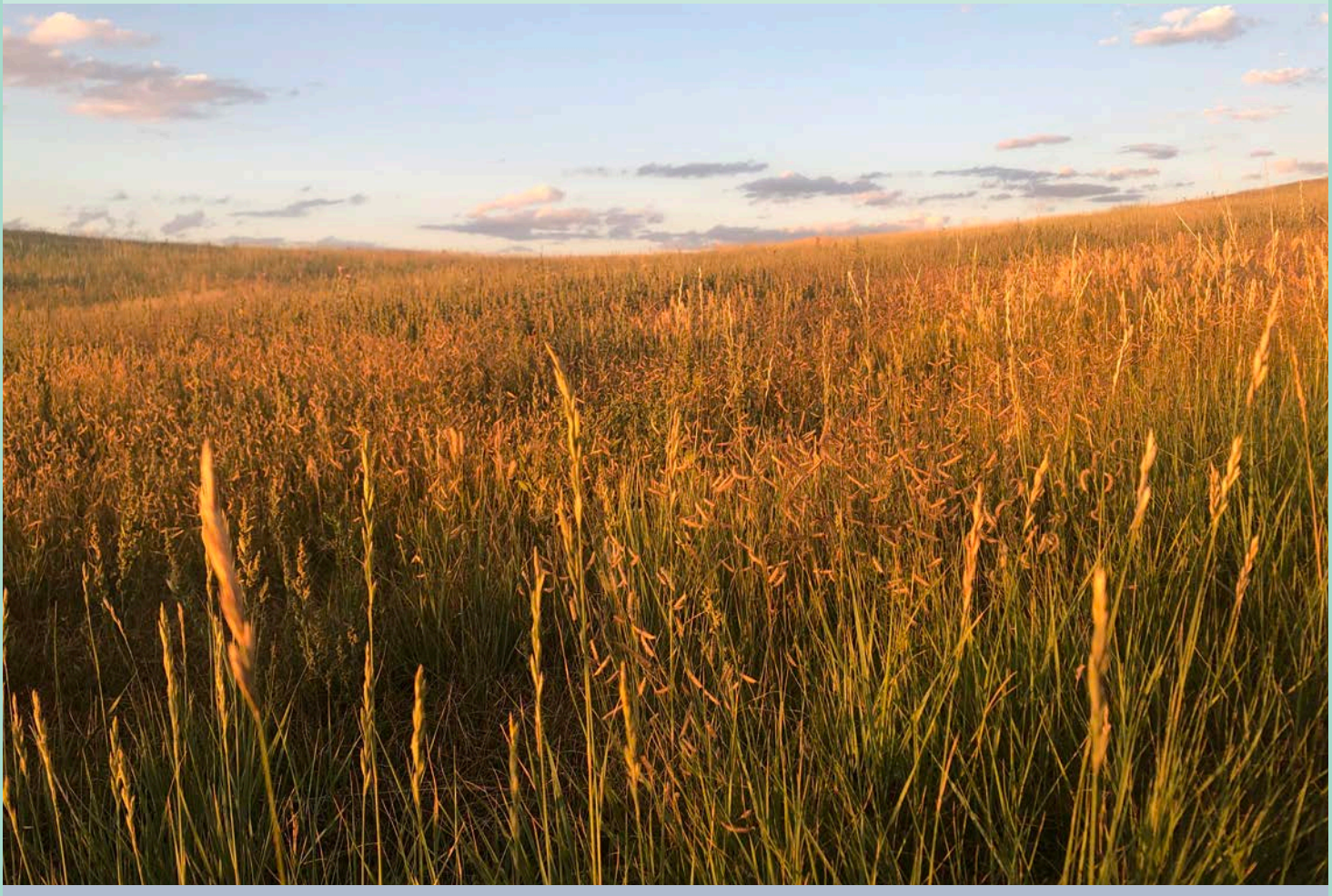
AMERICA'S GRASSLANDS CONFERENCE:

RECONNECTING AMERICA'S GRASSLANDS

PROCEEDINGS OF THE SIXTH BIENNIAL CONFERENCE ON THE CONSERVATION OF AMERICA'S GRASSLANDS



AUGUST 8-10, 2023 • CHEYENNE, WYOMING

AMERICA'S GRASSLANDS CONFERENCE: RECONNECTING AMERICA'S GRASSLANDS

PROCEEDINGS OF THE SIXTH BIENNIAL CONFERENCE ON THE CONSERVATION OF AMERICA'S GRASSLANDS

August 8-10, 2023
Cheyenne, Wyoming

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National Wildlife Federation
1200 G Street, NW, Suite 900
Washington, D.C. 20005
www.nwf.org

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The 6th Biennial Conference on the Conservation of America's Grasslands - August 8-10, 2023, Cheyenne, Wyoming

INTRODUCTION TO THE PROCEEDINGS

With over a decade of hosting America's Grasslands Conference, we continue to have a lot to be proud of. The most recent conference hosted in Cheyenne, Wyoming in August 2023 was also the first after skipping a convening in 2021 due to the ongoing COVID-19 pandemic. Despite the delays and logistical challenges, we welcomed approximately 300 attendees and had over 70 presentations, a real testament to the enduring popularity and significance of this biennial event. Our co-host for 2023 was the University of Wyoming's College of Agriculture, Life Sciences and Natural Resources who were instrumental in pulling off a successful conference.

A popular and distinguishing feature of the conference are the varied sectors in attendance and grassland conservation efforts represented. Of the almost 300 attendees in Cheyenne, we had individuals from twenty-nine states, the District of Columbia, plus attendees from Canada and Mexico. Participants included over 20 ranchers and producers, academics from 13 universities and a number of other research institutions, over 50 different non-profit organizations, multiple state and regional wildlife agencies, joint ventures, local and federal agency representatives, and numerous other entities ranging from conservation districts and wildlife reserves to native seed and prairie restoration companies.

This sixth conference was themed "Reconnecting America's Grasslands" to focus participants on reconnecting grasslands across North America and reconnecting across our areas of expertise and as partners after being apart these last few years. The overwhelming message throughout the conference was that while we still see grassland loss and dependent species decline, the tide might be turning with the renewed focus and exciting partnerships that are thriving throughout North America. We all are continuing to respond to this urgent need for grasslands conservation and the conference is a valuable venue to gather, connect, share, and advance our efforts.

We kicked the event off with a full day of different field trips to nearby ranches, native prairies, wildlife management areas while spending the rest of the conference in multiple breakout sessions, roundtable discussions, poster sessions, and a novel indigenous kinship circle proposed by partners through the Central Grasslands Roadmap. A common refrain at the grasslands conference is that it is incredibly hard to pick between all the incredible topics and knowledge sharing sessions that we have to squeeze into the short time available. Cheyenne did not disappoint in that regard and attendees got to choose between grazing management, transboundary partnerships, tracking and inventories, conservation policy, grasslands dependent wildlife, education, indigenous and community-based stewardship and much more.

As always, we couldn't have done this without our conference organizing committee and a number of partners in Wyoming and beyond that helped us immensely. The enduring success of this conference is in large part due to the dedication of many partners and we hope to continue these valuable partnerships. Lastly, we are deeply grateful for the generous support from our conference sponsors, some of whom have supported America's Grasslands Conference for over a decade and we hope will continue to support our future convenings.

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National Wildlife Federation

Aleta Dam
National Wildlife Federation

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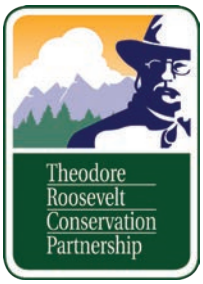

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PRESENTATIONS
1. GRASSLAND INVENTORIES, TRACKING, AND TRENDS

GRASSLAND EFFECTIVENESS MONITORING (GEM): A TIERED APPROACH FOR HABITAT TREATMENT ASSESSMENT ACROSS PRIVATE LANDS INCENTIVE PROGRAMS

Anna M. Matthews,
American Birds Conservancy

Other Authors: Rebekah J. Rylander, American Bird Conservancy; Daniel Bunting, U.S. Fish and Wildlife Service; Michael C. Duniway, U.S. Geological Survey; James J. Giocomo, American Bird Conservancy; Anna Knight, U.S. Geological Survey; Adriana Leiva, U.S. Fish and Wildlife Service; Robert M. Perez, American Bird Conservancy; Kourtney Stonehouse, U.S. Fish and Wildlife Service; Derek Wiley, Texas Parks and Wildlife Department; Don Wilhelm, U.S. Fish and Wildlife Service.

Introduction

The decline of North American grasslands is a topic of increasing interest as agencies and organizations work to address subsequent declines in wildlife species, including grassland birds (Rosenberg et al. 2019), pronghorn (Antilocapra americana) (Gedir et al. 2015), and other grassland-dependent taxa. In response to grassland habitat loss, conservation programs and policies have been developed to provide biologists and landowners mechanisms to restore grassland habitat on private lands. These range from federal programs such as the U.S. Fish and Wildlife Service's (USFWS) Partners for Fish and Wildlife program (PFW) and the Natural Resources Conservation Service's (NRCS) Environmental Quality Incentive Program, state programs such as Texas Parks and Wildlife Department's Pastures for Upland Birds, and partnership-based programs such as the Oaks and Prairies Joint Venture's Grassland Restoration Incentive Program (GRIP). When managing and restoring grassland habitat, these programs typically utilize the same set of practices: prescribed grazing, prescribed fire, herbicide, brush management, and range planting. To restore grasslands at scale, large sums of funding have been invested into these programs. For example, approximately $1 million is spent by PFW in Texas annually (D. Wilhelm, USFWS, personal communication). However, it is rare for these conservation programs to have associated monitoring efforts that are consistently used to assess the effectiveness of the aforementioned practices in achieving program and project objectives. As such, it is difficult to communicate to funders and the public whether these conservation programs are successfully addressing grassland decline. Similar objectives and practices across programs, however, provide a unique opportunity for

developing an innovative monitoring methodology that focuses on providing a collaborative solution to this dilemma.

Our objective is to develop a grassland monitoring program that can be used across agencies, organizations, and conservation programs to assess the effectiveness of practices and programs in restoring healthy grasslands. In addition, we seek to develop a program that maintains consistency to allow for regional to national-scale reporting while also allowing flexibility for achieving local and partner monitoring objectives. Our vision is for this program to be used across North American grasslands to improve our ability to address the questions: "Is it actually working?" and "How can we improve habitat delivery?"

Overview of GEM

The Grassland Effectiveness Monitoring (GEM) protocol is designed to be applicable across a range of objectives, geographies, and knowledge-bases. To keep GEM collaborative, we reviewed existing vegetation monitoring protocols that targeted grassland biomes. After extensive review, we selected the Bureau of Land Management's Assessment, Inventory, and Monitoring (AIM) protocol and the NRCS' Natural Resources Inventory (NRI) as the basis of our designing process for GEM. We maintained a design that ensured data collected from these three protocols (AIM, NRI, and GEM) are compatible for combined analyses.

There are four main sub-protocols to GEM: 1) line-point intercept (LPI), 2) gap measurements, 3) plant density and composition, and 4) species richness. All sub-protocols are collected within a spoke-and-wheel transect design (Herrick et al. 2018). The LPI sub-protocol consists of identifying plants that touch pins dropped along the transect lines, vegetation height measurements, litter depth measurements, and overlying and embedded soil cover. The gap measurement sub-protocol consists of two pieces: 1) gaps between any vegetation along each transect line and 2) gaps between woody vegetation (i.e., >0.5 m) only. The plant density and composition sub-protocol is a belt transect established on each of the three transects. Users count individuals or estimate cover of select plant species, which usually consist of species of management concern. Lastly, the species richness sub-protocol is a timed plant species search in the circle formed by the spoke-and-wheel design.

GEM is a tiered approach, which means differing implementations of the sub-protocols are available to fit the user's objectives and skill set. In Tier 1 GEM, all four subprotocols are implemented on all three transects, and all plants encountered during the LPI and species richness subprotocols must be identified to the species level. However, while extensive plant identification skills are required, users receive a detailed and flexible data set that is informative about specific plant species that may be of interest. In Tier 2 GEM, all sub-protocols except for the species richness sub-protocol are implemented on all three transects. Users are only required to identify plants that are on a key plant species list, and all other plants are identified to functional group. Plants on the key plant species list are usually indicators of healthy grassland systems, invasive plants, key pollinator or wildlife plants, and plants of similar importance. Each ecoregion has its own key list to facilitate regional differences. Lastly, Tier 3 GEM is a rapid assessment that is implemented via step-point rather than transect tapes. Only the LPI and gap sub-protocols are implemented. Additionally, all plants are identified to functional group (although users can identify to species if they are known), and data is only required to be collected on a minimum of one

transect. Tiers 2 and 3 GEM were designed with users that have limited plant ID skills, limited personnel, or more general objectives in mind. While data from these tiers are still compatible with data collected from Tier 1 GEM, AIM, and NRI, implementation of Tiers 2 or 3 do require users to ensure that the more limited information or precision will still meet monitoring questions or objectives. More information about GEM sub-protocols and the indicators they produce, GEM Tiers, and data collection apps can be found in this publication under Rylander et al.

Methods

We piloted GEM Tiers 1 and 2 on GRIP projects in the northern and southern portions of the Oaks and Prairies Joint Venture Texas-based geography (Figure 1). These projects were brush management and prescribed fire projects performed in 2016-2019, with the goal of restoring native grassland habitat structure for the benefit of grassland birds. We surveyed 12 sites in 2021 (nfire = 7; nbrush = 6; some sites had 2 treatments in separate pastures) and 13 sites in 2022 (nfire = 8; nbrush = 7). We stratified and randomized surveys within similar soil groups using Ecological Site Descriptions to reduce variability in plant growth due to differences in soil type.
We examined the effects of treatment on several habitat indicators using repeated measures mixed-effects models, including percent cover of native perennial grass and percent cover of woody vegetation. We controlled for the random effects of GRIP project, and all models included the treatment year, survey year, and an interaction between the treatment and survey year. Additionally, we roughly assessed several other indicators to provide examples of other possible analyses given the available data set, though these were not intended to be statistically rigorous. Lastly, we estimated the length of time required to complete different sub-protocols and different tiers of GEM using time estimates provided by Survey123 data and estimates from field crews when data was not available.

Results

GEM protocols were able to assess differences between prescribed fire and brush management treatments for two indicators of interest. GEM protocols collected sufficient information to statistically detect a difference in percent cover of woody vegetation (Figure 2a., ptreatment = 0.0492) between the two treatment types. Additionally, the percent cover of native perennial grass differed between treatments (ptreatment = 0.0488) and between years (pyear = 0.0018). The greatest difference in percent cover of native perennial grass cover occurred in 2021 (ptreatment:year = 0.0420) (Figure 2b.; other indicators were analyzed but are not displayed in this publication).

We also demonstrated two simple tests that can be used to address various objectives that habitat programs may have. These examples include: 1) the utilization of county-level NRI data as a control population for LPI-based indicators (Figure 2c.), and 2) assessment of variable effects of treatments on different species using data from the plant density and composition sub-protocol (Figure 2d.). These provide examples of a small subset of the potential indicators that GEM can produce.

Lastly, we estimated the approximate time required for each tier of GEM. Tier 1 GEM requires approximately 2 hours per point. Most of this time is spent performing the LPI sub-protocol which takes approximately 1 hour. The gap sub-protocol accounts for ~25 minutes, plant density and composition sub-protocol is ~10 minutes, and species richness is ~15 minutes. Tier 2 GEM requires 1 hour and 40 minutes

per point. The time required for the LPI, gap, and plant density and composition sub-protocols is approximately the same as the estimates for Tier 1, thus the time difference is largely due to the removal of the species richness sub-protocol. Tier 3 requires ~26 minutes per point, which includes the LPI and gap sub-protocols combined.

Discussion

GEM and other national monitoring programs have the potential to identify the success of meeting a variety of objectives, whether that be assessing changes in percent cover, distribution, species richness, and more, thus facilitating adaptive management (McCord and Pilliod 2023). Additionally, because we specifically designed GEM to collect data compatible with AIM and NRI data, GEM data can be compared against NRI or AIM data from adjoining lands, which could be as simple as general county-level averages or for use in more sophisticated before-after control-impact studies (BACI). Lastly, in combination with a sound study design, GEM can be implemented to assess objective success over many scales, from assessing the effectiveness of single habitat projects to assessing effectiveness across programs or landscapes.

Due to GEM's unique design of multiple tiers, users can select a tier that can help meet their local objectives while also collecting data that will contribute to a larger database should collaboration to answer larger-scale questions be desired. Currently, the GEM design team is developing additional tools to ease data processing and initial analysis, as well as compiling user-friendly training materials. Partnership is critical for mitigating and reversing the decline of our grassland habitats in North America, and similarly partnership is critical for assessing our collective success in reaching this goal. Shared monitoring protocols and programs such as GEM can be one tool to assist in achieving this vision.

Acknowledgements

Thank you to the many partners who have participated in the development of GEM and to the field crews who have piloted GEM. Field crews include: A. Nelson, S. Sanders, C. Cardenas, M. Trevino, S. Rainey, N. McManus, M. Meiser, M. Rainey, B. Griffin, C. Kempton, & K. Wogan. Any use of trade names is for descriptive purposes only and does not imply endorsement by the US Government.

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Figures

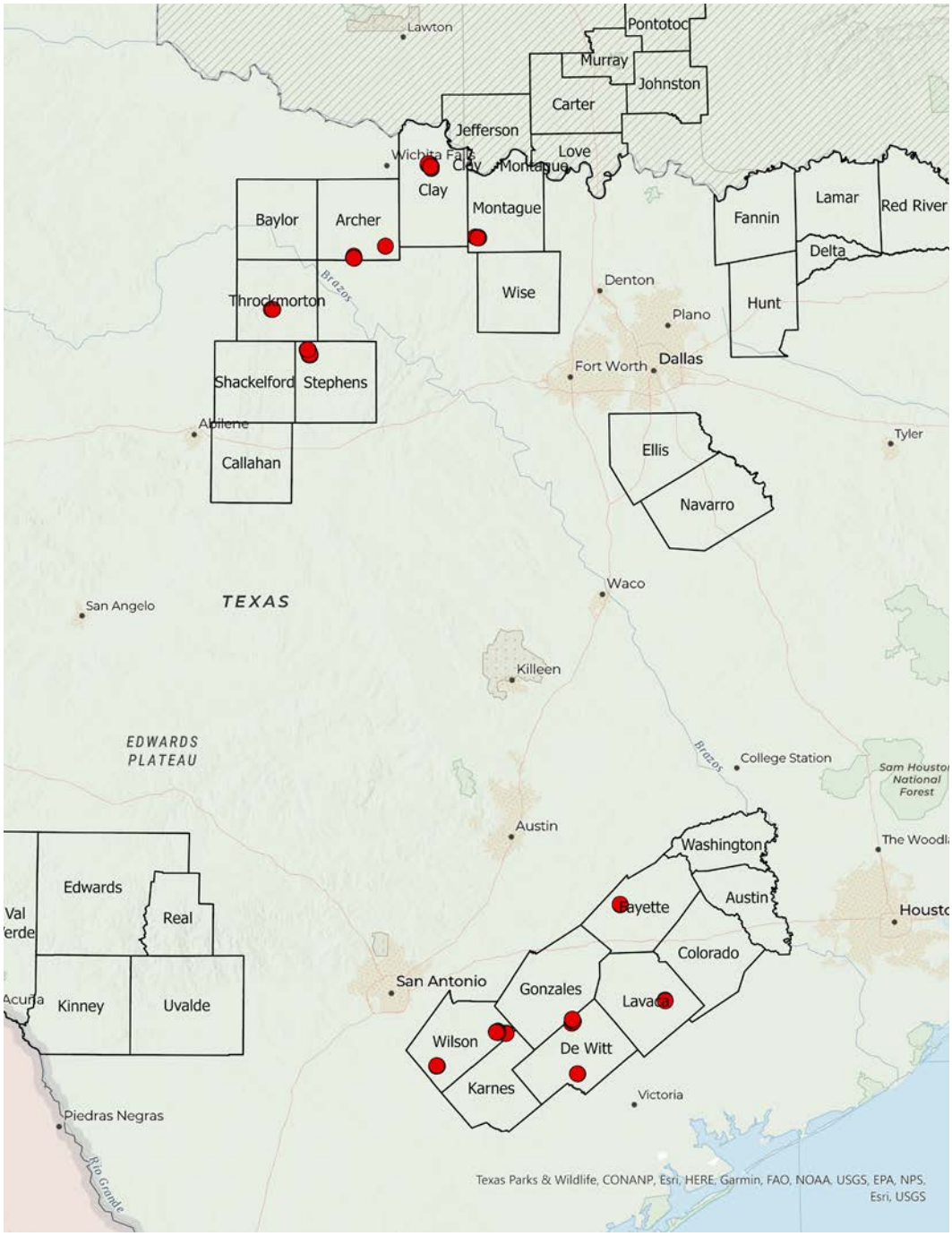


Figure 1. Grassland Restoration Incentive Program (GRIP) projects where the Grassland Effectiveness Monitoring (GEM) protocol was piloted. Prescribed fire and brush management projects were completed between 2016-2019, and sites were visited in 2021 and 2022. Tier 1 was implemented in 2021 and Tier 2 in 2022.

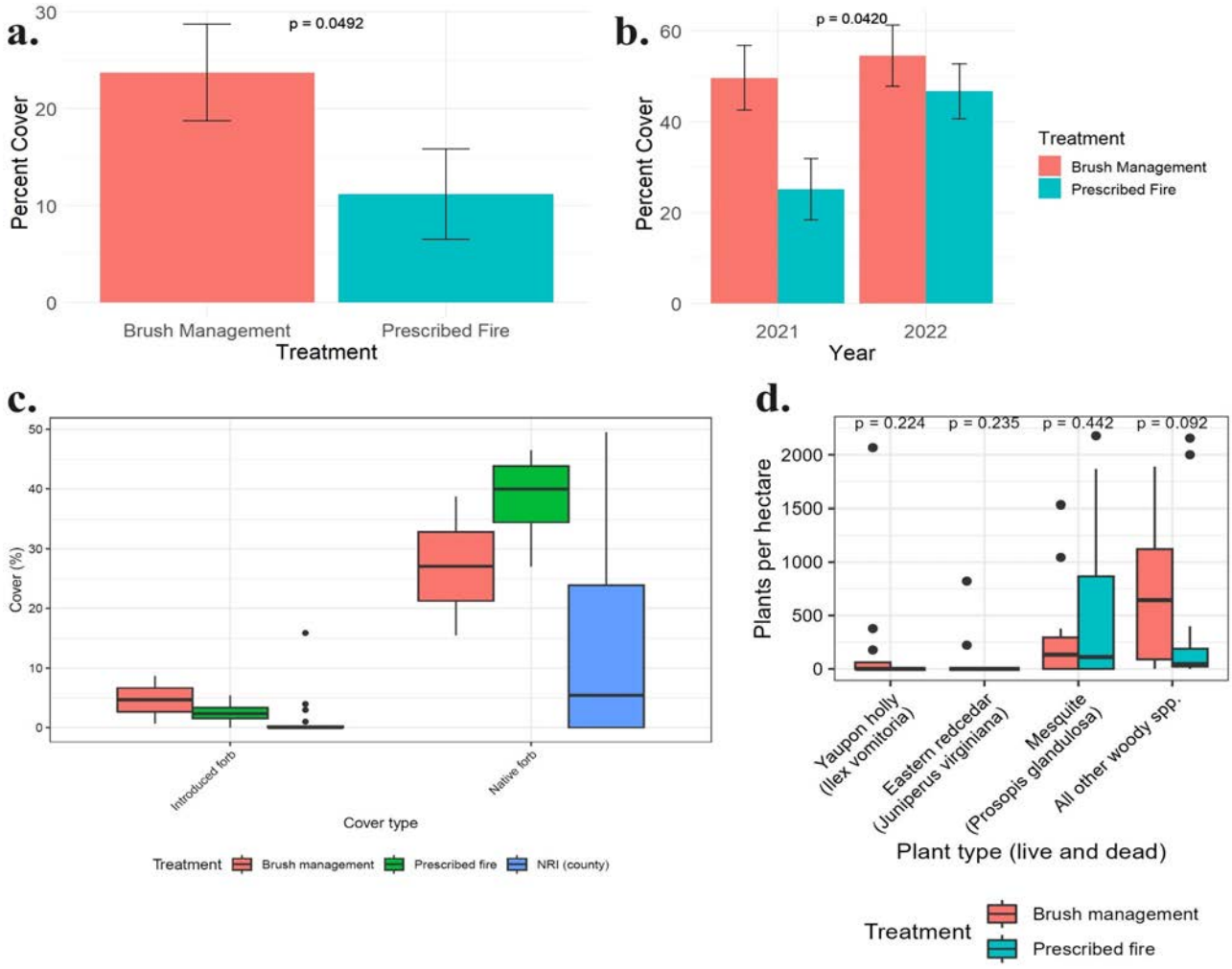
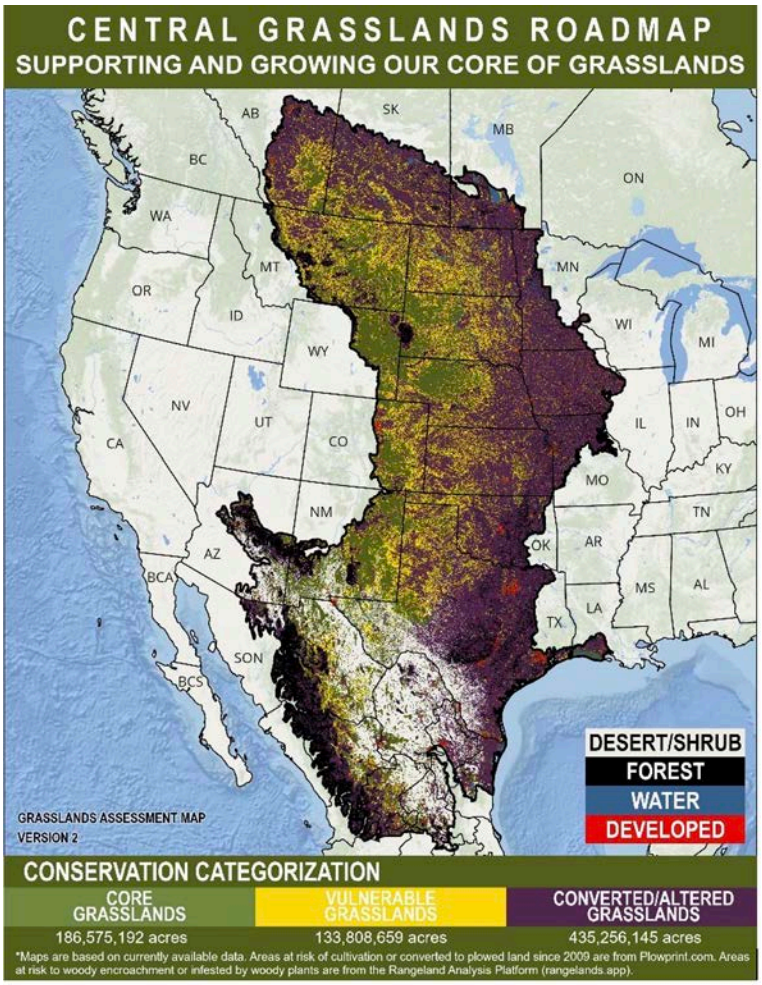


Figure 2. Effects of prescribed fire and brush management treatments on vegetation indicators, produced by data collected using the Grassland Effectiveness Monitoring (GEM) protocol. The percent cover of woody plants was higher for brush management as compared to prescribed fire (Figure 2a.), and the percent cover of native perennial grass differed between treatments (ptreatment = 0.0488) and across years (pyear = 0.0018), with the differences being greatest in 2021 (Figure 2b.). As additional examples of how GEM data can be used to assess habitat treatments, we provided two rough assessments using other indicators. Data from BLM's Assessment, Inventory, and Monitoring (AIM) program or NRCS' Natural Resources Inventory (NRI) can be used as point of comparison, such as in Figure 2c. where percent cover of native forbs from a single site is being compared to NRI county-level data. Additionally, species-specific responses can be examined, such as in Figure 2d. where the effects of treatments on the density of different native invasive woody plants is examined.

CENTRAL GRASSLANDS ROADMAP: GRASSLANDS ASSESSMENT MAP

Sarah Olimb, World Wildife Fund and Dirac Twidwell, Jr. UNL

The Central Grasslands Roadmap Grassland Assessment Map is a biome-level map that pulls together data on cropland expansion and woody encroachment to identify Core, Vulnerable and Converted/Altered Grasslands across the expanse of the North American Great Plains. These areas can be targeted with specific conservation delivery methods including: keeping the core areas intact by removing young cedars and invasive shrubs and supporting sustainable range management practices; working in vulnerable areas to address woody species encroachment, voluntarily retain grasslands and maintain connectivity with large blocks of existing grassland; and making strategic investments in the converted/altered grasslands to remove woody species, convert cropland on marginal soils back to grassland, improve productivity and ecosystem health and connect to larger blocks of existing grassland. The map, and accompanying data, will be updated regularly and available for viewing and download at the Central Grasslands Roadmap website (www.grasslandsroadmap.org/).



A NEW TOOL FOR ASSESSING AND MONITORING RESTORATION SUCCESS IN TALLGRASS PRAIRIE ECOSYSTEMS: THE NATURAL COMMUNITY HEALTH INDEX (CHI)

Mike Leahy, Missouri Department of Conservation

In the Midwest we have many historically fire-adapted natural communities including tallgrass prairies, oak savannas and woodlands, and pine oak woodlands. As resource managers we need tools to first prioritize the best sites for restoration and second, we need ways to efficiently monitor our progress or determine what's not working. To do natural community management within an adaptive management framework you need to do four things:

- Define and describe what natural communities are.
- Conduct an inventory and assessment of natural communities.
- Monitor natural communities as management occurs.
- Re-assess the effectiveness of management actions.

To address this need we have developed a natural community health index (CHI) as an intermediate level of ecological monitoring, in between detailed plot sampling and remote sensing techniques. There are six steps we have utilized in developing a CHI:

1. Select the ecosystem type to be assessed
2. Identify the key ecological attributes of the ecosystem type
3. Select a level of assessment (3 levels)
4. Identify the metrics (an iterative process)
5. Identify scores and thresholds for the metrics (includes field validation)
6. Provide scorecards and reports that facilitate interpretation of what's driving the scores

The CHI attempts to assess four broad ecological metric groups including landscape context and patch size, native plant species composition, vegetation structure, and negative impacts such as non-native invasive species. We created this protocol using expertise from Missouri and beyond from ecologists, botanists, and wildlife biologists. We field tested the protocol and modified the protocol based on this experience.

