Symposia Program and Abstracts Monday, Wednesday and Thursday Ball Room

Monday

1:00 to 3:00 Symposium A
Prescribed Fire Seasonality: New Insights from Research on Fire Effects in Remnant and Reconstructed Tallgrass Prairies
Host: Tallgrass Prairie and Oak Savanna Fire Science Consortium
The presenters in this session have studied contemporary prescribed fires and will share insights on the effects of burns conducted during the growing season and dormant season. Their studies represent a range of spatial scales, experimental methods, and response variables (including the plant community and insects).

Moderator: Craig Maier, Tallgrass Prairie and Oak Savanna Fire Science Consortium
1:00 to 1:10 Introduction, Craig Maier
1:10 to 1:30 Dr. Thomas B. Bragg, Professor of Biology, University of Nebraska Omaha, Omaha, NE. tbragg@unomaha.edu
Trends in a 40-year-long fire seasonality and frequency experiment

1:30 to 1:50 Dr. Devan A. McGranahan, Research Ecologist, USDA-Agricultural Research Service Livestock and Range Research Laboratory, Miles City, MT. devan.mcgranahan@usda.gov
Barriers to a summer fire regime in northern prairies: Ecological, physical, and social

1:50 to 2:10 Justin Thomas, NatureCITE, Springfield, MO. justin.thomas@naturecite.org
Floristic quality response to non-dormant season fire in Missouri and Kansas prairies

2:10 to 2:30 Bethany Roberton, PhD student, Department of Entomology, North Dakota State University, Fargo ND. bethany.roberton.ndsu@gmail.com
Short-term impacts of seasonal burn treatments on plant diversity and pollinator recruitment in a tallgrass prairie

2:30 to 3:00 Discussion, Questions and Answers, Craig Maier

Abstracts:
S1 Trends in a 40-year-long fire seasonality and frequency experiment, Thomas Bragg
Research plots established in 1978 assess the long-term effects of fire frequency and season on restored tallgrass prairie. Results show Species Richness increased with all fire treatments, although the greatest increase occurred with 4-year interval spring burns and annual fall burns and least with annual spring burn. Among all treatments, Species Richness increased the most with annual fall mowing and 4-year mowing in the spring, although, the average cover of smooth brome increased with mowing but declined in the burn treatments. These results are site specific. For example, at a replicate research site where smooth brome cover was high (20% cover in 1980), smooth brome decreased only in annual burn plots, increasing in all other mow or burn treatment, irrespective of treatment season or frequency. Individual species responded differentially to fire frequency and season with, for example, white prairie clover (*Dalea candida*) increasing with all annual burns except those in the summer whereas leadplant (*Amorpha canescens*) increased mostly in 4-year interval spring and fall burns, also doing poorly with summer burns. The results reinforce the concept that a diverse regime of fire and other perturbations is important to maintaining a biologically diverse and functional prairie.

S2 Barriers to a summer fire regime in northern prairies: Ecological, physical, and social, Devan McGranahan
Prescribed fire management in the Northern Great Plains typically consists of dormant season burns in the fall or early spring and early growing season burns in the late spring. Because substantial evidence suggests an active summer burning period characterized pre-colonial fire regimes, there is increasing interest in conducting prescribed fire during the growing season. Alongside a spring fire patch-burn grazing treatment, researchers in North Dakota also attempted to implement a spring and summer fire regime in which one half of a 16 ha patch was burned in the spring, and the other half slated for summer fire that same year. We assessed the success of the summer fire regime treatment with respect to the frequency of summer fire across project years and the completeness and severity of the burns that were conducted by analyzing remotely sensed data. We found that in several years, few or no summer burns were successfully completed. Barriers to summer burn implementation included “too wet” conditions—high relative humidity and high fuel moisture—and “too dry” conditions during which burn bans were often a limiting factor. When burns were conducted, spread and severity were generally lower than adjacent spring burns. We discuss meteorological factors that disproportionately affect growing-season vs dormant-season fire, especially

in agricultural regions, and contrast the objectives and expectations of modern growing season fire regimes against how summer fire likely looked on pre-colonial landscapes.

S3 Floristic quality response to non-dormant season fire in Missouri and Kansas prairies, Justin Thomas
Many of the remaining Tallgrass Prairie fragments in western Missouri and eastern Kansas are transitioning from high-quality (determined by mean C-values), highly ordered (determined by Shannon diversity), open grasslands to low-quality, chaotic, natal/novel communities dominated by shrubby/thicket species (*Rhus, Rubus, Cornus, et al.*). However, many prairie fragments remain dynamically stable in high-quality states, even with only a fence between them and an adjacent collapsing prairie system. The consistent difference in management is the timing of prescribed fire. Prairies that are regularly burned before mid-February (end of the dormant season for this region) are dynamically stable or increasing in quality. Prairies burned after mid-February, and increasing with the calendar, are collapsing. Nitrogen cycling is the likely driver of this mechanism. An evidence-based holistic perspective/synthesis is presented to support these claims.

