Contributed Oral Sessions Schedule

All times noted are in Mountain Standard Time

Events taking place prior to the Boise in-person meeting: *both events will be accessible via Zoom and recorded.*

Monday, February 6th

8am-11am (MT): International Affairs Committee Meeting

Tuesday, February 7th

8am-Noon

Symposium: Global Issues Influencing Success for the International Year of Rangelands and Pastoralists (IYRP), 2026 and Beyond (this session will be live streamed)

Description: The IYRP 2026 has been approved by the UN and endorsed by SRM (https://iyrp.info/). In the run-up to 2026, key issues are being identified that will influence the success of the IYRP in terms of promoting sustainable global rangelands. This symposium will put a spotlight on six important topics that variously affect all 11 global regions.

Schedule:

8:00 to 8:05, *Welcome* from Jim O'Rourke

8:05 to 8:10, Talk from moderator Layne Coppock, *Summary of progress for the IYRP at SRM Albuquerque 2022* (5 minutes includes a pre-recorded presentation)

8:10 to 8:22, Invited talk from Igshaan Samuels and Maryam Niamir-Fuller*, Introduction to the symposium and reflections on action planning for increasing awareness and knowledge on sustainable global rangelands.* (12 minutes includes a 10-minute, pre-recorded presentation and 2-minute Q&A in an online chat format)

8:22 to 8:34, Invited talk from David Briske and Layne Coppock, *Global rangeland stewardship needs transformational change*. (12 minutes includes a 10-minute, pre-recorded presentation and 2-minute Q&A in an online chat format)

8:34 to 8:46, Invited talk from Batkhishig Baival, Una Jones, and Peter Hughes, *Unified certification approach and principles via a global Rangeland Stewardship Council.* (12 minutes includes a 10-minute presentation and 2-minute Q&A in an online chat format)

8:46 to 9:05, *First discussion moderated by Layne Coppock and Lauren Svejcar, open to all symposium participants with simultaneous online Q&A chat. Key issues to be addressed include: Where is global rangeland stewardship headed? How can the IYRP 2026 help transform global rangeland stewardship for the better? What initiatives could reinforce this process?*

9:05 to 9:17, Invited talk from Bora Masumbuko, Mounir Louhaichi, and Maryam Niamir-Fuller, *Global action for rangeland restoration and achieving Land Degradation Neutrality.* (12 minutes includes a 10-minute presentation and 2-minute Q&A in an online chat format)

9:17 to 9:29, Invited talk from Michael Odhiambo, *Equitable water governance for sustainable rangelands.* (12 minutes includes a 10-minute presentation and 2-minute Q&A in an online chat format)

9:29 to 9:41, Invited talk from Susanne Vetter and David Briske, *Scrutinizing the benefits of rangeland afforestation.* (12 minutes includes a 10-minute presentation and 2-minute Q&A in an online chat format)

9:41 to 10:01, *Second discussion moderated by Layne Coppock, Maryam Niamir-Fuller, and Lauren Svejcar, open to all symposium participants with simultaneous online Q&A chat. Key issues to be addressed include: What are the vital messages from the IYRP that can influence national and global efforts for the better? What are mechanisms to implement these messages?*

10:01 to 10:31, *Roundtable discussion moderated by Lauren Svejcar and Layne Coppock, open to all symposium participants with simultaneous online Q&A chat.*

- Statements from front-line stakeholders, *Amplifying pastoral voices on key global issues*
    - Pre-recorded videos: Voices from the World's Rangelands, compiled by Ann Waters-Bayer (10 minutes);
    - Pre-recorded message from Dawn Chatty and Ariell Ahearn (Dana +20; 5 minutes)
- Action plans from the IYRP regions
    - *Overview of the 11 regions* by Igshaan Samuels (live, 5 min)
    - *Special focus on the North American region* by Barry Irving (live, 5 min)
    - *Special focus on the South American region* by Cecilia Turin (live, 5 min)

10:31 to 10:46, *Third discussion moderated by Layne Coppock, open to all symposium participants with simultaneous online Q&A chat. Key issues to be addressed include: How can preparations for the IYRP reach all regions? How can major stakeholder groups (pastoralists, governments, civil society, private sectors, academia, etc.) be best engaged?*

10:46 to 10:56*, Final conclusions—how best to achieve impact by 2026 and beyond—as summarized by moderator Layne Coppock. Open to all symposium participants with simultaneous online Q&A chat.*

Saturday, February 11th

8am-5pm: SRM Board of Directors Meeting
Executive Boardroom, Boise Centre

Sunday, February 12th

7am-8am: 2023 Planning Committee
Room 140

4pm-12:00am: HSYF Home Room
Grove Hotel, Aspen/Cedar

9am-5pm: SRM Job Fair
100C

6am-11pm: Student Plant ID Study Room
Grove Hotel: Evergreen Ballroom

8am-Noon: Finance Committee
Room: 120B

Noon-5pm: Endowment Committees
Room: 120B

8am-Noon: Membership Committee
Room: 120C

8am-5pm: Advisory Council
Room: 110AB

10am-Noon: CPRM Committee
Room: 430A

Noon-2pm: CRMC Committee
Room 120A

1pm-4pm: SRM Leadership Initiative
Room: 430A

1pm-4pm: Policy and Public Affairs Committee (PPAC)
Room: 100E

1pm-3pm: Program Accreditation Committee
Room 110CD

2pm-4pm: Outreach, Communications, and Website (OCW)
Room: 120A

2pm-4pm: Targeted Grazing Committee
Room: 120C

5pm-6pm: Student Conclave Social
Room: 110CD

5pm-6pm: New Members Welcome Event
Room: Main Lobby, Boise Centre

6pm-8pm: Trade Show Mixer
Room: Grand Ballroom AB

MONDAY, FEBRUARY 13TH

7am-8am

2023 Planning Committee
Room: 140

8am-9:30

Plenary
Room: 400 Ballroom

8am-6pm

Trade Show
Room: Ballroom AB

9:30am-10am

Break: Coffee provided in the Tradeshow
Room: Ballroom AB

9:30am-5pm

Job Fair/Interviews
Room: 100C

6am-11PM

Student Plant ID Study Room
Room: Grove Hotel, Evergreen Ballroom

8am-Noon

URME
Room: Grove Hotel, Cedar Ballroom

10am-4pm

Extemporaneous Speaking #1 (Grad Student)
Room: 430A

10am-4pm

Extemporaneous Speaking #2 (Grad Student)
Room: 430B

10am-11:30am

Symposium: (Full day Session) The emerging urgency of fuel breaks: developing a better understanding of likely impacts on wildfire, plants, wildlife, and people (Organizer: Strand)
Room: 120A

Description: To combat increasingly large and frequent fires in the Great Basin, thousands of miles of fuel breaks are being implemented as a key management strategy. This symposium will provide a synthesis of fuel break performance and their impacts on rangeland ecology. Presentations will cover the following topics: 1) fuel break efficacy in modifying fuel loads, altering fire behavior, and limiting fire spread; 2) effects of fuel breaks on adjacent plant communities (including invasives) and wildlife; 3) fuel break design and treatment options (e.g., targeted grazing, herbicide application); and 4) management considerations of fuel breaks.

Start: 10:00-10:10
Doug Shinneman and Eva Strand (set stage)
Introduction: Future direction of fuel break science and management in sagebrush rangelands

Importance of fuel breaks

10:10-10:30: Erik Kriwox
"Fuel break management and maintenance considerations"

10:30-10:45: Kayla Johnston (University of Idaho)
"Evaluation of greenstrip linear fuel breaks in the Twin Falls BLM District (South-Central Idaho)"

10:45-11:00: Morgan Roche et al. (CSU)
"A spatial data synthesis of fuel breaks in relation to wildfire, invasive annual grasses, and sagebrush obligate wildlife"

11:00-11:20: Mike Guerry (RFPA/Idaho Rancher)
"Importance of fuel breaks during operations of a Rural Fire Protection Association"

Discussion
Opening discussion re: fuel break importance and concerns (led by E. Strand and D. Shinneman)

Symposium: What role do rangelands play in climate neutrality for beef production? (Organizer: Derner)
Room: 120B

Description: Contemporary commitments by many entities for climate neutrality by a certain year in the near future raises questions for the role of rangelands in these climate neutrality pledges for beef production. We will showcase the extent of these climate neutrality pledges, present current analyses from life cycle assessments, identify research and knowledge gaps, and provide a path forward for integrated systems approaches to assist with science-informed and data-driven solutions.

Each speaker will have a total of 30 minutes (20 minutes presentation with 10 minutes for questions):

What are climate neutrality commitments, who is making them, and what do they mean? (Sara Place)

What do Life Cycle Analyses tell us about climate neutrality for beef production? (Greg Thoma)

Identifying research and knowledge gaps – what about rangelands in climate neutrality? (Justin Derner, Stacey Gunter, and Gonzalo Irisarri)

A path forward: integrated systems-level approaches ("birth to plate") for solutions that are desired by society. (Logan Thompson and Kim Stackhouse-Lawson)

Workshop: VGS User Group Workshop (Organizer: Hall)

Room: 120C

Description: VGS is a free software application designed for recording and managing ecosystem sampling data. The program provides customizable quantitative (species composition, frequency, ground cover, etc.) and qualitative (surveys) data collection options as well as rapid analysis and reporting. Version 5 of VGS was published for distribution and includes new features like two-way syncing. VGS Online was also recently released and provides users with the option of using an online data repository for storing, managing, and reporting their data using the standard folder structure, as well as spatially from maps. The workshop will provide a live demonstration of VGS for current or interested users, answer questions current users may have, give general tips and tricks for using the program, and update users on the future of VGS.

Presenters: Ashley Lauren Hall and Charles Perry

Workshop: (10am-3pm) Range Sheep Production Systems: Current trends, issues and innovations (Organizer: Macon)

Room: 110AB

Description: Range sheep production systems are a long-standing, but often misunderstood, component of rangeland landscapes across the Western US and beyond. Our session includes academic and practitioner presentations and is organized around three driving questions. First, what are range sheep production systems and how are they changing? Second, what are the biggest challenges and opportunities for producers and managers working in range sheep systems? Finally, what new and creative ways are range sheep systems innovating and adapting to change?

Welcome and Regional Setting - Mike Guerry, Idaho Sheep Producer (20 min)

The Sheep Industry in the 21st Century - Dan Macon, UC Cooperative Extension (30 min)

From Forage to Fiber: Innovations in Wool - Brent Roeder, MSU Extension Sheep Specialist (20 min) (invited)

Innovations in Range Sheep Diet Selection Research - Melinda Ellison, University of Idaho Extension (30 min)

Not Just Little Cows: What We Know About Rangeland Sheep Diets - Derrick Scasta, University of Wyoming (30 min) (invited)

Current Research at the US Sheep Experiment Station - Brett Taylor and Hailey Wilmer, USDA ARS (20 min)

Innovators Panel (Producers and Stewards) (60 min)

- John Helle, Duckworth Wool (invited)
- Reed Anderson, Anderson Ranches
- Bianca Soares, Talbott Sheep/Star Creek Land Stewards

Workshop: (10am-5pm) Invasive Annual Grass Management: From Satellites to Surveys to Spray Decisions (Organizer: Mealor)

Room: 110CD

Description: Management of invasive annual grasses has become an important focus for land managers conserved with agricultural production and conservation of natural resources. While broad-scale principles have been articulated (i.e. "defend and grow the core") and new remote sensing products have supported regional prioritization efforts, clearly linking those concepts and tools to on-the-ground decision has been somewhat lacking. In this workshop, we will demonstrate remote sensing products, discuss how prioritization decisions may vary among locations, provide monitoring considerations when planning annual grass treatments, and hear from land managers who are actively controlling annual grasses at landscape scales.

10:00 – 10:15 Introduction to the Workshop – Brian A. Mealor

10:15-10:45 Defend and Grow the Core: A Proactive Battle Plan for Saving Sagebrush Country
Jeremy Maestas and Lindy Garner

11:00 – 11:30 DISCUSSION

Workshop: Walking the borderline: How crossing, eliminating, or acknowledging boundaries can lead to positive change in rangelands [Diversity & Inclusion Forum] (Organizer: Dial)

Room: 420B

Description: Rangeland conservation is a challenge that surpasses societal boundaries, yet those working in rangelands are often separated by physical, language, or cultural barriers. What can happen when we choose to cross, eliminate, or simply recognize these societal borders? We will hear from speakers who have navigated such borders in rangeland conservation – striving to work across countries, languages, or cultures. A panel Q&A and participant discussion will follow to explore these experiences, identify key take aways, and discuss how we can use these lessons to enhance our day-to-day management, conservation, and enjoyment of rangelands.