The first step is to delineate your sampling units in GIS. Utilize ecological, soils, and management maps to delineate sampling units. Sampling units typically are 40-80 acres. You spend an hour or less for a 40-acre unit. Sample time length is dependent on size of the unit (~45 sec/ac). Pre-determined sample points are mapped to capture representative landform and soils within the sampling units.

You conduct three timed meanders per sampling unit, meandering to the pre-determined sampling or assessment points. During the timed meanders a list of 80-100 indicator plant species are searched for. Indicator plant species are resampled in each of the timed meanders allowing for the calculation of frequency of occurrence as well as diversity. Indicator plant species are relatively easy to identify vegetatively during the growing season and are longer-lived throughout the growing season – avoiding early year ephemeral species. Species must also indicate habitat quality. We use the concepts of floristic quality assessment in determining which target species to include on the list.

At each of the sampling points you estimate the cover of the following metrics within a 37 foot radius:

- % cover of invasive native shrubs (e.g., sumacs, dogwoods, Rubus spp, Prunus spp)
- % native graminioid cover (native warm and cool-season grasses, sedges, and rushes)
- % native forb cover
- % non-native invasive species cover

Native and non-native tree and shrub cover is also estimated for the whole sampling unit using aerial imagery and the walk-through information. The final step of the CHI is scoring. Each of the metrics gets a score.

From 2018-2020 we gathered CHI data on prairies in Missouri.145 managed remnant prairie sampling units and two prairie plantings were sampled at 33 different sites. This was a sample of 20% of the remnant tallgrass prairie remaining in Missouri. The CHI model used at that time included animals but issues with herptile sampling during the survey precluded using these data and the total possible score for a CHI sample was shifted to 90 points. Scores ranged from 22 to 66 points and the mean was 47. We created a histogram of the data and ran a K-S test on the data which indicated that the data didn't significantly deviate from a normal distribution.

Based on this we fitted the data to a normal distribution to determine the subjective condition classes of "good, fair, and poor" based on CHI scores. Fair condition was defined as units with scores that ranged plus or minus one standard deviation of the mean. Good condition was defined as units with scores that ranged greater than the mean plus two standard deviations. 12% of the units were in good condition, 73% fair, and 15% poor. These data provide a baseline on which to evaluate future restoration efforts. Another way to examine the prairie CHI data is to parse the data into fifths or quintiles.

The CHI scores make intuitive sense with the prairie data we gathered. A prairie planting on former row group ground at Morris Prairie Conservation Area scored a 29 being in the lowest 20%. Whereas nearby the remnant Morris Prairie Natural Area scored a 58, putting it in the top quintile. CHI scores by management unit can be constructed in GIS giving managers a quick visual look at which units are performing the best. We also compared CHI scores from the same five units sampled by two different crews in two separate years. Encouragingly the scores were similar with an average difference of just 3.2 +/- 0.9 SEM between the two crews.

Over the past three years we have been gathering data and refining an Ozark pine – oak woodland CHI along with other Ozark community types. Since CHI is a rapid assessment, one of the concerns was whether the ground flora metrics adequately capture the floristic quality of the sites. In pine – oak woodlands we compared the CHI ground flora scores of 43 CHI units to total plant composition quadrat data collected by an expert Missouri botanist. We compared the CHI ground flora scores directly to Total Mean C, a floristic quality assessment metric. The correlation coefficient here was 0.65 and the regression showed a significant p value. This indicates that a good amount of what is being found on quadrat level work is being picked up during the rapid assessment. However, please keep in mind that rapid assessments may be more feasible given time and resources, but quadrat level data will always be more accurate.

So far, we have the following conclusions regarding the CHI:

- CHI is a useful tool for teaching the components of what makes a healthy natural community.
- CHI is a coarse scale but efficient monitoring tool.
- CHI is easily used by resource managers with a moderate amount of field botany training; it doesn't require expert botanical skills.
- CHI is not a substitute for detailed plot work and statistical design to answer cause-effect questions or evaluate fine-scale changes in communities.
- Further sapling is needed to assess trends in CHI scores with paired botanical plot scores.

ADDRESSING THE THREAT OF TREE ENCROACHMENT FOR BIODIVERSITY AND CONNECTIVITY IN U.S. GRASSLANDS

Scott L. Morford, University of Montana

Other Authors: David E. Naugle, University of Montana; Dirac Twidwell, University of Nebraska Lincoln

Global grassland biomes are experiencing a surge in tree encroachment. Factors like fire suppression, livestock overgrazing, nutrient pollution, and rising CO2 emissions accelerate this trend. This encroachment jeopardizes grasslands resilience and conservation potential, impacting wildlife habitat, biodiversity, and vital ecosystem services such as water storage and herbaceous production (essential forage for wildlife and livestock).

The slow pace of tree encroachment makes it challenging to communicate its threat and impact, especially during the early phases when management intervention is most effective, yet the impacts remain hard to detect. Here, we summarize the pace and magnitude of tree encroachment across United States (U.S.) grasslands and shrublands (together: rangelands) and present decision support tools to help communicate, evaluate, and address this biome-level threat.

Using new satellite technologies, we show that more than 25% of U.S. rangelands are experiencing tree cover expansion, with total tree cover increasing by 50% between 1990 and 2019 (**Figure 1**). Tree cover is expanding more rapidly in grasslands, where tree cover has increased by 85%. In total, we calculate that over 30 years, more than 36.5 million acres (equivalent to the size of Iowa) have transitioned from tree-free rangelands to woodlands. Moreover, this threat is growing; our analysis shows that more than 50.6 million acres (equivalent to the size of Nebraska) have become vulnerable to tree encroachment over the past 30 years.

The magnitude of grassland and shrubland loss is similar to cropland conversion, the other primary threat impacting grassland in the United States. From 2008 to 2016, the conversion of intact rangelands to cropland accelerated rapidly across the western U.S.; annual conversion rates were 0.4 to 1.1 million acres annually. In comparison, the mean annual loss of rangelands to tree encroachment was 0.63 million acres over this same period. Together, these data suggest that rangelands of the western U.S. are being lost at a rate of 3,168 acres per day, losses that are 68% higher than estimates based solely on row-crop conversion.

Two-thirds of western U.S. rangelands are under private ownership, and conservation of these lands requires addressing ecological and economic sustainability linkages. As part of this work, we evaluated the impact of tree encroachment on herbaceous production to determine how ongoing woody encroachment impacts producers and rural economies. We found that between 1990 and 2019, some $4.1–$5.6 billion U.S. dollars had been lost in revenue to U.S. producers and rural economies, representing 5-6% of the total herbaceous production of U.S. rangelands. Losses now top over $320 million annually (**Figure 2**); without large-scale restoration, production losses to woody encroachment are expected to grow to $1 billion annually in the next 50 to 60 years.

Preventing the biome-scale transition from grasslands and shrublands to woodlands is costly. We estimate that the restoration cost to address tree encroachment on privately owned U.S. rangelands is between $8.8 to $10.8 billion, requiring the treatment of some 134 million acres of land. Given that restoration invention of this scale is unlikely, we instead suggest that land managers deploy a 'defend the core' strategy (Figure 3, Maestas et al., 2022) to prioritize restoration management practices among intact grasslands and shrublands that have not yet experienced widespread woody transitions. This strategy is particularly important in the northern Great Plains, where tree encroachment is starting to accelerate rapidly. In addition to protecting core areas, we suggest prioritizing managing connectivity pathways based on known migration routes and genetic connectivity studies (Cross et al., 2023).

To help scale-up communication and restoration efforts, our team has developed numerous communication and decision support tools, including:

- **Yield Gap:** A communications tool that summarizes tree cover expansion and yield losses for producers to help them make conservation-friendly woodland management decisions that benefit their bottom line. https://wlfw.org/yieldgap/

- **Vulnerability and pocket guide:** Resources to help practitioners develop management and restoration plans to address woody encroachment. Get these decision support tools at https://www.theprairieproject.org.

- **Landscape Explorer:** An online mapping tool to evaluate landscape change since the 1950s using historical aerial imagery. https://LandscapeExplorer.org

The full presentation is available to download as a PDF: https://storage.googleapis.com/wlfw-public/Morford-AGC-20230807.pdf

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Figures:

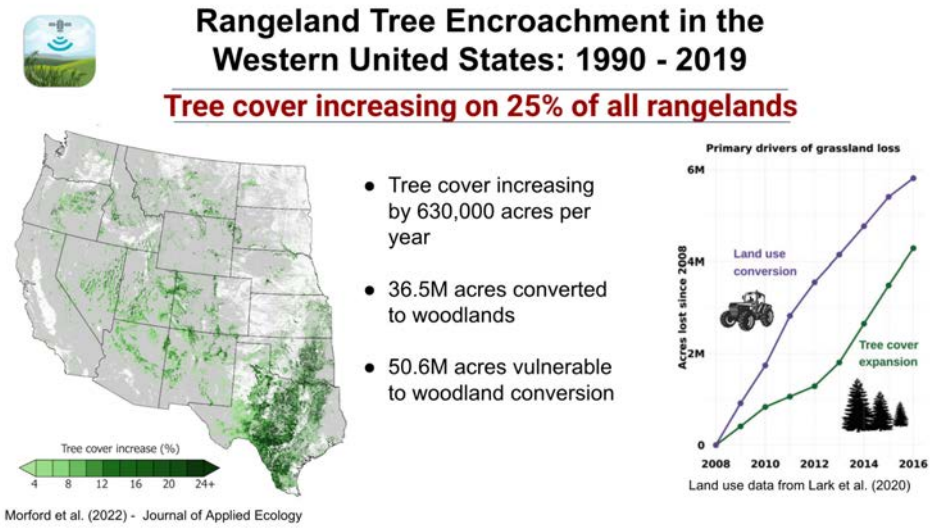


Figure 1: Tree encroachment is a biome-level threat to the conservation of intact grasslands and shrublands in the United States.

	Rangeland production (tons)[a]	Rangeland production lost to WPE (tons)[a]	Equivalency metrics for understanding losses		
			Round bales lost[b]	Cows supported[c]	Economic losses[d]
North Dakota	11,130,966	14,189	23,648	2,993	$268,882
South Dakota	24,246,024	145,352	242,253	30,665	$4,513,180
Wyoming	15,799,568	209,285	348,808	44,153	$4,955,869
Colorado	14,059,223	262,232	437,053	55,323	$5,105,657
New Mexico	15,873,691	291,875	486,458	61,577	$4,915,175
Montana	24,130,281	297,051	495,085	62,669	$7,660,945
Nebraska	23,908,316	419,328	698,880	88,466	$17,964,012
Kansas	29,993,183	1,525,841	2,543,068	321,907	$29,708,124
Oklahoma	30,741,853	4,491,096	7,485,160	947,489	$54,387,173
Texas	102,505,037	14,716,404	24,527,340	3,104,727	$193,667,877
Great Plains	292,388,141	22,372,653	37,287,755	4,719,969	$323,146,892
Cumulative 30-year Total	7,586,856,458	349,937,323	583,228,872	73,826,439	$4,507,464,711

Figure 2: Communicating the economic cost of woody encroachment to producers is an effective means to engage private landowners in conservation practices for woody encroachment.

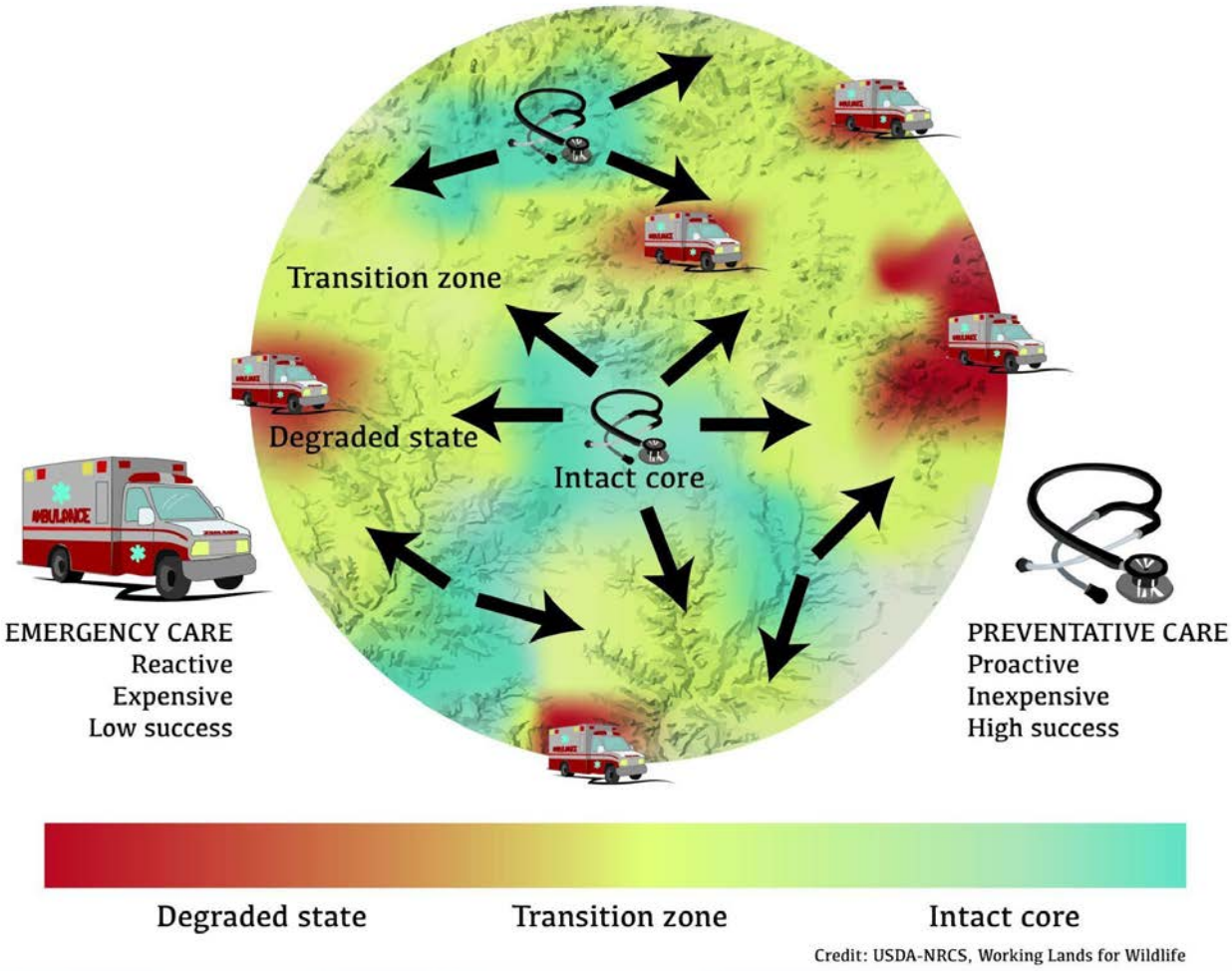


Figure 3: The 'defend the core' strategy for tree encroachment emphasizes management that anchors to intact core grasslands and works outwards to transition zones to maximize cost efficiency and protection of the grassland core.

King Ranch/Julie Sibbing, NWF

2. GRAZING AND MANAGEMENT

ENVIRONMENTAL ORIENTATION, RANCH CHARACTERISTICS AND PERFORMANCE: A COMPARISON OF RANCHES UNDER DIFFERENT GRAZING MANAGEMENT PRACTICES

Tong Wang, South Dakota State University

Other Authors: Urs Kreuter, Texas A&M University

To reverse widespread rangeland degradation, it is important for ranchers to utilize sustainable livestock grazing strategies that generally require higher management intensity. Under conventional continuous grazing (CG), where livestock have unconstrained access to a single paddock throughout the grazing season long, patch or area-selective grazing is common and often leads to excessive defoliation of preferred plants and further land degradation over time, even at low stocking rates (Teague et al. 2013). In contrast to CG, multi-paddock grazing, also referred as rotational grazing (RG), divides the available grazing area into several paddocks with one paddock being grazed and the other paddocks recovering from prior grazing. In practice, multi-paddock grazing spans a wide range

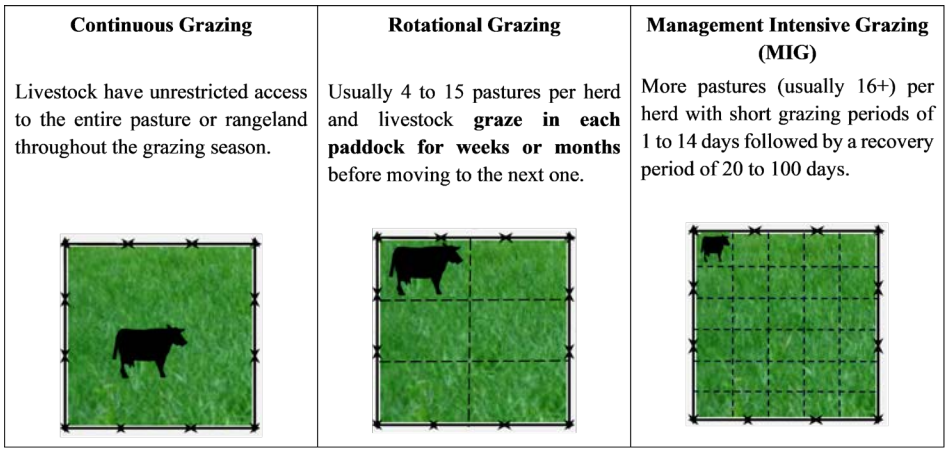


Figure 1. Common grazing strategies

To compare different practices and identify those that promote sustainable ranching outcomes, we surveyed 870 ranchers in North Dakota, South Dakota, and Texas from January to March 2022 using the modified Tailored Design Method (Dillman et al., 2009). Producers were contacted for up to four mailings, which contains an advance letter with the online survey link (1st mailing), a paper-version questionnaire with pre-paid return envelope (2nd mailing), a reminder/thank you postcard (3rd mailing), and a second copy of questionnaire with pre-paid return envelope (4th mailing). We received 334 responses out of 781 eligible sample at a response rate of 43%.

We asked producers about their grazing strategies and paddock numbers, as indicators of management intensity. To ensure that all respondents applied the same criteria to determine their grazing strategies, we provided definitions in the questionnaire as in Figure 1. Under both grouping criteria, ~30% fit into the low management intensity group, the majority (nearly 60%) fit into the intermediate management intensity group, and ~10% of producers fit into the high intensity group (Figure 2).

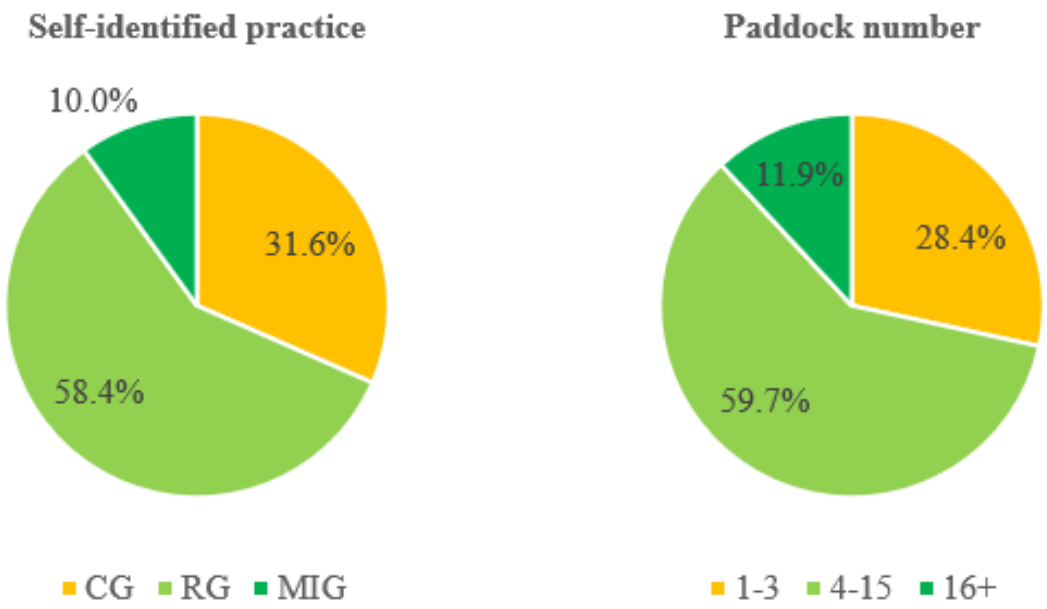
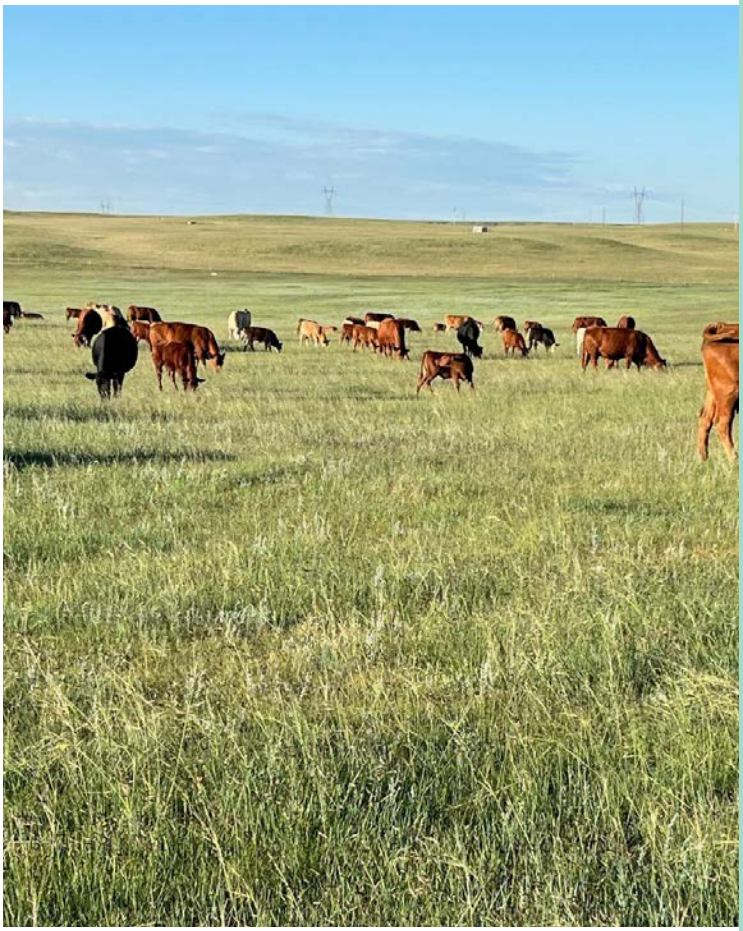


Figure 2. Percentage of ranchers under self-identified practice vs. pasture number criteria

of systems from simple grazing deferment for some time to more intensive short duration grazing systems (Holechek et al., 2011). Multi-paddock grazing can be characterized as a continuum of management intensity levels with greater management intensity typically being associated with more paddocks, shorter grazing and longer post-herbivory recovery periods in each paddock (Figure 1). It intends to mimic the grazing behavior of wild herbivores that move across the landscape, thereby allowing inter-defoliation plant recovery and avoiding the detrimental effects of long-term concentrated grazing (Teague et al., 2013).

Our objective was to compare low, intermediate, and high management intensity groups regarding six categories of variables: 1) ranch characteristics; 2) soil and water; 3) environmental perceptions; 4) neighborhood and rancher association; 5) cost, profit and labor change; and 6) grassland management outcomes. Duncan's multiple range tests were applied as the comparison involves more than two groups.



King Ranch/Kendall Roberts

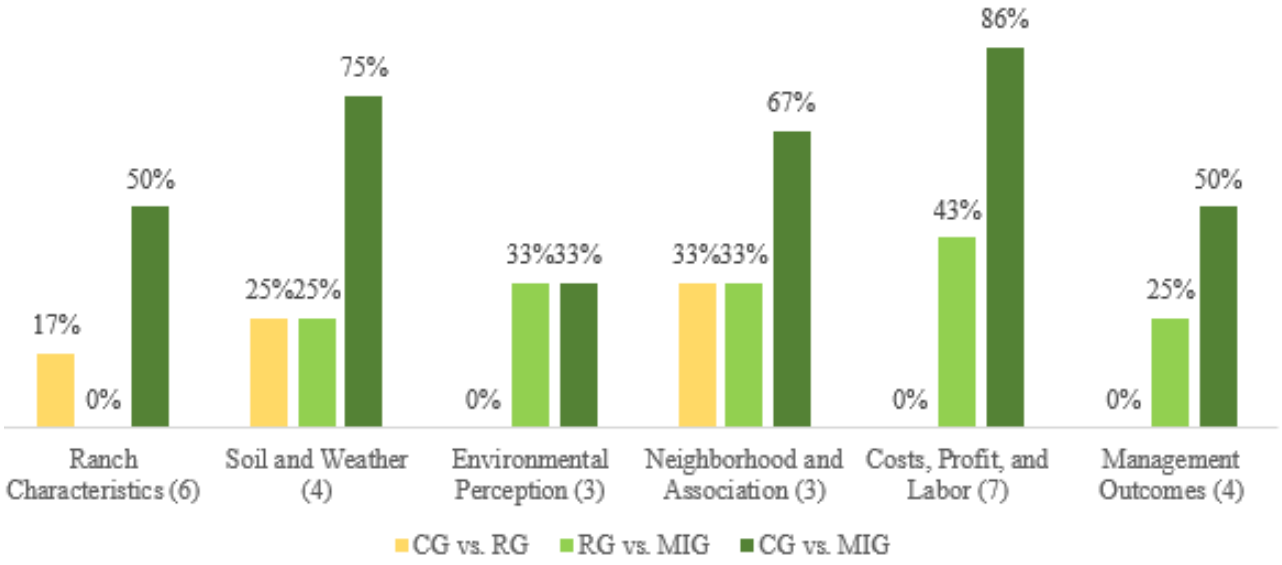


Figure 3. Percentage of significantly different outcomes under self-identified practice criterion

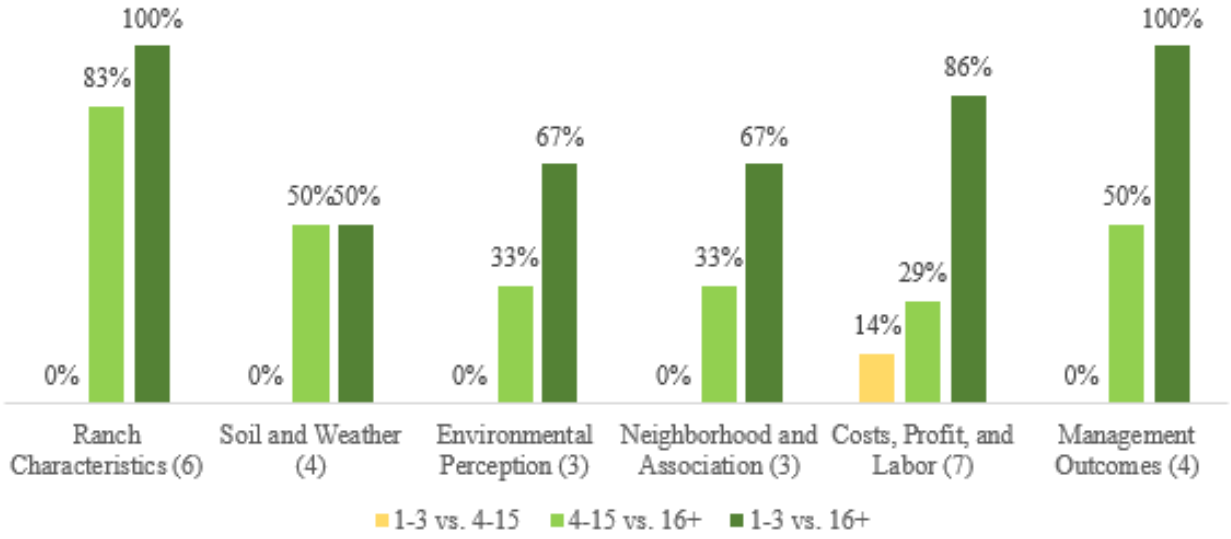


Figure 4. Percentage of significantly different outcomes under paddock number criterion

Overall, we found few differences between the low and intermediate intensity groups, as represented by the yellow bar in Figures 3 and 4, especially under the paddock number criterion (Figure 4). Under both criteria, Figures 3 and 4 demonstrate no difference between the two groups in ranching outcomes, regarding increased grazing days and increased stocking rate. The low intensity group only differed from intermediate group in 4-15% of the examined variables (Figure 5), which support previous literature findings that RG provides little benefits over CG (e.g. Briske et al., 2008). In comparison, the percentage of differences between the intermediate and high intensity groups is much greater, as represented by the light green bar in Figures 3 and 4, which suggest the need for distinguishing multi-paddock grazing into different groups in future research. We also identified major differences exist between

low and high intensity groups (63-81%), which suggests that using high intensity and adaptive grazing management practices, such as MIG, will improve ranch performance when compared with the conventional CG practice (Teague & Kreuter 2020; Wang et al., 2018, 2022).

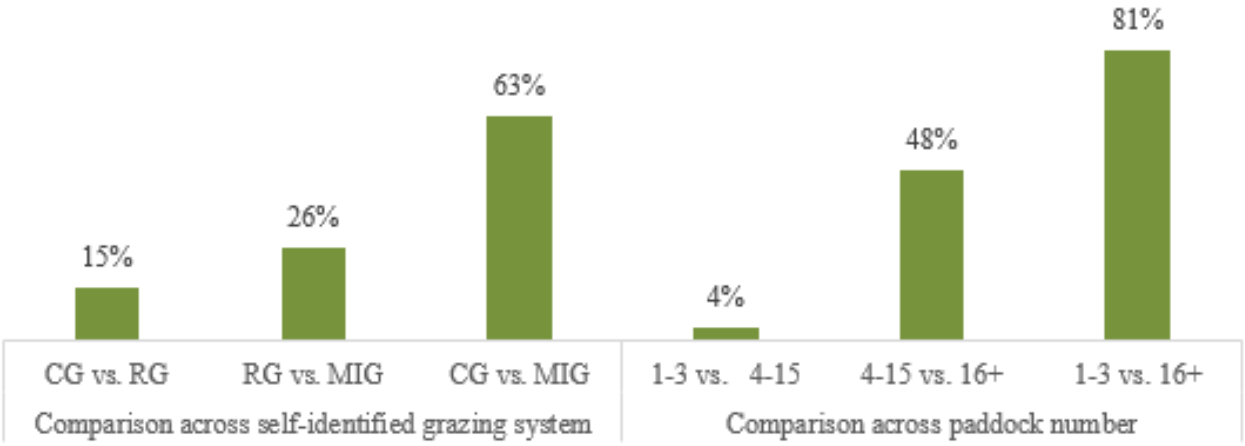


Figure 5. Percentage of significantly different variables across grazing management intensities.

