November 2019 Grassland Research and Management Workshop
Summary and Next Steps

Introduction

Semi-arid grasslands cover millions of acres of federal, state, and private land in the USA. They provide habitat for animals and plants, livelihoods and ecosystem services for people, and are an iconic part of southwestern landscapes. Unfortunately, grasslands face multiple threats including fragmentation and loss to urban development; degradation from unsustainable management and drought; and invasion by shrubs and other non-native plants. These problems are too large for any one person, organization, or agency to solve and require collaboration across vast acreages and over the course of many years to address effectively.

The Workshop

In 2019, the partners below worked to plan a one-day Grassland Research & Management workshop in Tucson, Arizona.

- US Fish and Wildlife Service Science Applications Program
- University of Arizona Cooperative Extension
- Pima County
- Arizona Game and Fish Department
- Bureau of Reclamation
- Arizona Department of Forestry and Fire Management
- University of Arizona School of Natural Resources and the Environment
- The Altar Valley Conservation Alliance
- Southwest Decision Resources
- The Nature Conservancy

This workshop responded to needs voiced by land managers for research support addressing specific grassland management and restoration challenges. Before the meeting, organizers asked workshop registrants to prioritize discussion topics. Based on responses, the workshop focused on five topics: **1) management of woody plants and non-native grasses, 2) enhancing working lands, 3) soil health and erosion, 4) landscape fragmentation and grassland connectivity, and 5) grassland restoration for wildlife.** The workshop, held on November 9, attracted over 80 participants from 35 organizations, agencies, tribes, universities, and private ranches. This initial meeting was viewed as a way to gauge interest in and determine the need for ongoing collaboration to support future grassland work. The workshop demonstrated the widespread interest and commitment to seeking collaborative solutions to grassland management issues, however limitations in staffing support and impacts of the COVID-19 pandemic have unfortunately resulted in delays in sharing this workshop report and in following up on many of the important recommendations from the discussions. We are delighted to be able to share this report now and invite interested individuals to join a grassland-focused community of practice launching in April 2021 that will help the discussions started in this workshop become on-the-ground grassland conservation and restoration work.

The goals of this workshop were to:

- **Share tools & knowledge**: Share new knowledge about relevant topics in grassland research and management & share existing tools to improve decision making and management of grasslands
- **Prioritize research & action**: Clarify the state of knowledge and develop a list of current research needs & management priorities from workshop participants
- **Foster partnerships & collaboration**: Generate ideas for new projects and catalyze future partnerships that can result in successful projects
- **Identify key issues for the southwestern grassland community**: Hone in on the most relevant issues and determine where additional communication and coordination is desired.

These critical topics were explored through two rounds of lightning talks followed by focused breakout discussions that allowed participants to get more specific on their research and management needs, share knowledge about successes and failures, and meet others who share similar management objectives. The remainder of this synthesis document will summarize the talks and breakout sessions, list key workshop outcomes, and outline recommendations and next steps.

Lightning Talks

Workshop attendees explored priority topics through a series of eight brief presentations by local ranchers, federal and state land managers and scientists, and representatives of non-profit conservation organizations. Presenters shared lessons learned from on-the-ground restoration experience, discussed how they prioritized areas to target for restoration, and shared tools they developed that respond to the research needs of grassland managers and restoration practitioners throughout the Southwest.

- "Arizona Partners Working to Improve Southeastern Arizona Pronghorn Habitat, Populations and Connectivity, " Glen Dickens, Arizona Antelope Foundation
- "Fire as a Grassland Management Tool," Willie Sommers, Arizona Department of Forestry and Fire Management
- "Restoring Severely Degraded Grasslands Using Innovative and Ancient Techniques," Trevor Hare, Watershed Management Group
- "Enhancing Working Lands," Sarah King and Mary Miller, Altar Valley Conservation Alliance
- "Desert Grassland Bird Conservation," Adam Hannuksela, Sonoran Joint Venture
- "Spatial Assessments and Prioritization," Gita Bodner, The Nature Conservancy
- "Addressing Research Needs," Molly McCormick, USGS RAMPS
- "Lessons Learned from On-The-Ground Grassland Restoration, Emillio Carillo, USDA Natural Resources Conservation Service

Participants learned how to restore grasslands for wildlife such as migratory birds and pronghorn antelope; how to use specific restoration tools like rock structures, fire, and seeds to improve soil health and manage vegetation; and heard about the common pitfalls and keys to success for grassland restoration.