Contributed Oral Session: Riparian and water resources
Room: 410A

10am-10:15am: Benjamin Menapace
Evaluating Changes in Riparian Complex Ecological Sites Over Time

10:15am-10:30am: Mary Rowland
What Drives Cattle to Water? Accounting for Summer Riparian Use to Inform Management

10:30am-10:45am: David Bohnert
Supplement Type and Factors Affecting Use by Cattle in a Montane Riparian Pasture

10:45am-11am: Lia Qin Ryan Ossanna
Using rock detention structures to slow erosion in ephemeral streams: A 10-year case study

11:am-11:15am: James Dobrowolski
Water Quality and Quantity Programs of USDA-NIFA Supporting Rangeland Science and Management

11:15am-11:30am: Gregg Simonds
How Proper Grazing Management Can Improve Water Security

Contributed Oral Session: Fire, *session 1 of 2*
Room: 410B

10am-10:15am: Lauren Svejcar
Post-fire recovery of native and introduced plant species across an elevation gradient

10:15am-10:30am: Theresa Becchetti
Shrub encroachment effects on wildfire potential (incidence) in California's Wildland Urban Interface

10:30am-10:45am: Jacqueline Ott
Sagebrush survival following spring prescribed fire at the ecotone of sagebrush steppe and mixed-grass prairie in northeastern Wyoming

10:45am-11am: Troy Ocheltree
Nutrient availability and plant responses to fire-induced sagebrush mortality at the sagebrush steppe/mixed-grass prairie ecotone

11am-11:15am: Jonathan Bates
Early succession after prescribed fire in low sagebrush steppe

11:15am-11:30am: Jacob E Powell
Vegetative Fuel Break Establishment and Effectiveness in the Columbia Plateau

Contributed Oral Session: Restoring rangelands, *session 1 of 3*

Room: 410C

10am-10:15am: Juan-Gilberto Garcia-Cancel
The effects of Mexican feathergrass density on blue grama seedlings

10:15am-10:30am: Amber Johnson
Breaking dormancy and increasing restoration success of native forbs with innovative seed coating and planting techniques

10:30am-10:45am: Scott Shaff
Ten-year ecological responses to fuel treatments within semiarid Wyoming big sagebrush ecosystems

10:45am-11am: Matthew Rinella
Theory of seed mix design with applications to rangeland restoration

11am-11:30am: Tolibjon Mukimov
-SELECTION OF BREEDING SOURCES FROM PROMISING SPECIES OF ASTRAGALUS
-ORGANIZATION OF SOWING OF PROMISING DESERT-FORAGE PLANT SPECIES

Contributed Oral Session: Grazing, *session 1 of 5*
Room: 420A

10am-10:15am: Abbigail Rodgers
Grazing intensity and fire frequency effects on plant species and community characteristics in tallgrass prairie

10:15am-10:30am: Sherman Swanson
Contrasting Grazing Management for Livestock Versus Free-Roaming Horses and Burros

10:30am-10:45am: Sherman Swanson
Sustaining Riparian Functions with Management of Livestock and Free-Roaming Horses and Burros

10:45am-11am: Amy Nagler
Labor Changes in Beef Production: A Social and Economic Investigation of Labor Market Shifts

11am-11:15am: Justin Clarke
Avian Nesting Communities and Success in a Heterogeneity-based Rotational Grazing System

11:15am-11:30am: Matt Rinella
Early calving benefits livestock production under winter and spring warming

11:30am-1pm

Student Conclave and YPC Business Lunch
Room: Junior Ballroom

Past President's Lunch
Room: The Grove Hotel; Cattail Boardroom

Trade Show Mixer Lunch (Open to all attendees; complimentary food available on a first come first served basis)
Room: Grand Ballroom AB

1pm-3pm

Symposium: The emerging urgency of fuel breaks: developing a better understanding of likely impacts on wildfire, plants, wildlife, and people (Organizer: Strand)
Room: 120A

Planning and assessment

1:00-1:15: Jason Kreitler et al. (USGS)
"A return-on-investment approach for evaluating Great Basin fuel break priorities - Optimizing fuel break placement/implementation using fire behavior modeling and other spatial considerations"

1:!5-1:30 Peter Coates et al. (USGS)
"A retrospective assessment of fuel break effectiveness for containing rangeland wildfires in the western U.S."

1:30-1:45 Matt Germino and Jake Price (USGS)
"Vegetation and modeled fire response to fuel breaks installed in and around recently burned areas: critical inference for breaking the annual-grass fire cycle"

1:45-2 Cali Roth et al. (USGS)
"A comprehensive fuels treatment database for novel inferences and applications in wildfire management across the western U.S."

2-2:15 Jesse Young (USFS)
"The success of fuel breaks in the containment of large wildfires vary across fuel break and weather conditions"

2:15-2:30 Julie Heinrichs et al. (CSU)
"HexFire: Simulating fire spread and interactions with fuel breaks"

2:30-2:45 Karen Short (USFS)
"Fuel break scenario planning informed by quantitative assessment of transmitted wildfire risk in the Great Basin, USA"

2:45-3: Erin Buchholtz et al. (USGS)*
"Assessing large landscape patterns of potential fire connectivity using circuit methods

Symposium: *Understanding the potential (risks) of carbon ranching to mitigate climate change (Organizer: Reinhart)*
Room: 120B

Description: The symposium will review the potential and challenges for the practice of carbon (C) ranching, where ranchers are paid to alter their management to increase soil C sequestration. Speakers will discuss the measurement, reporting, and verification of soil C sequestration projects. They will get into the weeds on C ranching including how practices, soil properties, and more impact soil C sequestration. Speakers will explore a range of causal drivers (and indicators) that likely underpin whether a shift in livestock grazing will increase accrual (or turnover) of soil C for a specific system and timespan.

1pm-1:15pm: Machmuller, M. "Soil carbon sequestration potential in grazing lands- from theory to practice"

1:15pm-1:30pm: Sanderman, J., Xia, Y., Hernandez-Yañez, H., Watts, J., Cotrufo, F., Ewing, S., Machmuller, M. "Measuring soil carbon on the range: Challenges and emerging approaches"

1:30pm-1:45pm: Dietz, C., Sanford, G., Jackson, R. "Soil C change in restored prairie of southern Wisconsin"

1:45pm-2pm: Reinhart, K., Sanni Worogo, H., Rinella, M., & Vermeire, L. "Lessons from a next generation carbon ranching experiment in US Northern Great Plains"

2pm-2:15pm: Lucas, J.* "Rangeland carbon storage in the face of multiple global change factors"

2:15pm-2:30pm: Bagchi, S.* "Soil carbon under livestock and wild herbivores"

2:30pm-2:45pm: Wilson, C. "Carbon farming on grazing lands? A social-ecological systems perspective on the promises and perils of putting pasture and rangeland into carbon offset trading markets"

2:45pm-3pm: Discussion

Symposium: Fire and herbivory for restoring and maintaining the delivery of ecosystem services in rangelands (Organizer: Kreuter)

Room: 120C

Description: Fire and herbivory are major interdependent drivers of rangeland ecosystems globally. Historically, they have often been addressed singularly and not in combination as necessary disruptive events in grassland and savannas. Widespread land use conversion, fire suppression and overgrazing by sedentary domestic livestock have led to widespread degradation of these former resplendent ecosystems. The purpose of the symposium is to concomitantly address the need for broader use of prescribed fire and environmentally responsible grazing management practices to mitigate wildfire risks and restore diverse rangelands that provide services upon which human well-being is predicated.

1pm-1:15pm: Sam Fuhlendorf: Pyric herbivory at landscape scale: Reconnecting fire and grazing in North America.

1:15pm-1:30pm: Rheinhardt Scholtz et al. High-intensity fire to manage shrub encroachment: Lessons from South Africa and the USA.

1:30pm-1:45pm: Devan McGranahan et al. The case for burning rangeland pastures for sustainable livestock production.

1:45pm-2pm: Richard Teague et al. Managing grazing to restore soil health, ecosystem function and ecosystem services.

2pm-2:15pm: Carissa Wonkka et al. Socio-ecological context: Barriers to adoption of fire, getting producers to re-think grazing management and getting land management agencies to re-think post-fire grazing.

2:15pm-2:30pm: Stephanie Larson. Animal-based meat and rangeland ecosystem services: From range to plate.

2:30pm-2:45pm: David Toledo. An integrative assessment and management optimization system for grazing lands.

2:45pm-3pm: Urs Kreuter. An integrative framework to evaluate the use of prescribe fire and responsible grazing management for restoring the ecological functionality of grasslands.

Workshop: (10am-3pm) ***Range Sheep Production Systems: Current trends, issues and innovations (Organizer: Macon)--CONTINUED***

Room: 110AB

Description: Range sheep production systems are a long-standing, but often misunderstood, component of rangeland landscapes across the Western US and beyond. Our session includes academic and practitioner presentations and is organized around three driving questions. First, what are range sheep production systems and how are they changing? Second, what are the biggest challenges and opportunities for producers and managers working in range sheep systems? Finally, what new and creative ways are range sheep systems innovating and adapting to change?

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Current Research at the US Sheep Experiment Station - Brett Taylor and Hailey Wilmer, USDA ARS (20 min)

Innovators Panel (Producers and Stewards) (60 min)

- John Helle, Duckworth Wool (invited)
- Reed Anderson, Anderson Ranches
- Bianca Soares, Talbott Sheep/Star Creek Land Stewards

Workshop: (10am-5pm) ***Invasive Annual Grass Management: From Satellites to Surveys to Spray Decisions (Organizer: Mealor)--CONTINUED***

Room: 110CD

1:00 – 1:15 RangeView Digital Solution
Craig Hossfeld - RangeView Product Manager, Envu

1:15-1:30 Evaluating High-Frequency, Moderate-Resolution Satellite Imagery for Remote Sensing of Invasive Annual Grasses
Octave Lepinard – Planet
Andrea DeStefano, Chloe Mattilio, Brian A. Mealor – University of Wyoming IMAGINE

1:30 – 1:45 Invaders at the doorstep: using INHABIT invasive plant models to focus watch lists
Catherine S. Jarnevich, Peder Engelstad, Terri Hogan, Ian Pearse, Jennifer Sieracki, Helen R. Sofaer, Jillian LaRoe, Janet S. Prevéy, and Nicholas E. Young

1:45 – 2:00 Spatial planning for landscape-scale management of invasive annual grasses in Oregon
Megan Creutzburg, Institute for Natural Resources, Oregon State University

2:00 – 2:15 Strategic, Landscape-scale Invasive Annual Grass Management in Wyoming
Brian A. Mealor – University of Wyoming IMAGINE,
Ian Tator – Wyoming Game and Fish Department,
Slade Franklin – Wyoming Department of Agriculture

2:15 – 2:30 DISCUSSION

2:45 – 3:00 Management Considerations for Targeted and Prescribed Livestock Grazing of Cheatgrass
Paul Meiman (presenter), Barry Perryman and Brad Schultz

Symposium: (1-5pm) ***Producer &Young Producer's Symposium: Rangelands Across the World (Organizer: Orozco)***
Room: 100D

Workshop: (1pm-5pm) Stakeholder Engagement for the International Year of Rangelands and Pastoralists (IYRP) 2026: Action Planning Workshop for the North American Region (Organizer: Coppock)
Room: 100E

Description: The IYRP 2026 has been approved by the UN and endorsed by SRM (https://iyrp.info/). The agenda of the IYRP is to promote sustainable rangeland systems across 11 geographical regions worldwide. Global planning has started. This workshop will facilitate a planning process for the North American Region—including the USA, Mexico, and Canada—where stakeholders describe the priority challenges they face, potential ways to make progress, and their preferred means of communication and collaboration. To achieve this outcome, the event will engage representatives of SRM's 21 sections along with key GOs and NGOs using in-person and virtual formats.

Symposium: ***Global perspectives on using geospatial approaches for rangeland ecology and management (Organizer: Perotto)***
Room: 420A

Description: Climate change, woody cover encroachment, invasive species and current threats are affecting rangeland health and function. The use of geospatial technologies worldwide has opened new opportunities to gain a better understanding of the spatial and temporal landscape dynamics in rangelands. Moreover, we can monitor how landscape level management changes can affect woody cover distribution, habitat for wildlife, and forage availability. We want to promote a global understanding of the role that geospatial technologies is having in rangeland research and management.

Humberto L. Perotto (US): Multiple-scale approaches to understanding invasive species dynamics in rangelands.

Luciano Gonzalez (Australia): Geospatial technologies for rangeland ecology and management: What have we learned and how do we use them?

