerships had unexpected and very positive results. This presentation will tell the story of how this partnership-based focus came to be and how \$750,000 has leveraged more than \$200 million dollars resulting in conservation of 260,000 acres of wildlife habitat in northwest Montana.

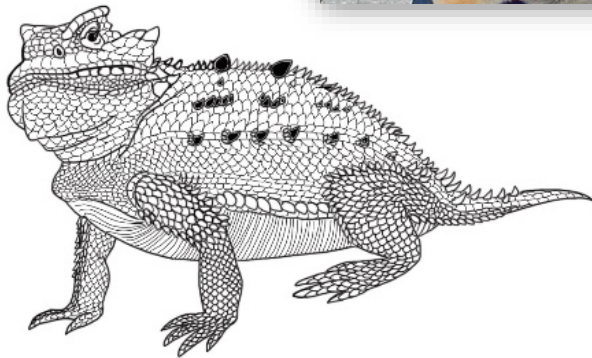
## **QUANTIFYING ELK AGGREGATION FROM GPS, SATELLITE, AND UAS DATA ON THE NATIONAL ELK REFUGE**

Michael Yarnall\*, Northern Rocky Mountain Science Center, U.S. Geological Survey, Bozeman, MT

The transmission and prevalence of CWD and other wildlife diseases likely depend on the density of animals on the landscape, which can have important implications for the frequency of animal contacts and the potential for environmental transmission. Amid increasing concern regarding the spread of CWD, new tools are needed to characterize the degree to which animals are aggregated on the landscape so that managers can assess the effectiveness of actions intended to reduce aggregation and disease transmission. Ideally, the type of data used to measure aggregation would a) provide precise and accurate information on how aggregation changes through time, b) yield additional information on the number and distribution of animals, and c) be inexpensive. We evaluated 7 aggregation metrics calculated using elk locations on the National Elk Refuge derived from GPS collars, satellite, and UAS imagery. We assessed 1) the accuracy of these methods relative to traditional aerial and ground counts, 2) which approaches adequately identify changes in aggregation across time periods relevant for disease management action, and 3) whether aggregation metrics from different data sources can be compared directly to enable comparisons across multiple populations. We discuss potential pitfalls and benefits presented by new approaches to quantifying elk aggregations. We found that satellite and GPS data were most valuable for comparing elk aggregations across time and in relation to feeding activities. Inter-elk distance distributions and kernel density estimates represent easily interpretable metrics that are sensitive to changes in elk aggregation.

## 2020 CONFERENCE T-SHIRT DESIGNS

Montana FWP's Rebecca Mowry is back again this year as the artist behind the T-shirts that are available at this year's conference. Thanks again Rebecca for sharing your artistic talents with us, and we hope you all enjoy a Montana Chapter of the Wildlife Society T-shirt this year!



# THE MONTANA CHAPTER OF THE WILDLIFE SOCIETY IS HERE TO SERVE YOU AS WILDLIFE PROFESSIONALS

In order to be effective and to influence circumstances for Montana's wildlife resources, we must have an active and committed membership. Please consider volunteering and becoming an active member of any of the following committees or ad hoc committees. Your participation is always appreciated and needed. Refer to Bylaws for duties and composition of standing committees (Article VIII).

## STANDING COMMITTEES 2020-2021

### NOMINATING AND ELECTIONS

A three-member Nominating and Elections Committee shall be selected by the President of the Montana Chapter not later than October 1 of each year and shall submit to the Secretary on or before October 15, the names of two candidates for each of the elective positions; namely the President-Elect, and every third year the Secretary or Treasurer, depending on the position coming open.

**Committee Chair:** current MT TWS President (Brett Dorak, [mttws.president@gmail.com](mailto:mttws.president@gmail.com))

### MEMBERSHIP

This committee shall encourage the maximum number of qualified persons working or residing within the Chapter's organizational area to become members of The Wildlife Society, the Northwest Section, and the Montana Chapter. The Committee shall also recommend Honorary Membership for deserving individuals in accordance with Article IV, Section 4.

**Committee Chair:** current MT TWS Secretary (Rebecca Mowry, [mttws.secretary@gmail.com](mailto:mttws.secretary@gmail.com))

### PROGRAMS

This committee shall arrange programs of all regular and annual meetings and provide the President with a proposed agenda for the Annual Meeting at least two months prior to the meeting date. The President-Elect shall serve as Chair of the Program Committee.