Breakout Sessions

After the first round of lightning talks, participants met in breakout groups to pursue more focused discussions about the following topics:

- **Fire as a grassland management tool:** maintaining vegetation structure and preventing shrub encroachment


Fire crews managing controlled burns in grasslands, pictures courtesy of Altar Valley Conservation Alliance

- **Restoring grasslands for wildlife:** supporting birds, pronghorn, and other ungulates


Pronghorn in fragmented (left) and open (right) grassland, picture from AZ Antelope Foundation and TNC

- **Vegetation management:** combating woody plant encroachment and non-native grasses


Aerial picture of a mesquite control project and adjacent un-treated area, picture courtesy of the Altar Valley Conservation Alliance

- **Enhancing working lands:** meeting multiple management goals and preventing fragmentation


Picture of working lands in the Altar Valley, courtesy of the Altar Valley Conservation Alliance

- **Soil health and erosion:** reducing/reversing erosion and increasing soil health


Rock erosion control structure (left) and keyline subsoil plowing (right), pictures courtesy of Watershed Management Group

Participants had the opportunity to deepen conversation with others who are working on similar issues and who share similar management goals and challenges during these breakout sessions. The result was a clear articulation of the **principal challenges** grassland managers face to implementing restoration and conservation, their most pressing **research and management needs**, and **opportunities for collaborative projects** to address these challenges.

Table 2. Highlights from the first breakout session

	Goals	Challenges	Opportunities
Fire	Cross-boundary collaboration to foster landscape-scale fire management	Navigating regulations, partner buy-in, and liability concerns	Large-scale models like the USFS firescape project and Yavapai county fire initiative
Wildlife	Understanding wildlife population dynamics and increasing the permeability of landscape for movement of multiple species	Long-term monitoring, broad cooperation, continuity of funding and involvement	Connecting to volunteers & schools, engaging youth
Vegetation management	Prioritizing areas for restoration, early detection, and effective, location-appropriate actions	Long-term success with lack of monitoring, funding for re-treatment, lack of political support, and changing climate conditions	Increasing efficiency of partnerships by linking funding sources, researchers, land managers & knowledge gaps in applied projects
Working Lands	Developing long term management and monitoring plants that reduce landscape fragmentation & woody plant encroachment.	Lack of time & money, difficulty with sustaining partnerships with key agencies & navigating regulations, climate change and invasive species	Obtaining funding for long-term cross boundary management planning and implementation
Soils	Preventing erosion and implementing effective restoration techniques for watershed health	Lack of incentives and funding for soil conservation (no carbon credit markets and high soil C variability), fragile soils and harsh climate, collaboration with multiple users and managers.	Communicating research needs to researchers & translating science to managers. Facilitating ongoing collaborations.

During the second breakout session, participants organized into three subject-specific working groups to put this need for collaboration into action. These sessions were even more solution oriented, focusing on sharing lessons learned, examples of successful projects, and details of successful management techniques.

The working groups during the second session focused on **1) landscape fragmentation 2) soil health and erosion, and 3) management of problematic plants**.

Participants in the three breakouts also shared specific experiences of success and failure in meeting management goals. The **landscape fragmentation** breakout discussed the importance of assessing where future development was planned, using data about animal movement to prioritize locations for restoring connectivity, successful use of volunteers, the importance of coordinating with local planners, and specific strategies like Forest Legacy and land swaps. The **soil health and erosion** breakout discussed the importance of assessing soil conditions before implementing grassland restoration, how to successfully reduce erosion in uplands using seeding and keyline plowing, how to reduce erosion from roads, and how to restore eroded washes with berms, plugs, brush weirs, and check dams. The **problematic plants** breakout discussed where mechanical, cultural, and chemical treatments were most effective, details of how to mix and apply different chemicals, how to combine mechanical, cultural, and chemical

methods of woody plant removal for greatest success, and when certain techniques were not economically viable.

Workshop Outcomes

Fostering Geographical and Topical Collaboration

A common theme that emerged throughout the workshop was the importance of collaboration--both the need to connect people regionally to collaborate on watershed-scale projects across jurisdictional boundaries and the need to connect people who are working on similar issues across broad geographies throughout the Southwest. The breakout sessions allowed participants to gather with people, both near and far, who share similar research and management interests.

Sharing Tools & Knowledge

During the lightning talks, participants shared information about specific tools to improve grassland management and restoration outcomes. Workshop participants learned from speakers who shared lessons learned from on the ground projects, implementation of specific restoration techniques, logistical challenges to undertaking projects, and program implementation. Breakout sessions allowed participants to discuss these ideas with each other and share personal experiences from addressing similar issues and attempting to meet similar management goals.