Jason Karl (US): Tangled in complexity: can a simpler, cheaper approach to virtual fencing manage livestock effectively on open rangelands?

Sean Cunningham (US rancher) and Sergio Arispe (US): A Producer's Perspective on Applying Geospatial Technologies on Western Rangelands

Leonor Calvo-Galvan (Spain): Fire severity assessment as a key factor in the analysis of wildfire effects

José Manuel Fernández-Guisuraga (Spain): Monitoring ecological impacts of wildfires through novel multiscale remote sensing techniques

Contributed Oral Session: Plant Ecology, *session 1 of 3; Woody plants*

Room: 410A

1pm-1:15pm: Mohammed Abdelkreim
Investigation of Change in Vegetation Attributes at EL_Khauwie District, Western kordofan State, Sudan

1:15pm-1:30pm: Matt Reeves
Quantifying Encroachment on Rangelands in the Kaibab National Forest

1:30pm-1:45pm: Samantha Cady
Quantifying and describing woody plant encroachment risk in the Great Plains

1:45pm-2pm: Dillon Fogarty
Grassland risk and vulnerability to woody encroachment in the Great Plains

2pm-2:15pm: Pete Bauman
Use of NAIP and LiDAR Imagery to Determine the Rate of Loss of Native Grasslands in Eastern South Dakota from 2012 – 2021.

2:15pm-2:30pm: Trevor Caughlin
Achieving the promise of landscape demography with drone-based measurements of sagebrush demographic rates

2:30pm-2:45pm: Ryan Schroeder
Soil seed bank and aboveground vegetation community dynamics across a shrub encroachment gradient in the Northern Chihuahuan Desert, U.S

2:45pm-3pm: Katie Joe Pennartz
Niche divergence of a drought-deciduous shrub and its implications on range expansion under changing climate scenarios

Contributed Oral Session: Grazing, *session 2 of 5; Targeted grazing, virtual fencing & more*

Room: 410B

1:15pm-1:30pm: Shelemia Nyamuryekung'e
Virtual Fencing of nursing cattle grazing large pastures of Chihuahuan Desert rangelands

1:30pm-1:45pm: Brett Blum
Applications of Virtual Fence Technology in Quantifying Livestock Resource Selection in a Semi-Arid Ecosystem

1:45pm-2pm: Alexander Smart
Targeted browsing with goats for eastern redcedar (Juniperus virginiana) control

2pm-2:15pm: Andrew Evans
Targeted grazing in California grasslands increases native annual forbs and reduces fine fuels

2:15pm-2:30pm: Agustina Rivoir
Effect of herbage allowance and animal genotype on the selectivity for high and low patches of beef cows grazing native subtropical grassland.

2:30pm-2:45pm: Shiva Torabian
The seasonal effects of residual Ivermectin on nutrient cycling, plant biomass and dung beetle

2:45pm-3pm: Courtney Buchanan
USING GENETIC SEQUENCING OF FECAL SAMPLES TO UNDERSTAND DIETARY AND MICROBIAL DIFFERENCES IN FERAL HORSES AMONG BLM HERD MANAGEMENT AREAS

Contributed Oral Session: Avian wildlife on the range

Room: 410C

1pm-1:15pm: Peter Coates
Estimating spatiotemporal trends of sage-grouse population abundance within stochastic environments: six decades of declines across the American West

1:15pm-1:30pm: Jeff Beck
Increasing Feral Horses Adversely Affect Greater Sage-Grouse Nest Survival in Central Wyoming

1:30pm-1:45pm: William Richardson
Shifts in Sage-Grouse Arthropod Food Sources Across Grazing and Environmental Gradients in Upland Meadow Communities

1:45pm-2pm: Megan Milligan
Linking resource selection to population performance to identify species' habitat across broad spatial scales: an example of greater sage-grouse in a Distinct Population Segment

2pm-2:15pm: Brian Prochazka
Assessing the efficacy of conservation efforts aimed at improving rangeland conditions for greater sage-grouse within the Bi-State Distinct Population Segment

2:15pm-2:30pm: Seth Dettenmaier
A science-based management of ravens tool (SMaRT): A 3-tiered hierarchical framework

2:30pm-2:45pm: Shawn O'Neil
Dynamic spatial modeling of common raven densities and a decision support tool to manage predation of greater sage-grouse nests

2:45pm-3pm: Sarah Webster
Geothermal energy production impacts a sensitive indicator species within sagebrush ecosystems in western North America

3pm-5pm

Workshop: (10am-5pm) Invasive Annual Grass Management: From Satellites to Surveys to Spray Decisions (Organizer: Mealor)

Room: 110CD

3:00 – 3:15 Seeding in Areas with Low Recovery Potential
Jane Mangold, Montana State University

3:15 – 3:30 Getting the most from your annual grass herbicide program
Brian A. Mealor – University of Wyoming IMAGINE

3:30 – 3:45 Using Monitoring to Inform Adaptive Management
Jaycie Arndt – University of Wyoming IMAGINE, Northeast Wyoming Invasive Grasses Working Group

3:45 – 4:00 Idaho's Cheatgrass Challenge
Greg Becker and Charles Sandford

4:00 – 4:15 Protecting resilient plant communities with collaborative landscape scale cheatgrass management
Julie Kraft, Sublette County (WY) Weed and Pest District

4:30 – 5:00 DISCUSSION

Symposium: Measuring rangeland management impacts on carbon and ecosystem services: Insights across disciplinary borders (Organizer: Foster)

Room: 120B

Description: Soil organic carbon relates to rangeland productivity, water storage, and potential sequestration for climate change mitigation, yet rarely are these outcomes discussed together. This symposium drills down into the emerging soil data and models, focusing on how soil carbon can serve to indicate rangeland health and potentially mitigate climate change. We will dive into questions about rangeland variability, how management impacts soil carbon, soil sampling strategies, models to capture management impacts, and current knowledge gaps. We invite rangeland managers and researchers across disciplines to discuss existing rangeland data, approaches to monitoring, and how soil carbon relates to other ecosystem outcomes.

3:00 Jeff Goodwin; Texas A&M University - Monitoring for ecosystem outcomes in grassland systems

3:15 Chelsea Carey; Point Blue Conservation Science - How to measure soil carbon and health on rangelands in the face of heterogeneity

3:30 Sheri Spiegal; USDA-ARS Jornada Experimental Range - Measuring the effects of management on soil carbon and its bedfellows on ranches of the Americas

3:45 Paige Stanley; Colorado State University - Prospects for grazing management to AMP up soil carbon on California rangelands

4:00 Corey Shake; Point Blue Conservation Science - How existing and future rangeland research can connect carbon and conservation

4:15 Rebecca Ryals; University of California, Merced - Effects of Compost Amendments to Rangelands with Steep Slopes on Soil Carbon, Greenhouse Gas Fluxes, and Nutrient Runoff

4:30 Toby Maxwell; Boise State University - Challenges and opportunities in measuring the response of rangeland soil carbon to disturbance, invasion, and management: an example from sagebrush steppe

4:45 Jennifer Soong; Corteva Agriscience - Data collection for emerging carbon markets in managed grasslands

Symposium: (Full Day) The emerging urgency of fuel breaks: developing a better understanding of likely impacts on wildfire, plants, wildlife, and people (Organizer: Strand)

Room: 120A

Effects on plant communities and wildlife

3:15-3:30 Francis Kilkenny (US Forest Service)
"Dynamics of forage kochia spread from fuel-break seedings in the Snake River Plain of Idaho, USA"

3:30-3:45 Steven Matthews-Sanchez et al. (USGS)
“Developing and evaluating fuel break performance metrics across spatiotemporal scales and for multiple risk factors in sagebrush landscapes of the Great Basin”

3:45-4: Susan McIlroy and Doug Shinneman (USGS)
“Fuel break treatment effects on plant communities and fuel loads across diverse fire histories in south central Idaho”

4-4:15: Julie Heinrichs et al. (CSU)
"Assessing the cover, connectivity and future proliferation of invasive fine fuels"

4:15-4:45: Closing Discussion
Closing discussion re: next steps in fuel break science and management (led by E. Strand and D. Shinneman)

Workshop: Applying Grazing to Meet Landscape and Vegetation Objectives: Targeted Grazing in the Great Basin and Surrounding Rangelands (Organizer: Anderson)
Room: 120C

Description: This workshop will define targeted grazing and discuss examples of different applications of the practice throughout the Northwestern United States. Emphasis will be given to special projects where monitoring has determined the effectiveness of grazing We will highlight the importance of graziers monitoring their projects and offer simple techniques practitioners can use.

Andres Cibils: Overview of Targeted Grazing

Pat Clark: Grazing firebreaks, multistate experiment

Kirk Davies: Grazing Cheatgrass to increase perennial expression

Lance Okeson or Brian Thrift: Targeted Grazing on the Owhyee Front (invited)

Ray Holes, Prescriptive Livestock Services: Idaho Targeted Grazier (invited)

James Bogan: Idaho Targeted Grazier (invited)

Other area graziers for panel discussion TBD

Symposium: (1-5pm) Producer &Young Producer's Symposium: Rangelands Across the World (Organizer: Orozco)—*CONTINUED*
Room: 100D

Workshop: (1pm-5pm) Stakeholder Engagement for the International Year of Rangelands and Pastoralists (IYRP) 2026: Action Planning Workshop for the North American Region (Organizer: Coppock)--*CONTINUED*
Room: 100E

Contributed Oral Session: Range technologies*, session 1 of 2; UAVs*

Room: 410C

3pm-3:15pm: Keegan Hammond
Detecting Spatiotemporal Variation of Alfalfa Leaf Area with Drone

3:15pm-3:30pm: Peter Olsoy

Estimating shrub biomass and productivity at the Great Basin LTAR site with an unoccupied aerial system (UAS) time series

3:30pm-3:45pm: Dan Lauritzen
Predicting bulbous bluegrass green-up using weather and soil measurements and remote cameras in eastern Idaho

3:45pm-4pm: Sean Kearney
Prairie dog burrow and colony mapping from unmanned aircraft systems (i.e., drones)

4pm-4:15pm: David Rowley
Mapping Grassland Plant Communities Subjected to Nutrient Influx and Disturbance using UAV Remote Sensing and Machine Learning

4:15pm-4:30pm: Lori Massey
Using UAVs to Quantify Forage Production of a Pastureland

4:30pm-4:45pm: Xavier Jaime
Exploring effective detection of Prickly Pear Cactus (Opuntia lindheimerii) from airborne imagery before and after prescribed fires in the Edwards Plateau

4:45pm-5pm: Nick Litizette
Mapping Milkweed for Monarchs

Contributed Oral Session: Plant Ecology, *session 2 of 3: Climate, water & drought*

Room: 420B

3pm-3:15pm: David Toledo
Drought effects on plant species composition and root biomass in a Kentucky bluegrass Invaded northern Great Plains rangeland

3:15pm-3:30pm: Carlos Ochoa
Soil Moisture, Vegetation, and Shallow Groundwater Level Variability in a Rangeland Setting in the Chihuahuan Desert, Northern Mexico

3:30pm-3:45pm: Thomas Merchant
Seasonal dry spell effects on primary production in Colorado grasslands

3:45pm-4pm: Julie Finzel
Long-term Impacts of Drought in the Southern San Joaquin Valley

4pm-4:15pm: Tolibjon Mukimov
CULTIVATION OF FODDER CROPS BASED ON THE USE OF GROUNDWATER IN THE KYZYLKUM DESERT

4:15pm-4:30pm: Federico Villarreal-Guerrero
Chlorophyll fluorescence of fourwing saltbush (Atriplex canescens) and blue dalea (Dalea bicolor) under climate change scenarios

4:30pm-4:45pm: Rebecca Finger Higgens
Drought diminishes differences among ecological states across a historical grazing gradient

4:45pm-5pm: Fidel Hernandez
Evaluating the Insurance Hypothesis: Biodiversity and Rangeland Productivity in a Variable Environment

Contributed Oral Session: Grazing, *session 3 of 5; Grazing systems & management*

Room: 420A

3pm-3:15pm: Cameron Shea Burleson
Long-term adaptive management trends on USFS Region 3 grazing allotments

3:15pm-3:30pm: Gregg Simonds
How Proper Grazing Management Can Improve Water Security

3:30pm-3:45pm: Katherine Wollstein
Working with ranchers to improve rangeland wildfire preparedness outreach

3:45pm-4pm: David Augustine
Adaptive, multi-paddock, rotational grazing management alters foraging behavior and spatial grazing distribution of free-ranging cattle

4pm-4:15pm: Sheila Barry
Conserving habitat and species, the role of livestock grazing on California's rangelands

4:15pm-4:30pm: Nicolas Caram
Factors affecting seasonal defoliation patterns by cattle in heterogeneous grassland

4:30pm-4:45pm: Jen Hanson
Plant community response to changes in grazing and precipitation timing in the Shortgrass Steppe

Contributed Oral Session: Restoring rangelands, *session 2 of 3*

Room: 410A

3pm-3:15pm: Elise Gornish
Granivorous ants prefer small and unprotected seeds—implications for restoration in arid rangelands

3:15-3:30pm: Tolibjon Mukimov
RE-INTRODUCTION OF PERENNIAL, DROUGHT-RESISTANT FORAGE PASTURE CROPS IN THE CONDITIONS OF THE FOOTHILL ZONE OF UZBEKISTAN

3:30pm-3:45pm: Pete Bauman
Do cover crops enhance the success of prairie plantings? A cautionary tale from Eastern South Dakota.