**Committee Chair:** current President-Elect (To-be-determined, [mttws.preselect@gmail.com](mailto:mttws.preselect@gmail.com))

### FINANCIAL MANAGEMENT

This committee shall consist of a Chair and at least two other members, serving staggered three-year terms. The Financial Management Committee shall review the financial records and supporting documents of the Treasurer at least annually. The Committee also shall review these records and documents prior to any change in the office of the Treasurer. The Committee shall prepare an annual financial management plan for approval by the membership at the annual meeting.

**Committee Chair:** current MT TWS Treasurer (Lorelle Berkeley, [mttws.treasurer@gmail.com](mailto:mttws.treasurer@gmail.com))

## EDUCATION AND INFORMATION

This committee shall seek and employ methods of informing the public of basic wildlife management concepts and of Chapter and Wildlife Society activity and interests.

**Committee Chair:** Brent Lonner ([blonner@mt.gov](mailto:blonner@mt.gov))

## RESOLUTIONS AND PUBLIC STATEMENTS

This committee shall receive proposed resolutions or public statements from members at any time, and shall prepare, submit, and recommend action on such items to the Executive Board in accordance with Article VII, Section 5. Submit resolutions/statements to the Executive Board.

**Committee:** Executive Board - Find email addresses: <https://mttws.org/>

## SCHOLARSHIPS

Each year the Chapter President will appoint a three-member selection committee to consist of one wildlife instructor from the University of Montana, one from Montana State University, and a member-at large from the Chapter membership. The committee will select all scholarship recipients. The committee chairmanship will alternate every other year between the two universities.

**Committee Co-Chairs:** Bob Garrott (MSU) [rgarrott@montana.edu](mailto:rgarrott@montana.edu)  
Chad Bishop (UM) [chad.bishop@umontana.edu](mailto:chad.bishop@umontana.edu)

## AWARDS

This committee shall consist of three members, one from each geographic region of the Chapter. A fourth member of the committee will be appointed by the President for input on selection of recipients for the Bob Watts Wildlife Communications Award. This fourth member will be one of the Board Members of the Bohemian Corners Foundation, until such time as all original members of the Bohemian Corners Foundation, as published in the June 1990 Chapter Newsletter, are no longer members of the Montana Chapter.

## YEARLY AWARDS NOMINATIONS

The Chapter annually seeks nominations for four awards to be presented at the annual Conference.

1. The ***Distinguished Service Award*** is presented annually for cumulative, past, current and/or continuing achievements in wildlife conservation.
2. The ***Biologist of the Year Award*** is presented annually for significant achievements in wildlife conservation anytime during the five years immediately preceding the award presentation.
3. The ***Bob Watts Communication Award*** is presented for significant communication in media such as professional publications, popular wildlife articles, books, movies or videos that have a relatively wide audience.
4. The ***Wildlife Conservation Award*** is given to an individual or non-governmental organization for past, present or ongoing efforts that enhance wildlife conservation in Montana.
5. The ***Rising Professional Award*** (new in 2020) recognizes emerging professionals and rising leaders in the wildlife field who are drivers of professional progress in Montana.

**Committee Chair:** Thank you Brendan Moynahan for your leadership! ***Position Open***

# AD HOC COMMITTEES

## CONSERVATION ACTION

This ad hoc committee monitors legislative and congressional issues pertinent to the Montana Chapter and makes recommendations to the Executive Board regarding reporting requirements and efforts at the legislature and during interim periods by lobbyist.

**Committee Chair:** Kris Boyd and Steve Gniadek ([boyd.kristina@yahoo.com](mailto:boyd.kristina@yahoo.com), [grayjaybro@yahoo.com](mailto:grayjaybro@yahoo.com))

## GRANTS

This ad hoc committee shall receive and review applications for Montana Chapter Grants and make recommendations to the Board. Grants may not be distributed annually depending on the financial status of the Chapter. See GRANTS page on website.