S4 Short-term impacts of seasonal burn treatments on plant diversity and pollinator recruitment in a tallgrass prairie, Bethany Roberton
Our research examines the impacts of prescribed fire timing on flowering plant communities, nectar investment, and pollinator visitation within the first growing season following burn application. We performed three experimental seasonal burn treatments (spring, summer, or fall) in a tallgrass prairie near Americus, Kansas. We examined (1) the response of the flowering forb community in terms of density and diversity, (2) how individual milkweed plants (*Asclepias* spp.) invested in nectar to recruit pollinators, and (3) the composition of pollinators visiting milkweed plants. We found that burn timing did not affect flowering forb density but did impact flowering forb diversity: It was lowest following spring burns, whereas summer- and fall-burned plots were more diverse. In contrast, burn timing did not influence nectar sucrose concentration of milkweed plants nor the abundance and diversity of visiting pollinators. Overall, while individual plant investment strategies and pollinator recruitment may be more sensitive to other factors, the timing of prescribed burns seems important in promoting flowering forb diversity, which could have important downstream consequences on the diversity of pollinators and other animal communities.

3:30 to 5:30 Symposium B

Insects: What we don't know and how you can help!
Host: BugGuide.net, Department of Plant Pathology, Entomology, & Microbiology, Iowa State University, Ames, IA
"How can we be responsible stewards and conservators of threatened habitats when we do not even know the resident fauna?" Dr. Dan Young, University of Wisconsin-Madison Entomology

It's 2023. Farmers know the insects of corn fields and bean fields. Gardeners know the insects that threaten their backyard crops and we all know the monarch – an international symbol of renewal and perseverance – but how well do we know the rest of the insects in the prairies, remnant and planted? Or in the oak savannahs and woodlands? Just how much do we not know? Join our panel of 2 entomologists, a conservation biologist, and a prairie ecologist to explore what is not known about insects in native habitats and how you can help fill the gaps. From missing information about host plants, life cycles, and distribution to finding species new to science, this panel will explore and provide guidance on how professionals can work with enthusiasts, naturalists, and citizen scientists to make a big difference for some of the smallest animals. Following the presentations by the four panelists, two local insect enthusiasts will share their inspiring work and join the panelists for questions.

Moderator: Megan O'Donnell, Research Data Services Lead and former Entomology Librarian, Iowa State University Library, Ames, IA.

3:30 to 3:35 Introduction, Megan O'Donnell

3:35 to 3:55 Dr. Jessica Petersen, Invertebrate Ecologist, Minnesota Biological Survey, Department of Natural Resources, Saint Paul, MN. Jessica.d.petersen@state.mn.us
Insect conservation by accelerating learning

3:55 to 4:15 Chris Helzer, Nebraska Director of Science, The Nature Conservancy, Aurora, NE. chelzer@TNC.ORG
Learning to see the prairie through the eyes of insects

4:15 to 4:35 Dr. Greg Courtney, Professor of Entomology, Department of Entomology, Curator of Iowa State Insect Collection, Iowa State University, Ames IA. gwcourt@iastate.edu
Aquatic insects of upper Midwest wetlands: A "well known" fauna that isn't

4:35 to 4:55 Jay Watson, Conservation Biologist, Department of Natural Resources, Madison, WI. Jay.Watson@wisconsin.gov

Native bees in our prairies, what's all the buzz about

4:55 to 5:05 Jim Durbin, Insects of Iowa website, https://www.insectsofiowa.org

5:05 to 5:15 MJ Hatfield, rearing insects yields new information, mjhatfield@oneota.org

5:15 to 5:30 Questions and Answers, Megan O'Donnell

Abstracts:

S5 Insect conservation by accelerating learning, Jessica Petersen

I am regularly challenged to help make conservation decisions about rare and declining insects despite a lack of complete biological information or experts. Poweshiek skipperling (*Oarisma poweshiek*) is federally listed, with less than a dozen populations in the wild and we know little about the factors that caused its decline, or the ways in which we might recover the species. Examples like this are a call to action, to collectively better understand the biology and ecology of prairie insects as many species may follow the same path. One species that we know some things about is the regal fritillary (*Argynnis idalia*). As a federal candidate for listing, we need to accelerate our collective understanding of this species by working together before it is too late.