3:45pm-4pm: Randi Lupardus
Reclamation following oil and gas development on the Colorado Plateau governed by abiotic setting and time

4pm-4:15pm: Chandan Shilpakar
Vegetation diversity, productivity, and soil dynamics in reclaimed grassland

4:15pm-4:30pm: Molly Reichenborn
Plant community dynamics following herbicide application across a mesquite encroachment gradient

4:30pm-4:45pm: Alexandra Urza
Variation in drought responses and restoration applications for pinyon pine

Contributed Oral Session: Invasives, *session 1 of 2*

Room: 410B

3pm-3:15pm: William Austin Rutherford
Trait responses of a grassland shrub invader to altered moisture regimes

3:15pm-3:30pm: John Paul Wasan
Disturbance, Drought and Nutrients: Investigating Absinthe Invasion in Native Grassland in the Canadian Prairies

3:30pm-3:45pm: Devii Rao
Control of Russian thistle (Salsola spp.) on California's Central Coast Rangelands

3:45pm-4pm: Jeff Mosley
Long-term vegetation dynamics after 2, 4-D treatment to suppress Wyethia helianthoidesin mountain meadows of central Idaho

4pm-4:15pm: Erik Lehnhoff
Lehmann Lovegrass (Eragrostis lehmanniana) Removal Facilitates Black Grama (Bouteloua eriopoda) Recovery in the Chihuahuan Desert

4:15pm-4:30pm: Nic McMillan
Scale, biodiversity, and invasion in the tallgrass prairie: a test of the Invasion Paradox across large working rangelands.

4:30pm-4:45pm: Katherine Hovanes
Demographic rates of invasive perennial bunchgrass grass buffelgrass (Pennisetum ciliare) vary with topography

4:45pm-5pm: Jaycie Arndt
Evaluating Bulbous Bluegrass Control by Various Herbicides

3pm-6pm

Rangeland Cup
Room: Grand Ballroom AB

5pm-6pm

Poster Session #1

Room: Grand Ballroom AB

6pm-8pm

Basque Center Dinner and Entertainment--Offsite

TUESDAY, FEBRUARY 14TH

7am-8am

2023 Planning Committee

Room: 140

8am-6:30pm

Trade Show

Room: Grand Ballroom AB

8am-9am

Plenary

Room: 400 Ballroom

8am-5pm

On Site Hiring

Room: 100C

9am-9:30am

Coffee Break

Room: In the Trade Show! Ballroom AB

6am-Noon

Plant ID

Room: Grove Hotel: Evergreen Ballroom

9:30am-5pm

HSYF Paper Presentation

Room:120A

9:30am-11:30am

Workshop: Data Management – Plans, Storage, and Access (A PSA, public service announcement) (Organizer: Kaplan)

Room: 430A

Description: The art and science of rangeland ecology and management is holistic in nature which puts a premium on long-term data, both experimental and experiential. However, maintaining and curating these datasets along with new requirements for developing data management plans creates challenges and makes for a confusing time for researchers and others. The workshop will feature hands on examples of data management plans and storage opportunities, creative small group conversations, an interactive question and answer session, and the opportunity for follow up mentoring with researchers who are familiar with data management and curation.

Dr. Marquea King (Tentative)—The importance of a data management plan in research

Drs. Amy Ganguli and/or Dr. James – What does a good data management plan look from a NIFA perspective.

Nicole Kaplan and Holly Johnson—What is tidy data and why is metadata considered a love note to your future self?

Nicole Kaplan and Erin Antognoli—Where do I store my data and what does a DOI get me?

Whole group—small group discussions on setting up data plans

Whole group-- One on one discussions about your individual data plan

Symposium: (Full Day Session) Beyond Meat - Livestock, soil carbon and ecosystem service markets in the U.S. West: generating complementary funding for rangeland and rural community stewardship? (Owen)

Room: 120C

Description: 3-part session; The full day symposium will explore a range of examples and models for natural resource management, conservation and financing that value landscape functionality for both agriculture commodity production and a full suite of ecosystem services derived from rangelands. Within their individual areas of expertise and experience, speakers will respond to the general question of, what are the opportunities for the West of a land-based economy in which the return on investment grows over time as the lands and communities from which services are derived are stewarded and restored?

SYMPOSIUM AGENDA

Session 1 (9:30 – 11:30) - **Meeting the needs of western landscapes and communities with Ecosystem Service Markets.** Local knowledge is paramount to stewardship of ecosystems, along with a comprehensive understanding of management strategies for a particular ecotype. However, viability of management strategies requires more than production knowledge and geographic eco-literacy. Models that focus on financial viability, trust and a shared commitment to people and place generate efficiencies, improve stewardship outcomes, and serve landowners and communities. Through responsiveness to questions and ideas that emerge as producers are engaged, partners can engage to further improve our understanding of the capacities of landscapes, the management strategies that build landscape functionality, and the financial mechanisms and policy structures that match supply and demand in ways that benefit rangeland landscapes.

(10) **Bre Owens** (Western Landowners Alliance) – overview of the day
(20) **Jared Talley** (Boise State University) – Markets, ecosystems, and western communities: what are we talking about?
(60) **Producer Panel** and audience Q&A - A facilitated panel discussion with five ranchers to discuss ranch goals and the relationship to carbon and ES markets – Facilitated by Bre Owens

- **Glenn Elzinga** (Alderspring Ranch, ID)
- **Mark Pratt** (Pratt Family Beef, ID)
- **Bill Milton** (Milton Ranch, MT) - tentative
- **Agee Smith** (Cottonwood Ranch, NV)
- **Jack Hanson** (Willow Creek Ranch, CA) - tentative

(20) **James Rogers** (Northway Ranch Services) - Challenges faced by the western ranching community to achieve desired objectives of ES markets

Symposium: An Appreciation of the Contribution of Dr. Steve Archer to Arid land Ecology and the Management of Rangelands (Organizer: Brown)

Room: 110AB

Description: Dr. Steve Archer, and his collaborators, have produced a uniquely relevant and insightful body of work linking rigorous experimental investigations to management challenges faced by rangeland managers. Steve, and his students and post-doctoral fellows, have maintained a 4-decade long focus on the ecological processes and mechanisms underlying common arid land management challenges, and on the responses necessary to alleviate undesirable impacts. In this symposium, we will present the body of research within the context of common management challenges and the influence of the work. The presentations will cover shrub increase, invasive species, ecosystem change, ecosystem services and management responses and will conclude with a Q&A.

The importance of understanding seed dispersal and seedling recruitment in arid grassland:shrubland transitions. (Joel Brown, Austin Rutherford and Nate Pierce)

Can soil properties mediate nonnative grass invasions in arid rangelands? (Cheryl McIntyre)

Rethinking grass: shrub Interactions in arid rangelands: management implications. (Dawn Browning and Katherine Predick)

The effects of shrub:grass conversions on ecosystem functions (Heather Throop)

Evaluating and managing for Ecosystem Services in arid rangelands (Adam Naito and Steven Jones)

Discussion, Q&A

Symposium: Virtual Fence Technology: Challenges and opportunities for implementing virtual fence across public, private, and research sectors. (Organizer: Brennan)

Room: 110CD

Description: Virtual fencing (VF) technology can enable rangeland managers to better manage the timing, duration, and distribution of grazing animals on the landscape, while reducing labor and material costs associated with physical fencing. Recently, several commercial options have become available to livestock producers, and VF projects and partnerships have been initiated across U.S. rangelands. The objective of this symposium is to give a broad overview of virtual fence applications and ongoing projects across different groups, regions, and organizations including 1) university

researchers, 2) NGO/Government organizations, and 3) private livestock producers, while discussing challenges associated implementing VF systems.

9:30am-9:45am: Dr. Joslyn Beard. University of Arizona. Overview of Virtual Fence Systems

9:45am-10am: Dr. Rory O'Connor. USDA-ARS Burns. The potential of virtual fence for managing fine fuels in the sagebrush steppe

10am-10:15am: Dr. Jameson Brennan. South Dakota State University. Comparison of Virtual Fence and Continuous Graze systems on Animal Behavior

10:15am-10:30am: Dr. Ryan Reuter. University of Oklahoma. Effects of virtual fencing on cortisol concentrations and behavior of beef cattle

10:30am-10:45am: Stephanie Pitt. Managing Rangelands with Virtual Fencing for Grazing Lands Conservation in Eagle County, Colorado.

10:45am-11am: Anthony Capizzo and William Burnidge. Virtual fences: a win-win for cattle ranching and conservation? A pilot project in the Flint Hills.

11am-11:15am: Clay Burtrum. Burtrum Cattle LLC. Producers' perspective on implementing a virtual fence system.

11:15am-11:30am: Nick Jorgensen. Jorgensen Land and Cattle. Perspectives from a South Dakota beef cattle operation on virtual fence technology: ups and downs lead to insights and changes.

11:30am-11:45am: Dr. Dana Hoag. Colorado State University. Producer views about virtual fencing.

11:45am-Noon: Panel Q&A

Symposium: The Role of Invasive Exotic Plant Species in Reclamation and Restoration (Organizer: Di Stefano)

Room: 120B

Description: Invasive exotic plant species, hereafter referred to as weeds, are a major driver of degradation to rangeland ecosystems throughout the world. In addition to driving degradation, weeds pose a major challenge to re-establishing desired species by altering ecosystem processes and outcompeting desired species for limited resources. As such, weeds are a major issue for restoration of rangeland systems. This half day symposium will bring together cutting-edge research on the restoration of rangeland systems degraded by weeds.

Mae Elsinger (AGR-GC, Great Plains) – confirmed: Managing Kentucky bluegrass infestation of native species plantings

Amy Gill (CSU, Great Plains) – confirmed: Native seed mix functional diversity increases competition with invasive annual grass Bromus tectorum

Chad Kluender, Matt Germino (US Geological Service, Boise) – Breaking the cheatgrass-fire cycle with co-produced, adaptive management: importance of a whole-community perspective, grazing, and biocrusts.

Charlie Clement/Daniel Harmon (USDA-ARS, Great Basin) – confirmed: Restoring cheatgrass invaded systems of NV sagebrush steppe

Josh Davy (UC Extension – Tehama County, California Annual Grassland) – confirmed: A synopsis of multiple approaches to weed control and restoration in California Annual Rangelands

Theresa Becchetti (UC ANR- Modesto, California Annual Grassland) – confirmed: Restoration at the Pasture Scale: Using Grazing and Planting Strategies to Control Medusahead Infested Pastures.

Symposium: Strategies and Tools for Prioritizing Management Actions in Sagebrush Ecosystems (Organizer: Crist)

Room: 100D

Description: The sagebrush biome is undergoing major ecological transformations due to a variety of perturbations. New policies and funding provide increased opportunities for conserving and restoring these rangelands. Strategies developed for prioritizing management to maximize benefits include the "Sagebrush Conservation Strategy" and "Science Framework for Conservation and Restoration." New geospatial information on core sagebrush habitat as well as current and projected future ecological resilience and invasion resistance advance these strategies. We discuss the importance of the new funding and policies, integration of the existing strategies, and role of the new geospatial layers in prioritizing management in these important ecosystems.