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King Ranch

ANY WAY YOU WANT IT, THAT'S THE WAY YOU GET IT: MULTI-PURPOSE GRASSLANDS

Cecilia Shadrock, Jordan Senn, Katherine Hays, and Olivia Lasater, Texas A&M AgriLife Research and Tarleton State University

Other Authors: Emily Green and James P. Muir, Texas A&M AgriLife Research and Tarleton State University

Introduction

Degradation and fragmentation of semi-arid grasslands in south central United States prairies has increased as climate change persists, land and resource demands for livestock grow, and calls for alternative energy sources rise (Chengcheng et al., 2014; Reid et al., 2020). Exotic bunchgrasses used as a solution to these issues require costly supplemental irrigation and soil amendments to efficiently produce (Perkins, et al., 2011). Additionally, when these exotic grasses escape cultivation it is detrimental to grasslands, reduces livestock carrying capacity, and decreases biodiversity and value to wildlife (Ditomaso, 2000). We propose using native grassland species as a catchall solution in the form of a low-input, market- and climate-flexible grassland-derived bioenergy feedstock.

This resolution stems from literature reviewed and our own ongoing research into bioenergy feedstocks by utilizing native bunchgrasses and directly comparing them to exotic grasses in mono and polyculture settings. Native grasses are historically climate-change resistant and drought tolerant (Craine et al., 2013). This resilience leans to the idea that a native grassland permaculture may provide producers more market stability as crop production persists despite harsh weather conditions. A cultivated native prairie or rangeland provides stability and contributes greater ecosystem services (Hirschfeld and Van Acker, 2021); furthermore, highly regionalized ecotypes of native bunchgrasses are being developed and show promise in producing more effectively than both commercial exotic and native grass seed. The presence of legumes further increase biodiversity and support productivity, as legumes regulate and fix biological nitrogen through their root nodules and diazotrophic bacteria (rhizobia) in the soil, even when present in mixed grasslands (Ledgard & Steele, 1992).

Objectives

1. Measure dry matter yield (DMY) and identify herbage characteristics of various dominant native perennial bunchgrasses in multiple ecoregions.

2. Compare the highest producing natives from Objective 1 to exotic bunchgrass monocultures under low-input management in multiple ecoregions.
    a. Determine if natives have similar or better DMY and herbage characteristics for forage or bioenergy than exotics

Current Research

Objective 1. In the 2021 and 2022 growing season we sampled various perennial native bunchgrasses from different ecoregions around Texas: Lubbock, Kingsville, Nacogdoches, Stephenville, and Knox City at cultivated locations. We harvested each set of grass once in the summer for initial forage value, and then reharvested in the fall season for regrowth forage value. A bioenergy harvest was also taken in the fall season. Measurements we took during harvest included each specimen's height and the distance between neighboring grasses and rows. After

collection, we dried, weighed, and ground the grasses. We calculated DMY and sent ground plants for lab assays to determine herbage characteristics, including: in vitro digestibility, ash content, lignin, acid-detergent fiber, neutral detergent fiber, and C:N ratio.

Objective 2. We established research fields at three Texas AgriLife locations in Lubbock, Stephenville, and Beeville at the beginning of 2022. Species selection for plots included the highest performing natives from Objective 1, plus a legume species (*Acacia angustissima*), wildtype accessions of commercial natives, and common exotic bunchgrasses. In Year 1 (2022), we transplanted species to the field at the start of the season and gave supplemental water to aid establishment; Year 2 had no supplemental irrigation. We harvested each location multiple times for forage and once at the end-of-season for bioenergy. Measurements we took included basal circumference, height, inflorescence count, and a sub weight if applicable. We dried the plants, calculated DMY, and ground them. We sent the plants to a lab for herbage characteristic analysis after.

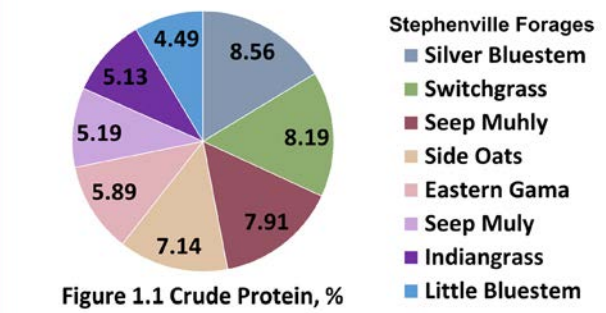


Figure 1.1 Crude Protein, %

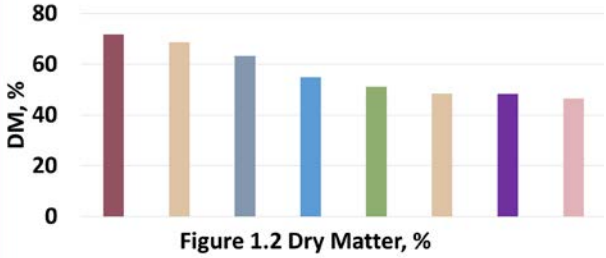


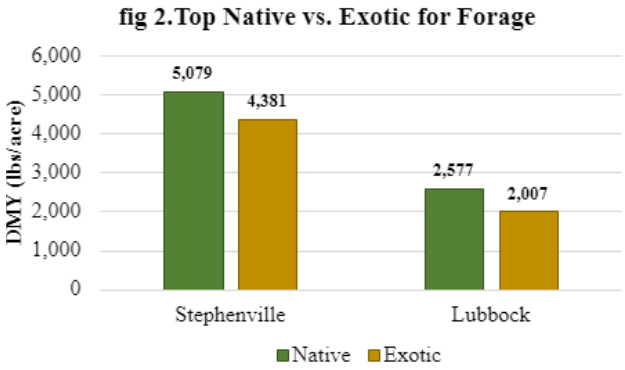
Figure 1.2 Dry Matter, %

Findings

Results from Objective 1 indicate that natives are of substantial forage value (fig. 1.1). Preliminary results from Objective 2 suggest that natives were slower to establish than exotics, however performed roughly equivalent to exotics in terms of DMY to exotics by the end-of-season harvests.

Top performing 2022 end-of-season natives include: Lubbock's silver bluestem (*Bothriochloa laguroides*) "Santiago": 1,552 lbs/acre regrowth; 1,615 lbs/acre bioenergy.

Beeville's eastern gamagrass (*Tripsacum dactyloides*): 972 lbs/acre regrowth; ecotype silver bluestem: 1,169 lbs/acre bioenergy. Stephenville's Indiangrass (*Sorghastrum nutans*) "Lometa": 1,154 lbs/acre regrowth; 2,786 lbs/acre bioenergy.



The initial 2023 summer forage harvest shows that despite the native's previous slow establishment, compared to exotics they are performing strongly in Year 2 (fig. 2.). The top yielding native in Stephenville is eastern gamagrass, and top exotic is Kleburg's old-world bluestem (*Dichanthium annulatum*). Lubbock's top yielding native is silver bluestem "Santiago", and top exotic is yellow bluestem (*Bothriochloa ischaemum*) "WW-SPAR".

Future & Implications

We have further research being conducted on polyculture native and exotic grass-legume mixtures, our aim with this is to measure DMY and herbage characteristics of a polyculture grassland-derived bioenergy feedstock. These results can help create region specific seed mixes and species lists that can be utilized across the Southern United States. Based on our literature review and our research thus far, we believe a mixed, native, low-input, multiple-use grassland-derived bioenergy feedstock system is a viable option for ranchers and farmers interested in the conservation reserve program, increased grazing opportunities, or a stable feedstock production. Seed companies and grassland managers may also find this system to be favorable considering its resilience to climate and market fluctuations. Implementing such systems is not only beneficial economically but encourages grassland restoration and nurtures ecosystem services. Native species' continuous growth and increased production despite Texas's persistent summer droughts and historically high temperatures showcases native species' adaptations, and thus strong potential for native grassland-derived bioenergy feedstocks. We recommend ranchers, farmers, land managers, and other natural resource producers seeking to restore grassland or create permaculture to locate native locally sourced seed or regional varieties that correspond to their personal or targeted ecoregion.

Acknowledgements

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RANCH-LEVEL SUSTAINABILITY INDICATORS FOR GRAZING LAND MANAGERS

Patrick Lendrum, World Wildlife Fund – Northern Great Plains

This presentation was built around a set of rangeland monitoring indicators identified in:

- Ahlering, M. A., Kazanski, C., Lendrum, P. E., Borrelli, P., Burnidge, W., et al. (2021). A synthesis of ranch-level sustainability indicators for land managers and to communicate across the US beef supply chain. Rangeland Ecology & Management, 79, 217-230 https://doi.org/10.1016/j.rama.2021.08.011.

While increasing numbers of ranchers are striving to demonstrate sustainable ranching operations geared toward a healthy landscape, companies are seeking to advance sustainability along beef supply chains and consumers are making more environmentally oriented purchasing choices. Yet there is a need for greater clarity on which indicators are most effective for assessing and monitoring sustainable management and continuous improvement of ranching operations. Our objective was to synthesize existing guidance on monitoring and assessing ranch-scale sustainability in the United States and to identify core ecological, social, and economic indicators that could identify well-managed ranching, support adaptive management, and demonstrate producers' sustainability and continuous improvement to retailers and consumers. We evaluated 21 range and pastureland assessments from nongovernmental organizations, agencies, and academics that totaled 180 indicators. From this, we selected 20 commonly used "core" indicators (12 ecological and 8 socioeconomic). We identified indicators that are designed to detect change over time for management practices, common among many approaches, and/or critical indicators for outcomes of common interest to producers, companies, and consumers. The synthesis of indicators across many guidance documents offers insight into what a diverse set of range professionals and institutions see as critical to demonstrate and track ranch-level sustainability, and producers, consumers, and companies may find a subset of these indicators to be relevant for their operation and region, values, and/or company sustainability goals. The synthesis also highlights the need for more integration and agreement on socioeconomic indicators of ranch sustainability. We acknowledge that socioeconomic indicators are context dependent and discuss the pitfalls of not integrating them into ranch assessments. Finally, we identified four issues to consider in operationalizing widespread use of common indicators: 1) who bears the cost, 2) agreement on simple and robust standardized protocols, 3) developing region-specific thresholds, and 4) issues of data privacy and sharing agreements for data use.

King Ranch/Aleta Dam

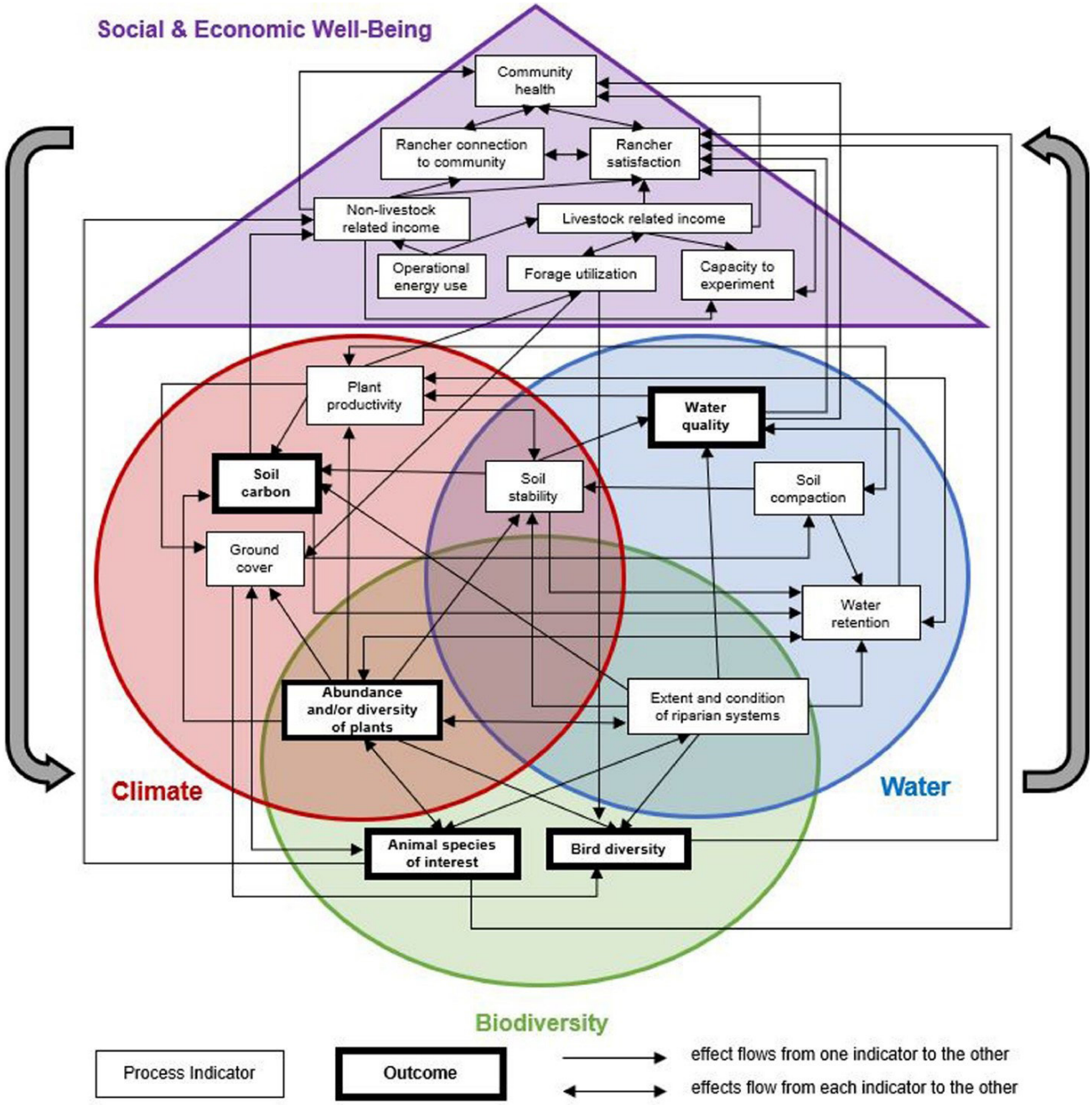


Figure 1. This conceptual diagram shows the direct relationships between core indicators identified through the synthesis (individual boxes) and how they relate to ranch and company sustainability goals (colored bubbles). Because these indicators are intricately connected, we only visualized direct connections between indicators. The native and invasive plant indicators were combined for this diagram. Each arrow between indicators represents a recognized, direct effect. Some effects are one-directional, whereas others are two-directional (i.e., each indicator influences the other). Some indicators are not directly linked by arrows but also connected through other indicators (e.g., soil compaction affects soil carbon through its effects on plant productivity and soil stability). The *large gray arrows* surrounding the figure indicate the overall linkage between ecological indicators and socioeconomic indicators. Indicators are organized by the sustainability goals they most closely relate to. Indicators in boxes with a bolded border and text are also in and of themselves sustainability outcomes.

Averi Reynolds, University of Wyoming

Putting this research into practice, World Wildlife Fund's Northern Great Plains program has developed the Ranch Systems and Viability Planning Network which provides resources to grazing managers with an interest in increasing the sustainability of their operation. The program provides technical assistance, training and education opportunities, cost-share to improve ranch infrastructure that helps meet ranch plans, baseline and repeat ecological monitoring to track trends as a result of practice change following the metrics outlined in Ahlering et al. (2021), and a peer-peer learning network. The same set of ecological indicators are also being monitored by Native Nations on Native-owned and managed bison herds that WWF supports. Monitoring is being used to inform the ecological role of buffalo on the landscape and to incorporate monitoring into adaptive grazing management plans. An example of this is the Wolakota Buffalo Range, managed by Sicaŋǧu Co. which began ecological range monitoring prior to the return of buffalo at the site and have been tracking condition, annually, since then. Collective action in monitoring a unified set of ecological indicators across intact grasslands will lead to improved ecological function of this at-risk landscape, ultimately increasing the resiliency of the communities living across the region. In closing, the following two quotes highlight the importance of understanding the relationship between grazing animals and healthy landscapes for people and nature:

"As the largest native species in the grassland prairie, the bison plays a healing and restorative role in a healthy ecosystem. And as an animal recognized by the Sicangu Lakota as a relative, the buffalo plays a healing and restorative role in the Native cultural economy. When the buffalo is healthy, the Sicangu Oyate is healthy." – Sicaŋǧu Co

"Consistent monitoring, both on an individual ranch and on ranches across the country, can provide us with the necessary data and insights to learn and adapt, improving outcomes for ranchers, eaters, and the planet. Identifying common indicators of ranch-level ecological, economic, and social sustainability, as well as addressing common data issues, are critical elements needed to scale the practice of regenerative agriculture." – TOMKAT Ranch

3. GRASSLAND DEPENDENT WILDLIFE

REINTRODUCING BLACK-TAILED PRAIRIE DOGS TO ARIZONA: A 15 YEAR UPDATE

Jennifer Presler, Arizona Game and Fish

After extirpation from Arizona by the early 1960s, the Arizona Game and Fish Department has worked to reintroduce black-tailed prairie dogs to their former range in the state since 2008. As of 2023, the Arizona population has grown to five reintroduction colonies and two dispersal colonies. This growth has allowed for the Department to use local population sources to further expand reintroduction efforts. While the reintroduction has thus far been on an upward trend, we continue to mitigate challenges and support these small colonies as they establish. Future efforts to restore this keystone species to the southeastern Arizona grasslands will continue toward a goal of self-sustainability and connectivity across their former range.

In the first fifteen years of reintroduction, the population of black-tailed prairie dogs has not grown as quickly as many expected, but we continue to work towards the goal of 7100 occupied acres. In addition to translocations to create new colonies in the state when possible, efforts to help restore the keystone species include supplemental feeding during the breeding season, site maintenance to help with visibility and expansion, and close monitoring. Dispersal has been encouraged through mowing, and satellite burrow systems, but so far the only dispersal has been observed onto private property. Efforts to expand community support are ongoing, and the project has slowly gained support of local ranchers. Arizona game and fish will continue working towards reestablishment of black-tailed prairie dogs in the future with additional planned translocations throughout their former range.

ARIZONA ANTELOPE FOUNDATION-ARIZONA GAME & FISH DEPARTMENT & NATIONAL FISH AND WILDLIFE FOUNDATION'S "SOUTHEASTERN ARIZONA GRASSLANDS PRONGHORN INITIATIVE" 2010-2019

Glen Dickens-CWB, Arizona Antelope Foundation

Other Authors: John Millican, Arizona Antelope Foundation, Rana Murphy, Arizona Game & Fish Department

Abstract: A "Southeast Arizona Collaborative Grassland Workgroup" was created in February 2010 by the Tucson office of the Arizona Game and Fish Department and collaboratively drafted a southeastern Arizona Regional Pronghorn Strategy to increase pronghorn population numbers, distribution and connectiveness. Partners in this working group included: AAF, AGFD, BLM, USFS, ASLD, USDA, USFWS, NRCS, TNC, Altar Valley Conservation Alliance, Pima County, Arizona Wildlife Federation, AZ Land Trust, Audubon Society, Tombstone High school, Range Riders, Southern Arizona Conservation Corps and local ranchers/landowners. Long-term

goals for this 9-year grant period 2011-19 were to; 1) establish a region-wide dynamic geodatabase with integrated multi-species layers to prioritize grasslands restoration/maintenance activities for pronghorn and other sensitive grassland species, 2) permanently record pronghorn travel corridors and remove or modify barriers, including fences, shrubs and trees, 3) target/plan grassland treatments/burns in priority habitat locations on an annual and long-term basis to benefit the highest number of keystone grassland species, 4) supplement at least one pronghorn population and increase numbers in two subpopulations and 5) improve grassland habitat in five pronghorn subpopulation zones.

In 2011, 2013 and 2014 the Arizona Antelope Foundation (AAF) was awarded 3 different grants through the National Fish and Wildlife Foundation's (NFWF) Sky Islands Initiative totaling $510,000 to support the Arizona Game and Fish Department (AGFD) and AAF's 10-year *Southeastern Arizona Grasslands Pronghorn Initiative* initiated in April 2010. These funds were matched in-kind by 1) $245K - Rancher/landowner labor, equipment, and materials. 2) $337K - AAF labor, travel, food, equipment, and materials. 3) $569K - Habitat Partnership Funds and other project cash match and 4) $80K - Pima County Open Space Conservation land-acquisition funds for a total of $1.231M In-kind match. Final combined project financial total was $1.741M. AAF and partners accomplished the following results between 2012 and 2019: Pronghorn connectivity was improved on 191,800 acres in 6 herd zones through 27 fence projects, modifying 105 miles of fencing. The majority of that work was accomplished by 769 volunteers who drove 185,517 miles and donated 13,270 hours of labor. University and high school students, as well as Boy Scouts participated in 14 of the 27 fence modification projects. Eleven grasslands projects completed in 4 herd zones restored 7,874 acres of grasslands through burning, mesquite grubbing, and spot treatments with herbicides. Thirteen water projects were completed to provide year-around water distribution and security in 4 herd zones. Ninety-five (95) pronghorn were transplanted to supplement 6 subpopulations. The pronghorn population was increased in those subpopulations by a minimum of 548 animals as of August 2019, meeting the minimum viable population objective of 125 animals in 3 of the 6 subpopulations. A long-term GIS data base, including 658 total layers for each of the 6 herd zones, was established to monitor the pronghorn and habitat changes. Long-term landowner/rancher relations were improved on 21 separate properties. The projects efforts continue today with operating funds provided by the AAF and miscellaneous available AGFD habitat partnership, grant and federal funds.

BLACK-FOOTED FERRET RECOVERY ON PRIVATE LANDS, FUNDING FOR A MODEL IN CROSSING BOUNDARIES

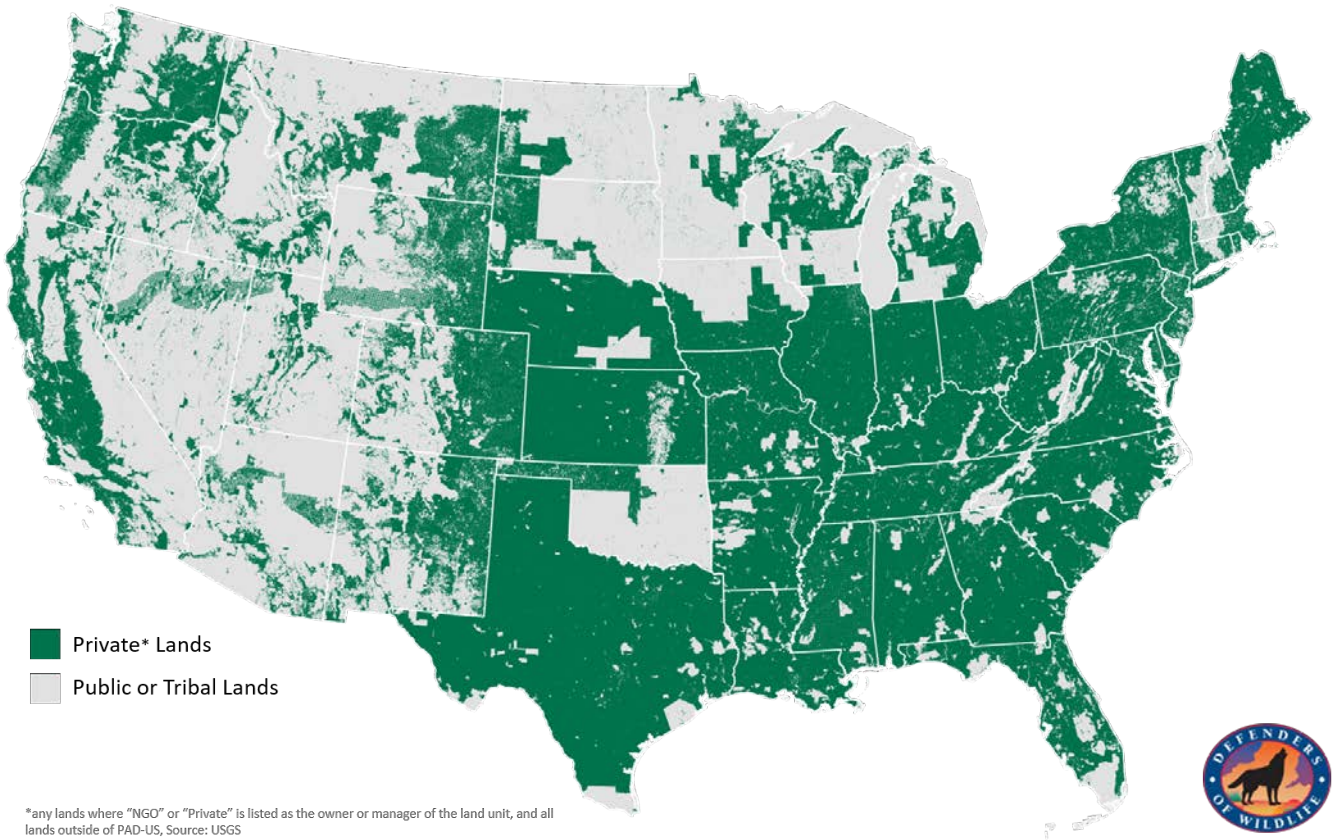
Mary Pfaffko, Senior Policy Analyst, Private Lands, Defenders of Wildlife

Other Authors: Patty Knupp, Wildlife Biologist, USDA, NRCS, Chamois Andersen, Senior Representative, Defenders of Wildlife

The black-footed ferret is one of North America's most endangered mammals. From only 18 survivors in 1987, a captive breeding program has produced thousands of ferrets released among reintroduction sites across the species' historic range. Most sites have proven unable to restore and maintain a population large enough to downlist or delist the species. The main reasons are inadequate prairie dog

habitat (as a prey item and their burrows inhabited by ferrets) and sylvatic plague that can wipe out entire colonies. Today, however, private landowners are protecting vital prairie dog habitat for ferrets. This is being accomplished through voluntary incentive programs, such as the Farm Bill's Environmental Quality Incentives Program (EQIP), coupled with coexistence tools and measures designed to conserve prairie dogs on key private land recovery sites.

Private lands managed for agriculture account for 40 percent of the US land base. These lands are of major consequence for native plains wildlife, especially since 70 percent of federally endangered or threatened species spend at least part of their life cycle on private land, along with about 10 percent of those species occurring only on private land. The Farm Bill and programs such as EQIP are key to incentivizing private landowners to manage their lands for wildlife conservation values. For the endangered black-footed ferret (BFF), this involves conserving prairie dogs and the unique habitat they create with their burrowing activities. Incentivizing landowners to not lethally control prairie dogs but rather protect prairie dog acres help working ranches while also paying dividends to wildlife.



*any lands where "NGO" or "Private" is listed as the owner or manager of the land unit, and all lands outside of PAD-US, Source: USGS

The EQIP voluntary incentive program receives annual funding through the Farm Bill, which is authorized every five years by the US Congress. The funds are distributed through state Natural Resource Conservation Service (NRCS) offices. For ferret recovery, this involves the NRCS entering into agreements with landowners for dedicating a percentage of their land to prairie dog conservation and toward BFF recovery. Over the years, these private land funds have been vitally important to plains wildlife and for prairie dog conservation, a keystone species vital to healthy grasslands.

Landowners in Colorado have benefitted from these EQIP funds. The state NRCS has distributed the funds for up to five years with the goal to keep working lands under agricultural management. These funds account for the loss of livestock forage consumed by prairie dogs. The landowner agrees not to conduct lethal control of prairie dogs, enrolls in the US Fish and Wildlife Services Safe Harbor agreement, and provides quarterly reporting to NRCS. In Colorado, after the EQIP contract expires, Colorado Parks and Wildlife has initiated and funded its own state program to continue to incentivize the same landowners. This program also requires the agency to be able to conduct sylvatic plague mitigation efforts—to protect prairie dogs and ferrets against the disease—as well as for the agency to conduct ferret monitoring on the private land recovery sites.

These programs demonstrate that agricultural production and wildlife conservation can be compatible. Other states like Colorado can also be proactive and dedicate funds for a long-term program, and in follow-up to the EQIP 5-year program. In addition, and in complement to these voluntary incentive programs, nongovernment organizations can also help with coexistence and nonlethal prairie dog management approaches.

Defenders of Wildlife works directly with ranchers to conserve prairie dogs on key BFF recovery sites. Rather than shooting or poisoning prairie dogs that may venture near adjacent neighbors, coexistence tools such as vegetation barriers, consider the prairie dogs' natural behaviors to keep them within the property line. With this nonlethal coexistence strategy, tall, ungrazed vegetation discourages prairie dogs from dispersing onto neighboring ranch properties to prevent future conflict. This technique—a vegetation or visual barriers keeps prairie dogs within the core private lands BFF recovery site.

Incentive programs and nonlethal tools such as vegetation barriers are available to landowners for working ranches but funding at the national level is of paramount importance. Congressional reauthorizing of the Farm Bill ensures full funding for EQIP and other wildlife programs, which are making a difference for conserving native plains wildlife.

Larry Haverfield of Butte Creek Ranch, Logan County, Kansas, a key private lands black-footed ferret recovery site.
(Credit: Defenders of Wildlife)

4. GRASSLAND BIRDS

INFORMING CLIMATE-SMART GRASSLAND MANAGEMENT BY MAPPING GRASSLAND BIRD COMMUNITY DISTRIBUTION UNDER A CHANGING CLIMATE

Nicholas J. Van Lanen, U.S., Geological Survey, Fort Collins Science Center

Other Authors: Adrian P. Monroe, U.S. Geological Survey, Fort Collins Science Center David J. Augustine, USDA Agricultural Research Service Courtney J. Duchardt, Oklahoma State University Cameron L. Aldridge, U.S. Geological Survey, Fort Collins Science Center

Background: Populations of grassland songbirds declined precipitously over the last half-century and there is a pressing need to identify priority areas for their conservation in the context of a changing climate. However, current projections have not considered bird responses to future scenarios of vegetation productivity while estimating relevant spatial scales of effect.

Approach: We are using an extensive breeding season bird monitoring dataset, a hierarchical community model, and datasets characterizing aboveground net primary production and land-use change to model grassland bird communities across the western Great Plains. We will then use the model to project distributions of species and communities, given future vegetation production under different climate scenarios.

Geographic and Temporal Scope: The study will encompass a latitudinal gradient spanning the western Great Plains, including Prairie Potholes (11), Badlands and Prairies (17), and Shortgrass Prairie (18) Bird Conservation Regions (BCR) (Figure 1, pg. 34). We will predict future avian density distributions using mid-century (2040 – 2069) and late-century (2070 – 2099) climate

Collaborations and Engagement for Actionable Science: Projected future bird density distributions will provide needed regional context for climate

Deliverables: We will develop maps of current and projected distributions of grassland birds across the study region (Figure 1) under different climate, land use, and management scenarios, a web-based application to access and interpret these maps and learning modules to train end-users in the use of the web-based application.