S6 Learning to see the prairie through the eyes of insects, Chris Helzer

My passion for insects started when I began exploring the world through the macro lens of my camera. It grew stronger when I started learning the stories behind the insects I photographed and then started to link those stories to the kinds of prairie management and restoration work I was involved with as a land steward and scientist. I also started to realize that my frustration with my lack of knowledge and understanding of the insect world was shared by many, including people who had dedicated their career to entomology. I had lots of questions that couldn't be answered; not because I couldn't find the answer but because no one *had* the answer. Recognizing those big gaps in our collective knowledge about insects has spurred me to learn as much as I can – and to share what I learn with as many people as I can. I've increased the number of observations I share with Bugguide.net and other sites. I pay extra attention to the insects I know and look for patterns of behavior, especially in terms of how they respond to land stewardship treatments. I try harder to learn the natural history of the insects I see so I can share those stories with others and boost the number of people who care about insects. Mostly, though, I pay special attention to insects because it makes my life much more interesting. It'll make yours more interesting too – guaranteed.

S7 Aquatic insects of upper Midwest wetlands: A "well known" fauna that isn't, Greg Courtney

The science of Entomology has the unique task of understanding the most diverse group of animals on Earth, of which most (perhaps 85%) remain undescribed. Compared to many disciplines in biology, entomology is still in an early exploratory and descriptive phase; new taxa, distributions, and lifestyles are discovered continuously. Much of my past research has focused on insects from mountain streams across the globe. While it has never been a surprise to discover new, undescribed, and unnamed insects from Thailand, Patagonia, or other exotic locations, it is perhaps unexpected to find new (or at least previously unrecorded) species from wetlands "in our backyard". Such has been the result of recent inventories from the upper Midwest, including surveys of rivers and prairie wetlands in Iowa and Nebraska. These records confirm that many purportedly rare taxa can be quite common, but rarely captured because of ineffective sampling and/or poor timing. Accurate assessment of the presence and abundance of many insects requires collection methods that effectively survey the habitat, as well as appropriate timing of samples. Furthermore, collection data often suggest that habitat degradation and environmental change may impact local populations of many aquatic insects, potentially before we can even document their presence. Such discoveries have reaffirmed my belief that the landscape, even in seemingly monotonous parts of the upper Midwest, can be complex and heterogeneous, and the key to understanding this landscape is to observe carefully and often the diversity of microhabitats and their resident biota.

S8 Native bees in our prairies, what's all the buzz about, Jay Watson

In recent years native bees have been getting more attention with their importance as pollinators in our agricultural systems and natural areas. However, with many if not most, native bee species we are lacking information on their current distribution and conservation status. In Wisconsin, we have a "Bees of Wisconsin" checklist completed in 2008 by Amy Wolf and John Asher with 388 species of bees verified but there are likely 50 to 100 more species based on lists from surrounding states. We also haven't surveyed in our prairies (remnant and planted), oak savannas and woodlands much at all. Some of these species can be challenging to identify but groups like the bumble bees (*Bombus* spp.) can be identified through photos. We have learned a lot about our bumble bees in the past few years thanks to the hundreds of volunteers submitting observations to CBM programs (e.g., Bumble Bee Brigade), but we still have a lot to learn.

Wednesday

7:30 to 9:30 Symposium C
Spirit of the Prairie: Connecting through Storytelling
Host: Iowa Prairie Network
This symposium is focused on storytelling by landowners and prairie enthusiasts, sharing their personal experiences with the land and prairie. The invited speakers will begin by each reflecting on what the prairie means to them. The remaining time will provide a moderated panel discussion aimed at a deeper conversation of how to cultivate an appreciation for the environment and prairie in others. Audience participation and questions are welcome.

Moderator: Dr. Nancy Grudens-Schuck, Associate Professor, Agricultural Education and Studies, Iowa State University, Ames, IA.

7:30 to 7:40 Welcome and Introduction, Dr. Nancy Grudens-Schuck
7:40 to 8:40 Storytelling from invited speakers
7:40 - 7:55 Dr. Roger "Jake" Landers
7:55 - 8:10 Ray Young Bear
8:10 - 8:25 Ron Eckoff
8:25 - 8:40 Dr. Ray Hamilton
8:40 to 9:30 Panel discussion; Questions and Answers

Speakers:
Dr. Roger (Jake) Landers, retired extension range specialist, Texas A&M University, College Station, TX. In 2019, Dr. Landers received the Outstanding Alumni Award for his contributions to range science. His prairie career began at Iowa State University where he helped organize the first NAPC in Iowa (1976) and kindled a love of prairie in many of his students. Jake lives in Van Meter, IA.
jakelanders.tx@gmail.com