Policies, Funding and Prioritization – where are the agencies headed (Karen Kelleher (BLM ID State Director) and Mary Farnsworth (FS R4 Regional Forester))

Linking efforts to conserve and restore sagebrush ecosystems (Tom Remington (WAFWA) and Michele Crist (BLM))

Defining core sagebrush habitat (Kevin Doherty (FWS) and team)

New indices of resilience to disturbance and resistance to invasion based on climate and soil water availability (Jeanne Chambers (USFS RMRS) and team)

Projected changes in R&R and fire risk in a warming environment – implications for current management (John Bradford and Daniel Schlaepfer (USGS))

Discussion: Integration – next steps

Contributed Oral Session: Rangeland technologies, *session 2 of 2; Cameras and remote sensing*

Room: 410A

9:30am-9:45am: Anne Blackwood
Remote Sensing for Wildlife

9:45am-10am: Taylor Bayne
SMART WILDLIFE MONITORING: EVALUATING CAMERA TRAPS ENABLED WITH ARTIFICIAL INTELLIGENCE

10am-10:15am: Biquan Zhao

Linking on-ground plant functional group biomass production to remote sensing in the semi-arid grasslands of the Nebraska Sandhills

10:15am-10:30am: Cara Applestein
Considerations when using remote sensing fractional cover products for land management purposes

10:30am-10:45am: Matthew Rigge
Rangeland Condition Monitoring Assessment and Projection (RCMAP): Tracking Fractional Rangeland Component Cover Over a 36-year Time-series

10:45am-11am: Pete Bauman
Innovative use of NAIP and LiDAR Imagery to Identify Potentially 'Undisturbed' Land in South Dakota and the Great Plains: Implications for Retention of Native Grasslands.

11am-11:15am: Wayne Smith
Exploring Spatial and Dimensional Differences Across Multiple Resolutions in Image Classification

11:15am-11:30am: Lucas Phipps
Assessing vegetative state utilizing remotely sensed fractional cover and vegetation inventory data

Contributed Oral Session: Restoring rangelands, *session 3 of 3*

Room: 410B

9:30am-9:45am: Michelle Jeffries
Accessible Adaptive Management: An Introduction to the Land Treatment Exploration Tool

9:45am-10am: Corey Gucker
Biology, Ecology, and Use of Forbs in Restoration

10am-10:15am: Alan Alvarez
Selecting grass species for grasslands restoration through environmental niche modeling

10:15am-10:30am: Akasha Faist
Biocrust and nutrient additions increase vascular plant biomass of perennial rangeland grass Arizona Cottontop (Digitaria californica)

10:30am-10:45am: Kyle Cook
Effects of seed coatings on emergence and survival of winterfat

10:45am-11am: Amy Symstad
Prescribed fire and targeted herbicides may not be enough to restore invaded northern mixed-grass prairie

11am-11:15am: Curtis Drake
Targeted Grazing to Reduce Cheatgrass Abundance

Contributed Oral Session: Grazing, *session 4 of 5; Case studies from around the world*

Room: 410C

9:30am-9:45am: Wendimu Bireda
Multivariate analysis to Distinguish Indigenous Cattle in North Shewa zone of Oromia, Ethiopia

9:45am-10am: Mesay Guyo
Physiological features reactivity of Arsi-Bale goats reared under the three agro-ecologies of the Bale zone, southeastern Ethiopia

10am-10:15am: BRIEN NORTON
Rotational grazing success in Central Asia

10:15am-10:30am: Matthew McIntosh
Assessing grazing behavior of heritage, hybrid, and conventional cattle breeds in response to climate change

10:30am-10:45am: Javier Arturo Ñaupari Vasquez
Response of Degraded Rangelands to the Exclusion of Cattle Grazing within the Huascaran National Park, Ancash-Peru

10:45am-11am: Caroline Wade
Assessing the impact of water and forage resources on sheep and goat distribution in Queensland, Australia – a case study

11am-11:15am: Erach Mamedov
CULTIVATION OF FODDER CROPS BASED ON THE USE OF GROUNDWATER IN THE KYZYLKUM DESERT

11:15am-11:30am: Tolibjon Mukimov
THE USE OF EFFECTIVE TECHNOLOGIES IN ANIMAL HUSBANDRY IN UZBEKISTAN

11:30am-1pm

SRM Business Meeting Lunch
Room: Junior Ballroom

2pm-4pm

Tour: Basque Center Walking Tour

1pm-3pm

Workshop: Putting the R in Rangelands: Data Management and Visualization Using Tidyverse in R (Organizer: Harrison)

Room: 100D

Description: This workshop will introduce participants to R statistical software for rangeland specific data. Using packages within the tidyverse, we will clean, manipulate, summarize, and visualize data.

During the workshop, example code and datasets will be provided and explained and then practice datasets will be provided for participants to get hands-on experience with the material. This workshop's intended audience is students, early career professionals, and anyone interested in learning more about using R's tidyverse to manage data and create visualizations. If possible, participants should bring a laptop with R Studio (free) installed.

Georgia Harrison (University of Idaho)
Leah Dreesmann (University of Idaho)
Claire Tortorelli (UC Davis)

Symposium: (Full Day) Beyond Meat - Livestock, soil carbon and ecosystem service markets in the U.S. West: generating complementary funding for rangeland and rural community stewardship? (Organizer: Owen)

Room: 120C

Session 2 (1:00 – 3:00) - The nuts and bolts of rangeland Ecosystem Service Markets
Interest in carbon markets across the US is exploding. Despite this, it can be difficult for managers and ranchers to know if they will benefit from participation, and how to get involved. This session's goal is to demystify developing markets. Speakers in this session will discuss, credit development, market nuts and bolts, economic viability, and provide insight on how to launch projects, along with address the widespread doubt that semi-arid rangelands can sequester meaningful amounts of SOC. Additional discussion will look beyond just the single ecosystem service of carbon, and consider market-based mechanisms that value suites of rangeland ecosystem services generated by whole and healthy landscapes.

(1:00) **Developing protocols and markets for ecosystem services**
(20) **TBD -** A history of ecosystem service markets and new approaches: Multiple pathways for generating and selling "credits" from ranch to marketplace
(20) **Regen Network** (invited) – CarbonPlus Grasslands: An ecosystem services marketplace methodology for carbon and co-benefits in grasslands
(20) **Hallie Mahowald** (Western Landowners Alliance) – Habitat leasing: A market-based mechanism for stewardship of working-wild landscapes

(2:00) **Economics and science of ecosystem services**
(20) **Amber Bieg** (Warm Springs Consulting) – An economic model of the costs and benefits for grazing lands carbon market participants
(20) **Taylor Payne** (Utah Grazing Improvement Program) – Livestock grazing and stewardship: Economic relevance to a northern Utah community
(20) **Megan Nasto** (Working Lands Conservation) – The effects of livestock grazing on soil health and organic carbon in semi-arid rangelands: A case study from northern Utah

Ignite: Science for adaptive management of burned rangelands: Insights for breaking the cheatgrass-fire from the 2015 Soda Megafire (Organizer: Germino)

Room: 100E

Description: The annual-grass and wildfire cycle continues to spread and cause loss of perennials and ecosystem services across vast areas, in spite of decades of management action and research. A significant aspect of the problem is that the areas burned are vast, remote, and more heterogeneous than is appreciated, which creates uncertainty on plant and soil

factors that affect or define recovery and management treatment success. To overcome these issues, a coordinated management and science response to the 2015 Soda Megafire near Boise produced a rich set of well-documented and replicated management treatments that was followed with the most intensive scientific assessment of a burned area to date. The burned area has become the best-well studied, globally, and there are many ongoing projects and opportunities. This ignite session will highlight the major findings and their relevance to other burned areas, and will be linked to a poster session in which details of each study can be discussed.

Identifying and overcoming data needs for post-fire management

Germino M, Torma P, with commentary from BLM officers: Introduction and overview – variability and the challenges it poses to managing burned rangelands. Historical context, importance, triggers, and key treatments of the Soda wildfire management response.

Price, J: Reconstructing the Soda Wildfire using fire simulation models: importance of heterogeneity in the pyroscape.

Fisk, M: Methods for rapid field sampling of a large megafire area to inform rapid management response.

Applestein C: How well can we know post-fire vegetation recovery? - Field data, sample sizes, modeling, and remote sensing considerations.

Germino M: Soil stability: Passive sensors reveal otherwise undetected post-fire soil erosion patterns.

Kluender, C: Overcoming bias in determining post-fire treatment effectiveness: new statistical tests provide insights on combining herbicide and seeding.

Plant community recovery and restoration effects

Applestein C: Biotic diversity and biotic interactions within and among exotic annual grasses reveal more complexity than is recognized in current literature and management.

Fisk, M: Does native plant diversity matter for resistance to annual grasses? 1500 points and 5-year of inference.

Germino M: Hotspots for sagebrush seeding effectiveness vary over time since fire and development of restored vegetation

Davidson B: Sagebrush planting effectiveness reveals importance of soil mapping and co-treatments.

Protection and wildlife use of the investment

Price, J: Fuel breaks: Protecting the restoration investment, but what are their effects?

Anthony, C: Assessing post-fire livestock impacts below the scale we have spatial information on cows for: can we model selective use of pastures?

Davidson, B: Experiments to estimate the elusive effects of livestock grazing resumption after fire.

Pilliod, D: Pollinator responses to vegetation recovery.

Anthony, C: Do sage grouse benefit from post-fire restoration treatments? The answer depends on data type and potential problems with spatial autocorrelation.

Symposium: Poisonous Plants Across Rangelands (Organizer: Stonecipher)

Room: 420A

Description: Poisonous plants are found throughout rangelands in the western U.S. and the World. They grow within natural and disturbed landscapes consisting of diverse plant communities such as sagebrush steppe, desert shrub, short grass prairies, foothills and mountain rangelands. Poisonous plants cause large economic losses through reduced animal weight gains, reproduction losses, lost grazing opportunities, and animal death. Understanding some of the plants that poison animals on rangelands and how such plants effect animals is beneficial to producers to best understand how to graze such rangelands and reduce animal losses.

1pm-1:15pm: Geographical and seasonal variation in larkspur alkaloids – Clint Stonecipher, Poisonous Plant Research Lab

1:15pm-1:30pm: What happens when an animal consumes more than one toxic plant? Kevin Welch, Poisonous Plant Research Lab

1:30pm-2pm: Noninvasive specimens to diagnose livestock exposure to toxic plants. Stephen Lee, Poisonous Plant Research Lab

2pm-2:15pm: DNA metabarcoding as a diagnostic tool for poisonous plant research. Daniel Cook, Poisonous Plant Research Lab

2:15pm-2:30pm: Sheep grazing for control of Geyer's larkspur (Delphinium geyeri). Derek Scasta, University of Wyoming

2:30pm-2:45pm: Limiting the risks of selenium toxicosis when managing livestock on seleniferous rangelands. Zane Davis, Poisonous Plant Research Lab

2:45pm-3pm: Can clays bind plant toxins in the rumen? Ben Green, Poisonous Plant Research Lab

Symposium: (1pm-5pm) Cultivating future rangeland professionals and rangeland-literate public – An integrated cross-boundary approach of the Prairie Project (Organizer: Wu)

Room: 110AB

Description: Woody plant encroachment poses grave threats to sustainability of rangelands globally. Pyric herbivory and mixed-species grazing are management strategies that can help control woody plants, support livestock production, and promote biodiversity. Their adoption by rangeland managers and support in the policy arena have been limited because of cultural constraints and public misperceptions. We present an integrated cross-boundary education and outreach effort, as a key component of the USDA- funded Prairie Project, that develops agents of change and education and Extension resources, cultivates progressive rangeland professionals and rangeland-literate public, and supports broader adaptions of these management strategies and rangeland sustainability.

Chase Brooke, Texas AgriLife Extension Service, “Burn it, graze it, teach it, use it: Building effective extension programming to demonstrate best range management practices with landowners”

Laura Goodman, Oklahoma State University, “Bridging the divide between research and management: A new approach for extension programming”

Humberto Perotto, Texas A&M University-Kingsville, “Using drone imagery in the classroom to compare vegetation changes after a prescribed fire”

Erika Sullivan, Texas AgriLife Extension Service, “Learning about woody brush encroachment outside the classroom through the Prairie Project”

Evan P. Tanner, Texas A&M University-Kingsville, “Utilizing thermal landscapes as an impetus towards integrating climate science into patch-burn management education in undergraduate curriculum”

Allison Thompson, Oklahoma State University, “Social media - What works for extension?”

Morgan Treadwell, Texas AgriLife Extension Service, “Rangeland literacy: Learning from the rancher on the ranch”

Ben Wu, Texas A&M University, “Developing agents of change and innovations in K-16 education to promote rangeland literacy”

Bryan Yockers, Jenks High School (Jenks, OK), “Fire Ecology Research Station for Teaching (JenksFERST): Opportunities for science communication”

Workshop: (1pm-5pm) SRM Leadership Initiative (Organizer: Roath)
Room: 120B

Description: Assisting the next generation of land managers with skills in collaboration and innovation is essential to building healthy rangelands, maintain the rangeland profession, and strengthen the Society for Range Management. The goal of the Leadership Initiative Task Force is to explore opportunities for early-career rangeland professionals to build networks of resources and advocates that will create a culture of open communication, innovation, and problem solving for rangeland management.