Averi Reynolds, University of Wyoming

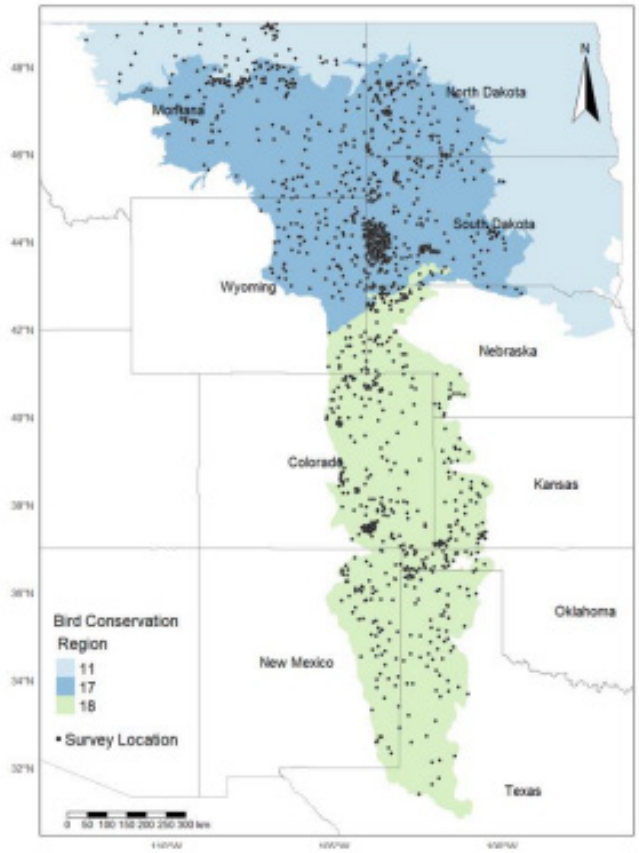


Figure 1. Survey locations (dots) from the Integrated Monitoring in Bird Conservation Regions (IMBCR) Program located within the United States portions of Bird Conservation Regions 11, 17, and 18. Avian detections from the displayed survey locations will be used to develop a model predicting grassland songbird density distributions throughout the shaded region. smart planning by partners, including for USDA-Agricultural Research Service, the Collaborative Adaptive Rangeland Management (CARM) project, the Stewardship Program of the Bird Conservancy of the Rockies, and the Conservation Ranching Initiative implemented by Audubon Rockies. Throughout the project's development, we will also engage with land managers and decision makers at federal, state, non-government, and tribal levels to increase the relevance of our models and deliverables for land managers and other decision-makers, beginning in the fall of 2023. Please contact the authors if you are interested in participating in this coproduction endeavor.

COLLABORATION TO PROMOTE DROUGHT RESILIENCY, ECONOMIC VIABILITY, AND GRASSLAND BIRD BIODIVERSITY

David C. Pavlacky Jr., Bird Conservancy of the Rockies

Other Authors: Rachel Belouin, Chris Latimer and Jennifer Timmer, Bird Conservancy of the Rockies; Lauren Connell, U.S. Fish and Wildlife Service; Kevin Miller, Croissant Red Angus, Weld County, CO; Daniel Mooney, Colorado State University; Steve Smutko, University of Wyoming; Jim Sturrock, livestock producer, Weld County, CO.

The stewardship of working rangelands occurs within complex social-ecological systems (Allen et al. 2017). For this reason, working rangelands face several challenges including sustainability of traditional rural livelihoods, maintaining biotic integrity of rangelands and conserving populations of declining grassland birds. Climate change, unexpected weather patterns, and economic market events make cattle production in the shortgrass prairie a challenging and risky livelihood (Morgan et al. 2008). Therefore, private livestock producers must make grazing management decisions under constant environmental variability and uncertainty. Resource concerns involving reduced forage production during drought conditions may increase the likelihood of rangeland degradation, which has implications for ecosystem services in the public trust, including habitat management for wildlife species of conservation concern.

Habitat loss and fragmentation are widely considered the greatest threats to declining populations of grassland birds (Rosenberg et al. 2019), but ongoing

habitat degradation in remaining grasslands continue to accelerate population declines (Brennan and Kuvlesky 2005). Many grassland species evolved with historical grazing disturbance from American bison (*Bison bison*) and black-tailed prairie dogs (*Cynomys ludovicianus*). The collective action of grazing herbivores, fire and weather patterns produced a mosaic of vegetation structure and composition that maintained grassland bird biodiversity (Brennan and Kuvlesky 2005). Habitat homogenization or "managing to the middle" from a century of domestic livestock grazing is a management strategy that we now recognize is significantly contributing to habitat degradation for several species of grassland birds (Derner et al. 2009). The combination of high stocking-rates to improve habitat suitability for disturbance-dependent species and pasture deferral to maintain tall-dense habitat for disturbance-sensitive species is likely to restore avian diversity.

Considering drought may become more common and severe under future climate scenarios, private livestock producers, Natural Resource Conservation Service (NRCS) staff, and private land wildlife biologists may benefit from decision support for drought management to achieve economic, rangeland health, and biodiversity objectives in a way that is opportunistic, flexible and adaptive (Morgan et al. 2008). We developed a collaborative decision-making model with a case study for a livestock operation in Weld County, CO (Wilmer and Sturrock 2020).

Our collaborative group process centered-on a decision-maker working group composed of 6 livestock producers from eastern Colorado, 2 NRCS rangeland ecologists and 3 private lands biologists employed by Bird Conservancy of the Rockies. Beginning in February 2020, we engaged the decision-maker working group in several virtual and in-person workshops to develop the problem statement, objectives, alternatives, consequences and tradeoffs that define the Structured Decision Making (SDM) process (Conroy and Peterson 2013, Allen et al. 2017). Together the group developed the following short problem statement:

"Private livestock producers depend on forage production in native rangelands and are vulnerable to financial and ecological effects of drought. Efforts to reverse population declines of grassland birds are among the highest conservation priorities in North America. Our goal is to determine which drought management practices improve economic viability, rangeland health and bird biodiversity in shortgrass prairie of Colorado over the next 10 years."

We identified 3 objectives for 1) economic viability, 2) grassland bird biodiversity and 3) rangeland health, reflecting decision-maker values and resource concerns involving drought management.

In the next series of meetings, the decision-maker group identified several alternate drought management strategies to achieve the objectives. Drought preparation strategies to reserve forage supply for a future drought included 1) conservative stocking, 2) resting pastures, 3) grass-banking and 4) incorporating yearlings (Kachergis et al. 2014). We included rotational grazing and rest-rotation grazing as strategies for resting pastures. There was discussion to consider NRCS, Environmental Quality Incentives Program (EQIP) as a cost-effective drought preparation strategy for resting pastures. In addition, we evaluated drought response alternatives to reduce forage demand in a current drought year, including 1) reducing herd size, 2) selling retained yearlings and 3) weaning calves early (Kachergis et al. 2014).

We measured economic viability according to annualized grazing income in dollars per pasture for

a 5-month growing season (D. F. Mooney, Colorado State University, unpublished report). The economic analysis included stochastic weather and productivity simulations for variation in forage supply and demand, 3 stocking rates, and constructed enterprise budgets using data from the Total Ranch Analysis for Colorado (Rhoades and Mooney 2023). We created a forage production model based on Ecological Site Descriptions and normal year productivity from Soil Survey Geographic Database. We measured grassland bird biodiversity by estimating species diversity for 61 species that use grassland habitat as all or part of their life history using data from the Integrated Monitoring in Bird Conservation Regions program (Pavlacky et al. 2017). A community abundance model predicted grassland bird diversity according to annual variation in productivity, and disturbance-driven and inherent heterogeneity (Fig. 1, Fuhlendorf et al. 2017). We plan to develop the rangeland health objective in a future iteration.

The case study involved a 4,551-ac cow-calf operation in Weld County, northeastern Colorado (Wilmer and Sturrock 2020), and we evaluated a scenario in a drought year with 70% of normal year productivity (1,475 lbs ac-1). A decision analysis determined consequences of drought management alternatives on economic viability and avian biodiversity objectives using an influence diagram version of a Bayesian belief network (Fig. 2, Conroy and Peterson 2013). We discovered a tradeoff between drought preparation strategies for financial viability and grassland bird diversity. Profitability was greater for rotational grazing with all pastures utilized during the growing season than rest-rotation grazing with one pasture rested for the growing season. In contrast, species diversity was lower for rotational grazing than rest-rotation grazing with increased disturbance-driven heterogeneity. In terms of drought preparation to reserve forage supply, cow-calf operations enrolled in EQIP rest-rotation grazing with moderate stocking-rates provided optimal outcomes for the economic and biodiversity objectives, with EQIP cost-share incentives for fencing, water and pasture deferral. Incorporating yearlings and conservative stocking reduced overall outcomes, but held more forage in reserve. In terms of drought response to reduce forage demand, reducing herd size best satisfied objectives at high stocking rates, but weaning calves early was the optimal strategy at moderate stocking rates.

Grazing management in private livestock operations occurs within complex social-ecological systems

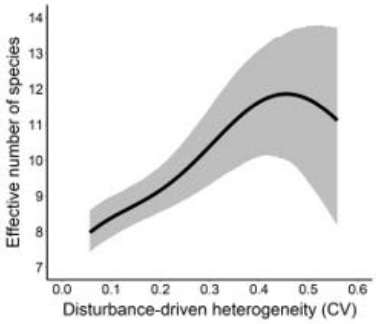


Figure 1. The effect of disturbance-driven heterogeneity on grassland bird diversity in eastern CO, 2010 – 2020, measured by the Coefficient of Variation (CV) in productivity.

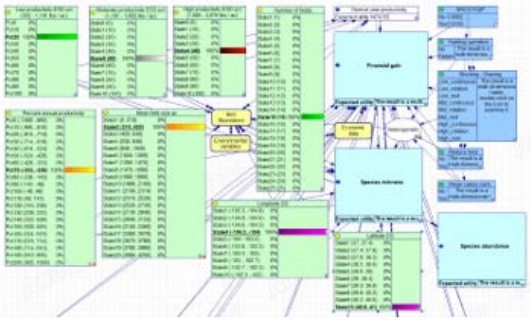


Figure 2. Influence diagram version of the Bayesian belief network. The green boxes illustrate ranch-level inputs (EQIP cost-share input not shown).

with multiple objectives and stakeholders, short- and long-term effects, and multiple sources of social and ecological uncertainty (Allen et al. 2017). We developed a SDM framework as a basis for collaborative learning and collective action among decision-makers and diverse stakeholders to produce actionable knowledge, increase adaptive capacity and maintain resilience of rangeland-systems (Derner and Augustine 2016). We suggest co-production between private producers, resource professionals and scientists, and integrating producer values and decision-making into conservation efforts provides the way forward to maximize food production, human well-being and grassland bird biodiversity in the Great Plains.

The prototype SDM model developed in this project is able to serve as a foundation for the Adaptive Management (Allen et al. 2017) of drought-resilient rangelands with important extensions to climate adaptation for economics, rangeland health and avian biodiversity in the Great Plains. Future directions include collaboration with producers and rangeland ecologists to develop 1) a rangeland health objective, 2) a dynamic model to evaluate the cost-benefit of drought management and forage security in consecutive years, and 3) spatial explicit mapping of economic viability, ecosystem services and avian diversity in response to weather patterns.

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THE EVOLUTION OF GRASSLAND BIRD AND HABITAT DATA WORKFLOWS

Ethan Duke, Cofounder/Codirector, Missouri River Bird Observatory

Presentation Synopsis: We all now keenly aware of the plight of grassland-obligate species (3billionbirds.org). The avian indicators are among several in our natural communities that show that grassland habitats are in decline. We need to harness every tool in our kit to overcome this. Time is getting short. We cannot afford the disconnects between research, monitoring, and management activities. We can use the recent, rapid advances in technology to help us collect quality data, perform insightful analysis, and deliver timely content at scale to meet stakeholders needs. This presentation covered data workflows for birds using mobile data collection and habitat using drones.

At the Missouri River Bird Observatory (MRBO), we collect bird data on a modest tens of thousands of acres with a small crew, analyze it near real-time, and provide results in interactive dashboards. In 2023, we covered a quarter million meters of line transects on 82 sites and detected 30,000 birds. Data analysis provided density estimates and bird-friendliness scores on the day surveys were completed.

Bird species densities and conservation concern values are combined with diversity measures to achieve a bird-friendliness metric. Birds provide one good indicator of community health. We should be able to provide more solid metrics for other taxa to emphasis the value lands under good stewardship.

An example of these results can be found in this dashboard at: **https://mrbo.maps.arcgis.com/apps/dashboards/a56cb83fb42f4d5abb9111b335048868** The dashboard is best viewed at the site level. Mapped data of spatially explicit bird detections can be filtered by year and species using the charts.

Data collection was accomplished using Field Maps for ArcGIS. Analysis workflows used automation in model builder in desktop ArcGIS Pro for data prep and R-studio for analysis. R-bridge was used to pull data in from ArcGIS Online. Data in a singular database hosting all of MRBO's data is used to served in filtered views and served to a variety of stakeholders.

In 2023, MRBO began collecting habitat data via drone with a multi-spectral payload. Imagery obtained provides high-resolution maps for land stewards, including RGB and multi-spectral orthomosaics as well as 3D point clouds and meshes.

Further, planned applications of those data include invasive plant species tracking, habitat use analysis (using spatially explicit bird data), and more accurate tracking of habitat management. Currently, MRBO is developing workflows for classification of fine-scale habitat features.

In general, the methods presented could be applied across the ecological spectrum to quantify other taxa that are indicators of grassland health and the ecological services grasslands provide. Land stewards can now have more precise, timely, mapped data for adaptive management in a rapidly changing climate.

5. GRAZING MANAGEMENT AND DECISION-MAKING

MANAGING RANGELANDS FOR CARBON DIOXIDE CAPTURE

Lewis Heaton, Heaton Ranch and Rebecca Phillips, Ecological Insights Corporation

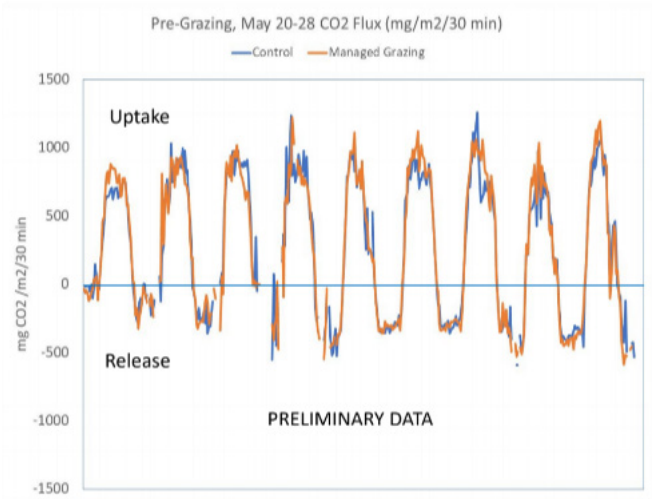
Other Authors: Jesse Beckers, North Dakota Natural Resources Trust

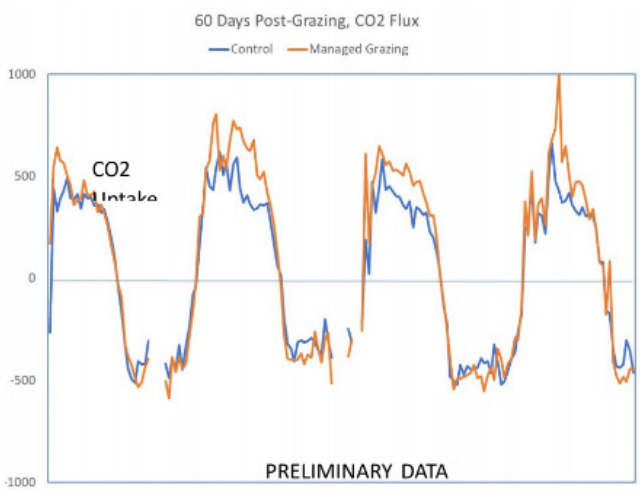
Rarely do scientists, ranchers, conservationists, and energy production companies partner for the purpose of advancing understanding how northern prairie rangeland ecosystems function to drawdown carbon dioxide from the atmosphere. Grasslands worldwide are more effective at capturing excess carbon dioxide and storing carbon belowground than forests (Terrer et al. 2021). Natural carbon capture by grazed grasslands over millennium led to healthy soils high in organic matter. Now that excess atmospheric carbon dioxide needs to be removed and transferred below ground, several organizations are asking how this natural process could be enhanced to benefit the ecosystem and land values for ranchers.

Each partner in this project is motivated differently, but we all want to know a) if rangelands can be managed to enhance carbon dioxide capture and b) the number of metric tonnes per year that are sequestered in rangelands. Ranchers like Lewis assert that managed grazing results in more productive rangeland, with higher organic matter and greater soil water holding capacity. Data supporting these assertions on working lands, however, are lacking. The goal of this project is to determine how managed grazing affects net ecosystem production and the annual amount of carbon sequestered over a large area (> 100 acres) on a working ranch using 150 cow-calf pairs. Research on working lands is challenging but may be essential for applying results to the real world of ranching. Lewis Heaton hopes that results will add value to rangelands through annual carbon sequestration payments at little or no risk to the rancher.

Currently, federal incentives, known as 45Q, favor carbon dioxide capture at the stacks of industrial facilities, most notably ethanol production plants. Prices for these "carbon credits" are sold in units of metric tonnes of carbon dioxide. Prices vary but tend to range from 40 to 180 dollars, depending on how the carbon dioxide is used and stored. Emissions of carbon dioxide from automobiles or stacks are easily quantified and so qualify for 45Q status and pricing. Natural carbon dioxide captured in rangelands, however, is more difficult to quantify. There is a great deal of uncertainty as carbon dioxide is drawn out of the air and converted to different forms of carbon within the ecosystem. Consequently, these natural systems fall into the voluntary market, where pricing is approximately 15 dollars per metric ton of carbon. Note: a metric ton of carbon dioxide is only 0.27 metric tonnes of carbon. A grassland that sequesters 0.5 metric tonnes of carbon per acre per year is sequesters 1.8 metric tonnes of carbon dioxide per acre per year.

Our project applies known technologies and methods for carbon dioxide measurement for two 50-acre pastures on Lewis Heaton's ranch. One pasture is an ungrazed control. The other pasture is used for managed grazing and is comprised of four 11-acre paddocks. One paddock is grazed in spring, one in early summer, one in late summer, and one in autumn. A herd of 150 cow-calf pair grazes for two days and then is moved off the experiment to another pasture. We target 50% leaf area removal during each grazing event. The grazed paddock is then allowed to recover for the remainder of the season. The following year, season-of-use changes, so the same pasture grazed in spring the first year is grazed in early summer the second year. In addition to continuous collection of atmospheric exchange of carbon dioxide and weather data, we measure leaf area, species composition, mass of forage removed by grazers, plant digestibility, and soil carbon. Data collection began May 1, 2023. We will need a full year of data to construct the annual net ecosystem carbon balance for each pasture. The carbon balance consists of net ecosystem production, the amount of production removed by grazers, and the amount of manure deposited by grazers. We present some preliminary results to show how net ecosystem exchange of carbon dioxide varies over time and with management. Our presentation at the conference can be viewed here: **https://www.ecologicalinsights.org/education**.





Carbon dioxide uptake and release for control and managed grazing pastures are shown below. Data shown below were collected prior to the first grazing event. During the day, values are above zero. At night, values fall below zero.

After the spring grazing in the southeast paddock on May 30, leaf area was reduced between 40 and 50%. Not long after grazing, carbon dioxide data collected upwind of the southeast paddock indicated a reduction in uptake, as compared to the control. However, carbon dioxide data collected upwind of the southeast paddock two months after grazing indicated an increase in uptake, as shown in the figure below. These preliminary results show that grazing followed by recovery may result in greater atmospheric carbon dioxide uptake weeks after grazing.

A full accounting of carbon sequestration under managed grazing will not be available until later in 2024. If you are interested in this project and would like to learn more, please contact the authors of this paper. We hope to be setting up an online portal with project updates in 2025. Special thanks to our funding partners, including the North Dakota Industrial Commission, North Dakota Game and Fish, Hess Oil Company, National Fish and Wildlife Foundation, North Dakota Grazing Lands Coalition, Northern Great Plains Joint Venture, The Nature Conservancy, and Ducks Unlimited.

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GRAZING MANAGEMENT AS A CRUCIAL TOOL FOR GRASSLAND BIRD CONSERVATION

Steven P. Riley, CWB, American Bird Conservancy

Other Authors: Dr. Terry Z. Riley, CWB, North American Grouse Partnership

Abstract

Grassland ecosystems in North America face a crisis with a significant decline in bird populations, particularly grassland birds, reaching a tipping point that puts at least 70 species at risk (Rosenberg et al. 2019). Historically, these ecosystems often evolved in symbiosis with large herbivores and wildfires (Anderson 2006). However, grazing management practices, especially systems that fail to include adequate periods of rest or those that overstock grazers, have led to ecological imbalances, impacting biodiversity and soil health. We explore the importance of managed grazing systems that include adequate land health recovery periods and highlight the role of incentives and policy frameworks, such as the Farm Bill, in promoting sustainable land management practices. Furthermore, we discuss the Rest-Recover-Recapture concept and its implications for the conservation of species like the Lesser Prairie-chicken.

Grasslands and their soils evolved under the influence of temperate climates, large herbivores like bison and elk, and frequent wildfires. These factors contributed to the development of diverse grassland ecosystems, crucial for supporting a wide array of species, including grassland birds. Livestock grazing practices that are incompatible with healthy

grasslands, particularly season-long grazing, often lead to overutilization of forage, reducing biodiversity and soil health. This unsustainable approach threatens the survival of grassland bird populations and the ecological integrity of these landscapes. Adopting managed grazing systems, such as rest-rotational grazing, can restore ecological balance by mimicking natural grazing patterns (Cutting et al. 2024). Rest periods enable native vegetation to recover, promoting biodiversity and soil health while supporting ground-nesting bird recruitment.

Policy frameworks like the Farm Bill play a crucial role in incentivizing landowners to adopt sustainable land management practices. By providing financial assistance and technical support, these policies might encourage the adoption of grazing prescriptions that benefit both ranchers and wildlife. We offer the Rest-Recover-Recapture concept that will incentivizes landowners to implement rest periods, allowing forage and ecosystems to recover. This type of incentivized system could greatly improve wildlife habitat and pay producers a fair market value for the ecosystem services they provide. By establishing long-term conservation goals and monitoring protocols, this approach ensures sustainable management practices over time. We hope to see this type of an offering included in the Farm Bill in the future.

Implementing the Rest-Recover-Recapture concept at scale will require either the establishment of a new program or including new offerings to existing programs. Either would likely be a part of the Conservation Title of the Farm Bill. The new or expanded program would allow ranchers to incorporate rest periods in their grazing systems to promote plant recovery. Regular recovery periods increase and improves plant species diversity, heterogeneity, soil health, air quality, stability, resilience and sustainability, stores carbon (recapture), and increases forage production (learn more at: **https://abcbirds.org/birdsaver**).

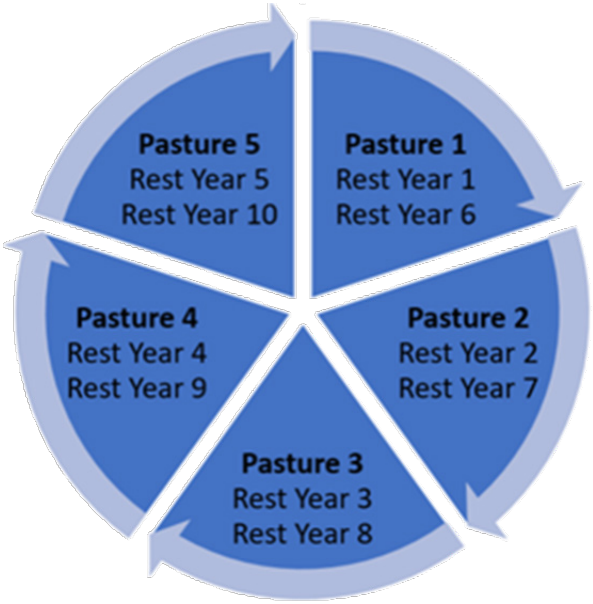

Figure 1. Simplified model of a grazing plan that incorporates cyclic recovery.

Species like the Lesser Prairie-chicken (*Tympanuchus pallidicinctus*), primarily occurring on private land, face threats from habitat loss, degradation, and fragmentation. Collaborative initiatives, such as the Lesser Prairie Chicken Initiative, the Lesser Prairie-chicken Landowner Alliance, and Prairie Grouse Partners, aim to provide non-regulatory pathways to conservation, enabling both species and ecosystems to recover. Grazing management emerges as a key strategy for grassland bird conservation, offering a pathway to restore ecological balance and safeguard biodiversity while helping private ranchers thrive and maintain their land in grass. Through collaborative efforts, policy support, and incentives, we can ensure the sustainability of grassland ecosystems for future generations.

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6. WORKING LANDS AND GRASSLAND CONSERVATION

SUSTAINABLE LIVESTOCK IN JANOS BIOSPHERE RESERVE

Celene Ahime Moncayo Perez, Natural Protected Areas National Commission (CONANP)

Other Authors: Jesse Beckers, North Dakota Natural Resources Trust

The Janos Biosphere Reserve was established by presidential decree on December 8, 2009. Grasslands were once the most widely distributed biome in the world, yet they are now one of the most threatened and least protected. Mexico is no exception to this trend. Despite grasslands covering around seven percent of the national territory and being present in portions of several Protected Areas, none had been specifically established with the primary objective of protecting this ecosystem.

The Janos Biosphere Reserve is in the northwestern part of the state of Chihuahua, south of the border with the United States and east of the state of Sonora. Covering an area of more than 1.3 million acres. Besides, the geographic location of the Janos Biosphere Reserve grasslands represents an important natural corridor within the system of protected areas of Canada and the United States. The protection and restoration of native grasslands are two of the main objectives of the conservation activities in the Janos Biosphere Reserve.

Native grasslands represent 42.4 percent of the Reserve's area. This contributes to making livestock the most significant economic activity. Scrublands are 12.12 percent of the Reserve's surface. The oak forest has 23.7 percent of the Reserve and is in the foothills of the Sierra Madre Occidental, in the northwest part. The coniferous forest represents 13.51 percent of the Reserve's area and is situated in the mountainous region of the Reserve, featuring species such as Pinus

ponderosa, Pinus engelmannii, and Pseudotsuga menziesii. We find riparian vegetation in 1.71 percent of the Reserve's area which is located along rivers, streams, and perennial ponds. Although crops occupy only 3.28 percent of the area, they represent a significant threat due to land use change that converts native pastures into agricultural fields.

Representative Species

The Reserve has a highly diverse fauna, which includes eight species of large mammals, some listed as endangered, such as the black bear, jaguar, bison, pronghorn, and gray wolf. Others are priorities for the Reserve, such as mule deer, white-tailed deer, collared peccary, and puma, among others, which represent one of the sites with the highest number of large mammal species in Mexico. Some species such as the prairie dog and the bison have the southern limit of their distribution in this area and others such as the thick-billed parrot have the northern limit of their distribution here.

In October 2009, a herd of 23 American bison (Bison bison) was released from Wind Cave National Park in South Dakota and was donated as part of a binational collaboration to conserve the grassland habitat of North America. By 2023, there is a population of 326 adults and 68 newborns this year. The Reserve maintains a great wealth of bird species. Only in the valley and the lower part of the foothills of the Sierra, 206 species of birds have been recorded. Also, is an important wintering site for grassland birds because it is in these sites that they find their source of food for this season.

Threat

Use of grasslands: The management of this resource is often inefficient in most cases, as it surpasses the carrying capacity of the grasslands, leading to a gradual deterioration of the vegetation's health and consequently a decrease in the productive potential of the grassland. For this reason, productivity is decreasing year by year, resulting in the loss of vegetation cover in certain areas and subsequent water erosion.

Today it is recognized that poor practices and intensive overgrazing of grasslands have had a negative impact on native wildlife.

This has motivated a project to promote regional production and marketing of organic meat, which supports both the recovery of native grasslands and the sustainability of livelihoods for a group of local producers through agrochemicals-free production. The initial phase was the establishment of a local organization of producers who have made preliminary progress in training for certification, understanding the process requirements, and market implications in the organic sector.

The support consisted of training courses for producers for the implementation of good livestock practices, development of livestock management programs, and the production of bio-inputs, and through the subsidies program of CONANP, they were able to buy basic equipment.

Through the certification of organic meat production, sustainable livestock practices are promoted, such as stocking capacity adjustment, grazing systems, pregnancy diagnosis, fertility testing in bulls, and implementation of zoo sanitary and nutritional programs.

The main social aim is to promote organizational governance for decision-making through a win-win approach between producers and the stakeholders

involved (governmental and non-governmental organizations).

We should remember that this project is long-term and is in the initial phase of its development process.

With this Results:

- 33 ranchers producing beef under organic standards and sensitized on issues of coexistence with wildlife.
- 74,000 acres are managed under organic production and wildlife refuge schemes.
- Increase in the profitability of the ranches.

The goal is to make livestock production in the Janos Biological Reserve profitable and not cause negative impacts on ecosystems while coexisting with wildlife.

7. GRASSLAND CONSERVATION PARTNERSHIPS

LAND TRUSTS AS PARTNERS IN CONSERVATION

Zach Hurst, Andrew Mackintosh, and Mike Carter, Playa Lakes Joint Venture

Other Authors: Andrew Mackintosh, Playa Lakes Joint Venture; Mike Carter Playa Lakes Joint Venture

Playa Lakes Joint Venture (PLJV) is a partnership-based conservation organization. Its mission is to conserve the playas, prairies and landscapes of the western Great Plains through partnerships for the benefit of birds, other wildlife, and people. Accordingly, the PLJV is structured around finding partner-based solutions to conservation challenges, which is largely accomplished in collaboration with the over 20 organizations that are represented on the Management Board and Science Advisory Team that together form the PLJV partnership. As an organization PLJV, and joint ventures more generally, operate within a strategic habitat conservation planning framework. This framework integrates biological planning, conservation design and delivery to help understand what needs to happen and where along with plans on how to implement these actions.

This conservation planning framework was used by PLJV to outline the social and ecological threats in the southern Great Plains. As has been well documented, this landscape is highly modified which is adversely impacting grassland species. Of particular interest for PLJV is the significant decline in grassland birds. Grassland birds in the Southern Great Plains are imperiled from land conversion for agricultural production and encroachment of woody plants. Annually approximately 500,000 acres of grass are converted to row crops and approximately 1.1. million acres are invaded by woody plants in the PLJV region. These threats are occurring in concert, and they are occurring along with changes in land ownership motivations which can have an impact on

the likelihood of engaging in conservation and land management behaviors as people shift away from production-based motivations. Such demographic shifts can ultimately result in a loss of grasslands. To curb continued grassland bird declines, grasslands need to be protected from conversion and managed to reduce woody plant invasions.