Identifying and Collaborating on Shared Research Priorities

Both before and after the workshop, facilitators asked participants about their top research priorities. This feedback can help guide future workshops, webinars, and products to be developed that can support stewardship of grasslands. Most interest centered on research about specific restoration techniques, especially those related to the management of woody shrub species and non-native grasses. Many participants also noted the need for long-term monitoring of vegetation, wildlife, and restoration project outcomes to learn about the long term effects of grassland restoration and management techniques. The need for collaborative research was noted by many agency scientists and private landowners, particularly research that can help prioritize the location and type of restoration projects on a landscape scale.

Post-Workshop Feedback

Feedback from participants was generally positive. The opportunities to network were noted to be especially valuable. Several participants suggested organizing further opportunities to go deeper into specific topics and offering more time for participants to share experiences. Many expressed a desire to follow up on this workshop with specific collaborative, action-oriented projects.

Moving Forward: A Community of Practice Supported by CCAST

The Collaborative Conservation and Adaptation Strategy Toolbox (CCAST) supports individuals, agencies, and organizations that are working to address the emerging and current challenges in grassland restoration. CCAST does this by facilitating knowledge exchange through online case studies, webinars, and workshops, and by supporting Communities of Practice, partnerships that support the development of collaborative projects and decision support tools for land managers.

In response to feedback from the 2019 workshop, the CCAST team has worked to secure support for a full-time coordinator to continue grassland conversations that were explored during this workshop. One of the first tasks of the coordinator has been to compile and summarize the workshop discussions and recommendations in this document, as a reference for forward planning.

A Grassland Restoration Community of Practice

One important way to continue this collaboration is by launching **a grassland-focused Community of Practice (CoP)**. A community of practice is a group of individuals that regularly interact to learn from each other how to more effectively do their work and achieve common goals.

The CCAST Team is working on launching a CoP to respond to the specific requests from workshop participants for opportunities to go deeper into specific research and management topics, share experiences with other land managers, and collaborate on geographically and topically relevant grassland issues. This grassland-focused CoP will support federal and state agencies, tribal nations, private landowners, non-governmental organizations, university researchers, government scientists, and land managers.

If you are interested in joining the grassland Community of Practice, please contact Ariel Léger, the CCAST grassland restoration coordinator at ArielLeger@email.arizona.edu

Grassland Case Studies, Syntheses, and Webinars

CCAST will also continue to support grassland conservation and restoration by publishing grassland-related Case Studies and developing synthesis documents on grassland topics discussed during the workshop, and prioritized by grassland CoP members. CCAST will also host grassland webinars and workshops to support development of decision-support tools for grassland restoration and conservation.

CART's Grassland Community of Practice: Supporting Conservation and Restoration of Semi-Arid Grasslands

In November 2019, the Conservation and Adaptation Resources Toolbox (CART) hosted a day-long workshop focused on Grassland Restoration and Management in the Southwest. This workshop focused on increasing understanding of the primary threats to grassland ecosystems and identifying the support that grassland managers need to address them effectively.

One of the results of this workshop was the launch of CART's Grassland Community of Practice in March 2021 to support continued peer-to-peer knowledge sharing around priority grassland topics. Focused on semi-arid grasslands, the Grassland Community of Practice used case studies and webinars about grassland restoration and conservation to bring together managers from across the Southwest to learn from each other and improve management outcomes.

This section captures key needs, challenges, and opportunities articulated by hundreds of grasslands managers, conservation practitioners and researchers across the Southwest during the 2019 workshop and as well as Community of Practice webinars and panel and group discussions.

CART's Grassland Research and Management Workshop

The Grassland Research & Management workshop responded to needs voiced by land managers for research support addressing specific grassland management and restoration challenges. Before the meeting, organizers asked workshop registrants to prioritize discussion topics. Based on responses, the workshop focused on five topics:

1. Management of woody plants and non-native grasses
2. Enhancing working lands
3. Soil health and erosion
4. Landscape fragmentation and grassland connectivity
5. Grassland restoration for wildlife

The workshop attracted over 80 participants from 35 organizations, agencies, tribes, universities, and private ranches.

Result: A clear articulation of the principal challenges grassland managers face to implementing restoration and conservation, their most pressing research and management needs, and opportunities for collaborative projects to address these challenges.