Workshop: (1pm-5pm) Restoring Riparian Habitats: A Practical Approach to Assessing, Planning, Implementing, and Monitoring Restoration Projects. (Organizer: Winford)
Room: 110CD

Description: Mesic areas (including riparian zones and meadows) provide a host of services and benefits to humans and wildlife and the restoration of these areas on public and private lands is a focus of many programs and funding sources. This workshop will bring together several aspects of the restoration process and provide attendees an overview of how to strategically plan and carryout a restoration project. The workshop will cover the following topics: stream assessment in

order to identify key threats, implementation framework including permitting and consideration of specific techniques, and monitoring approaches to determine if objectives are met.

Chad Boyd (ARS)/ Dustin Johnson (OSU) "Assessing threats to streams"

Josh White (USFWS) "A framework for implementing process-based restoration"

Caroline Nash (CK Blueshift)/ Eric Winford (UI) "Process-based monitoring"

Contributed Oral Session: Grazing, *session 5 of 5, Diets & more*

Room: 410A

1pm-1:15pm: Keith Harmoney
Vegetation and Animal Production in Pastures Sprayed for Western Ragweed Control

1:15pm-1:30pm: Laura Snell
Livestock Mortality Composting in California

1:30pm-1:45pm: Cory Oltjen
Effects of temperature and lunar illumination on cattle activity and distance traveled from water at night by Corriente cattle

1:45pm-2pm: Robin Malik
The effect of diet diversity on goat meat quality

2pm-2:15pm: Anna Dagel
Precision Supplementation Effects on Heifer Development and Reproduction

2:15pm-2:30pm: John Walker
Dietary Preference Nature or Nurture?

2:30pm-2:45pm: Logan Vandermark
Comparing Net Energy for Activity Between Continuous and Virtual Grazing Systems Using GPS Data and Daily Weights

2:45pm-3pm: Carmen Willmore
Forage Intake and Digesta Kinetics of Beef Cattle Differing in Feed efficiency While Grazing Idaho Rangelands

Contributed Oral Session: Plant ecology, *session 3 of 3; Animal interactions & more*

Room: 410B

1pm-1:15pm: Andy Kleinhesselink
Long-term trends in vegetation on Bureau of Land Management rangelands in the western U.S.

1:15pm-1:30pm: Lindsey Buehler
Evaluating Ungulate Usage of Rangelands with Black-tailed Prairie Dog Disturbance

1:30pm-1:45pm: Lauren Porensky
Ecosystem resilience to prairie dog disturbance offers opportunities for rangeland management

1:45pm-2pm: Stephanie Yelenik
Disturbance and plant community assembly in exotic-dominated landscapes

2pm-2:15pm: Martín Do Carmo Corujo
Improving herbage mass prediction by regression tree analysis

2:15pm-2:30pm: Sergio Arispe
Predicting Litter Biomass in Degraded Sagebrush Rangelands of the Northern Great Basin

2:30pm-2:45pm: Brandi Wheeler
Leveraging erosion models with established land health assessments to support management decisions

2:45pm-3pm: Lea Condon
Intact Habitat for Greater Sage-Grouse Includes Biological Soil Crusts

3pm-5pm

Symposium: Utilizing current statistical methods for proper ecological inference and applications to management (Organizer: Applestein)
Room: 100D

Description: For decades, ecological data analysis has been conducted using statistical methods developed for laboratory or crop science. These analyses do not adequately account for the real-world variability inherent to ecological data. As a result, findings are often unclear, contradictory, or don't predict real world outcomes. Several recent reviews and papers have shown that the choice of statistical analysis can have significant and severe impacts on ecological inference, sometimes obscuring true effects or inaccurately displaying effects that don't exist. We will explore how to improve our inference using cutting-edge statistical methods to better understand variable management outcomes.

Allison Simler-Williamson - Quantifying treatment effects in light of the non-random application of restoration efforts: a case study in burned sagebrush steppe
Thomas Rodhouse - Statistical survey designs, models, and management: Bridging the gap for practitioners in sagebrush steppe

Katherine Banner - Use it or lose it! Considerations for using informative priors in Bayesian models to address ecological questions of interest

Kathryn Irvine - Why everyone should be using the beta distribution for assessing temporal and spatial variation in plant cover

Andrii Zaiats - LDA to aid understanding patterns of biodiversity and identification of plant communities and states

20 minutes panel discussion at the end

Symposium: (9:30am-5pm) Beyond Meat - Livestock, soil carbon and ecosystem service markets in the U.S. West: generating complementary funding for rangeland and rural community stewardship? (Organizer: Owen)

Room: 120C

Session 3 (3:00 – 5:00) – People and livestock at work in rejuvenating western landscapes

(3:00) Suites of services and case studies of regenerative grazing
(20) Lynn Huntsinger (University of California, Berkeley) – Managing for and valuing ecosystem services beyond carbon
(20) Kris Hulvey (Working Lands Conservation) – How do we manage for stacked ecosystem services in semi-arid rangelands? Examples from the Three Creeks grazing project
(20) Caryl Elzinga (Alderspring Ranch) – A Range of Benefits: Reinventing Herding in the 21st Century

(4:00) Necessary next steps
(20) Producer Panel – Additional thoughts and takeaways
(40) Audience engaged discussion - Facilitated by Bre Owens, Kris Hulvey and Jared Talley

Ignite: Applications of gap intercept monitoring methods to understand rangeland ecological dynamics (Organizer: McCord)

Room: 100E

Description: Gap intercept is a widely used monitoring method, included as core method in the BLM AIM and the NRCS NRI programs as well as local research and monitoring projects. Land managers have many valid questions about using canopy gap information to inform decision-making and improve understanding of ecological dynamics. This is in part due to lack of consensus on ecological interpretations of gap intercept as well as variability in implementation of the gap intercept method. Canopy gap with all vegetation, perennials-only canopy gap, and basal gap are the dominant implementations of this method. In this session, we present the use and application of different gap intercept datasets to understand post-fire treatment success, fuels treatment success, wind and water erosion dynamics, invasive species spread, and wildlife habitat condition. We will conclude the session with a discussion to synthesize the appropriate use of gap intercept data and to identify remaining gaps in the application and use of gap intercept data.

Sarah/Emily/Aleta— The gap intercept method: history and remaining questions

Matt Germino- Gap intercept in post-fire monitoring: Application to sagebrush steppe rangelands under threat of the invasive grass-fire cycle.

Nick Webb— Using gap intercept data to assess wind erosion risk and land management effects on air quality

Jason Williams— Gap intercept in water erosion modelling

Beth Newingham – Exploring opportunities to use gap intercept data in fuels management

David Pilliod— Gap intercept applications for assessments of wildlife habitat, predation risk, and fearscapes

Madelon Case--Gap intercept and invasive species dynamics

Leah Dreesmann— Mind the gap: an overview of potential errors and their implications in gap intercept data

Anthony Schaefer – Linking canopy gap intercept to biocrust cover and composition

Symposium: Wolf-Livestock Conflict Management on U.S. Forest Service Lands (Organizer: Charnley)
Room: 420A

Description: This symposium highlights how conflict associated with wolf presence and livestock grazing on Forest Service-managed lands in the western U.S. is being addressed and managed. Federal lands pose particular challenges for managing wolf-livestock conflict owing to the large size, remote nature, and rough terrain of many grazing allotments; a multiple use management context; and state versus federal responsibilities for managing wolves versus livestock grazing, respectively. We focus on the successes and challenges in implementing coexistence approaches on Forest Service lands, and factors that influence their outcomes.

Dr. Jeff Martin, U.S. Forest Service, Pacific Northwest Research Station Fellow: "Setting the Stage: Wolves, Livestock, and Conflict over their Management on Forest Service Lands"

Dr. Nick Bergmann, University of Idaho "The Emotional Political Ecologies of Managing Wolf-Livestock Conflict in the Pacific Northwest"

Jan Bowey, US Forest Service, Beaverhead-Deerlodge National Forest: "Livestock/Wolf Depredation Prevention Measures on the Beaverhead-Deerlodge National Forest"

Dr. Robert Anderson, US Forest Service, Pacific Northwest Research Station Fellow: "Large, rugged, and remote: applying tools and techniques for wolf-livestock coexistence on US Forest Service lands"

Brandon Weinmann, U.S. Forest Service, Colville National Forest: "Finding success with wolves and livestock on public land: insights from the Colville National Forest"

Dr. Alex Few, Western Landowners Association: "Innovation of policies and practices to address carnivore conflicts on federal lands"

Symposium: (1pm-5pm) Cultivating future rangeland professionals and rangeland-literate public – An integrated cross-boundary approach of the Prairie Project (Organizer: Wu)--*CONTINUED*
Room: 110AB

Workshop: (1pm-5pm) SRM Leadership Initiative (Organizer: Roath)--*CONTINUED*
Room: 120B

Workshop: International Rangeland Congress, Australia 2025: An opportunity to stimulate US-Australia rangelands collaboration (Organizer: Ash)
Room: 420B

Description: Australia is hosting the XII International Rangeland Congress in June 2025. This will be the first in-person International Rangeland Congress in nearly a decade and it provides a good platform to stimulate US-Australia rangelands collaboration. To make the most of this opportunity, discussion and networking needs to start now. This session will provide a brief overview of planning arrangements for the IRC followed by a presentation on key issues, challenges and opportunities in US and Australian rangelands. A moderated discussion will explore areas of mutual interest for collaboration as well as seeking broader ideas and input to the IRC program.

Workshop: (1pm-5pm) Mesic Area Restoration: Assessment, Implementation, and Monitoring (Organizer: Winford)--*CONTINUED*

Room: 110CD

Description: Mesic areas (including riparian zones and meadows) provide a host of services and benefits to humans and wildlife and the restoration of these areas on public and private lands is a focus of many programs and funding sources. This workshop will bring together several aspects of the restoration process and provide attendees an overview of how to strategically plan and carryout a restoration project. The workshop will cover the following topics: stream assessment in order to identify key threats, implementation framework including permitting and consideration of specific techniques, and monitoring approaches to determine if objectives are met.

Chad Boyd (ARS)/ Dustin Johnson (OSU) "Assessing threats to streams"

Josh White (USFWS) "A framework for implementing process-based restoration"

Caroline Nash (CK Blueshift)/ Eric Winford (UI) "Process-based monitoring"

Contributed Oral Session: Carbon on the range

Room: 410B

3pm-3:15pm: Seton Bachle
Belowground storage in grassland systems: the impact of seasonal fires on non-structural carbohydrate reserves in native forbs

3:15pm-3:30pm: OPEN

3:30pm-3:45pm: Zg Chen
Effects of extreme rainfall events and different functional types on the net ecosystem exchange, biomass and nitrogen mineralization in a Northern Great Plains mixed grassland

3:45pm-4pm: Travis Brammer
Arriving at a natural solution: Bundling credits to access rangeland carbon credits

4pm-4:15pm: Landon Schofield
Acute Effects of Fire on Soil Carbon

4:15pm-4:30pm: Eric Sant
Mapping Percent Soil Carbon and its Change in the Riparian Areas of the Humboldt Ranch

4:30pm-4:45pm: Mike Anderson
Upland soil carbon pools: sampling, mitigating costs, and defining carbon distributions across large landscapes.

Contributed Oral Session: Exotic Annual Grasses, *session 1 of 2*

Room: 410ª

3pm-3:15pm: Lisa Rew
Evaluating integrated control practices for cheatgrass at high elevation sagebrush sites

3:15pm-3:30pm: Brynne Lazarus
Critical questions for pre-emergent herbicides in sagebrush steppe: longevity of target and non-target effects on species and ecosystem properties

3:30pm-3:45pm: Maddy Case
Exotic annual grass invasion and grazing across Northern Great Basin rangelands: a cross-scale perspective

3:45pm-4pm: Ranae Zauner
Effects of imazapic and drought on plant communities in intact Mojave Desert ecosystems

4pm-4:15pm: Beth Fowers
Effects of Indaziflam Application Timing on Annual Grass Control at Seven Rangeland Sites

4:15pm-4:30pm: Jake Courkamp
Long-term cheatgrass (Bromus tectorum L.) control with indaziflam in sagebrush-grasslands in Sublette County, Wyoming: research synthesis and future directions

4:30pm-4:45pm: Joe Smith
Invasive annual grasses and fire in the Great Basin: New insights from remote sensing

4:45pm-5pm: Stephen Boyte
Bi-weekly early estimates of exotic annual grass abundance in rangelands of the western U.S.