This conservation situation of Southern Great Plains grasslands was discussed among the PLJV partnership to help develop a plan for maintaining and restoring grassland habitats. These discussions resulted in the identification of overarching strategies to guide conservation efforts in the region, with a focus on on-the-ground delivery of habitat. The resultant framework for action identified four general, non-exclusive conservation priorities: 1) land protection, 2) invasive shrub management, 3) CRP lifecycle, 4) Partnership Development. Each of these priorities was discussed further to identify goals and strategies related to their implementation.

During this planning, it was highlighted that the threats and landscape-scale changes that are occurring in the Southern Great Plains are occurring in a region with some of the lowest rates of public land ownership in the United States. The PLJV found that public lands accounted for only 1.2% of lands in its region, making it necessary to consider private lands in any conservation plan. In order to maintain grasslands, management is needed. Historically grasslands were maintained by a combination of drought, grazing and periodic fires. In the absence of such disturbances grasslands can shift to woodlands, and so active management is needed. More specifically, keeping lands in wildlife-friendly agricultural production represents a pragmatic approach to management. Working lands create an economic incentive for maximizing forage production, and so active management is more likely in these areas. However, not all production is wildlife-friendly, and well-managed cattle ranching can result in benefits for wildlife to a greater extent than with other production systems such as dryland farming.

As a result of these discussions, PLJV set a goal to reach 5% protection, or a total of 2.2 million acres, in the next 15 years. Given the capacity of PLJV and its programs, it was decided to reorient an ongoing grant program towards land protection. For over 30 years, in association with ConocoPhillips the PLJV maintained a small grant program, which provided a basis for reorientation. This program was responsible for identifying organizations that were in need of resources that could be used to help alleviate bottlenecks and constraints to their ability to deliver habitat conservation. It successfully disbursed funds to increase on the ground conservation or restoration of over 100,000 acres of wildlife habitat. Based on guidance from the PLJV partnership, this program was reoriented to provide grants to land trusts in 2019.

The PLJV ConocoPhillips Land Trust Program is designed to help the PLJV partnership reach its 5% land protection goal that is a part of its grassland conservation priorities. This program, leveraged the pre-existing relationships to develop a collaborative centered on land protection. Currently, four land trusts operating in five states are active grantees under this program: Colorado Cattlemen's Agricultural Land Trust, New Mexico Land Conservancy, Ranchland Trust of Kansas, and Texas Agricultural Land Trust. This is an active partnership that collaborates on best practices and strategies for overcoming environmental and political challenges to their work. These land trusts have protected more than 62,000 acres as part of their grant activities, with 147,000 more acres expected in 2024. The success of this partnership for achieving land protection led to additional discussions with the Texas Parks and

Wildlife Department (TPWD) and grantees about a broader, more cohesive collaboration.

In 2022, PLJV hosted an inaugural roundtable discussion where the land trusts in the PLJV ConocoPhillips Land Trust Program brainstormed different ways of collaborating across their respective boundaries. These discussions among the four existing grantees, PLJV, TPWD and Nebraska Land Trust as a new, fifth partner led to the development of a project for protecting an additional 254,000 acres of habitat. This $4 million project was funded by National Fish and Wildlife Foundation under its America the Beautiful grant program. Titled "The Southern High Plains Grassland Protection, Restoration and Enhancement Project" this project will enable the five land trusts to learn, share, and permanently protect working grasslands for the benefit of wildlife and people across a multi-state region.

The partners will work together to implement land protection that benefits at-risk wildlife, expands habitat connectivity, provides a range of ecosystem services, engages local communities, and contributes to their economies. More specifically, the project will: 1) accelerate grassland protection by supporting transactional, acquisition, and stewardship costs of new easements; 2) invest in regional outreach to landowners to encourage enrollment in permanent conservation easements; and 3) restore and manage grassland to maintain high-quality blocks of grass for the benefit of wildlife over the next four years. It combines the expertise and strengths of the partnership with each having a goal that is in line with their capacity or operational approach. The project also supports PLJV's ongoing development and improvement of GIS models for targeting, prioritization, and accounting of conservation impact across a multi-state region.

Conclusion

Although an ongoing and developing partnership, the Conoco-Phillips PLJV Land Trust Program can already be labeled a success representing a shift in strategy with potential for considerable sustained habitat conservation. Some of its lessons that can be applied in other contexts. In particular, two aspects of the program, its focus on 1) forming and engaging in partnerships; and 2) responding to their needs in program and project design. These combine to contribute to the design, development and implementation of programs.

The Conoco-Phillips PLJV Land Trust Program is a reorientation of an existing program. This shift was enabled based upon the focus of PLJV being responsive to the partnerships. First, the PLJV partnership engaged in conversations to better understand the context and threats that were occurring in the PLJV region, as well as opportunities to achieve the conservation goals. These conversations lead to a prioritization of program areas and a reorientation of existing goals and programs to better address the threats in the area. The program's pre-existing relationships helped in the creation of the land trust collaborative. This focus on partnership continues as efforts are ongoing to maintain a community of practice wherein learning and co-development of strategies can occur.

The partnership-based process of co-development has resulted in the tailoring of PLJVs grassland conservation activities to the strengths of the individual partners but in a way that can achieve regional conservation impacts. Such tailoring of conservation strategies to a particular situation may take longer, but has the benefit of generating trust, buy-in and tailored strategies for a given

conservation situation. Although these benefits are hard to quantify, the trajectory of the Conoco-Phillips Land Trust Program's delivery of land in protection indicates that these benefits translate to on-the-ground outcomes for conservation and people.

JV8 CENTRAL GRASSLANDS INITIATIVE: CONNECTING THE GRASSLAND BIOME THROUGH PROVEN PARTNERSHIPS FOR BIRDS, OTHER WILDLIFE, AND PEOPLE

Migratory Bird Joint Ventures are cooperative, public-private partnerships that work at regional scales to conserve habitat for the benefit of birds, other wildlife, and people. Joint Ventures take conservation priorities and objectives that have been identified at national and international levels and work to address them at the regional level. They bring together partners to pool financial and human capital to develop, fund, and carry out habitat projects that further the goals of major bird conservation partnerships. JVs also provide critical scientific, technical, and planning to support effective on-the-ground habitat conservation efforts. Each JV Management Board is comprised of state and federal agencies, non-governmental organizations, and private sector representatives including agricultural and corporate partners. The JV Management Boards provide regional leadership and work to cultivate partnerships, resources, and support for partners working toward established conservation goals. Over their history, JVs have worked with thousands of partners on projects, including habitat restoration and protection, capacity building, inventory and monitoring, planning, scientific research, and communications, education, and outreach.

The Central Grasslands of North America primarily overlap eight Migratory Bird JVs including the: Prairie Habitat, Prairie Pothole, Northern Great Plains, Rainwater Basin, Playa Lakes, Sonoran, Oaks & Prairie, and Rio Grande JVs. Through these eight Migratory Bird Joint Ventures — representing over 72 federal, state, provincial, non-profit, academic and industry conservation partners — the JV8 Central Grasslands Initiative is collaborating to stem the loss of grasslands and negative impacts to grassland birds. Through the JV8, JVs are working together across the breeding, migration, and wintering habitats occupied by grassland dependent birds throughout their annual cycle in Mexico, the USA, and Canada. JV8 is an ambitious initiative with the goal of conserving the iconic landscape and wildlife of the central grasslands of North America while supporting the ecosystem stewardship and livelihoods of the people who live there. Collectively, JV8 has identified a conservation goal of >12 million acres to sustain priority bird populations.

The challenge of reconnecting grasslands in Central North America is daunting and requires diverse partnerships, innovative programs and policies, and effective conservation delivery networks. JVs are trusted partnerships with a wealth of experience and expertise in grassland conservation. They respond to key threats to habitat and species by building on their history of implementing conservation actions to conserve wetlands and wetland birds. The JV8 promotes shared experience and best practices between the 8 Joint Ventures and their partners to address conservation bottlenecks and expand effective grasslands conservation efforts. Further, the JV8 Central Grasslands Initiative directly supports goals of the Central Grasslands Roadmap by leveraging existing conservation delivery networks focused on voluntary conservation programs that sustain extant grasslands, restoring and enhancing

degraded grasslands, and using the best available science to guide programs for meaningful grassland conservation.

In this session we will highlight examples of JV partnerships and conservation delivery networks focused on addressing landscape stressors and improving the health and resiliency of grasslands. We will also highlight the importance of international and cross-regional coordination to ensure the "table is set" with quality habitat throughout the annual cycle of grassland birds. Additionally, this session will highlight emerging science and tools to help guide conservation actions and evaluate outcomes from conservation investments. Finally, this session will explore emerging challenges and opportunities for scaling up grassland conservation efforts and the power of partnerships to innovate.

Session Moderator (Robert Perez)
Presentations:
JV8 Central Grasslands Initiative: Delivering Conservation Across Scales for Birds, Other Wildlife, and People. Bishop A., Carter M., Chapman K., Devries J., Duberstein J., Perez R., Vest J., Wightman C.

International Coordination and Collaboration for Conservation Delivery. Chapman K., Devries J., Duberstein J.

Central Grasslands Avian Modelling Project (CGAMP): Population and Habitat Objectives for Grassland Birds. Robinson B., Latimer C., Olimb S.

TreeAge: Developing an online DST to estimate grassland bird response to brush management. Bartuszevige A., Haverland A., Robinson B.

JV8 Central Grasslands Initiative: Effective Partnerships and Outcomes in Grassland Conservation. Bishop A., Carter M., Chapman K., Devries J., Duberstein J., Perez R., Vest J., Wightman C.

CENTRAL GRASSLANDS AVIAN MODELING PROJECT (CGAMP)

Sarah Olimb, World Wildlife Fund

Other Authors: Barry Robinson, Environment and Climate Change Canada, Brandt Ryder, Bird Conservancy of the Rockies, Chris Latimer, Bird Conservancy of the Rockies. John Carlson, USFWS, Graeme Patterson

Grasslands are an imperiled ecosystem. The interacting threats of agricultural conversion, woody plant encroachment, and extreme drought are pushing these ecosystems and the species that rely upon them to a critical threshold. To date, grassland bird populations have lost 700 million individuals with 75% of species in decline (Rosenberg et al. 2019). Conservation efforts in this ecosystem, however, are multi-faceted and complex because most grasslands are privately owned working lands primarily used for food and livestock production. As a result, these landscapes are vital from an economic and human livelihood perspective while simultaneously providing crucial ecosystem services and biodiversity benefits. Landscape scale conservation solutions in this biome are additionally complicated because of the vast geography of the central grassland (Canada to Mexico; ~4,523,889 acres) and its biogeographic (i.e., soil, precipitation regimes and vegetation ecotypes) and cultural diversity. As such, durable conservation solutions must integrate diverse stakeholder objectives and data that account for human-dimensions, conservation of biotic diversity, economics, land-use, climate resilience as well as the effectiveness of management.

Recently, international collaborations have begun bringing together transdisciplinary teams to develop strategic coordinated efforts aimed at conserving and restoring the central grasslands and grassland dependent bird species. Specifically, the Central Grassland Roadmap Summit (CGRS) is a collaborative tri-national multi-sector effort advancing grassland conservation through partnership development, policy refinement, and co-produced knowledge. Simultaneously, the Road to Recovery Initiative (R2R) was developed to jointly use biological and social science to produce actionable conservation solutions. R2R's primary focus is to recover North American bird populations and prevent species from becoming threatened or endangered. Currently five grassland bird species are identified as "on the brink". Despite these nascent efforts, the essential data products needed to inform actionable science are still largely lacking at the spatial and temporal scale required to implement effective "spatially prioritized" conservation action.

The CGRS and R2R efforts underscored the need for a grassland bird working group focused on identifying knowledge gaps and developing spatially explicit models at scale that integrate data across various disciplines and geographies. As such, the Central Grassland Avian Modeling Project (CGAMP) was formed to begin filling these gaps, with the central focus of advancing analytical models and subsequent spatial prioritization tools to address these urgent conservation needs. To date, CGAMP has leveraged diverse long-term continental scale bird-monitoring data from 2012-2020 (e.g., USGS Breeding Bird Survey, Bird Conservancy of the Rockies Integrated Monitoring of Bird Conservation Regions, State Breeding Bird Atlas Data and Canadian Wildlife Service Survey data) and key environmental covariates (e.g., land cover, topography, climate, and vegetation) to develop annual, spatially explicit species density models for breeding grassland birds across the central grasslands from Canada to Mexico. Using a Boosted Regression Tree approach (Elith, Leathwick, and Hastie 2008) and species-specific detectability offsets (Sólymos et al. 2013), the models generate a spatially explicit density surface which can then be translated into trend. Relationships between avian density and grassland habitat are used in a simulation framework to forecast population responses to various rates of agricultural conversion and grassland restoration. Establishing the relationship between percent change in grassland area and percent change in population size will allow grassland conservation and restoration targets to be set based on a population objective of achieving either stable or increasing trends by 15 years into the future.

Although these modeled outputs are a crucial step toward actionable conservation planning, they fail to account for other essential socio-economic, ecological factors, and indigenous traditional ecological knowledge (ITEK) that will undoubtedly drive the success of conservation interventions in this landscape. These can include but are not limited to, economic cost of land, socio-political will or inertia towards voluntary conservation actions, and the additionality of land conversion risk and climate change. Moreover, the scale mismatch between regional conservation targets and local conservation action can result in inefficient and less effective allocation of conservation resources if diverse factors are not accounted for (Jarvis et al., 2020). The essential next step to help land managers make regionally informed decisions at scale in grasslands is to integrate diverse data to co-produce a systematic conservation planning framework that spatially prioritizes habitat protection and restoration targets that maximizes conservation return on investment.

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THE PERMIAN-BASIN PANHANDLE NATIVE SEEDS PROJECT

Jameson Crumpler, Texas A&M-Kingsville, Caesar Kleberg Wildlife Institute, Texas Native Seeds

The Permian Basin-Panhandle Native Seeds Project (PBPNSP) is a collaborative native seed source development project successfully built on multi-level partnerships across federal, state, local, and private entities. The PBPNSP is part of the statewide Texas Native Seeds Program (TNS) operated by the Caesar Kleberg Wildlife Research Institute (CKWRI) at Texas A&M University-Kingsville (TAMUK). PBPNSP is modeled after the successful South Texas Natives Project (STN), which began in 2000 because of concerns presented by private landowners to CKWRI researchers regarding the lack of native plant materials available to consumers for use in combating the spread of exotic grass species and declining wildlife habitat (South Texas Natives, "How It Started").

In 2017, PBPNSP began operations in the Permian Basin. As the demand for native seed sources continued to rise, the need for a true Panhandle project area was quickly realized. In 2019, TNS staff expanded the area of operation to include the entire Texas Panhandle region, with base of operations in Midland and Lubbock. Today, PBPNSP staff continue to seek out partnerships and increase collaboration among the many entities required to successfully grow a native seed development program in a diverse region like the Panhandle.

Currently, PBPNSP is developing new seed sources for sand bluestem (*Andropogon hallii*), Purple coneflower (*Echinacea angustifolia*), and Canada wildrye (*Elymus canadensis*). PBPNSP hopes to have seeds of these species released to the public within the next 5 years. Additionally, PBPNSP is developing a new germplasm evaluation site near Canyon and continues to utilize existing evaluation sites throughout the project region in developing new native seed sources. Over the next 10 years, PBPNSP hopes to release 2-3 new native seed sources per year.

One of the major challenges for PBPNSP promoting the use of native seeds in the region is the conversion of farmland and rangeland to developed landscapes. Texas loses more than 1 square mile

of land to development each day (Texas Land Trends) and remains under a critically high threat of conversion to non-working landscapes. Most of the South Plains region (south of the Texas Panhandle) is planted to row crops, yet, as farmland is abandoned due to rising input costs, declining water levels in the Ogallala Aquifer, and an increasingly competitive global agriculture market, much of former cropland is sold to commercial and residential developers. PBPNSP can help to slow the conversion of farmland and rangeland to developed lands by offering landowners locally adapted seed sources to place their land in native grass and forbs and in the hands of families.

The opportunities in a new operational space hold great potential at the federal, state, local, and private levels. The Permian Basin-Panhandle Native Seeds Project is uniquely positioned to make landscape-level impacts in neighboring states such as Colorado, Kansas, New Mexico, and Oklahoma.

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8. EDUCATION AND OUTREACH STRATEGIES

CIRCLE UP: A MEDIATED PEER-TO-PEER WORKSHOP FOR INTERACTIVE LANDOWNER OUTREACH

Dr. Maureen Frank, Sul Ross State University

Other authors: Kaitlyn Restivo, Texas A&M AgriLife Extension Service; Dr. Sandy Smith, Penn State University

Peers and Pros 360° (P&P 360) is a mediated peer-to-peer teaching method that allows the exchange of knowledge and ideas within a framework prepared by professionals. This is different from the traditional outreach format where a professional lectures to a group of participants, and there is little if any interaction among the participants. Various studies indicate that adults prefer learning environments where they can share their experiences and learn from each other (Rothwell 2020). However, if this sort of learning environment lacks structure, natural resource management will not necessarily improve (Nykvist 2014). Mediated peer-to-peer learning like Peers and Pros 360° can provide structure and allow interaction (Smith 2018). We designed and conducted P&P 360 workshops on prescribed fire in the Edwards Plateau ecoregion of Texas and evaluated their effectiveness at increasing participant knowledge and likelihood to adopt new management practices (Restivo et al. 2023).

We developed our curriculum with the help of four prescribed fire specialists who work in the Texas Hill Country. These included two Texas A&M AgriLife Research fire scientists, one Texas A&M AgriLife Extension Range Specialist, and one Oaks and Prairies Joint Venture (OPJV) fire biologist. During our first meeting with these professionals, we asked them to share statements that they commonly hear landowners and land managers say about prescribed fire. Once they had brainstormed about 30 statements, we grouped these based on common themes that each seemed to address. We ended up creating 8 themes: benefits of prescribed fire, wildlife, livestock, vegetation, liability, timing, cost, and resources. For each theme, we selected 3 statements for the curriculum. Each of these statements was later printed on a card and laminated to use during the program. The fire professionals also helped us to create talking points about each of the themes.

We chose three workshop sites throughout the Texas Hill Country: Kerr Wildlife Management Area, Mason Mountain Wildlife Management Area, and a private ranch. All sites use prescribed fire to manage their resources. Participants ("peers") were recruited to the workshops through county extension agents, social media, and local prescribed burn associations. The OPJV fire biologist served as one of the professional mediators ("pros") at all three programs, and we recruited one local biologist with prescribed fire experience to be the other mediator at each site. To start the program, each participant was handed one or two statement cards. Then for the first theme, participants with cards 1-3 were asked to read their statements out loud, and all participants were encouraged to react to the statements. Once discussion died down, the pros contributed additional information as needed. We spoke with pros beforehand about their role in the program and, importantly, instructed them to be very sensitive when correcting misinformation so that peers did not feel embarrassed. In all instances during our workshops, any misinformation was corrected by peers during the course of discussion. We repeated the process of having participants read the three statements and discuss for all eight themes. At the end of the workshop, we provided participants with printed extension publications about prescribed fire and brochures and information from local natural resource agencies.

After each workshop, we handed participants a paper survey with questions about their perceived knowledge change, opinions about the P&P 360 method, and intent to adopt new practices. Across all three workshops, participants reported an increase in knowledge about all themes discussed. In particular, knowledge change was greatest about resources for implementing prescribed fire (78% of participants) and ways to offset the cost of a prescribed burn (76% of participants). Most participants (93%) preferred the P&P 360 method over traditional teaching methods. In particular, participants indicated that they enjoyed learning from their peers, having the opportunity to network with other landowners and land managers, open discussion, and not having a professional lecture. On average, participants across the three workshops planned to adopt five new practices, with all but three participants indicating they would adopt at least one new practice. The practice that participants were most likely to adopt was contacting a local state agency or non-governmental organization for more information about prescribed fire.

Land ownership in the Texas Hill Country has trended towards smaller parcels and recreational use. Thus, landowners in this area are less likely to meet each other in town than in previous years. Furthermore, many landowners are new to the area,

and may not be familiar with state agencies and the resources they can provide. We therefore consider it a substantial benefit of this method that landowners enjoyed getting to know each other and learn from each other, and that the workshop increased their knowledge of the resources that local experts can provide. We received many positive comments, verbally and in writing, from peers and pros about how much they enjoyed the workshop. The P&P 360 teaching method is a flexible tool for designing and conducting relevant, engaging conservation programs, and we look forward to seeing other topics developed and implemented in the future.

This work was published one month after the AGC, and can be downloaded for free until Nov. 9, 2023 at https://authors.elsevier.com/a/1hnwq5WcHRGjU9.

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MULTIMEDIA STORYTELLING: LIFE ON THE PRAIRIE

Emma Balunek, University of Nebraska-Lincoln/Platte Basin Timelapse/ Benson Lab of Predator-Prey Ecology

Grasslands are teeming with wildlife and plants that are all connected in some way with each other, and ultimately with each of us. However, the grasslands are one of the most threatened and endangered ecosystems. Many different people have lived in the grasslands including Native Americans, European settlers, homesteaders, farmers, ranchers, scientists. The 1898 Homestead Act marked the beginning of fragmentation of the once vast North American grasslands. Although the grasslands have changed dramatically, people still call this part of the world home and so do a number of diverse plant and animal species uniquely adapted to this part of the world.

Storytelling using photos and videos connect people with this landscape and bring attention to the beauty of the often-overlooked grasslands. Interactive multimedia applications bring together components of ecology, wildlife, and natural history of a region, painting a larger picture that immerses the viewer into a way of seeing the connections they have not previously experienced.

My presentation walked through several stories of "Life on the Prairie" in Northeastern Colorado, highlighting different people throughout different time periods along with the diversity of wildlife in the area. I am doing this work as part of my master's project at the University of Nebraska-Lincoln in the Applied Science program with a specialization in Conservation Storytelling. Along with the storytelling, I am also studying the coyote-badger hunting relationship which occurs in many locations across the grasslands.

Coyotes and badgers in western North America sometimes hunt prairie dogs and ground squirrels together using their complementary hunting skills. Specifically, the badger digs up burrowing animals, while the coyote captures prey that flushes above ground and surveys the surrounding area. This collaborative partnership has been documented by Indigenous folk for thousands of years, but little is understood about the behavioral and ecological mechanisms underlying this relationship. This project is formulated specifically to help fill this knowledge gap. We set up trail/game cameras at multiple sites in Colorado, South Dakota, Wyoming, and New Mexico to learn more about the different pairs in these areas. The photos collected document coyote-badger pair occurrences and other wildlife, which will be used to test our research predictions with the goal of contributing to greater understanding of the relationship between these two species – and interspecific cooperation more generally.

For more information on my project check out this story map: **https://arcg.is/1e14PG**

ACHIEVING IMPACT WITH CONSERVATION MEDIA: SHOWCASING THE POWER OF GRASSLANDS PARTNERSHIPS

Irene Liu, Cornell Lab of Ornithology

Other Authors: Megan King and Tom Swartwout, Cornell Lab of Ornithology; Dale Veseth and Martin Townsend, Rancher Stewardship Alliance; Kendall Wojcik, Winnett ACES

The Center for Conservation Media, one of six centers at the Cornell Lab of Ornithology in Ithaca, New York, is a team of filmmakers and scientists using the power of visual media to translate science and inspire action. We serve conservation partners by providing targeted communications resources, co-designed to influence conservation outcomes.

North America has lost more than half its historic coverage of grasslands, with much of the remaining grasslands facing continued risk of conversion. Given the urgency and scale of this issue, Conservation Media committed itself to exploring how best to contribute our services to grasslands protection. We felt science-based media could frame the necessary information and that our outcome-driven approach could help conservation groups deliver their messages to relevant audiences.

Conservation Media was awarded a contract from the National Fish and Wildlife Foundation (NFWF)'s Northern Great Plains Program to produce four films about NFWF-supported conservation and grazing improvement projects in Nebraska, South Dakota, and

Montana. The films highlight four current grantees' efforts in restoring, protecting, and/or managing priority habitats and species. They also serve as outreach and fundraising tools to increase local participation in conservation efforts.

The films can be seen at **https://www.birds.cornell.edu/conservation-media/grasslands-conservation-in-the-northern-great-plains/** and are as follows:

- "Mending Fences": Migration science has improved our understanding of where and how fences impact big game and other species. Collaborative efforts mitigate these impacts through fence removal and/or modifications to accommodate wildlife while meeting ranchers' needs. (Grantees: Rancher Stewardship Alliance and Winnett ACES)

- "Reconsidering Cedar": Woody encroachment degrades grasslands and poses a serious threat to grassland-based economies. The Sandhills Task Force proactively works with ranching communities to treat and prevent encroachment. (Grantee: Sandhills Task Force)

- "Vital Signs": Collaborative, data-driven monitoring of grassland birds provides information that can be used to assess ecosystem health and guide restorative management practices benefiting both birds and landowners. (Grantee: Bird Conservancy of the Rockies)

- "Uncrossed Arms": Rancher-led organizations build partnerships between conservation groups and producers. Their work provides local communities with resources to maintain the healthy working grasslands that support their culture and livelihoods. (Grantees: Rancher Stewardship Alliance and Winnett ACES)

NFWF identified two primary audiences for these films. First, showing these films to current and future funding partners ensures continued financial support for NFWF and for individual grantees. Second, introducing new landowners to the grantees' programs increases awareness and sign-on for conservation and grazing improvements – achieving the ultimate goal of keeping grasslands intact.

Our early research involved extensive calls to learn about each grantee and the conservation work they championed. The following points helped us envision each film:

- Even though grasslands are in serious trouble, they do not receive the attention paid to other habitats. The general public understands the values of forests and wetlands but often needs to be convinced of the value of grasslands.

- Successful conservation in these privately owned, working landscapes is community-based. Contrary to the popular image of ranchers as isolated and exploitative, people share tools and knowledge to steward the land.

- Healthy ecosystems and livelihoods go hand in hand. Stakeholders can have different priorities and still work together to achieve a common mission.

Our production team took three trips to the Northern Great Plains. In total, we spent a month filming the grantees, the ranching families they collaborate with, and the on-the-ground work they were undertaking together. With footage in hand, we created intimate, people-focused pieces showing the power of partnership in a rural landscape. We also included the latest science by building accessible data visualizations to illustrate the scale of each issue.

The films were delivered to NFWF and grantees in March 2023. Members of the Rancher Stewardship Alliance and Winnett ACES reported that since then, the film "Uncrossed Arms" has been shared on their social media platforms, included in grant applications, accepted at conference screenings, and shared with media outlets to help explain these organizations' complex partnerships and working models. Keys to the success of these films were listening to ranching communities, empowering landowners to tell their stories in their own voices, and staying focused on communications strategy throughout the production workflow.

Since the launch of these films, Conservation Media has embarked on other science-based media projects for the community. By helping grasslands and the people on them gain the appreciation and resources they deserve, we are committed to keeping this valuable, vulnerable ecosystem from being permanently lost to other land uses.

STORYTELLING IN GRASSLAND LANDSCAPES

Ethan Freese, Carlee Moates, and Dakota Altman, Platte Basin Time-lapse/University of Nebraska-Lincoln School of Natural Resources

Conservation storytelling helps communicate the vital work occurring to conserve habitat and wildlife. Since 2011, Platte Basin Timelapse (PBT) has been telling the story of the Platte River's watershed through timelapse cameras spread across Nebraska, Colorado, and Wyoming. Currently, the project has over 70 timelapse cameras from the alpine tundra in Colorado to the tallgrass prairies of eastern Nebraska.

Averi Reynolds, University of Wyoming

One objective of the project is to share stories about grasslands, including their diversity, conservation, and stewards. Herein, we feature multimedia content of working grassland landscapes in the watershed. PBT has produced stories covering diverse topics in grasslands, including tallgrass prairie restoration, prescribed fire, and wildlife friendly fencing.

PBT is a team of storytellers who seek to shed light on unassuming landscapes, including grasslands, and share the benefits and beauty that natural spaces provide for a diverse community of partners working on public, private, and tribal land.

To learn more visit: **https://plattebasintimelapse.com/**

9. GRASSLAND RESTORATION APPROACHES

NORTH DAKOTA CONSERVATION FORAGE PROGRAM

Joshua Lefers, Audubon Great Plains

Other Authors: Juli Bosmoe, Audubon Great Plains

The North Dakota Conservation Forage Program is an innovative state-based program to drive grassland restoration on marginal cropland acres with the intent to provide long-term sustainability as productive working grasslands. Audubon Great Plains identified the primary options for restoring grassland centered on two main categories: those that require a long-term set aside, such as CRP, and those that provide financial assistance for establishment but no support for the transition, before it could be used for livestock production. The Conservation Forage program seeks to fill this gap by providing financial assistance for establishment and grazing infrastructure, as well as three years of transition payments as part of a ten year agreement.

The Conservation Forage program was envisioned as a result of a decline in grassland habitat, forage quality, soil health, and available grazing lands for livestock operators. Existing programs focus on long-term set aside or simple cost share of establishment costs, such as seed and seeding labor. Though landowners expressed interest in restoration, a lack of financial support during grassland establishment period and a lack of locally administered options prevented conservation action.

A goal of the project is to support North Dakota producers with the adoption of grassland restoration and adaptive management. CFP is designed to accelerate and encourage grassland restoration to improve grassland and soil health across the state, while also expanding North Dakota's graze-able acreage with term protection. Enrolled landowners are provided financial and technical assistance to aid the incorporation of working grassland elements on privately owned acres.

In December 2020, Audubon Dakota was awarded $6,918,306 from the ND Industrial Commission through the Outdoor Heritage Fund. These funds provided the incentive for enrollment of at least 18,000 acres of private croplands to restore forage-based cover. Through the program, transition payments are provided for first three years of enrollment based on county cropland rental rates, which are intended to assist with new management and potential foregone income as the restored grassland become established. In addition, the program provides 60% cost-share for conservation forage seed mix and 50% cost share for grazing infrastructure such as perimeter fencing and water development. A follow up gift of $1.3 million from Corteva AgriSciences provided additional financial assistance for seeding costs, as well as the support for staff delivering and administering the program.

After the award was announced in 2020, the initial sign up period closed in August of 2021. The first contracts were in place in January of 2022. As of August 2023, 50 projects have been completed covering 5,243 acres. An additional 18 projects are underway, covering an additional 2,546 acres. One aspect Audubon sought to explore was the human dimensions side of participating in Conservation Forage Program. Audubon commissioned a study of landowners that participated, or chose not to participate, to explore what influences intentions for continued involvement, as well as to seek continual improvement to the program. 25 participating producers and 10 non-participating producers were interviewed and their responses anonymized for analysis.