**Committee Chair:** Claire Gower ([cgower@mt.gov](mailto:cgower@mt.gov))

## EFFECTS ON RECREATION

This ad hoc committee oversees distribution and updates of the Montana Chapter report entitled, Effects of Recreation on Rocky Mountain Wildlife - A Review for Montana. See Recreation in Wildlife Habitat: <http://joomla.wildlife.org/Montana>

**Committee Chair:** Bryce Maxell ([bmaxell@mt.gov](mailto:bmaxell@mt.gov))

## SPECIES OF CONCERN

This ad hoc committee oversees the review of the status of terrestrial animal species in Montana through;

1. Development of a status paper which summarizes all relevant information on the biology and status of the species in Montana, and
2. Completion of the NatureServe status model which evaluates population size, range extent or area of occupancy, short and long-term population trends, intrinsic vulnerability, environmental specificity, and scope, severity, and immediacy of threats.

Status papers and status scores are reviewed, revised if necessary, and voted on by committee members. Approved status papers and status recommendations are forwarded to the joint Montana Natural Heritage Program and Montana Department of Fish, Wildlife and Parks Species of Concern Committee. Portions of status papers are posted on the online Montana Animal Field Guide and status recommendations are used to update the Montana Animal Species of Concern Report. The Montana Animal Species of Concern Report provides a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and address conservation needs pro-actively.

**Committee Chair:** Dan Bachen ([dbachen@mt.gov](mailto:dbachen@mt.gov))

# MEMBERSHIP IN THE MONTANA CHAPTER OF THE WILDLIFE SOCIETY

Membership in the Montana Wildlife Society is open to all individuals interested in the perpetuation of Montana's wildlife resources. Voting membership in the Chapter is available to all paid regular, retired and student members. Governing board members must be current members of TWS. Membership activities continue to be a priority for our Chapter. In addition to increasing our own membership, we encourage our members to also become members of the Northwest Section and the National Wildlife Society.

## Membership Benefits

Becoming a member of the Montana Chapter of The Wildlife Society has many benefits to offer both professionals and students including;

1. Close association with a group dedicated to wise use of our state's wildlife resources. Members come from universities, colleges, high schools, environmental consulting firms, state and federal agencies, private organizations, and business.
2. Reduced registration fee for participation in the Annual Conference, where timely resource topics are explored.
3. Workshops that permit exploration of selected wildlife topics and management activities.
4. The Newsletters, containing reports on items of interest to wildlife professionals in Montana.
5. The opportunity to influence state and federal policy through an organization capable of providing a unified professional opinion on Montana's wildlife issues.
6. Providing support for the Intermountain Journal of Sciences.

## Information Updates

Our chapter newsletter is distributed twice a year and provides information about upcoming events as well as opportunities to get involved with one of our working committees.

## Peer Network

Increase your peer network by attending chapter meetings along with The National Society's annual conference. These meetings and conferences allow you to interact with people who represent the diversity of the profession. Students can take advantage of the unique opportunity to meet and learn from seasoned professionals and potentially meet future employers.

## Continuing Education

Gain in-depth exposures to timely wildlife management concerns by attending chapter meetings. National membership also allows you to demonstrate your dedication to professional development by achieving and maintaining the status of a Certified Wildlife Biologist®.

## Professional Growth

Students can obtain leadership skills and enhance their professional growth by serving as an officer, on a committee, or giving a presentation at a chapter meeting. We welcome you to join the Montana Chapter of The Wildlife Society. There is a role in the Chapter for the wildlife biologist, manager, technician, conservation officer, educator, naturalist, and any individual concerned about the welfare and future of Montana's wildlife resources.

## Becoming a Montana Chapter Member

To become a member log onto <https://mttws.org/membership/>



## Now Available on the Internet

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- *IJS has been published since 1995 to enhance the educational outreach goals of the sponsoring organizations.*

### **What is Published in IJS?**

- *Any regional submissions of manuscripts dealing with the sciences are welcome.*
- *Abstracts from presentations at annual meetings of the co-sponsoring organizations appear in the last issue of each volume if submitted by the sponsoring organization(s).*

### **What is Available Online?**

- *IJS has a world-wide presence through its website, Montana State University's Open Journal Systems (archival home of IJS) & Search Engines.*
- *All published manuscripts or written presentations and poster abstracts from the sponsoring organizations can be found as individual PDFs as conversion for internet access progresses.*

**As of 2020 - Volume 16, 2010 - Volume 24, 2018 are on-line!**

- *All contents are "OPEN ACCESS", ensuring maximum availability without costs and press ready PDFs can be downloaded, saved or printed immediately.*

**Additional Information and Contacts:  
[www.intermountainjournal.org](http://www.intermountainjournal.org)**