5pm-6pm

Diversity and Inclusion Committee Meeting
Room: 120B

5pm-6:30pm

Poster Session #2
Room: Grand Ballroom AB

5:30pm-8pm

Idaho Section Social
5:30PM-6:30PM

Room: 120A

University of Arizona Social and Friends
5:30PM-7:30PM
Room: 120B

Utah State University Social
5:30PM-7:30PM
Room: 120C

USFS Family Meeting
6:30PM-8:00PM
Room: 110AB

NRCS Family Meeting
6:30PM-8:00PM
Room: 110 CD

BLM Family Meeting
6:30PM-8:00PM
Room: 100E

8pm-11pm

Dance
Room: Junior Ballroom

WEDNESDAY, FEBRUARY 15TH

7am-8am

2023 Planning Committee
Room: 140

6:30am-7:30am

Fun Run

8am-9am

Plenary
Room: 400 Ballroom

8am-5pm

On Site Hiring
Room: 100C

9:30am-1pm

TOUR: World Center Birds of Prey
Offsite

9am-9:30am

Break

10am-Noon

NRCS Vegetation Monitoring and Data Interpretation Capstone Presentations
Room: 120A

9:30-11:30am

Extemporaneous Speaking Contest (Undergrad)
Room: 420B

9:30am-11:30am

Symposium: Beyond Direct Seeding: The Next Frontier of Landscape Scale Vegetation Restoration. Rangeland Technology and Equipment Council (RTEC). (Organizer: Gunnell)
Room: 420A

Description: This symposium will focus on efforts to implement the use of alternative plant materials (e.g. outplanting, transplanting, etc.) as a revegetation method within shrubland communities in the intermountain region. The discussion will outline current research and management efforts, as well as infrastructure and equipment limitations in expanding practice's to landscape scales. This symposium will be followed with a companion campfire discussion "Beyond Direct Seeding: Overcoming Limitations in Equipment and Infrastructure of Alternative Plant Materials" to further discuss how to overcome limitations in scale and capacity of revegetation efforts.

Introduction (Kevin Gunnell, 1-3 min), Steve Monsen Memoriam (Mike Pellant, 5 min), Revegetation Equipment Catalog Update (Corey Gucker, 7-9 min)

Jeremiah Pinto, Rocky Mountain Research Station, USDA Forest Service, "Considerations for growing target rangeland plant materials in nurseries".

Kari Veblen, Dept. of Wildland Resources and Ecology Center, Utah State University, "Establishment of mountain big sagebrush from mature plant vs. seedling transplants".

Kirk Davies, Eastern Oregon Agricultural Research Center, USDA-ARS Burns, "Microsite location and cattle grazing effects on sagebrush transplants".

Matthew Madsen, Dept. of Plant and Wildlife Sciences, Brigham Young University, “Use of Waterboxx® devices for establishing trees and shrubs on mineland overburden hillslopes”.

Andrew Nelson, Dept of forest, Rangeland and Fire Sciences, University of Idaho, “Drought conditioning seedlings to improve outplanting performance; Perspectives from tree seedlings and applications to rangeland plants”.

Matthew Germino, Forest & Rangeland Ecosystem Science Center, U.S. Geological Survey, “Relative importance of management and natural factors affecting post-fire sagebrush plantings and their implications for restoring megafires”.

Scott Jensen, Rocky Mountain Research Station, USDA Forest Service, “Designing a target plant and automated wildland transplanter for plant-based sagebrush restoration”.

Workshop: What you really need to know about the Carbon Market with Good Grazing Makes Cent$ (Organizer: Birrenkott)

Room: 100D

Description: With increased trading of carbon credits in the Ecosystem Marketplace, ranchers throughout the countryside are questioning the risks and rewards associated with entering a carbon credit contract. We'll explore carbon markets from all angles that a rancher needs to know in this interactive discussion- From the ecological perspective in terms of soil/land health, the economic perspective and its potential impact on an operation's bottom line, the law perspective regarding contractual agreements, the management perspective and grazing implications, and an overarching view of the impact this could have on the future of ranching. Participants will also have a chance to ask questions directly of experts, ranchers who have participated in a market, and market aggregators. Come with questions and ready for real talk.

Dylan Pettyjohn: Graybeal Group

Martin Townsend: Rancher's Stewardship Alliance

Ken Bentz: Ranch Real Estate Broker

Scott Warner: attorney

Anson Howard: attorney, rancher

Tucker and Merideth Garrigan: Enlightened Soil Corp, soil science

Jeff Goodwin: Program Director, Texas A&M Natural Resources Institute

Jenny Pluhar: Executive Director, Texas Grazing Lands Coalition

Jack Alexander: Synergy Resource Solutions

Roger Indreland, Montana Rancher

Zach Jones, Rancher

Symposium: Understanding the effects of fuel treatments in sagebrush ecosystems (Organizer: Chambers)
Room: 120B

Description: In recent decades more area burned in shrubland and grassland (56%) than tree-dominated ecosystems (44%) with particularly severe impacts in the sagebrush biome. Increases in wildfire extent and severity have resulted in policies to increase capacity to prevent and suppress fires and funding to implement fuel treatments. To address critical information gaps, we synthesize information on long-term effects of common fuel treatments in the sagebrush biome on fuel and fire behavior and on ecological resilience and resistance to invasion. We discuss the economic trade-offs of the treatments and describe new spatial data and tools for prioritizing fuel treatments.

Altered fire regimes and ecosystem transitions: Is the knowledge keeping up with the policies and funding? (Michele Crist, BLM; Ben Newburn, USDA Forest Service, R4)

Durability of common fuel treatments in sagebrush ecosystems (Lisa Ellsworth, OSU; Eva Strand, U of I; Matt Reeves, RMRS; Karen Short, RMRS)

Ecological effects of common fuel treatments in sagebrush ecosystems (Eva Strand, U of I; Jeanne Chambers, RMRS; Lisa Ellsworth, OSU; Claire Tortorelli, UC Davis; Ali Urza, RMRS)

Modeling economic tradeoffs of fuel treatments using state and transition models (Tom Bridges-Lyman, Mike Tayler, Katie Lacey, UNR)

Mapping nonforest fuels in the past, present and future (Matt Reeves, RMRS; Karen Short, RMRS)

New data layers to aid prioritization of treatment areas: resilience and resistance, core sagebrush areas, fire probability and cover of invasive annuals (Jeanne Chambers, RMRS; Jessi Brown, RMRS)

Symposium: Rangeland Stewardship Council (RSC): Towards rangelands sustainability certification and verification (Organizer: Baival)
Room: 120C

Description: Despite the environmental, social and economic importance of rangelands there is no common or agreed standard for effective and efficient rangeland management that could serve as the basis for sustainability certification of rangeland livestock products.

There is increasing stakeholder pressure to better manage the way we graze and raise livestock and the impact of extensive livestock husbandry on the environment and biodiversity. The effective management of rangelands through a credible standard will positively affect many supply chains such as meat, dairy, leather, mohair, cashmere, and other animal fibres. The symposium will be devoted to discussing the concept of rangeland sustainability certification, how it works, the perspectives of different sectors (conservation, industry, producers, etc.) and experiences of existing certification schemes, and presenting and discussions potential Global Principles for Rangeland Stewardship.

Section 1 the Case for Rangeland Sustainability Certification: Perspectives from Producers, Industry, and Conservation Organizations. The first session provides a broad overview of and presents the case for a unified

certification approach via a global Rangeland Stewardship Council, followed by shorter presentations from the perspectives of conservation, producer groups, industry and organizations involved in certification efforts.

1. Overview of the Sustainability Certification for Rangelands: The Case for a Rangeland Stewardship Council (15 min) Batkhishig Baival, Sustainable Fibre Alliance
2. Conservation Perspectives on Rangeland Sustainability Certification (12 min) - Nancy Labbe, TNC
3. Indigenous producer perspectives from Argentina/South Africa (3 min x 2 recorded video) Alpaca Association/Mohair South Africa
4. Industry perspectives from leather/meat (12 min) - Peter Hughes, Head of Sustainability Business development, Eurofins, BLC Leather Technology Centre Limited
5. Sustainability certification scheme (12 min) ISEAL - David D'Hollander, Manager Policy and Innovations International Social Environmental Accreditation and Labelling Alliance
6. Indigenous producer perspectives from Mongolia/Australia (3 min x 2 recorded video) Alpaca Association/Mohair South Africa
7. Supply chain sustainability (12 min) - Una Jones, CEO, Sustainable Fibre Alliance - Confirmed
8. Global principles for Rangeland Stewardship Standard, (15 min) – Daniele Gelz, Land Restoration and Private Sector team, UNCCD

Moderated Discussion (30 min)

Global principles for rangeland stewardship: towards a global standard, accountability, and feasibility. Presentations that address accountability and feasibility. To ensure balanced talks, representatives from different sustainability schemes will share their experiences with different commodities.

Workshop: (9:30am-3pm) Planning and management under new wildfire realities using a fireshed-scale approach (Organizer: Wollstein)

Room: 110AB

Description: Invasive annual grasses and frequent large wildfires on Oregon rangelands present challenges of such complexity they necessitate working across multiple jurisdictions. Managing for rangeland resilience now requires individuals and organizations to strategically coordinate rangeland and fire management activities so they translate to a scale that matters. This workshop introduces an integrated rangeland and fire management approach using Potential Operational Delineations (PODs). Participants will apply these principles using multiple data inputs to consider: 1) spatial scale for effective coordination, 2) entities to engage, 3) planning and management tools, and 4) decision-support tools and technologies for short- and long-term planning.

Speakers: Dustin Johnson (OSU), Vanessa Schroeder (OSU), Katie Wollstein (OSU), Casey O'Connor (Burns Interagency Fire Zone/US Fish and Wildlife Service), Megan Creutzburg (Sage Grouse Conservation Partnership), Chad Boyd (ARS), Josh Hanson (High Desert Partnership)

The workshop will be designed to encourage dialogue between participants and organizers with opportunities for questions, discussion, co-creation, and networking. The length of the workshop is estimated to be four hours, with the session organized as follows:

- Workshop goals and integrated fire management overview (20 minutes)
- New wildfire realities on Oregon rangelands: rangeland management is (or should be) fire management (20 minutes)

- Oregon's Geographic Strategy to spatially organize and prioritize efforts to defend the core, grow the core, and mitigate impacts (20 minutes)
- Break (10 minutes)
- PODs: A useful tool for coordinating activities before, during, and after fire. Participants will explore applications beyond Oregon in other fire-prone rangeland contexts.
- Stinkingwaters Case Study (35 minutes): Applying an integrating rangeland and fire management approach using PODs.
- Introduction to Landscape Planning Tools (15 minutes)
- Break (10 minutes)
- Practice applying an integrated range and fire management approach to rangeland contexts beyond Oregon
    - Breakout Group Activity: Applying integrated rangeland and fire management to the area surrounding the Cinder Butte Fire
    - Group report out and discussion
    - Wrap up discussion: Translating to on the ground management

Workshop: Solutions for the Rangeland Workforce Crisis (GS 0454) – Moving Forward (Organizer: Edinger)
Room: 100E

Description: The rangeland workforce is in crisis. Many Rangeland Management Specialists (GS-0454) positions face limited applicants or go unfilled. To address this situation some positions are being generalized to the General Natural Resources Management series (GS-0401) for more abundant applicants without specific rangeland management qualifications. We need solutions to increase the number of qualified people entering the rangeland management profession to ensure effective conservation and management of rangelands. This workshop will focus on solutions and concrete actions to address this crisis. Over the last decade, SRM has hosted several workshops and ongoing discussions. This year we will continue with this work by engaging intelligent, motivated, albeit frustrated range professionals into four working groups to develop and propose actions to address concerns and draft solutions. Team will work on the following topics to build a rejuvenating and vibrant workforce: 1) How to track and annually report the status of the rangeland profession, 2) Build effective youth and recruiting programs, 3) Emphasize public relations and branding to increase awareness of the rangeland profession, and 4) Rethinking curriculum to provide rangeland knowledge and skills. Come one and come all to participate, or just to listen and learn. Leaders/participants for each working group will have started addressing their charges in late 2022 and we will continue discussions and draft specific plans. Some steps may require additional resources, some we can accomplish for free as sheer forces of nature. Join us!

Workshop: Scaling ecological management frameworks in a changing world. (Organizer: Naumann)
Room: 110CD

Description: Ecological management frameworks, such as ecological sites, provide important context and defensibility for land managers. Understanding implications and risks of various decision options can help weigh various objectives (e.g. fuels reduction, carbon sequestration, forage production) in the face of different drivers (e.g. climate change, increased fire frequency, changing land uses). However, these decisions occur at various spatial and temporal scales that require flexibility. This symposium explores approaches and ideas for diversifying these frameworks at different scales (e.g. ecological site groups).