From the data, Audubon learned that the benefits of the program were well received and wide reaching, for the rancher, ranching operation, and community. Ranchers appreciated the program components and delivery, as well as meeting grassland and forage needs and having an alternative to cropping marginal lands. Many landowners responded that they would continue to crop the land without the financial assistance from CFP, and most planned to incorporate the acres into existing grazing or haying systems. Noted improvements from landowners included a need to increase financial assistance given that costs are significant, as well as signage to help alleviate neighbor concerns as the site looks weedy while native species establish. Additionally, collaboration with partners is critical to ensure seed drill availability across the state.

The model is now expanding, with North Dakota Game and Fish leading a Regional Conservation Partnership Proposal (RCPP) award to develop the Meadowlark Initiative in 2021. That project imitates the establishment payments as well as financial assistance for seed and seeding costs. Additional RCPP projects are currently being explored for use in neighboring states.

GRASS WARS: MANIPULATING MICROBIOMES TO FAVOR NATIVE BUNCHGRASSES

Jeff Brady, Texas A&M AgriLife Research

Other Authors: Jim Muir and Kelly Carroll, Texas A&M AgriLife Research; Jeanmarie Verchot, Texas A&M University; Tony Falk, Texas Native Seeds

The ecological balance of native grasslands in North America and elsewhere is threatened by urbanization, expanding farmlands, climate change and invasive species (Milton and Barnard 2003; DiTomaso et al. 2017). Native grasslands are key to entire ecosystems, particularly in the central plains of North America. Loss of grasslands due to anthropogenic forces or invasive species can signal the loss of native bird, animal, and insect species. *To state it clearly, the long-established biological heritage of localities across North America is being altered, then lost, as foundational species are replaced.* The resulting ecosystems are less productive, less diverse, and disruptive to native flora and fauna.

Invasive grasses are causing large-scale habitat loss, disrupting established ecosystems. Tactics currently available for converting rangelands dominated by invasive grasses back to native habitats are prohibitively expensive and often fail due to germination and regrowth of invasive grass seeds. Efforts using prescribed fire, soil disturbance, grazing management, reseeding, herbicides, etc., have had little long-term impact. As a novel tactic, we are utilizing microbes with promotive effects on

native little bluestem (*Schizachyrium scoparium*) germination and establishment, with simultaneous negative effects on the invasive grass King Ranch (KR) or yellow bluestem (*Bothriochloa ischaemum var. songarica*) to disrupt native/invasive plant competitive relationships.

Although this project focuses on a single native and one exotic bunchgrass, the technologies developed in this project are applicable to other plant species. Little bluestem, which is endemic throughout North America (NRCS 2020b), is an iconic perennial bunchgrass that struggles to compete with invasives when grasslands are overgrazed or otherwise disturbed (NRCS 1991). KR bluestem has replaced little bluestem and other native grasses on hundreds of thousands of hectares in the southern grasslands of North America (Schmidt et al. 2007) and is gradually adapting to colder, drier climates further north and west (NRCS 2020a).

We have collected KR bluestem and little bluestem leaf, root, and soil samples throughout the state of Texas to: 1) establish a collection of microbes from little bluestem we can use to inhibit KR bluestem germination and establishment, and 2) characterize the endophyte microbiome of both grass species. Plants have been collected from most Texas ecoregions (Figure 1). Analysis of the plant endophyte microbiome reveals a strong similarity between the two grass species, but the invasive grass contains higher microbial species richness and

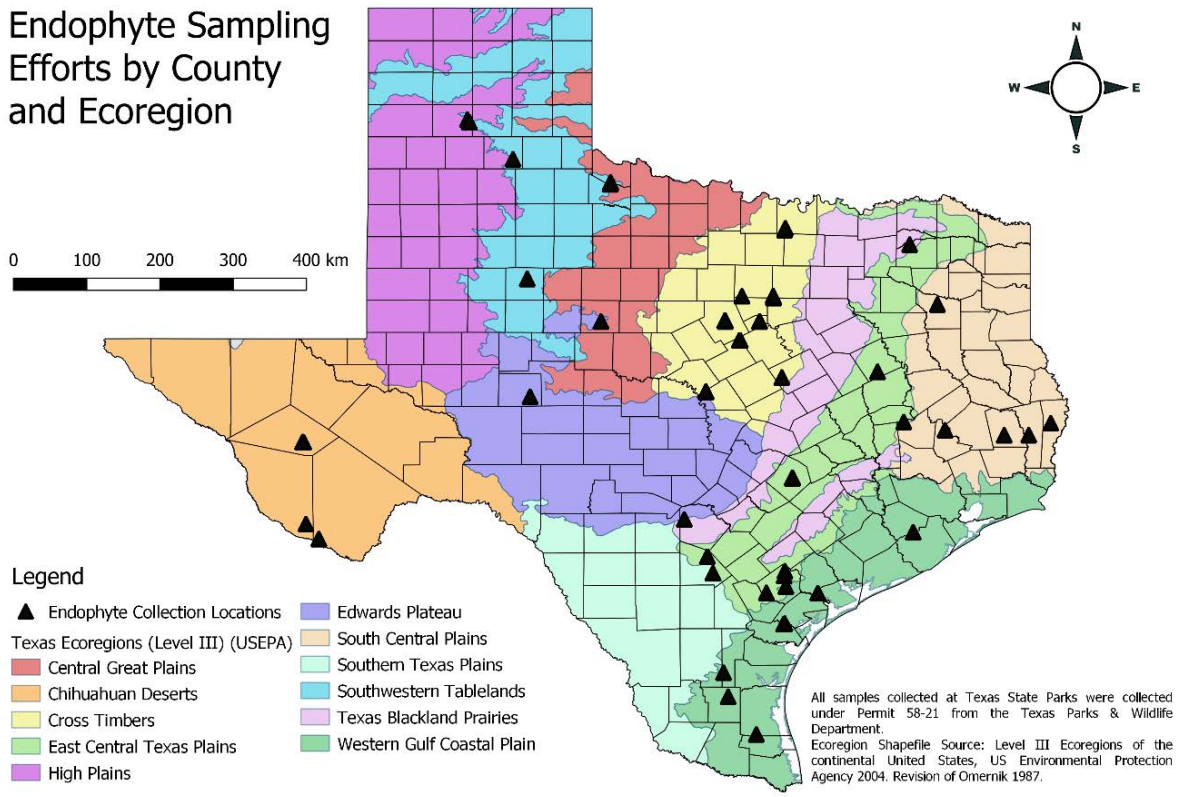

Figure 1. Collection sites for KR bluestem and little bluestem microbiome samples. Plant endophytic microbes (both bacteria and fungi) were isolated at each collection location. Additionally, a DNA-based survey of all bacteria and fungi in plant leaf and root tissue was conducted.

diversity. Additionally, precipitation events cause transient changes in microbial species richness in plant roots, leaves, and the rhizosphere surrounding plant roots. Initial screening of the plant microbes has identified two bacterial species that inhibit invasive KR bluestem germination. The microbes have neutral or promotive effects on native little bluestem germination. Continued work screening for inhibition of KR bluestem germination should identify a large consortium of microbes that can be used as biocontrol for KR bluestem germination and establishment. Biocontrol of KR bluestem would provide a game-changing benefit to native grassland restoration, reducing the competitive advantage of the invasive grass during early stages of grassland restoration efforts.

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APPLYING SOCIAL SCIENCE TO INCREASE WOODY PLANT MANAGEMENT

Ryan Roberts, Playa Lakes Joint Venture

Other authors: Ashley Gramza, Miruh Hamend, Lindsay Shorter, and Mike Carter, Playa Lakes Joint Venture

Background

Invasive woody plant species, such as eastern red cedar, honey locust, and sumac, are encroaching on millions of acres of grasslands throughout the Western Great Plains, with some areas facing upwards of 50% conversion of grasslands into woodlands (Morford et al., 2022). The ecological and social causes of encroachment are numerous and multifaceted. This conversion often results in losses of ecosystem services, such as the depletion of soil moisture and aquifer recharge (Zou et al., 2018), a decline of grasses available for livestock forage (Briggs et al., 2005), and a regional loss of grassland connectivity, which is vital for migratory bird species (Coppedge et al., 2001).

Conservation social science can be used to understand various conservation issues. Within this realm, social psychology is often used to determine how individual cognitions influence human behaviors that have conservation implications. In the context of invasive woody plants, human behaviors such as prescribed fire and other forms of brush management can serve as vital tools in preventing woody plant encroachment and maintaining grassland connectivity.

Understanding motivations for doing this work, along with identifying any important management needs and barriers can help us develop communication marketing messages aimed at encouraging this behavior and improving outreach to meet producer needs.

Playa Lakes Joint Venture (PLJV) secured funding through a Natural Resource Conservation Service Conservation Innovation Grant to develop an effective outreach model that fully integrates social science and communications to drive invasive woody plant management. The model is being piloted across a gradient of woody plant encroachment (light, medium, and heavy) as identified by the Rangeland Analysis Platform, an interactive online mapping tool created by the United States Department of Agriculture Agricultural Research Service that allows users to track rangeland vegetation over time with the goal of preserving core grasslands (USDA Agricultural Research Service, n.d.).

Our model is being piloted in six counties in western Kansas and Oklahoma. In Kansas, activities are centered in Osborne, Lincoln, and Barber Counties, and in Oklahoma the work is taking place in Woods, Beaver, and Roger Mills Counties. We believe that this model can be adapted and used across the region wherever invasive woody plant encroachment is an issue.

Methods

Literature Review

We began the literature review by developing and testing a search string in Google Scholar. We continued to make refinements until we didn't get any new hits. We then used a standardized three step methodology that is common in the systematic review world to screen the titles, abstracts, and finally full-body text of the 290 documents generated by the search (Collaboration for Environmental Evidence, 2022). This process resulted in 38 papers that we deemed relevant to extract data from.

Interviews

We worked with our project Advisory Team to develop an interview guide focused on producer motivations, barriers, and needs for effective management. We also worked with the conservation districts, NRCS offices, and other Partners to develop producer outreach lists. We aimed to select for producers that represented a variety of demographics that might affect their responses to maximize the diversity of our social science data. We completed our first round of interviews in January 2023 across our six focal counties. We conducted two interviews per county for a total of 12 interviews.

Focus Groups

We completed six focus groups across KS and OK in February 2023. We averaged 9 producers per meeting (ranging from 7-11). We asked similar questions as we did in the interviews, but the responses were collected from a collaborative group discussion, allowing us to speak to more people and for participants to build off of others' ideas. We will compare focus group results to interview responses to get a more holistic understanding of management from both the group and individual perspective.

Results

Literature Review

The strongest social motivations for conducting management were related to characteristics of the landowner's operation. Those that manage for crop or livestock production were more likely to manage for invasive woody plants than landowners who manage their land for recreation (McDaniel, 2018; Hoffman et al., 2020). Landowners who had conducted management in the past and held positive attitudes toward the experience often felt encouraged to continue managing into the future (Toledo et al., 2013; Bendel et al., 2020). Landowners who harbored some sort of internal moral responsibility or environmental stewardship ethic were also driven to manage more often than those without this ethic (Morton et al., 2010; Riechman et al., 2014; Coon et al., 2020; Rajala & Sorice, 2021).

Burn policies were cited as the number one barrier toward effective management, most notably when dealing with issues around liability (Morton et al., 2010; McDaniel, 2018; Clark et al., 2022). Producers living in counties with stricter liability standards are less likely to burn that those who lived in a place with gross negligence liability standards, which provides legal protection for fire damage if the landowner completes a series of due diligence requirements pre-burn (Weir et al., 2019).

Additionally, some landowners believed certain practices held inherent risks to their income or livelihood (e.g., less grass available for cattle post-burn) (Harr et al., 2014). Several practical barriers also limited the ability for producers to manage against encroachment, including a lack of labor and equipment (Coon et al., 2020; Fagundes et al., 2020), a lack of knowledge or technical experience to carry out the management (Symstad and Leis, 2017; Clark et al., 2022), or a perceived lack of time and funding.

Establishing programs from trusted sources that can provide targeted outreach and mentorship for those dealing with invasive woody plant problems was found to be an important need for effective management(e.g., McDaniel, 2018; Joshi et al., 2019; Starr et al., 2019; Adhikari et al., 2023). Offering collaborative opportunities for access to resources such as labor, equipment, and long-term sources of funding is crucial for successfully managing invasive woody plants. Collaboration for integrated management was typically catalyzed by local leadership on the ground, and was often initiated by individuals who were well known, ideally lived in or near the community, and were willing to serve as community leaders (Jobes, 2019; University of Nebraska, 2021).

Assistance programs should also continuously evolve in order to become more adaptable and flexible to a variety of landowners and environments (Olenick et al., 2005; Leis et al., 2017; Central Grasslands Roadmap, 2021; University of Nebraska, 2021). Providing shorter term contracts and removing some of the mandatory components of programs was found to be more attractive to a wider diversity of landowners (Olenick et al., 2005). In a similar vein, current state and federal policies should be periodically assessed for efficiency and adapted as needed. An example would be evaluating current burning liability standards in a given place.

Interviews and Focus Groups

One motivation that continued to arise from older producers was a nostalgia for the past. They remember what the landscape used to look like pre-woodland conversion. We heard many stories of "I remember when…" or "I've seen the change in my

own lifetime". This went in tandem with a desire to leave the land better for future generations. Newer producers did not have the same type of memories, so their decisions were informed by scientific and ecological data (e.g., understanding the ecological relationship between fire, water, and grass), or what neighboring producers had found to be successful. For any age demographic, seeing the benefits of management, such as healthier grasses and creeks flowing again, was an important motivator for producers to continue management after the initial treatment period had passed.

As in the literature review, liability was identified as a large barrier to management with our study participants. Producers had a fear of fires losing control, and the legal implications that could arise. Another barrier to fire was the biophysical landscape itself (e.g., lack of grass, rough terrain, wind speed and drought). There were also issues with assistance programs as they are currently set up, which was mentioned in almost every focus group. Producers felt that they couldn't get financial assistance for doing the right thing, which in this case was proactive management. Practical considerations were also brought up, especially a lack of contracted labor to actually do the work.

We asked our participants to let us know their thoughts on what they would change with current assistance programs, and how they envisioned what an ideal program would look like. From their perspective, a program would ideally support prescribed burn associations with resources, training and leadership to conduct burns. It would also prioritize maintaining intact grasslands and include burn requirements, educational opportunities, technical assistance, flexibility and more agency follow-up for different producers and their diverse operations. An ideal program should also include some sort of financial incentive in place for landowners who are not managing in order to limit seed spreading from neighboring properties.

The biggest desire from most producers was to learn from someone who has actual firsthand experience doing the work, and they really trusted other producers who had experienced success in management to provide them with useful information. This knowledge exchange could come in the form of producer-led workshops, or perhaps an Invasive Woody Plant Community of Practice. Lastly, compiling all of the various management tools and resources that exist could be really beneficial, including a real time list of available contractors for labor.

Conclusion

This project connects social science research and communications to promote brush management behavior across the western Great Plains. One of our long-term project goals is for the social science insights and communication products to be adapted for other states and used as a model for integrating social science, communications, and conservation delivery to drive conservation behaviors.

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GRASSLAND ECONOMICS: COMPETING INTERESTS AND FUTURE OPPORTUNITIES

John K. Pattison-Williams, University of Alberta

To target grassland limited conservation resources, this paper presents a base economic model for "cultivation return on investment" in the Canadian prairies for agricultural drivers of conversion, and then expand for renewable energy and attitudinal factors such as environmental sentiment and free-market orientation. Preliminary results indicate diminishing returns to profitability—the most profitable grasslands have already been cultivated—but that with increasing pressure from commodity prices even remaining grasslands become profitable for cultivation. Significantly, these results are amplified or tempered by attitudinal factors, which suggest greater emphasis on human dimension research to complement economic incentives is required.

10. GRASSLANDS POLICY

RFS AND GRASSLANDS – WHAT RESEARCH SHOWS AND POLICY IDEAS: A CONVERSATION ON THE RELATIONSHIP OF CONVERSION, CONSERVATION, AND CORN

Jennifer Prenosil, Nebraska Game and Parks Commission

The focus of this discussion was to give a background of row crop agriculture in Nebraska and some of the challenges of using certain conservation programs as it is related to the increase demand of corn for ethanol production. Nebraska is diverse in grassland ecosystems across the state. This is partially due to different soils and differences in precipitation ranging from 16 inches per year in the west and up to 28 inches per year on the eastern side. The soils, precipitation, and the presence of the Ogallala Aquifer make much of the state ideal for row crop production, particularly corn. Nebraska consistently ranks as one of the highest for corn production in the U.S., and second in corn ethanol production with 24 ethanol plants distributed across the state making corn, ethanol and by-products such as distillers grain and are important economic drivers for the state.

Increased incentives to grow corn, as well as corn's ability to produce higher yields per acre compared to other row crops, has changed Nebraska's row crop landscape. In 1990 there were 7,700,000 acres of corn planted, 2,450,000 acres of wheat planted, 1,600,000 acres of sorghum planted, 2,400,000 acres of soybeans planted, and 1,304,573 acres of cropland enrolled into the Conservation Reserve Program (CRP) (National Agricultural Statistics Service). Compared to 2020 corn increased to 10,200,000, soybeans increased to 5,200,00 while wheat decreased to 900,000, sorghum decreased to 195,000, and cropland acres enrolled into CRP decreased to 637,619 (this excludes the Grasslands CRP component).

Nebraska's conservation organizations have promoted CRP as a conservation program as it puts grassland habitat back on the landscape. When looking at General and Continuous CRP options, there is a noticeable decline in CRP enrollment starting between 2006 and 2008 which coincides with the same timeframe of the rollout of the Renewable Fuel Standard. Cash rent and land values also have increased. Personal communication with several farmers stated that CRP soil rental rates don't compete with cash rent and/or growing corn has the potential to bring a higher income.

Grassland CRP was excluded from the previously mentioned comparisons because Grassland CRP is intended for existing grass such as pastures or rangeland. When looking specifically at Grassland CRP and where much of it is being enrolled in Nebraska, it does not appear popular in areas of the state with heavy corn production. Areas where it does appear popular are arguably not suitable for row crop agriculture such as in the western Sandhills. When focusing on eastern Nebraska where we see the most corn production and very little Grassland CRP, Grassland CRP rates may not be enough incentive to breaking out remnant grasslands and growing corn where there is the illusion of a higher potential income for growing corn. Due to these observations,

it does not appear that Grassland CRP is dissuading landowners from growing corn. Corn and ethanol are important economical influences for the farmers in Nebraska. When considering how best to balance corn and ethanol production with grasslands and conservation it would be encouraged to include farmers and ethanol companies in those discussions.

Agriculture statistics were pulled from the National Agricultural Statistics Service website:
USDA - National Agricultural Statistics Service - Nebraska

CRP statistics were located at the USDA Conservation Reserve Program Statistics:
Conservation Reserve Program Statistics (usda.gov)

2023 FARM BILL STATUS AND OPPORTUNITIES FOR GRASSLANDS

Duane Hovorka, National Wildlife Federation

Farmers, ranchers, Tribes, non-profits and others who own or manage grasslands have access to advice, conservation planning, technical help and financial assistance through Farm Bill conservation programs. Those programs can provide help to adopt new management practices or systems, or to protect the land from conversion or development through a conservation easement.

The 2018 Farm Bill was set to expire September 30, 2023, but Congress extended it for 12 months to give it more time to write a new 5-year Farm Bill. The new Farm Bill provides opportunities for United States Department of Agriculture (USDA) conservation programs to provide even more support for America's grasslands. This paper highlights some opportunities for grassland owners and managers to obtain assistance through existing USDA conservation programs, and some proposals for expanding those opportunities in the next Farm Bill.

Background

The Farm Bill is a collection of policies intended to provide economic stability for farmers, conserve natural resources, and provide nutrition for low income and other vulnerable Americans. The first "Farm Bill" was a collection of several laws passed in the 1930's[1], including the Agricultural Adjustment Act of 1933 (which offered farmers payments in exchange for reducing production of surplus commodity crops, and authorized the federal government to distribute surplus crops to the needy), the Soil Conservation Act of 1935 (which created the Soil Conservation service, now the Natural Resources Conservation Service), the Agricultural Adjustment Act of 1938 (which created the Federal Crop Insurance program), and the Roosevelt Administration's creation of the first food stamp program in 1939 to formalize distribution of surplus commodities[2].

Modern Farm Bills continue to focus in those three areas. When enacted, the 2018 Farm Bill was projected to provide $326 billion over five years for nutrition programs, $69 billion to provide a safety net for farmers through crop insurance and commodity program payments, and $29 billion for conservation programs. The remaining 1% of the projected $430 billion cost was for a variety of programs covering trade, horticulture, research, rural energy, and forestry[3].

The Inflation Reduction Act of 2022 provided an additional $19.5 billion for USDA conservation programs to promote the adoption of climate-friendly farming systems. The Act also included $13.3 billion

for renewable energy and energy conservation in rural areas, and $5 billion for forest management, planning and restoration. Four USDA conservation programs received important supplemental funding because they routinely turn away two-thirds of the farmers and ranchers who apply for assistance.

USDA "Working Lands" Programs

The Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and Regional Conservation Partnership Program (RCPP) have been dubbed USDA's 'working lands' programs. For 2023, the Farm Bill provides $2.025 billion for EQIP, $1.0 billion for CSP, and $300 million for RCPP and the Inflation Reduction Act (IRA) adds funds for climate-friendly practices through EQIP ($250 million), CSP ($250 million) and RCPP ($250 million).

Both EQIP and CSP can currently provide technical and financial assistance to design managed grazing systems, install fence and water for rotational grazing systems, plant forage species, control invasive or woody species in grasslands, and a host of other conservation measures. The RCPP operates in targeted areas with a discrete set of eligible practices designed to achieve select conservation objectives; in areas where grasslands are targeted the RCPP can provide a flexible menu of options. Measured on an acres (not dollars) basis, from 2018 to 2022 the most popular practices funded by these three programs were watering facilities, brush management, prescribed grazing, livestock pipeline and fencing[4].

In the 2023 Farm Bill, National Wildlife Federation (NWF) and allies have proposed changes to the Farm Bill to make more funds available for practices that would benefit migrating wildlife such as virtual fencing, wildlife friendly fencing and water, and habitat restoration. Virtual fencing is a new technology that allows ranchers to move and track grazing animals with fewer fences, and it can provide benefits to migrating and local wildlife like antelope, deer, and prairie chickens[5].

Other USDA Conservation Programs

Traditionally the Conservation Reserve Program (CRP) and Agricultural Conservation Easement Program (ACEP) were considered 'set aside' programs that focused on marginal farmland, but both programs now provide substantial components that can benefit grasslands in active production. The Farm Bill authorizes 27 million acres of CRP enrollment in 2023 (about $2.1 billion in rental and other payments), and $450 million for ACEP. The Inflation Reduction Act provided another $100 million for climate-friendly ACEP agreements for 2023, but no supplemental funding for the Conservation Reserve Program.

The Conservation Reserve Program's 10-15 year contracts could be used as part of a long-term strategy to restore blocks of marginal cropland to grassland, or to plant grass buffer strips, filter strips and pollinator plots on cropland. The Grasslands CRP can be used to better manage and protect existing grasslands vulnerable to development or conversion to cropland.

Proposals for the 2023 Farm Bill from conservation groups include restoring incentives for enrollment that were reduced in the 2018 Farm Bill, more funds for installing fencing and water for rotational grazing during and after CRP contracts expire, restoring wildlife-friendly requirements for emergency haying and grazing of CRP land, and providing a preference or bonus for beginning farmers who enroll in CRP. Proposals have also been offered in Congress to

overhaul the CRP to replace the acreage cap with a dollar allocation and make the program more locally-led.

The Agriculture Conservation Easement Program provides funds to obtain permanent or long-term easements that protect grasslands and other farmland from development, typically using a local land trust to hold and manage the easement.

NWF and conservation allies have proposed the 2018 Farm Bill should require robust conservation plans on grasslands protected through ACEP, allow USDA to hold ACEP grassland easements (as it now does for wetland easements), and allow ACEP funds to be used for restoration and management of grasslands (not just acquisition of easements).

Conservation Compliance

The Farm Bill provides three requirements farmers and ranchers must abide by to obtain access to the many Farm Bill crop insurance, commodity program, conservation program, farm loan and other Farm Bill benefits. Swampbuster, enacted in 1985, prohibits farmers from draining or filling a wetland to grow crops on the land. Sodbuster, also enacted in 1985, requires that farmers have a soil conservation plan in place where they have highly erodible soil. Sodsaver, enacted in 2014, reduces the crop insurance subsidies available for several years on native prairie broken out to grow crops, but it only applies in six "Prairie Pothole" states: Iowa, Minnesota, Montana, Nebraska, North Dakota and South Dakota.

NWF and conservation allies have proposed that Sodsaver be expanded to cover native grasslands in all states, because native grasslands occur in a wide variety of states from California to Florida. Some conservation groups have also proposed that conservation compliance be strengthened to ensure modern scientific methods like satellite imagery are used to identify wetlands subject to Swampbuster, and ensure soil conservation plans are in place for all cropland under Sodbuster not just the one-quarter of cropland that is considered highly erodible.

Technical Assistance

Congress provided $801 million in 2023 for USDA's Conservation Technical Assistance program, which funds NRCS field office staff, conservation partners and Technical Service Providers who carry out conservation planning, education and outreach for farmers and ranchers. Unlike the conservation programs described above, funds for this program are appropriated annually by Congress rather than set aside every five years through the Farm Bill. Farmers and ranchers can ask USDA to provide advice and conservation planning for their grazing operations, and can get help applying for USDA conservation programs.

The Grazing Lands Conservation Initiative is a program that provides grant funds for state and regional organizations to provide grazing workshops and conferences and help establish rancher-to-rancher networks. Funding is provided annually by Congress, but in recent years the funding appropriated has fallen well short of meeting the need.

NWF and allies have asked Congress to reauthorize the Grazing Lands Conservation Initiative in the next Farm Bill and to provide dedicated funding for the program. Other organizations have proposed that NRCS be tasked with creating peer-to-peer farmer/rancher learning networks, and that the procedures for certifying Technical Service Providers be streamlined to increase the number of planning professionals available to farmers.

Farm Bill Opportunities

Farmers, ranchers and others with an interest in grasslands can help make the next Farm Bill do even more for America's grasslands by speaking out and writing about the importance of addressing the needs of America's grasslands in the next Farm Bill, and the need to protect conservation funding in the next Farm Bill.

Meeting with Members of Congress, attending events where they will be present, inviting Members and their staff to attend educational workshops and farm tours, and calling or writing Congressional offices are all ways individuals and organizations can influence decision-makers directly. Writing letters to the editor or opinion pieces for local newspapers and other media outlets, talking to reporters or inviting them to educational workshops and farm tours, sharing social media posts, and talking with friends, relatives and colleagues can help others have influence as well.

Conclusion

The 2018 Farm Bill provided about $6 billion per year for conservation programs that help farmers and ranchers understand and adopt better conservation systems. The Inflation Reduction Act of 2022 provided another $19.5 billion over the next several years to USDA to help farmers and ranchers adopt climate-friendly practices and systems. Owners and managers of grasslands have a huge opportunity to access those programs to get help paying for investments in better grazing plans, fencing and water for rotational grazing systems, brush removal and forage planting to renovate pasture and range, and other practices that will improve grassland management, boost their bottom line, store carbon in the soil and provide habitat for fish and wildlife.

Averi Reynolds, University of Wyoming

All of us can also work to ensure that the new Farm Bill continues to provide opportunities for grassland owners and managers and builds on these historic investments to restore, better manage, and protect America's grasslands.

GRASSLAND CRP AND WILDLIFE HABITAT

Patrick Lewis, USDA Farm Service Agency

Other Authors: Ivy Jean Reynolds, Alan Lange, USDA Farm Service Agency

In the last year, FSA has announced exciting new initiatives that focus on the need for production and conservation to work hand in hand when possible to work towards a more sustainable model. Through this, a landscape scale initiative has taken root in Wyoming where USDA and the State of Wyoming are working together to encourage landowners to install wildlife friendly infrastructure and implement resilient grazing plans through enrollment in grassland CRP and EQIP so that ranching can better exist alongside the migration of wildlife from Yellowstone National Park. This presentation will talk about the impacts grassland CRP can have on big game migration.

POSTER PRESENTATIONS

DETERMINATION OF THE SOIL CARBON BASELINE IN RANGELANDS OF PROTECTED NATURAL AREAS IN THE CHIHUAHUAN DESERT

Yanet Hernández Gaspar

Other authors: Francisco Torralba González 1, 1, Karla Liliana López García2 and Dulce Flores Rentería3

Abstract

The soil store carbon dioxide from the atmosphere through different processes, depending on the use and management of the land. For the Maderas del Carmen and Ocampo natural protected areas, one of the main conservation goals is to preserve natural habitats, ensuring an ecological balance and making a sustainable. The main productive activity in the region is extensive livestock. Different strategies have been explored for producers to modify their practices to ensure sustainable management. In this study, we established the baseline of sustainable management indicators according to the sustainable management protocol. Soils showed a low activity and low C with a high bulk density. Establishing this baseline will allow a starting point for a long-term evaluation different from those traditionally used when evaluating the productivity of the rangeland.

Introduction

Grasslands are among the most extensive ecosystems and cover around 16 billion acres, representing 26% of the world's land area and 70% of the world's agricultural area (Zhao, 2020). Soils have an enormous capacity to store carbon (C) from the atmosphere, sequestered through photosynthesis.

For the Maderas del Carmen and Ocampo Flora and Fauna Protection Areas (FFPA; Fig. 1), one of the primary conservation objectives is to preserve natural habitats and the most fragile ecosystems, ensure the balance and continuity of their ecological, evolutionary processes, together with a rational use and sustainable use of its natural resources. One of the main productive activities in these areas is livestock, which has traditionally been carried out over the years with little planning of the ecosystems inside and outside the protected natural areas.

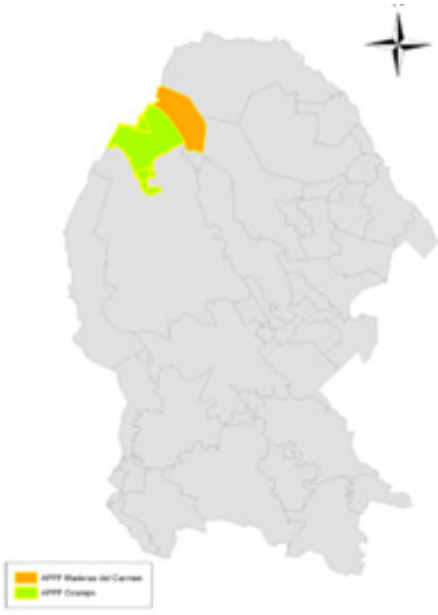

Figure 1. Location of Maderas del Carm en and Ocam Flora and Fauna Protection Areas

More recently, different strategies have been pursued to producers can modify their practices so that, from being a threat, it becomes a tool for the regeneration of ecosystems, which brings multiple benefits, including carbon capture. Such practices contribute to reaching the Sustainable Development Goals.