Participants were most interested in research about specific restoration techniques, especially those related to the management of woody shrub species and non-native grasses. Many participants also noted the need for long-term monitoring of vegetation, wildlife, and restoration project outcomes to learn about the long-term effects of grassland restoration and management techniques. The need for collaborative research was noted by many agency scientists and private landowners, particularly research that can help prioritize the location and type of restoration projects on a landscape scale. To facilitate focused discussion around priority topics, the workshop included two breakout sessions.

Breakout Session I

During the first breakout session, participants discussed the following topics: fire, wildlife, vegetation management, working lands, and soils. Associated goals, challenges and opportunities are outlined for each breakout session below.

	Goals	Challenges	Opportunities
Fire as a grassland management tool: maintaining vegetation structure and preventing shrub encroachment	Cross-boundary collaboration to foster landscape-scale fire management	Navigating regulations, partner buy-in, and liability concerns	Large-scale models like the USFS firescape project and Yavapai country fire initiative
Restoring grasslands for wildlife: supporting birds, pronghorn, and other	Understanding wildlife population dynamics and increasing the permeability of landscape for movement of multiple species	Long-term monitoring, broad cooperations, continuity of funding and involvement	Connecting to volunteers, schools, and engaging youth
Vegetation management: combating woody plant encroachment and non-native grasses	Prioritizing areas for restoration, early detection, and effective, location-appropriate actions	Long-term success with lack of monitoring, funding for re-treatment, lack of political support, and changing climate conditions	Increasing efficiency of partnerships by linking funding sources, researchers, land managers, and knowledge gaps in applied projects
Enhancing working lands: meeting multiple management goals and preventing fragmentation	Developing long-term management and monitoring plans that reduce landscape fragmentation and woody plant encroachment	Lack of time and money, difficulty with sustaining partnerships with key agencies and navigating regulations, climate change and invasive species	Obtaining funding for long-term cross boundary management, planning, and implementation
Soil health and erosion: reducing/reversing erosion and increasing soil health	Preventing erosion and implementing effective restoration techniques for watershed health	Lack of incentives and funding for soil conservation (no carbon credit markets and high soil C variability), fragile soils and harsh climate	Communicating research needs to researchers and translating science to managers. Facilitating ongoing collaboration.

Breakout Session II

During the second breakout session, participants discussed the following topics: landscape fragmentation, soil health and erosion, and management of problematic plants. This session was solution oriented and focusing on sharing lessons learned, examples of successful projects, and details of successful management techniques.

	Landscape Fragmentation
Areas of Importance	Assessing where future development is planned
	Data about animal movement to prioritize locations for restoring connectivity
	Successful use of volunteers
	Coordinating with local planners
	Forest Legacy and land swaps

	Soil Health and Erosion
Areas of Importance	Assessing soil conditions before implementing restoration
	How to reduce erosion in uplands using seeding and keyline plowing
	How to reduce erosion from roads
	How to restore eroded washes with berms, plugs, brush weirs, and check dams
	Assessing soil conditions before implementing restoration

	Management of Problematic Plants
Areas of Importance	Where mechanical, cultural, and chemical treatments are most effective
	How to mix and apply different chemicals
	How to combine mechanical, cultural and chemical methods of woody plant removal for greatest success
	Identifying when certain techniques are not economically viable
	Where mechanical, cultural, and chemical treatments are most effective

Community of Practice Webinars and Panel Discussions

CART coordinators used webinars and panel discussions as an opportunity to continue discussion on topics that were identified as high priority to participants of the Grassland Community of Practice. Hosting regular webinars on a wide variety of topics helped maintain momentum and interest of participants from a wide geography with diverse interests. Recording webinars allowed increased viewership and producing post-webinar summaries facilitated sharing of resources and information from post-webinar discussion. The webinar summaries also captured key research needs, policy barriers, and opportunities for collaboration, captured below:

Event Title		**Date**
Understanding Piñon-Juniper Encroachment and Pinyon Jays for Grassland Management		May 5th, 2023
Event Summary	The event included presentations from Tara Bishop and Scott Somershoe followed by a panel discussion with Tara and Scott as well as Valerie Foster, Steve Cassady, John Boone, and Edwin Juarez. Tara discussed tools her team is building for fire management in fire-prone Pinyon-Juniper landscapes using Ecological Site Groups, monitoring data and machine learning. Scott discussed the the Pinyon Jay Working Group and will discuss the group's Pinyon Jay Conservation Strategy, survey protocols, and a forthcoming predictive occurrence model among other products.	
Research Questions, Management Challenges, and Opportunities Identified		
Research Needs	What can managers do to help enhance habitat for Pinyon Jays in the face of changes like large-scale Pinyon die-off driven by drought?	
Research Needs	What does restoration in Pinyon-Juniper woodland itself look like to help meet habitat needs of multiple species?	
Research Needs	What are the available funds to make the changes we are seeking to make in Pinyon-Juniper ecosystems (including grasslands and woodlands), and what are the priorities those funds linked to, e.g. fuel reduction, pronghorn habitat improvement, etc.?	
Research Needs	What is the role of the mycorrhizal community in the transitions of Pinyon-Juniper ecosystems between various ecological states?	

Event Title		Date
Rock Erosion Control Structures to Improve Perennial and Ephemeral Riparian Habitat		May 19th, 2022
Event Summary	Presenters Laura Norman and Tess Wagner provide an overview of previous and current research about Natural Infrastructure in Dryland Streams (NIDS) that include many different types of erosion control structures from small scale one-rock dams, to medium sized check dams or beaver dams, and larger gabions as part of the USGS Aridlands Water Harvesting Study. Additionally, presenters provide examples of erosion control structures projects from the Borderland Restoration Network.	
Research Questions, Management Challenges, and Opportunities Identified		
Research Needs	How to implement, maintain, measure impact, and navigate regulations.	

Event Title		Date
Fire as a Tool for Grassland Restoration and Management		November 9th, 2021
Event Summary	This webinar featured presentations from Steven "Steve" Sesnie, Scott Collins, and Jeffery "Jeff" Adams. After the three presentations, panelists and participants use the content of the presentations to discuss fire in grasslands across the Southwest. Steve Sesnie discusses the use of fire at Buenos Aires National Wildlife Refuge in southeastern Arizona to improve habitat conditions for the Masked Bobwhite Quail, Scott Collins shared results from an experiment about the different vegetation response to fire in different seasons at Sevilleta National Wildlife Refuge in the Chihuahuan grasslands of New Mexico. Jeffery Adams discussed challenges and lessons learned about using prescribed fire to meet management objectives, and the need for science, adaptive management, and dialogue to develop Best Management Practices for fire in Southwestern grasslands.	
Research Questions, Management Challenges, and Opportunities Identified		
Research Need	Research to find optimal seasonality and frequency of burns to benefit desired species.	
Management Need	Tools that can help to prioritize when and where to burn during increasingly short burn windows (fall and winter) to optimize wildlife connectivity and linkages.	

Event Title		Date
Tools for Drought and an Online Rangeland Library Toolbox		September 28th, 2021
Event Summary	This webinar was the second of two panel discussions about grassland decision-support tools. The four speakers; John Bradford, Liz Delcamp, Anne Gondor, and Tonya Haigh; highlight tools for managing and restoring grasslands in the face of drought as well as an online library and toolbox about rangeland management and restoration. Tools included: Short-term Drought Forecaster Tool, Rangelands Gateway Library, and the Ranch Tool and Guide's Managing Drought Risk.	
Research Questions, Management Challenges, and Opportunities Identified		
Collaboration Opportunity	Pima County using USGS Drought Forecast and other predictive tools to look at future conditions.	

Additional Insights from Community of Practice Participants

CART's Grasslands Community of Practice provides an opportunity for a variety of one on one, small and large group discussions around grasslands managers, researchers, and practitioners. From these discussions, several additional research questions, management challenges, and opportunities for future work/research were identified, including:

Research Questions, Management Challenges, and Opportunities Identified	
Research Question	Riparian areas and connections to upland areas in terms of erosion, how does what we do in the uplands affect the riparian (erosion control structures, brush management, etc)
Research Question	Assessing the impacts of different types of brush management or climate adaptation strategies in semi-arid grassland system, even a research synthesis would be neat.
Collaboration Opportunity	Opportunity to plug into the Grasslands Adaptation Menu that's coming out
Research Question	How does changes in canopy cover impact stream flow. Does an increase in woody plant material reduce stream flow? Analyze changes in percent cover, precipitation, etc.
Research Question	CoP participants have highlighted specific gaps in knowledge and policy barriers that prevent scaling of mesquite management on a landscape scale. Specifically, recent research about climate impacts on grasslands is not yet usable by grassland managers. Furthermore, the long-term effectiveness of individual, and sequential combinations of treatments, remains variable and their costs, and long-term benefits for multiple species and resource areas are poorly understood.