B. Bestelmeyer and Jeb Williamson. A tool for guided state and transition model development based on ecological theory.

T.W. Nauman, J. Johanson, J.A Thompson. State and transition models in a time of change: toolsets for carbon management.

J. Johanson, T.W. Nauman, Defining and developing ecological site groups to meet diverse user needs.

M.C. Duniway, Knight, A, T.W. Nauman, Capturing ecosystem dynamics at regional scales using ecological site groups, state-and-transition models, and monitoring data.

S. Salley, B. Bestelmeyer, J. Pittenger , D. Rachal, C. Talbot, Nesting ecological sites within a generalized ecological management unit

J. Brown, Using Generalized State and Transition Models for Conservation Planning and Assessment.

Heller, A. A Generalized State Approach to Setting Reclamation Benchmarks.

Contributed Oral Session: Social science of the range, *session 1 of 2*

Room: 410B

9:30am-9:45am: Kelly Hopping
Who approves of livestock grazing? An assessment of Idahoans' changing views on rangeland issues

9:45am-10am: Ada Smith
Institutional interactions: How government programs and public land grazing permits influence adaptation on U.S. working rangelands

10am-10:15am: Kaylee Littlefield
Collaborating Across Borders for Rangeland Benefits

10:30am-10:45am: Lauren Hunt
Climate change beliefs, decision-making and adaptation behaviors of Western US ranchers

10:45am-11am: Krista Ehlert
beefSD: Exposure to a holistic view of the beef cattle industry helps beginning producers increase operation sustainability over time

11am-11:15am: Fadzayi Mashiri
Rangeland Conversion Drivers and Impacts of Post-Conversion Management Strategies on Landscape Level Ecosystem Health

11:15am-11:30am: Gwendwr Meredith
Great Plains fire cultures: Opportunities to align science, policy, and management

Contributed Oral Session: Fire, *session 2*

Room: 410A

9:30am-9:45am: OPEN

10am-10:15am: John Hendrickson
Impact of fire and drought on axillary bud numbers in Kentucky bluegrass (Poa pratensis L.)

10:15am-10:30am: Jim Ansley
Prescribed Fire and Invasive Woody Sprouters: Are We Trapped in a Fire Trap?

10:30am-10:45am: Amy Symstad
Prescribed fire and targeted herbicides may not be enough to restore invaded northern mixed-grass prairie

10:45am-11am: Abbigail Rodgers
Grazing intensity and fire frequency effects on plant species and community characteristics in tallgrass prairie

11:am-11:15am: Georgia Harrison
Cheatgrass increases flammability of native perennial grasses in laboratory-based combustion experiments

11:15am-11:30am: Sophia Heston
Exploring the status of historical greenstrip seedings containing forage kochia (Bassia prostrata) in northern Nevada

1pm-3pm

Campfire: Beyond Direct Seeding: Overcoming Limitations in Equipment and Infrastructure of Alternative Plant Materials. Rangeland Technology and Equipment Council (RTEC) (Organizer: Gunnell)

Room: Junior Ballroom

Description: This campfire session will be done as a follow-up to the Rangeland Technology and Equipment Council (RTEC) symposium "Beyond Direct Seeding: The Next Frontier of Landscape Scale Vegetation Restoration" on the use of alternative plant materials (e.g., nursery stock, wildlings, etc.) for wildland revegetation efforts. This will be a guided discussion on how to overcome equipment and infrastructure limitations of using these alternative materials. We hope to have a vigorous conversation with diverse stakeholders on how to develop the equipment, science, industry, and networks to increase the capacity and success of revegetation efforts within the intermountain region and beyond.

Campfire: Ecological Calendars: Exploring a Climate Adaptation Tool (Organizer: Macon)

Room: Junior Ballroom

Description: Increasingly, climate-related challenges, such as wildfire, drought, and the spread of invasive species, are driving significant disruptions in rangeland and pastoral livestock production systems globally. Shifts in growing and dormant seasons, loss of forage resources, and other factors require producers to adapt production systems, which can have downstream impacts on market access, production value, and livestock species and breed selection, among others. This Campfire session will explore the use of ecological calendars – cyclical calendars based on localized climatological

and biological observations, as well as socioeconomic and cultural influences – as a tool for helping producers understand and adapt to these challenges.

Campfire: Breaking down borders to enhance knowledge and improve management of invasive perennial grasses (Organizer: Hendrickson)
Room: Junior Ballroom

Description: Perennial grasses have invaded rangelands in the Great Plains and decreased plant and wildlife diversity. This campfire will discuss 1) what perennial invasive grasses are in your region, 2) how do landowners view these grasses and have perceptions changed, 3) what strategies are land managers using for control and management of invasive grasses, 4) what are the current research gaps and 5) how can research be coordinated to fill research gaps to identify and meet land manager needs? The last question is the most difficult because it requires the dissolution of institutional borders and increased trust among participants.

Campfire: Art and Science: Grazing Management Principles for the 21st Century (Organizer: Jablonski)
Room: Junior Ballroom

Description: Livestock grazing management in extensive rangelands is an enormously complex endeavor. Unfortunately, this complexity has led to a lack of clear guidance from the range profession about key principles for the application and evaluation of grazing. Responding to a request from JBS USA, we have convened an ongoing conversation in the profession aimed at distilling outcome-oriented, evidence-based grazing management principles. This effort is led by prominent range scientists from across the Western US and integrates survey responses from experts of all stripes. Join us in this campfire conversation to learn about the results of this work and provide input.

Campfire: "What's Missing? Ensuring Early Career Range Professionals Succeed"
Room: Junior Ballroom

Description: This is intended as a discussion to help identify the knowledge, skills, and leadership traits that early career range professionals need to not only succeed but excel in their careers. The discussion will be led by members of the SRM Leadership Task Force and will inform their efforts to develop a focused continuing education program that will fill in gaps and provide support and encouragement to the future leaders of SRM.

Workshop: (9:30am-3pm) Planning and management under new wildfire realities using a fireshed-scale approach (Organizer: Wollstein)--*CONTINUED*
Room: 100AB

Workshop: Rangeland Educational Resources iROAM (Organizer: Hulet)
Room: 110AB

Presenters: Gretchen Hyde, Idaho Rangeland Resources Commission and April Hulet, Associate Professor Brigham Young University

Idaho is a place of rich ecological diversity including forests, cultivated agricultural lands, urban areas, and rangeland. Rangeland is the largest natural resource in Idaho, comprising about 53% of the land cover, and has a legacy of multiple use that has affected where and how people live, work, and recreate. Idaho families have long built their lives on rangeland and act as land stewards to cultivate economic, social, and cultural values for generations to come. Despite these efforts, ranchers across the west struggle finding suitable successors to maintain and work on their ranches,

preserve local knowledge, and care for the lands that support fish and fauna. Additionally, students seeking range degrees is steadily declining despite the high demand for professionals who can manage rangeland.

Knowing these trends, we can ask ourselves, how can we raise young people's awareness of the opportunities and challenges on rangeland? Moreover, how can we increase young people's awareness of the goods and services provided by rangeland including livestock forage, wildlife habitat, outdoor recreation, renewable energy, and open spaces?

To address these questions, the Idaho Rangeland Resources Commission creates youth education programs and materials designed to increase the public's understanding of rangeland ecology, and the goods and services provided by rangeland. One example is the I-ROAM Rangeland Curriculum which provides lessons and activities for K-12 students that can be used for outdoor schools and classroom lessons. To further enhance educational opportunities for youth, the Idaho Rangeland Resources Commission and its partners built the I-ROAM Traveling Educational Trailer which focuses on teaching 5-8th grade students about rangeland ecology and management throughout Idaho. The educational trailer compliments the curriculum and can be easily integrated when teaching the various sections of the curriculum. Research shows that this age is the critical time to influence student's career trajectory, especially when experiential learning occurs. Thus, the educational trailer has interactive, hands-on learning activities inside, and is fully wrapped with an artful design on the outside that serves to raise awareness and understanding of the ecological and social implications of proper rangeland management.

This workshop will introduce the I-ROAM curriculum and provide hands-on trainings that can easily be adapted to your specific rangelands. Activities will include:

- Rangeland Stewardship, Can You Have It All? Uses and Values of Rangeland
- Skills Challenge: Plant Identification
- Build Your Own Watershed
- Rangeland Toolbox Activity

Participants will leave the workshop with materials and ideas that will promote rangeland education to youth and adults. These activities can be used for outdoor schools, such as range camps, or for classroom learning.

Workshop: Identifying and Prioritizing Science to Inform Adaptive Management in the Sagebrush Ecosystem: Updating the Actionable Science Plan (Organizer: Weichman)

Room: 110CD

Description: This session will provide an overview of the previous Actionable Science Plan (2016), a quantitative evaluation of recent progress towards meeting originally identified science needs, and a framework for creating a revised plan. Opportunities for attendees to provide input into important topics as well as the planning process will be provided. The current structure addresses five Priority Science Needs: Fire, Invasive species, Restoration, Sagebrush and Sage-Grouse, and Climate and Weather. The timeline for engagement of widespread and diverse stakeholders across the sagebrush biome will be presented, including opportunities to review identified needs and priorities, identify knowledge gaps and other needs, and help guide research and development that affects many conservation partners.

The existing Integrated Rangeland Fire Management Strategy Actionable Science Plan identified knowledge gaps limiting implementation of effective strategies to meet management challenges in the Sagebrush Biome. Sage-grouse conservation, habitat conditions, management experience and scientific knowledge have changed since that time and demand for well-informed applications remains. Recent collaborative work led by USGS began the effort by identifying additions to the knowledge base. Additional information is needed to complete the current evaluation and planning process.

The goal of this effort is identifying *actionable* science, and we consider topics actionable when/where: (1) the scientific community is able to take immediate actions to fill the information gap(s); (2) results could *directly* inform actions and decisions to protect, conserve, or restore the sagebrush ecosystem; and (3) actions facilitate funding and implementation of research. Across the board, the topics, research, and applications described must be effectively communicated to the management community.

Given this structure, this session offers an opportunity for peers across the rangeland management and research community to understand and contribute to development of research priorities. USGS and BLM will continue to work with partners who participated in the development of the first Actionable Science Plan throughout this process, and this meeting offers an open opportunity for new or renewed participation for anyone interested in contributing to this update.

Contributed Oral Session: Social science of the range, *session 2 of 2*

Room: 410B

1pm-1:15pm: Anna Clare Monlezun
Traversing the Social & Ecological Dimensions of Collaborative Rangeland Management Through Ecosystem Services Valuation

1:30pm-1:45pm: Courtney Buchanan
International Year of Rangelands and Pastoralists: Amplifying local voices through film

1:45pm-2pm: Elizabeth Bennett
The Impact of High Net Worth Individuals on Communities and Rangeland Management in Southwest Montana

2pm-2:15pm: Elena Graciela Dosamantes
In The Weeds: A Review and Synthesis Invasive Species Governance

2:15pm-2:30pm: Aaron Lien
Mind the Gap: Citizen Preferences and Motivations for Invasive Plant Management

2:30pm-2:45pm: Ken Erickson
Let's Go Brandin': An Ethnographic Look at Family, Community, and Ranching Practices in New Mexico's High-Low Country

2:45pm-3pm: Haley Netherton-Morrison
A values typology to support decision-making in working landscapes undergoing change

Contributed Oral Session: Exotic annual grasses, *session 2 of 2*

Room: 410A
1pm-1:15pm: Brandon Palmer
An Innovative Approach to Controlling Medusahead at a Management Scale

1:15pm-1:30pm: Adam Clifford

Post-Fire Recovery and Cheatgrass Resistance of Perennial Grasses used for Restoration

1:30pm-1:45pm: Esben Kjaer
Assessing the Drivers and Impacts of Invasive Cool-Season Grasses on Rangeland Plant Communities

1:45pm-2pm: Jaycie Arndt
Assessing Adaptive Invasive Annual Grass Management via Landscape-scale Vegetation Monitoring

2pm-2:15pm: Kristina Young
Understanding practitioner weed management practices and needs in Arizona and Utah

2:15pm-2:30pm: Marshall Hart
The Effects of Ventenata Removal on Rangelands of Northeast Wyoming

2:30pm-2:45pm: Marshall Hart
The Economics of Ventenata Control in Northeast Wyoming

2:45pm-3pm: Marshall Hart
Does annual grass invasion affect rangeland drought resistance?

3pm-6pm

SRM Honor and Student Awards
Room: 400 Ballroom

4pm-6pm

SageSTEP
Room: 410B