Producers have had positive results at first sight; one of them is the increase in plant cover; however, its evaluation is pending. Therefore, the objective of the study was to establish the baseline of carbon capture and storage in the soil in sites that will apply good livestock practices as a starting point for its subsequent evaluation following the Protocol for the assessment of Sustainable Soil Management (FAO-ITS, 2021).

Materials and Methods

The study was carried out in the Maderas del Carmen and Ocampo FFPA, located in the northwest of the state of Coahuila. Both areas add up to an approximate area of 1,365,662.49 acres. These FFPA are a representative portion of the Chihuahua desert, where the predominant vegetation types are microphyllous, rosetophyllous desert scrub, and grassland (Ochoa et al., 2018).

During the early summer of 2022 (July), nine sites with different use histories were evaluated (Table 1). In each site, the radial method (Fig. 2) was used to establish five sampling points for a total of 45 sampled points.

The following determinations were carried out in the field at each sampling point: soil respiration rate (during 60 seconds with an EGM-5 PP Systems, coupled to an SRC-2; Fig. 3), soil humidity and temperature, environmental humidity, and temperature, photosynthetically active radiation (PAR). In addition, a soil sample was collected to carry out subsequent determinations in the laboratory. The soil total carbon content was determined by Dumas dry combustion with a Flash analyzer.

Table 1. Historic land use at each studied site

Site	Land use
1	Rotational grazing/8 months rest/medium density
2	Rotational grazing/3 months rest/high density
3	Prescribed burn 2021/no grazing
4	Prescribed burn 2022/no grazing
5	Control without grazing
6	Natural fire 2011/no grazing
7	Continuous grazing/low density
8	Control without grazing
9	Continuous/high density grazing

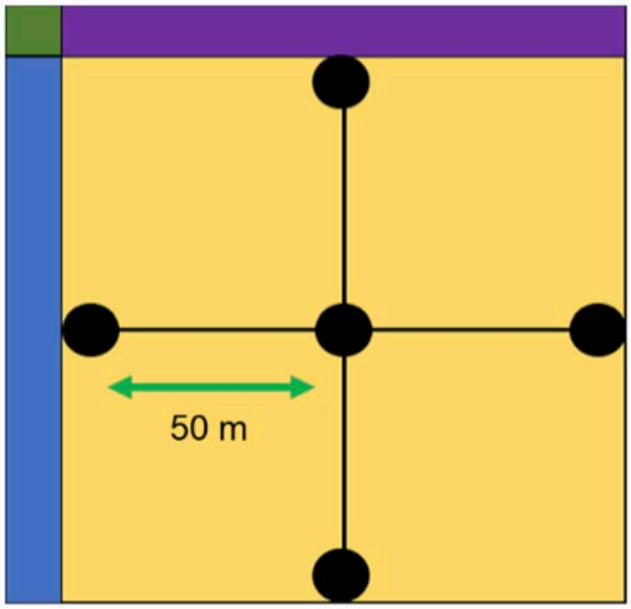

Figure 2. Plot sampling design

Soil productivity was determined by collecting plant biomass in 1x1m quadrats. The dry biomass of the vegetation collected once dried at 70ºC for three days was determined.

Figure 3. Soil respiration rate determination at Ejido San Francisco, Ocampo FFPA (top) and at El Carmen, Maderas del Carmen FFPA (bottom).

The following determinations were carried out in the field at each sampling point: soil respiration rate (during 60 seconds with an EGM-5 PP Systems, coupled to an SRC-2; Fig. 3), soil humidity and temperature, environmental humidity, and temperature, photosynthetically active radiation (PAR). In addition, a soil sample was collected to carry out subsequent determinations in the laboratory. The soil total carbon content was determined by Dumas dry combustion with a Flash analyzer.

Results and Discussion

The selected sites correspond to the most common practices of use (grazing) and conservation (burning) in the region (Fig. 4).

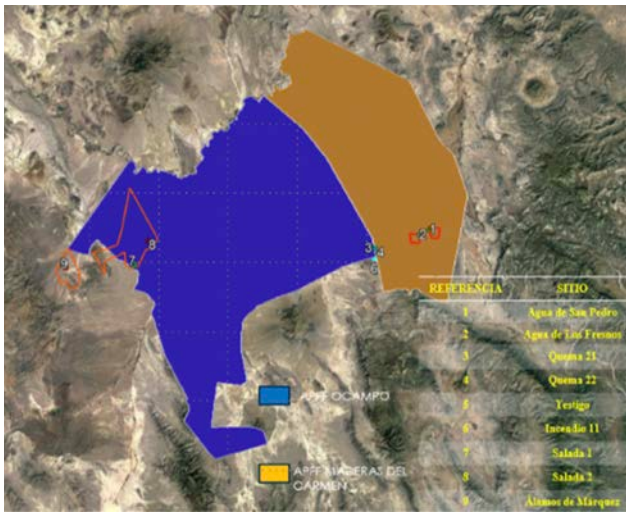

Figure 4. Distribution of study sites.

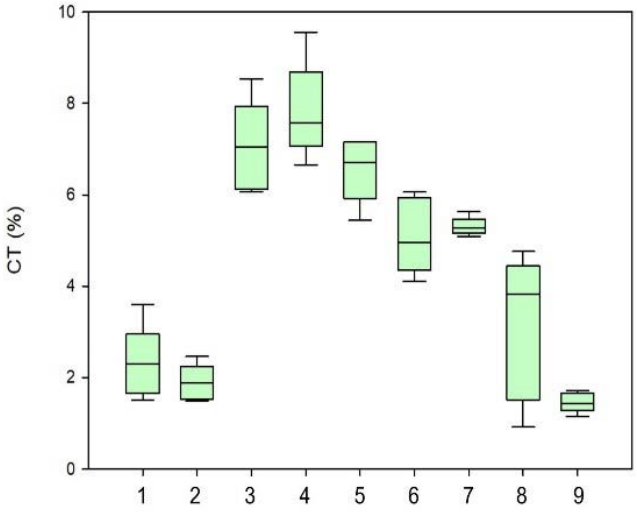

Figure 5. Soil carbon content at each study site. Box plot indicates the data distribution of the replicates.

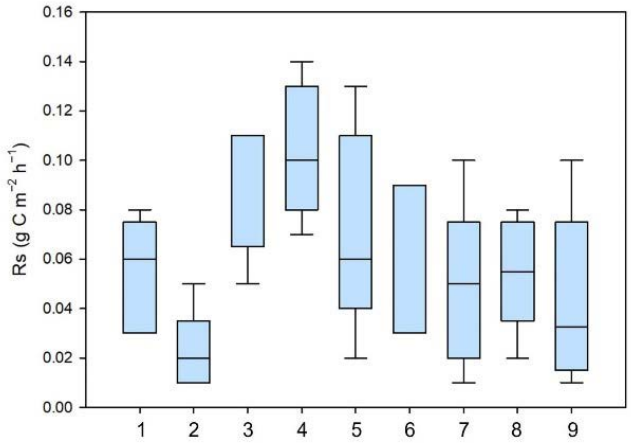

Figure 5. Soil carbon content at each study site. Box plot indicates the data distribution of the replicates.

The highest soil TC contents (Fig. 5) were observed in the most recent burning sites (2022 and 2021, sites 3 and 4), with a mean of 7.81% and 7.03%, respectively. Followed by the control site (site 5; 6.6%); and the natural burn site (site 6; 5.1%). In the case of the grazing sites, the TC content ranged from 5.3% (site 7, Salada North) to 1.47% (site 9, Álamos de Márquez). Similarly, the sites with the highest Rs were the sites with the most recent burning (2022 and 2021), with an average release rate of 0.104 and 0.092 g C m-2 h-1 respectively (sites 3 and 4), followed by the control site and the natural fire site (0.072 and 0.054 g C m-2 h-1). In the grazing sites 1, 7 and 8 presented very similar averages (around 0.055 g C m-2 h-1). The lowest Rs rates were presented by sites 9 and 2.

The sites with recent burns showed a higher C content and a higher release through respiration, indicating increased metabolic activity of the microorganisms. Fire can significantly impact soil C directly through the combustion of large amounts of organic matter (from the previously standing vegetation and the soil) or indirectly by affecting the soil's physical, chemical, and biological properties (Li et al., 2021). The long-term permanence of this C will depend on forming more stable pyrogenic C, becoming part of the long-term carbon reservoirs in the soil (Fontúrbel et al., 2021). However, a subsequent evaluation is necessary to verify this storage in the medium term. In the case of grazing sites, soil overgrazing modified the physical and chemical properties of the soil (Dlamini et al., 2016), reducing soil C content at grazing sites (specially 1, 2, and 9), and negatively impacting the microbial activity.

Conclusion

Although the data presented are still preliminary and require the incorporation of pending determination and a deeper analysis, establish a precedent as a baseline for what is intended to be a long-term evaluation different from those traditionally used to evaluate rangeland productivity, with a focus on soil carbon content and its multiple co-benefits.
The application of this Protocol in rangeland allows us to understand the impact of planned grazing systems or other pasture management practices as a restoration tool and mitigation mechanism for climate change's effects.

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FINDING A GEM: THE GRASSLAND EFFECTIVENESS MONITORING (GEM) PROTOCOL PROVIDES A TIERED APPROACH FOR HABITAT TREATMENT ASSESSMENT ACROSS PRIVATE LANDS INCENTIVE PROGRAMS

Rebekah J. Rylander, American Bird Conservancy (rrylander@abcbirds.org)

Other authors: Anna M. Matthews, American Bird Conservancy; Daniel Bunting, U.S. Fish and Wildlife Service; Michael C. Duniway, U.S. Geological Survey; James J. Giocomo, American Bird Conservancy; Anna Knight, U.S. Geological Survey; Adriana Leiva, U.S. Fish and Wildlife Service; Robert M. Perez, American Bird Conservancy; Kourtney Stonehouse, U.S. Fish and Wildlife Service; Derek Wiley, Texas Parks and Wildlife Department; Don Wilhelm, U.S. Fish and Wildlife Service.

Background

In recent years, there have been many successful voluntary conservation programs, such as the US Fish and Wildlife Service (USFWS) Partners for Fish and Wildlife (PFW) program and the Grassland Restoration Incentive Program (GRIP), that work with private landowners to restore critically declining grassland habitat in Texas. Though the success of these restoration and conservation programs are a step in the right direction to slow grassland habitat degradation and loss, few monitoring protocols exist that scientifically evaluate the extent to which habitat is successfully restored and if best management practices were used. Therefore, members of the USFWS, US Geological Survey, Oaks and Prairies Joint Venture (OPJV), Texas Parks and Wildlife Department, and Rio Grande Joint Venture (RGJV) developed the Grassland Effectiveness Monitoring (GEM) protocol which is modified from the Bureau of Land Management Assessment, Inventory, and Monitoring (AIM) strategy, and are compatible with data collected by the Natural Resources Conservation Service (NRCS) National Resource Inventory (NRI) rangeland on-site survey (Figure 1). GEM was also created to assess grassland response to management practices, which couples with avian abundance/density surveys, as the mission of many Migratory Bird Joint Ventures is to restore habitat and examine bird response to habitat restoration efforts.

What is GEM?

GEM is a statistically robust and user-friendly survey methodology to assess the effectiveness of best management practices used in restoring grassland habitat. It uses a spoke-and-wheel design where at each survey point, three 25-m transect tapes are strung out from the center of the spoke and spaced

evenly (120°) from each other (Figure 2) (Herrick et al., 2018). However, to account for vegetation trampling towards the middle of the point where gear and equipment are often placed, each transect tape begins 5-m from the center, allowing a 5-m radius "buffer zone."

GEM is comprised of four sub-protocols:

1. Line-Point Intercept (LPI): using a dropped pin every 0.5-m along the transect tape, this sub-protocol collects data on plant species or plant functional groups, vegetation height, litter depth, and overlying and embedded soils.

2. Vegetative gap and woody vegetation gap (Gap): along each transect tape, gap is measured as any break in any vegetation cover ≥ 20-cm. This measurement is repeated for woody vegetation only (≥ 0.5-m tall). These measurements estimate the spatial arrangement of vegetation and woody plants, as well as the amount of bare ground.

3. Plant Density and Composition: this sub-protocol consists of a belt transect that is established along the left side of the transect tape and is typically 6-m x 25-m (the length of the tape). Individual plants, typically characteristic native and invasive species of the region, are counted and recorded in height bins and classified as either alive or dead. For species like grasses and forbs where individual plants are difficult to count, surveyors can estimate ocular cover (percentage bins) over the entire transect or portions of the transect.

4. Species Richness/Inventory and Abundance (SRA): this timed protocol (typically 20 minutes) is performed within the spoke-and-wheel circle and allows the user to search and identify all plant species not encountered during the LPI or Belt sub-protocols.

A Tiered Approach

In addition to the four sub-protocols, GEM allows users to choose between three different tiered approaches, with each tier having varying levels of complexity, catering to expertise level, monitoring goals, budget, and project timelines.

- **Tier 1:** All plants within the survey area are identified to species. All four sub-protocols are run. Survey efforts can take up to 2 hours per point, and data is extremely detailed. Requires extensive plant knowledge.

- **Tier 2:** Only targeted plants (~50–150) within a region are identified to species and all others are identified to functional groups. Only the LPI, Gap, and Plant Density and Composition sub-protocols are performed. Survey efforts can still take ~2 hours per point, but knowledge on plant species can be trained or may already be known by biologists.

- **Tier 3:** All plants are identified to functional groups only. Instead of transect tapes, a step-point methodology is used, and at each point a minimum of only one transect must be surveyed. Only LPI and Gap data are collected. This tier is meant to be used as a rapid assessment of the treatment site (< 30 minutes per point), and users do not need plant identification knowledge like the other tiers require.

GEM Data Collection

Another benefit of GEM is that data for all four sub-protocols can be efficiently collected on any tablet or device capable of running apps created in ArcGIS® software by ESRI (Environmental Systems Research Institute, Redlands CA). Survey forms have been developed in ArcGIS Survey123 and have QA/QC functionality to assure data is collected correctly.

ArcGIS Field Maps can be used to assist surveyors with navigating to GEM sampling points. Once metrics are collected and saved using ArcGIS Survey123, data can be transferred into an ArcGIS Online account for further processing and analysis. Thus, managing paper data sheets or performing hours of data entry post-survey is eliminated using GEM.

Why GEM?

Because of GEM's flexible tiered approach, landowners and biologists can take into consideration project timelines, plant identification skills, and the complexity of the questions being proposed. GEM is already proving to be a statistically robust methodology to explain differences in grassland vegetation response to various management activities (mechanical shrub removal versus prescribed burn) within the OPJV's GRIP treatment sites (Matthews et al., 2023, this Proceedings issue). In 2024, analyses will be performed on GEM data collected across the RGJV in south Texas and in West Texas. Additionally, data collected using GEM is also compatible with data collected using AIMs and NRI methodologies, thus allowing for analyses to be conducted across larger landscapes. Therefore, by creating a standardized protocol that can be widely used in grassland restoration across North America, we may be better prepared to understand how management practices are influencing restoration efforts.

Acknowledgements

Any use of trade names is for descriptive purposes only and does not imply endorsement by the US Government.

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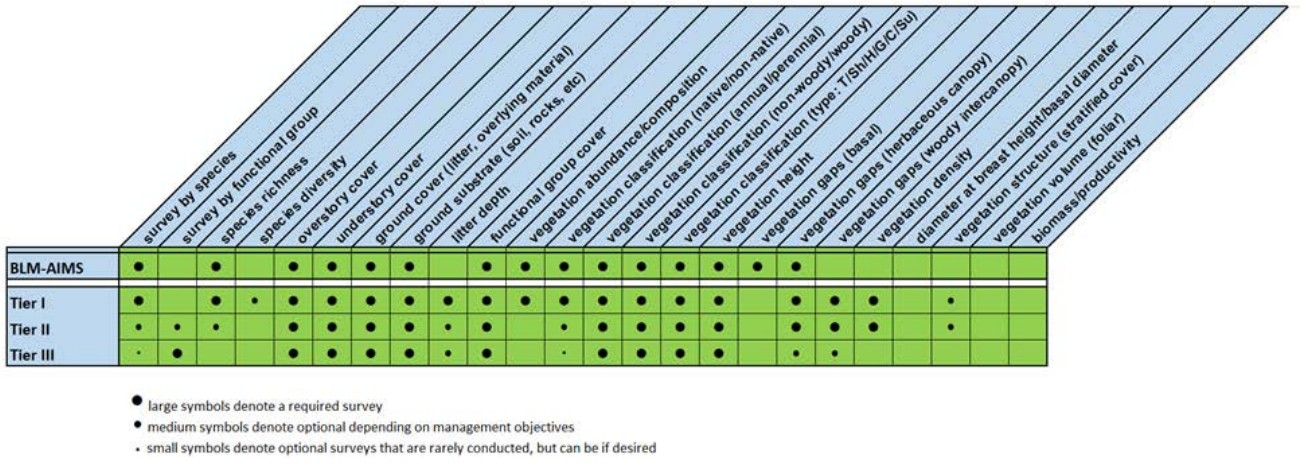


Figure 1. A comparison of the three GEM tiers and the BLM-AIM strategy protocol. Depending on the project goal and timeline, landowners and biologists can cater to their monitoring needs using different approaches with GEM.

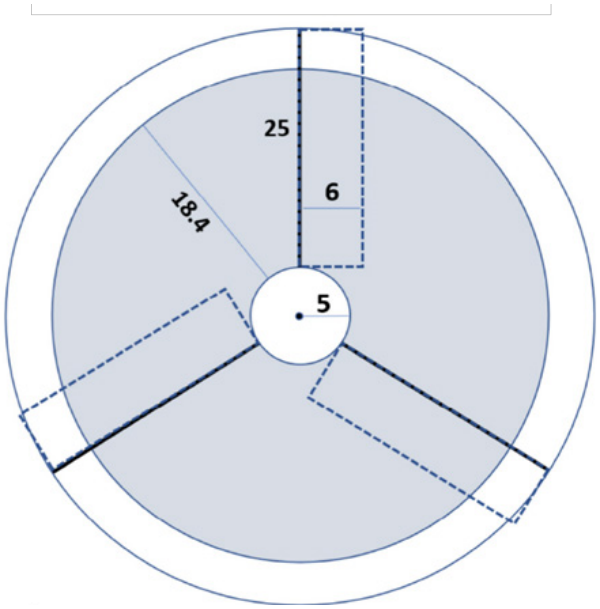


Figure 2. The spoke-and-wheel design of a single GEM sampling point. Given a 5-m buffer from the center point, each transect line is 25-m long and separated by 120°. Certain metrics (Line-Point Intercept and Gap) are collected along each 25-m transect. Plant density and composition measurements are collected within the 25-m x 6-m rectangle along each transect line. Species Richness/Inventory and Abundance data are collected within the shaded circle.

PRAIRIE BIRD BINGO! A CITIZEN SCIENCE EFFORT IN THE NORTHERN GREAT PLAINS

Nathan Reid, American Bird Conservancy

Other Authors: Kevin Ellison, Jessica Howell, and Jim Giocomo, American Bird Conservancy

Grassland birds have declined more than any other habitat group in North America. Therefore, many conservation efforts are underway to conserve habitats for grassland birds. Increased survey efforts for these species have been initiated through the US Geological Survey's Breeding Bird Survey (BBS) and the Integrated Monitoring of Bird Conservation Regions (IMBCR). Yet, the species distributions across vast rural areas complicate more even survey sampling efforts achievable in several species groups and habitats that commonly occur closer to human population centers and have more focused survey interest, e.g. shorebirds and birders; gamebirds and hunters/game management programs; raptors and migration count sites.

Simultaneous to the need for refined bird distribution and abundance data, greater public awareness to support conservation efforts is needed. A common question among grassland conservation efforts is how can conservation groups engage more of the public and raise awareness about the status of grasslands and grassland birds? To pilot a potential method for achieving both increased bird data and public engagement, we tested whether Cornell University's eBird (Sullivan et al. 2014) could be applied to engage citizens in science to survey grassland birds in remote areas that are often under-sampled.

Methods- During May 3-June 3 2022, we ran a pilot education/outreach activity called *Prairie Bird Bingo!* (PBB). We created a five-by-five cell bingo sheet with images of 25 target species (from top left to right: Sprague's Pipit, Burrowing Owl, Ferruginous Hawk, Western Meadowlark, Prairie Falcon, Mountain Plover, Short-eared Owl, Swainson's Hawk, Chestnut-collared Longspur, American Avocet, Baird's Sparrow, Thick-billed Longspur, Long-billed Curlew, Brewer's Sparrow, Upland Sandpiper, Sage Thrasher, Golden Eagle, Grasshopper Sparrow, Loggerhead Shrike, Sharp-tailed Grouse, Lark Bunting, Brewer's Blackbird, Greater Sage-grouse, Marbled Godwit, and Bobolink). We used the Long-billed Curlew as a center space as it is a flagship species for several projects that we conduct with landowners and outreach. We arranged species to complicate winning, yet facilitate different winning paths in different sub-areas where some

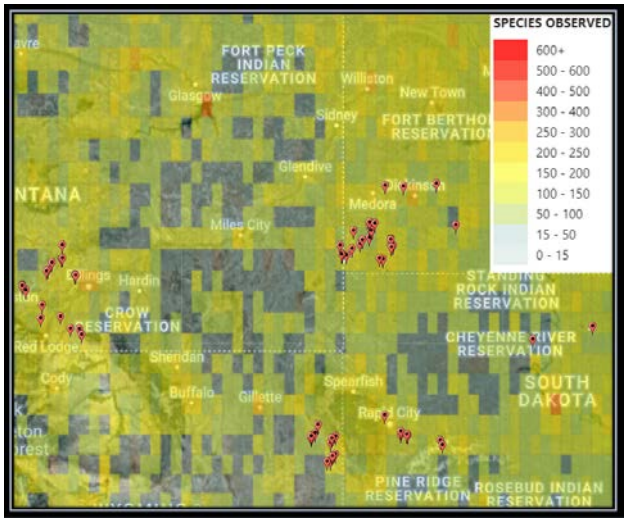
species are infrequent. We did this to better engage birders. We announced the game and the chance for winners to receive prizes through each state's Facebook Birding page for Montana, Wyoming, and the Dakotas. The announcement included the PBB card as a downloadable and printable file with rules. We constrained participation to southeast Montana, northeast Wyoming, and the western Dakotas with a simple ellipse on a map. Participants were instructed to type the words 'prairie bird bingo' in the comments section of each eBird checklist that they wanted to be counted towards the game.

To evaluate participant data, we uploaded monthly eBird data from each state and sorted checklists using the comments section column to exclude all sightings without the associated 'prairie bird bingo' words. We tracked each participant's progress towards a bingo using the unique ID field created by eBird for each user's account. Winners were notified by emails with addresses either obtained from their publicly available eBird profiles or through internet searches. Winners were provided e-gift cards of $50 value to birding related stores.

We assessed the species identified by the participants through the aggregate eBird data. We identified the locations for each checklist using the coordinates provided within the eBird data to assess geographic distribution of effort and to compare birding conducted by participants versus all other's during the same period using eBird data.

Results and Discussion - The online response appeared relatively active, with 105 positive reactions and dozens of comments and re-posts. During the 30-day game, eBird lists were submitted by 10 birders across all four states and included lists from 12 counties. Participants submitted 8,170 bird records, 954 of which were among the 25 species on the bingo card (only Bard's Sparrow and Sage Grouse were not detected). Checklists were distributed from around less-frequently surveyed areas (image below). Three participants scored a bingo.

We are planning a larger roll-out of the game in 2024, with goals of increased participation and diversity and value of prizes. We are considering how we might tier the game to engage novice and experienced birders, with a goal of getting more novices birding and growing the understanding of the uses of eBird. We may also explore using such a program to increase birder visits to lesser sampled areas (see Xue et al. 2016).



Map of PBB area with the locations (red pins) of all checklists submitted during the 30-d period, showing proximity to gap areas without checklists (empty pixels).

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SONGBIRD COMMUNITY RESPONSE TO GRAZING AND INFRASTRUCTURE ON A SAGEBRUSH STEPPE RANCH

Amanda Norton, Timm Gergini, and John Derek Scasta, Department of Ecosystem Science and Management, University of Wyoming Laramie

Spanning 165 million acres, the vast sagebrush habitat has been a defining feature of the American West. However, since European settlement sagebrush communities have disappeared from half of their historical range. Sagebrush and grassland habitats have historically been versatile for accommodating livestock grazing, human recreational activities, and diverse communities of wildlife. Although able to adapt to changing climate, sagebrush communities are now facing increased competition with invasive annual grasses and other exotic plants. Human urbanization and development also pose a significant risk to the health of these ecosystems. Extensive cattle grazing on sagebrush and grassland habitats and managing commodities regarding ecosystem health preservation is a common challenge among rangeland managers today. Many managers have advocated for the removal of livestock from semiarid rangelands to restore shrub coverage and improve biodiversity. In contrast, some suggest allowing livestock to graze in small quantities promotes seed germination and dispersal, increased fertilization, and plant growth.

With increased anthropogenic encroachment on critical sagebrush habitat, many wildlife species that depend on sagebrush for habitat selection are facing population decline. Competition for sagebrush cover at the local and landscape scales is most critical for sagebrush-obligate and grassland songbirds. Among the wildlife species, songbird populations are experiencing some of the most dramatic declines documented, particularly in grassland and shrubland ecosystems due to a variety of habitat disturbances. Functioning ranches may be a vital resource for migrating songbirds during their breeding season by providing nesting coverage and foraging opportunities. While the sagebrush steppe of Wyoming hosts diverse assemblages of such birds, their response to grazing management and infrastructure is relatively unknown. Monitoring songbird community responses to grazing management and infrastructure will yield insights for the provision of multiple ecosystem services on these rangelands. This research will present findings from point counts quantifying avian diversity relative to adaptive grazing management and infrastructure on a sagebrush steppe ranch.

The study site for this project is the University of Wyoming's McGuire Ranch located in Albany County, 30 miles northeast of Laramie along Highway 34. This study site is dominated by Wyoming Big Sagebrush (*Artemisia tridentata*) and native perennial cool-season grasses. This site is classified as a high-elevation sagebrush steppe rangeland. The ranch is 5,500 acres total, with about half of the ranch allocated to study 10 pastures on the southern end ranging in size from 96-367 acres. The 10 pastures will be divided into a prescriptive grazing treatment (5 herds with 10-33 cow-calf pairs) and an adaptive grazing treatment (1 herd with 100 cow-calf pairs) for cattle to graze June-September, respectively (Fig.1). The adaptive herd will graze a pasture for 1-3 weeks

and rotate through 5 total pastures while the prescriptive herds will graze one pasture for 12-13 weeks.

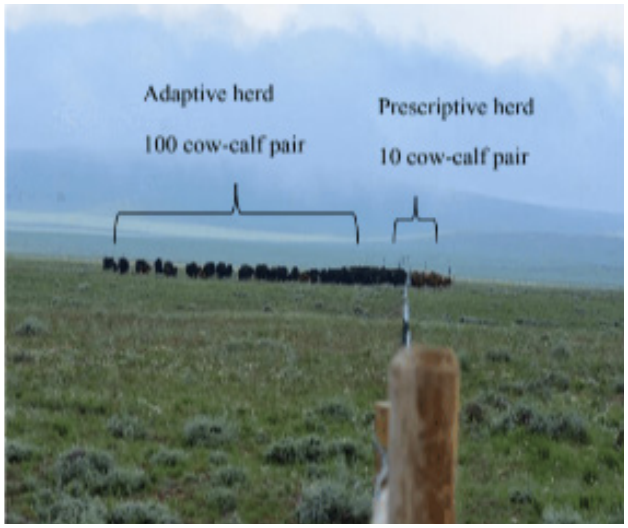

Figure 1. Angus herds socializing. The photo detials the difference between the adaptive (left) and prescriptive (right) grazing treatments.

Our preliminary results have shown that proportional abundance for the songbird community is dominated by three focal species. Horned Lark (*Eremophila alpestris*) which prefers areas with bare ground and sparse vegetation had the greatest abundance (59%) among all species counted on the ranch. Vesper Sparrow (*Pooecetes gramineus*; 15%) which prefers grass-dominated areas had the second greatest abundance. Brewer's Sparrow (*Spizella breweri*; 10%) which prefers areas dominated by sagebrush and/or saltshrubs had the third greatest abundance (Fig.2). Other species spotted during point counts were relatively low, with spotted occurrences ranging from one to five (0%-1%). Proportional abundance of songbirds remained steady throughout the breeding season, however, an increase in Brown-headed Cowbirds (*Molothrus ater*) and Cliff Swallow (*Petrochelidon pyrrhonota*) populations arrived later in the season.

Sagebrush-obligate songbirds are highly specialized species that respond poorly to disturbance. We predict long-term grazing may impact sagebrush-obligate songbird density by altering vegetation structure vital for nesting coverage and success. Continuous grazing in the prescriptive treatment could impact songbird populations more negatively as opposed to adaptive grazing which may facilitate greater habitat heterogeneity through the grazing season. The presence of large herd densities may also introduce brood-parasitic species that will disrupt nesting success among ground-nesting birds and sagebrush-obligate songbirds.

Grassland and shrubland ecosystems are facing wildlife population declines more rapidly than before. Avian communities across all habitats have experienced a near 50% decline in the last half-century. Habitat fragmentation of grasslands and shrublands has displaced several obligate songbirds that utilize these ecosystems for their breeding season. During migration, functioning ranches on rangelands may provide nesting coverage and foraging opportunities for breeding songbirds. The

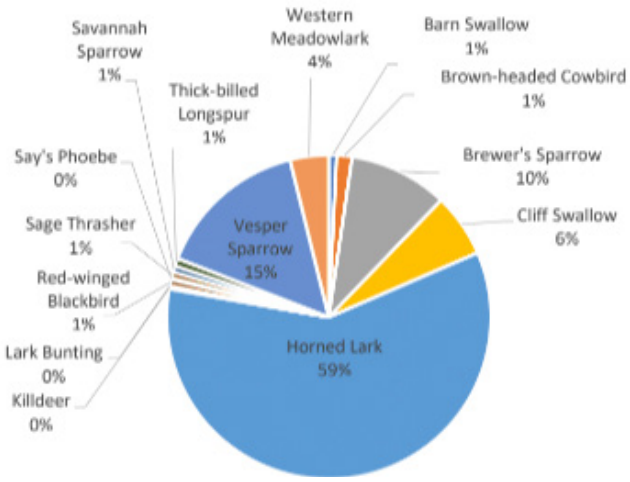

Figure 2. Proportional abundance of songbird presence on McGuire Ranch during peak breeding season for summer 2023. Horned Lark proportional abundance was significant to other songbird species.

use of point counts for this project will address important questions surrounding avian community population decline and response to disturbance. This project aims to understand the songbird community's response to grazing management and introduced infrastructure on a functioning ranch. Understanding avian response to disturbance may yield insights for future management strategies to protect avian species from further population decline in the context of working livestock ranches.

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DUCKS UNLIMITED'S WORKING LANDS AGRICULTURE PROGRAM IN MINNESOTA

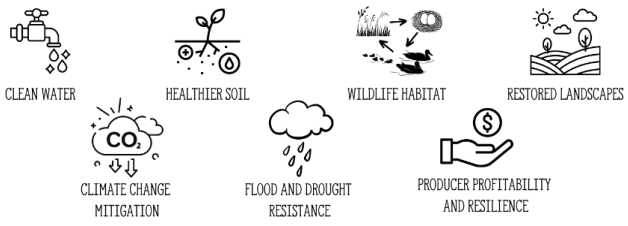
Sabrina Claeys, Ducks Unlimited

DU's Working Lands Team History: Ducks Unlimited's Great Lakes Atlantic Region (GLAR) established its Working Lands Agriculture Team in 2022. Their goals are to work more closely with private landowners, famers, and ranchers to address resource concerns in each of the GLAR's priority areas. The GLAR Working Lands Team is now a team of 12 and continues to grow rapidly. The Working Lands Team has developed partnerships with various organizations such as UDSA-NRCS, NFWF, ADM, and various state and non-government organizations. In Minnesota, they hired a Grazing Biologist in partnership with NRCS and NFWF to provide technical assistance to private landowners and livestock producers to implement and improve grazing systems on private working lands that foster sustainable and regenerative agriculture while promoting wildlife habitat conservation. This partnership between DU and NRCS is a win-win. NRCS can increase technical assistance capacity on grazing lands for their customers, while DU accomplishes their land management goals/objectives.

Minnesota Landscape History and Challenges: Native grasslands in Minnesota adapted much like many other Great Plains states, with fire and large grazing animals. While Minnesota contains a significant portion of the Prairie Pothole Region, Minnesota has lost an estimated 99% of our native prairie grasslands according to the Minnesota Department of Natural Resources. Although this native prairie grassland loss is significant, some acres have been restored to native and tame grassland through a variety of federal and state conservation programs.

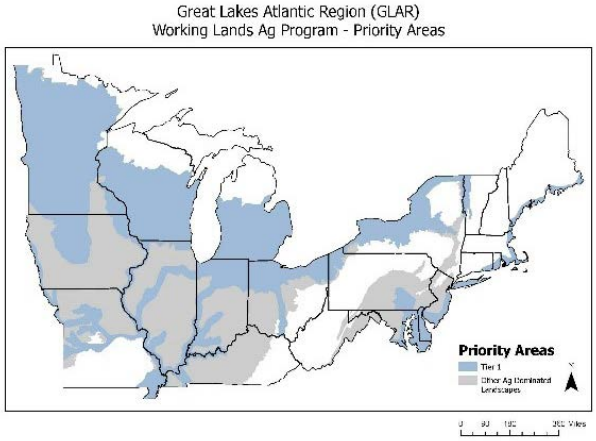
Other native grassland acres were converted to row crop agriculture. Additionally, with the loss of fire, grasslands are encroached with aggressive woody species, and competitive invasive species. Livestock producers are in search of new ways to boost sustainability and profitability. Thus, requests for technical assistance from livestock producers and private grassland landowners interested in grazing and grassland management is high and USDA's NRCS is primarily relied upon to provide technical assistance guidance to new and existing grassland management operations.

Prairie Pothole Region Goals: The western half of Minnesota is apart of the Prairie Pothole Region. Historically covered in native grassland/prairie and dense depressional wetlands. Deemed as "The Duck Factory", this part of the country is incredibly important breeding ground for migrating waterfowl. Over the past several decades, we have lost an astronomical amount of high-quality grasslands and wetlands, largely due to the increase of row crop agriculture. In turn, we've seen a tremendous increase in soil erosion, poor water quality, loss of quality wildlife habitat and other natural resource concerns. This working lands program plans to reverse those issues by rotating livestock, incorporating cover crops, restoring grasslands, and other practices. We are trying to advance short and long term ag friendly conservation on working lands.



Why is DU in the Agriculture Space: With the majority of the Eastern US being privately owned, the time is now to working with producers and not against them. We are striving to provide technical assistance backed by science, removing short-and long-term barriers to implementing conservation friendly agriculture practices. Together, we can create win wins for conservation and agriculture communities.

Why Grasslands and Grazing Management?
Grasslands are essential ecosystems to waterfowl species across the world which is critical for nesting and brood rearing habitat. Additionally, grasslands need livestock to maintain our native grasslands, as they are one of the best tools for managing our diverse grasslands. Unfortunately, our grasslands are continuing to be turned over to go into crop production, so every acre we conserve counts. Also, if we can promote rotational grazing to provide more nesting and brood rearing habitat, as well as a full sweet of improvements to the producer's operation. In addition to grazing management, other grassland management tools such as prescribed fire and woody control are high priority practices. Without prescribed fire, we see encroachment of unwanted woody encroachment and high fuel loads, which can lead to destructive wildfires.



King Ranch/Kendall Ranch

Grazing Biologists Duties: The number one deliverable we are focusing on is writing high quality grazing plans that will address resource concerns, create wildlife habitat, and will meet the producer's goals. The biologists work directly with the NRCS and livestock producer on site to develop a grazing management plan that works well for the producer. In the end, the producer has a resource to contact, a plan to move forward, and natural resource concerns being addressed. After practice installation these individuals will work to verify prairie pothole grassland conservation and sustainable land use outcome results. Additionally, the grazing biologists are tasked with conducting educational outreach to encourage folks to adopt the practices we are passionate about. Working in partnership with other NGOs, state and federal agencies to develop plans on public and private easement lands is another goal of these positions.

Program Future and Outcomes: Working grasslands provide high quality prairie wildlife habitat for many species, including native grassland birds and migratory birds including waterfowl. Native grassland birds evolved with large grazing animals and coexist well. In fact, grazing is critical to maintaining grassland plant health and diversity to provide high quality habitat in both prairie uplands and shallow seasonal and temporary wetlands. Before 2025, the biologist hired will complete 150 grazing plans, resulting 6,000 acres of managed grasslands. As this program grows, DU hopes to have more grazing biologists on board in Minnesota to work with more conservation minded producers.

TRANSBOUNDARY GRASSLAND PARTNERSHIP – COORDINATING CONSERVATION IN SASKATCHEWAN, ALBERTA, AND MONTANA

Cliff Wallis, Alberta Wilderness Association

Other Authors: Ruiping Luo, Alberta Wilderness Association; Carolyn Gaudet, Prairie Conservation Action Plan; Kevin Ellison, American Birds Conservancy

The Transboundary Grassland Partnership (TGP) works collaboratively to sustain healthy native biodiversity and the supporting grassland ecosystem and communities in the transboundary area of the Northwest Glaciated Plains of Saskatchewan, Alberta, and Montana. The TGP's purpose is to achieve better grasslands conservation outcomes by communicating, connecting, and collaborating across the TGP geography, which is centered around the Milk River Watershed (see map on Figure 1). This area supports hundreds of plant and animal species of conservation concern; several key habitat types, e.g. grasslands that support hotspots of biodiversity (WWF Canada 2022); and portions of core populations of several imperiled species (Somershoe 2018).

The TGP's current strategic plan has three main areas of activity, to:

- Engage and Connect— people and groups within the TGP geography.
- Collaborate—produce conservation outcomes within the TGP.
- Awareness—communicate the importance of the

TGP's conservation efforts to the broader grassland conservation community and the public.

Current efforts are focused on communicating the values of grasslands and expanding participation in the TGP, especially Indigenous Peoples and the ranching community. Our participants include governments, non-government organizations (NGOs), Indigenous Peoples, and producers. They help connect the many local projects to larger landscape level approaches and identify gaps in grassland conservation in the transboundary region.

A Core Team meets quarterly and the TGP holds an annual meeting of participants, with hosting responsibility rotating through the three jurisdictions.

Figure 1. Poster—Transboundary Grasslands Partnership

Aaron Kersh

The TGP's website is www.albertapcf.org/transboundary-grasslands

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STEWARDS OF SASKATCHEWAN: THREE DECADES OF ENGAGEMENT, PARTNERSHIPS, AND CONSERVATION OF SPECIES AT RISK HABITAT IN SASKATCHEWAN

Jordan Ignatiuk, Nature Saskatchewan,

Other authors: Kaytlyn Burrows, Emily Putz, Ashley Vass, Rachel Ward, Rebecca Magnus - Nature Saskatchewan

Nature Saskatchewan's Stewards of Saskatchewan (SOS) programs have been engaging and partnering with land stewards in voluntary stewardship since 1987, benefitting species at risk (SAR) and rare plants across southern and central Saskatchewan. Through voluntary stewardship agreements, stewards agree to not cultivate habitat for species at risk and rare plants, including tame or native prairie, shelterbelts and/or shorelines and to not knowingly destroy nesting sites. Stewards also agree to annually report the number of SAR on their land and any land use changes.

The SOS programs work with just over 1,000 stewards conserving approximately 925,000 acres of habitat and 147 miles of shoreline for many SAR and rare plants.

ROUND TABLE DISCUSSION NOTES

SAVING GRASSLANDS, SAVING RANCHERS: THE LATIN AMERICAN EXPERIENCE

Moderators: Jim Chu, Migratory Species and Invasive Species program International Programs US Forest and David Borre, Mexico Program, International Programs US Forest Service

Panelists:

- *Celene Moncayo –Natural Protected Areas National Commission – México*
- *Federico Shäffer – Aves Argentina (Alianza del Pastizal) – Argentina*
- *Robert Augspach – Producer – Argentina*
  Bildo Saravia – Producer - México

Discussion Notes

Roundtable goal:

Share histories about how Latin American partners are tackling grassland conservation, using science-based knowledge, but also local experiences.

Roundtable Development

1. For the first 20 minutes, each panelist had 5 minutes to introduce themselves and their work.

2. After those 20 minutes, the floor was opened to questions and dialog with the audience, some of the key aspects mentioned were:

a. Acknowledge the root problems of grassland degradation, with the intention of finding the best local solutions with the appropriate external input.

b. It's crucial to develop continuous training, education, and incentives for producers, avoiding contradictory subsidies, promoting market incentives, and showing how cattle genetics is related to profitability.

c. Water, this is a huge topic in North Mexico, corruption in water rights allocations is killing rural communities and causing water depletion.

d. Monitoring, we cannot make any decision without information, the ranch must be a profitable business and to achieve that, information is needed, both financial and ecological.

e. We must communicate inspiring histories from successful ranchers, the world is full of pessimist news about everything, and we must inspire ranchers to change.

f. Work with communities must be done, in the case of Mexico, almost 50% of land tenure is communal land, and we need to find ways and social tools to reach them, but definitely, we must not pretend that they are not there.

g. Work with the youths, we have lost an entire generation of ranchers that leave the rural life instead of going to cities looking for "opportunities".

Closing

The roundtable works to share a little about the LATAM experience, but due to the time, a lot of comments remained for outside talking.
More interchange between North and South America must be done and promoted by organizers, sharing knowledge can help all of us to achieve more sustainable, productive, and resilient grasslands and human communities.

INDIGENOUS KINSHIP CIRCLE AND DEVELOPING A SOCIAL WORKING GROUP FOR THE CENTRAL GRASSLANDS ROADMAP

Emily Boyd Valandra, Aimee Roberson, Katia Carranza, Ashley Gramza (Playa Lakes Joint Venture), Danielle Ross-Winslow; Ada Smith, Jennie Duberstein, Monica Rattling Hawk (Pine Ridge Oglála Lakhóta Oyáte, World Wildlife Fund), Tammy VerCauteren and Neal Feeken (Bird Conservancy of the Rockies), Katie Nuessly & Samantha Brooke (US Fish and Wildlife Service), Christian Artuso, Antoine Asselin-Nguyen (Commission for Environmental Cooperation)

Introduction

The purpose of this session at the America's Grassland Conference (AGC) was to bring together participants interested in the intersection of people and the North American Central Grasslands. Organizers created a space for sharing and holding a diversity of perspectives about what that means, including concerns for communities and the resilience of their cultures and livelihoods, human activities driving the loss of habitat and species, climate change-driven ecological transformation, and representation and inclusion of systematically marginalized groups in grassland stewardship. The session included presentations on the Indigenous Kinship Circle, research in progress on social science knowledge and needs for grasslands management, and input on formalizing a social working group for the Central Grasslands Roadmap (CGR; *see proceeding for Track 2: Central Grasslands Roadmap Initiative for more information*). It culminated with discussions to identify social topics that need to be addressed to improve outcomes for all human and non-human grassland communities. The following is a summary of the presentation topics and input from participants.

Indigenous Kinship Circle

The **Indigenous Kinship Circle** emerged from the inaugural summit of the **Central Grasslands Roadmap** in 2020 to elevate Indigenous voices, braid knowledge systems, and build bridges between many nations across Turtle Island who are in relationship with grasslands. The Indigenous Kinship Circle recognizes that the removal of Indigenous people and lifeways from their homelands and inequitable treatment of Indigenous peoples through ongoing colonialism has resulted in the precipitous decline of plants, animals, and ecosystem function. They are co-creating a cross-boundary community for Indigenous people and allies working to advance the wellbeing of Indigenous Nations, communities, and the living landscape as a whole.

Although each Indigenous Nation is unique, there are views and values that are shared. Indigenous values are well articulated as the "Four R's of Indigeneity" by LaDonna Harris—a Comanche woman—after dialoguing with Indigenous people around the world (Harris and Wasilewski 2004):

King Ranch/Kendall Roberts

- ***"Relationship is the kinship obligation,*** the profound sense that we human beings are related, not only to each other, but to all things, animals, plants, rocks–and the very stuff that the stars are made of."

- ***"Responsibility is the community obligation.*** This obligation rests on the understanding that we have a responsibility to care for all of our relatives."

- ***"Reciprocity is the cyclical obligation.*** It underscores the fact that in nature things are circular: for example, the cycle of the seasons and the cycle of life, as well as the dynamics between any two entities in relationship with each other."

- ***"Redistribution is the sharing obligation.*** Its primary purpose is to balance and rebalance relationships."

Indigenous people have always actively participated in the kincentric ecological systems on which we depend for identity, culture, nourishment, and well-being. Indigenous social-ecological systems are highly developed and complex. Since time immemorial, there have been laws and protocols around strategic, intentional burning in grasslands, sustainable agricultural systems, all forms of equitable harvest, and sustainable sharing of interdependent systems (these often referred to as "resources" in Euro-centric worldviews, but are considered kin in some Indigenous worldviews, including abiotic elements such as water).

From an Indigenous view, social and ecological issues are inseparable – a view that is an essential grounding principle for meaningful and effective conservation efforts. Yet, settler colonial conservation and land management itself has a history of violent removal and exclusion of Indigenous people and their perspectives from decision-making. Across North America, Indigenous people still suffer from violence, persecution, are still being forced to migrate from their lands and communities, are denied access to their homelands and sacred sites, and continue to be excluded from decision-making. Despite these continuing injustices, Indigenous people survive and our lifeways persist. Indigenous knowledge systems are scientific, testable, adaptable, and less prone to the

manipulations of privilege (e.g., gender inequity, class inequity and other abuses) than settler colonial knowledge systems.

Like Indigenous communities, other marginalized communities (including People of Color, low-income, and immigrant and environmental justice communities) also experience cross-scale forces contributing to ecosystem destruction, wildlife habitat, harm to human health, labor exploitation, conglomerate land holdings, and issues of access for small landowners. These communities, too, have the inherent ability to adapt and thrive, and they offer a wealth of lived experience and insider perspective for healing our social and environmental interconnections. The Indigenous Kinship Circle is working to develop an equitable approach to support the development of programs, policies, and practices that meaningfully involve and benefit historically excluded, harmed, and marginalized groups to advance their priorities for improving social and environmental conditions in the Central Grasslands and beyond.

Commission for Environmental Cooperation Grasslands Management Social Science Summary and Needs Assessment

Recognizing the importance of social science contributions in this space, this session included an update on research in progress funded by the Commission for Environmental Cooperation (CEC) to summarize social science work related to grassland management and understand the gap between social science needs and current and past social science work in this space across the central grasslands. Social scientists at the Playa Lakes Joint Venture are leading this work and it includes a literature review of social science related to grassland management in the Central Grasslands; a systematic Delphi process to gather information about social science needs, challenges, and opportunities among grassland management professionals, identification and prioritization of social science information needs to guide future efforts, and a summarization of three CEC surveys to understand challenges and opportunities for grassland conservation by ranchers, landowners, and agricultural producers in the U.S., Mexico, and Canada. *See conference proceedings "Social Science - What are We Learning and Coordinated Efforts Going Forward" for more information about this work.*

Developing a social working group for the Central Grasslands Roadmap

The Central Grasslands Roadmap has catalyzed collaboration in many focal areas (e.g., birds, soil, insects, land conversion) including human experiences on the landscape. A series of discussions began at the 2023 Pathways Conference (24 participants) and continued in this session at the 2023 America's Grassland Conference (40 participants), with the intent of building a broader social working group. To enable equitable participation, we discussed a foundation of ethical space, community norms, and overcoming the ways in which conservation has been, and continues to be, inequitable and harmful, excluding diverse voices, and failing to empower communities. Acknowledging the barriers created by oppression, we discussed skepticism, trust, and paths forward to authentic collaboration. With a focus on grasslands

as socio-ecological systems and centering social priorities, we gathered input on the questions below. These summaries represent the input from participants at both conferences.

1. What concerns people most about the future of the central grasslands

- Grassland conversion; water use and pollution; restoration expenses; carbon loss; biodiversity loss; development; state transformation; lack of diverse management practices; fortress conservation; loss of ecosystem functioning

- Exclusion of diversity and equity; reconciliation and equitable collaboration with Indigenous and marginalized people; lack of capacity; hopelessness; lack of collaboration

- Community impacts; rural communities; loss of cultures; livelihood loss; social resilience; environmental justice

- Differing political views; colonial institutions and practices; destructive economies and policies; political will on climate; competing pressures; socioecological approach; scale of threats; land grabs; interconnected social and environmental exploitation

2. Social issues we need to address to improve outcomes for people, wildlife, and nature

- Advancing inclusion, equity, diversity, and equitable collaboration with marginalized and local communities and building authentic relationships;

- Addressing inequitable distributions of risks and funding and addressing disparities and oppression;

- Coordinating efforts across sectors and scales; addressing research-implementation gaps; and connecting issues and efforts

- Employing a socioecological perspective that values all communities on the land

- Recognizing systems that contribute to perverse incentives and constrain conservation;

- Increasing awareness about importance of grasslands

3. Perceptions of who is involved and who missing in "conservation" of grasslands in the western Eurocentric paradigm:

- Missing: marginalized/excluded people - Black, Indigenous, and People of Color, low-income, immigrants; women; youth; workers; rural and urban people; environmental justice communities; community leaders; conservation practitioners; ejidatarios

- Included: Eurocentric views; white men; scientists; ranchers; landowners; wealthy people; federal and state agencies

- Needs: intentional and equitable engagement of marginalized groups; changing top-down approach; changing current narrow reflection of diversity; all working together respectfully; grasslands influencers; making youth feel welcome; ways to prevent people being overwhelmed; materials in accessible formats

4. Ideas for strengthening connections and growing a network for social issues:

- Community: establish community of practice;

resources for hiring personnel; wisdom and mutual care (recognizing common threats); structured collaboration and interdisciplinary approaches; strengthen conservation social networks to provide better outcomes for grasslands

- Equity: equitable collaboration; support existing efforts; inform movement with community priorities; invitation not enough (space must be welcoming); support Indigenous language revitalization; youth engagement; focus on wellbeing for all species and people; diversity of conservation approaches

- Economic: tangible economic analysis/discussion; understand costs to achieve conservation goals; more funding for Indigenous Nations and locally-led efforts; funding from carbon tax

- Communications: increased communication, coordination, and collaboration; regular dialogue (online spaces; bridging gap of time); mutual check-in and sharing; clear goals and expectations; creative use of all media to generate support for Indigenous science

Next Steps

Coming together provided an opportunity to build and strengthen relationships. It was the beginning of conversations for some. For others, it was a continuation of ongoing efforts. In order to address the systemic issues facing North America's Central Grasslands, we must be in relationship with each other and work together to create equitable pathways for dialogue and decision making. We must support reciprocity and just redistribution - rebalancing power, privilege, and resources. The Indigenous Kinship Circle is working to support the persistence of Indigenous knowledge systems, ancestral kinships, and the reconnection of

Averi Reynolds, University of Wyoming

Indigenous communities with their homelands. In addition, the Indigenous Kinship Circle strives to build bridges between two worlds and to advance equitable engagement; however, this is not a replacement for the genuine investment of time, energy, and funding for practitioners and organizations to work directly with the Nations and communities on whose lands they live and work (anywhere on Turtle Island). We recognize that this approach may make some people uncomfortable. Bringing together different knowledge systems and lived experiences will not come without growing pains. Recognizing the harm that historic and current systems and efforts cause is not easy. Addressing the complex social issues impacting all communities that depend on the Central Grasslands requires us to take responsibility for our words, actions, and each other as relatives. Only then will we be able to move forward together in reconciliation to help the grassland biome to thrive.

Literature Cited

Harris, L.D. and J. Wasilewski. 2004. Indigeneity, an alternative worldview: four R's (relationship, responsibility, reciprocity, redistribution) vs. two P's (power and profit). Sharing the journey towards conscious evolution. Systems Research and Behavioral Science. https://doi.org/10.1002/sres.631

RANCHER AND CONSERVATIONIST PANEL

Six grasslands champions from diverse background in ranching, conservation and policy had three minutes to introduce their role in grasslands conservation, and address a question posed by the moderator. In staying consistent with the conference theme of "Re-connecting America's Grasslands" the questions covered broad topics that relate to how best to connect grassland conservation efforts across social, political and geographical scales and to, as the closing keynote FWS Regional Director Matt Hogan states, harness the collective intelligence of grassland conservationist.

Moderator
Seth Gallagher of the National Fish and Wildlife Foundation

Panelists
Dale Veseth, Rancher Stewardship Alliance
Jim Faulstich, South Dakota Grassland Coalition
David Willms, National Wildlife Federation
Tracy Rosenberg, Abbey Grasslands of the Prairie Coteau
Shaun Grassel, Buffalo Nations Grasslands Alliance
Jorge Bildo Saravia Fuentes, Rancho el Ojo

Excerpt

Gallagher: Tracy, several presentations and sessions this week have focused on elevating diverse voices in grasslands conservation, how does this community continue?

Rosenberg: I believe that in order to find solutions to heal our grasslands we must first heal our relationships. While it may not be evident here, many times I witness a monoculture of voices crafting solutions, and with all due respect, those voices are often those of white men.

In other words we lack biodiversity in more than our grasslands. We must respect and embrace other voices, voices that might not exactly parrot our own thoughts:

First, Indigenous voices need to be heard and embraced for their Traditional Ecological Knowledge on the topic of grassland importance. Tribes have not only coexisted on prairies, they helped form the prairies. They need a voice at the table. Western science, while valid, isn't the only path toward a shared common goal.

Secondly, Women are natural nurturers, courageous protectors, and defenders of life. They deserve an EQUAL voice in committees and in leadership positions. And please, don't just give them the role as secretary or recorder, or someone who posts on social media, but give them an actual voice at the table. And then listen.

Third—there are important voices to be heard outside the 2nd, 3rd, 4th, 5th generation ranch family. We need to embrace those outside this normally heralded prototype. Individuals with fresh ideas, ones that are not wed to dogmas that must be painstakingly rewritten.

Mcquire Ranch/Derek Scasta

So while we mine for solutions into the future, I ask that we examine our top tiers. If it is a monoculture—12 white men from similar backgrounds, then you lack the diversity that is necessary to seek deep and complex solutions to problems, lack what is needed to build bridges, to coalesce into a solid rich team promoting such a noble goal as saving Americas grasslands.

While it may be convenient to choose voices in which everyone is alike and agrees, it is diversity of thought that drives lasting change. In other words, we need each other, especially the "other".

Last night I quickly counted the names on the participant list and found that here in attendance are approx. 133 women, and 126 men, nearly equal representation of genders. We've had both female and male presenters, and a rich diversity of voices have been heard. This is what makes this conference strong and resilient and powerful far into the future.

Please let us strive to be the "biodiversity" that we ask for to save our own grasslands.

CLOSING KEYNOTE

HARNESSING THE COLLECTIVE INTELLIGENCE OF GRASSLAND CONSERVATIONISTS

Matt Hogan, U.S. Fish and Wildlife Service

I'd like to start by acknowledging that we are on the Traditional homelands of the Cheyenne, Arapaho, Crow and Shoshone peoples.

And to note that yesterday was International Indigenous People's Day and recognize that we are here today because of the stewardship of Indigenous nations across Canada, the US and Mexico and their knowledge of and relationships with the land will be critical for the future of grasslands.

My name is Matt Hogan, and I am the regional director of the Fish and Wildlife Services Mountain-Prairie Region (or as my colleague John Carlson, our grassland lead calls it, the Prairie and Mountain Region. But more importantly, I am a product of the eastern deciduous forest that fell in love with the prairies and ultimately moved West to help work on their conservation.

Thank you to all the sponsors of this conference and for all the people who made the last 3 days possible. Let's give them all a round of applause.

Well, as I stand between you and both door prizes and departures for home, with the job to summarize the last few days and reflect on where we go next and do it in 15 minutes or less! Well, I'd suggest that is an impossible task but hope I can share some thoughts that might help as we think about where we go from here.

When asked to provide the theme for my remarks ahead of the conference, I said harnessing the Collective Intelligence of Grasslands Conservationists.

As I reflect on that theme now and having listened to all of the amazing speakers and participants, I am in awe of the collective intelligence in this room and at this conference.

But I also now believe that we have to both continue to harness this collective intelligence BUT ALSO figure out how we attract and harness the intelligence of others NOT in this room, not in this community and not part of the existing efforts to save our grasslands.

And while I am far from equipped to provide all the answers, I hope I can share some observations that will hopefully spark some creative thinking.

I'd like to start by reflecting on the words of wisdom we heard from two great philosophers at our opening plenary session: Ralph Waldo Emerson and Mr. Rogers.

As Emerson said, "To be great is to be misunderstood". And from Mr. Rogers, "As human beings, our job in life is to help people realize how rare and valuable each one of us really is". Emerson's observation implies that, usually, the

King Ranch/Kendall Roberts

general population does not accept or understand greatness. I would contend that we can extend that to suggest that the general population does not accept or understand the greatness of our grasslands in North America.

From Mr. Rogers, we learn that we are all rare and valuable and we can all contribute uniquely to our efforts to save grasslands.

So how do we each figure out how we can harness our unique contributions to not only demonstrate how great and important our grasslands are but increase the scope and scale of our efforts to save them.

However, I do think it is important to reflect on the amazing increase in investment and attention that has already been brought to our grasslands because of the work of so many in this room and so many others who could not be with us today.

Side note here: most of my awareness of these investments are centered around the work done in the Central Great Plains because I am most familiar with this work, but I recognize that I will likely not capture everything that is being done in the Great Plains let along what amazing work is happening in other grassland systems around the continent.

I also want to note, and I thank my friend and colleague, Neal Feeken for this observation. What sets this conference apart from many others on conservation is the generally upbeat and positive attitude that you can feel in the room. So, thank you for that.

So, On to the Observations:

- While we have plenty of room for improvement, I feel like the efforts to include indigenous voices in efforts around grasslands is better than other areas in the conservation world and one in which I believe many are committed to improving.

- We have amazing local and state-based partnerships centered around grasslands like the Ranches Stewardship Alliance, Winnet ACES, South Dakota Grasslands Trust and others that are doing amazing work and helping to spread the word to other communities.

- We have many organizations that are investing significant time and money in advancing and accelerating grassland conservation and we are seeing an unprecedented number of new resources coming to these efforts.

- In the Central Grasslands Roadmap, we have a landscape level planning tool that will help guide our work and that also represents a space where folks have worked hard to ensure indigenous voices are not only included but are helping to lead the effort.

- And we have the 8 Joint Ventures that cover the central grasslands coming together to help serve as the delivery arm of the Roadmap.

- We have increased momentum in Congress around the importance of grasslands and growing support for a North American Grasslands Conservation Act

- We have leveraged millions of dollars of funding from NGOs, Foundations, private philanthropy, and agencies and invested that money in strategic conservation efforts.

- We have and continue to develop science that not only helps to guide our work but also helps highlight the importance of grasslands for people, fish and wildlife.

- We have developed amazing outreach efforts that not only highlight the amazing work that is being done in grasslands but that helps connect people around the country with these landscapes.

- And likely many many more that I am not aware of

However, as I reflect on the last few days and all the good work, I think we must channel Emerson and Rogers and use the uniqueness of each and every one of us to not just continue the great work that is occurring but to challenge and reassess paradigms and process.

Innovation is critical and we must figure out how we expand our efforts, bring new voices to the discussion and think about where we have gaps in our capacity to address the challenges that we face.

We have to endeavor to break down the silos that exist between our respective organizations and as another good friend and colleagues suggested, not let egos and logos get in the way of our efforts.

We have to constantly think about what voices are not being heard and make sure that efforts to bring new voices to the conversation are not just done to check a box but are done truly think about old problems in new ways.

We need to identify and think of ways to overcome barriers that we are facing now while also thinking about what future barriers await us and not be bound by old ways of thinking about those future challenges.

And we need to figure out how we channel the energy that has been generated the last few days once we return to our individual places and spaces and not allow the tyranny of the urgent (like the piles of unread emails and unanswered phone calls that likely await us all) does not distract us from our important work.

As we wrap up our time together, I ask that each of us reflect on a few questions.

First at the individual level, how will you use your unique abilities keep the conversations from the meeting going and turn them into action?

At the organizational level, how do we work together to identify barriers (new and old) to our collective work and how do we work together better to address those challenges.

How do we ensure we replicate successes while not duplicating efforts?

How do we work together better to complement each other's efforts while not competing against each other for resources?

And how do we bring other resources, skill sets, backgrounds, perspectives, organizations, and individuals to our efforts to build on and grow our successes.

And finally, a suggestion. I would submit that most of what I suggest will not happen without purposeful action. To that end, I would suggest we convene a group of leaders in the grassland effort to come together on a regular basis to determine what collective efforts we need to build on the momentum that has been started at this sixth

Aaron Kersh

biennial conference and think about what we need to do to achieve our goal of reconnecting America's Grasslands.

Thank you all for what you do - it is important and noble work.

Safe travels, enjoy the rest of the summer and I look forward to seeing all the amazing work you have accomplished when we meet again for the 7th biennial conference.

National Wildlife Federation
1200 G Street, NW, Suite 900
Washington, D.C. 20005
www.nwf.org