Ray Young Bear, poet, author and member of the Meskwaki Nation; Ray was raised on the Meskwaki (Red Earth People) Settlement in central Iowa. He is the author of *Black Eagle Child and Remnants of the First Earth*, which received the Ruth Suckow Award as an outstanding work of fiction about Iowa. In 2016, *Manifestation Wolverine* (4 volumes of poetry) won the American Book Award from the Before Columbus Foundation. His tribal word-songs have also been featured in The New Yorker and For the Birds: The Birdsong Project (by Randall Poster and Rebecca Reagan). Ray lives on tribally-owned land that was established by his maternal grandfather, a hereditary chief, in 1856.
rayyoungbear@outlook.com

Dr. Ron Eckoff, retired Iowa Department of Public Health physician. Ron is a prairie owner and enthusiast; since 2001 he has been restoring about 35 acres of remnant prairie in Warren County; Ron contributed an essay "Making a Difference: A Personal Story" to "Tending Iowa's Land: Pathways to a Sustainable Future" and lives in Cumming, IA.
rdeckoff@gmail.com

Dr. Ray Hamilton, retired family practice and emergency room physician. Ray is a prairie owner and enthusiast who has helped protect several local native areas; he is the author of "Native Prairie Management Guide," a founding member of the Iowa Prairie Network, and lives in Solon, IA.
rayhamilton563@yahoo.com

10:00 to 12:00 Symposium D
What Prairie Can Teach Agriculture: Four Lessons
Host: Tallgrass Prairie Center and Iowa State University

Permanent land protection is the only way to guarantee protection of biodiversity and restoration of prairie ecosystem services into the landscape. However, sustainable farming practices that mimic natural systems may also help to restore critical elements of the prairie: grassland nesting birds, pollinators, soil organic matter, hydrological resilience and clean water, to name a few. We critically examine the benefits of using prairie as a model for more sustainable agricultural practices.

Moderator: Dr. Laura Jackson, Professor of Biology and Director, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA.

10:00 to 10:10 Introduction, Laura Jackson

10:10 to 10:35 Joe McGovern, President, Iowa Natural Heritage Foundation, Des Moines, IA. JMcGovern@inhf.org
Permanent land protection to benefit prairie and agriculture

10:35 to 11:00 Dr. Randall D. Jackson, Campbell-Bascom Professor of Grassland Ecology, Department of Agronomy, University of Wisconsin, Madison, WI. rdjackson@wisc.edu
Grassland 2.0 - Ecosystem functions of prairie are the goalposts for agriculture

11:00 to 11:25 Dr. W. Carter Johnson, Distinguished Professor Emeritus, Department of Natural Resource Management, Northern Plains Biostress Laboratory, South Dakota State University, Brookings, SD. President, EcoSun Prairie Farms, Inc carter.johnson@sdstate.edu
Restoring prairie on cropland for profit and services

11:25 to 11:50 Dr. Lisa Schulte Moore, Professor of Natural Resource Ecology and Management, Associate Director of the Bioeconomy Institute, Iowa State University, Ames, IA. lschulte@iastate.edu
Blurring the lines between preservationist and utilitarian views of grasslands with prairie strips

11:50 to 12:00 Questions and Discussion, Laura Jackson (There will also be 5 minutes for questions at the end of each presenter's time).

Abstracts:

S9 Permanent land protection to benefit prairie and agriculture, Joe McGovern
Permanent land protection in an agricultural state can take many forms. The presentation will introduce land protection tools that permanently protect prairie, including much needed stewardship, while allowing working lands to function and thrive. These will include public agency fee-title ownership, NGO fee-title ownership and private landowner conservation easements held by NGO's or Government entities. There will be real world examples of public and private land conservation projects with an emphasis on conservation easements on private land.

S10 Grassland 2.0 - Ecosystem functions of prairie are the goalposts for agriculture, Randall Jackson
Genuinely regenerative agriculture accumulates more matter and energy than it loses annually AND relies on diversity for strength and resilience – it restores tallgrass prairie function. The current agricultural system of the tallgrass prairie, temporarily called the Corn Belt, undermines diversity and loses devastating amounts of nutrients, soils, and energy. Moreover, this system is locked-in and resilient maintained by narratives and policies that privilege and incentivize maximizing production at the expense of the public good. Well-managed livestock grazing on perennial grasslands are our best, and perhaps our only, means of nutrient dense protein production that can help stabilize the climate, while simultaneously cleaning water, reducing flooding, enhancing biodiversity, and supporting vital agricultural communities, profitable farms, and individual health and well-being. Can we transform our agricultural system from extractive to regenerative? Grassland 2.0 is an effort to help re-center the dominant narrative through regional place-making where communities engage in a process of Collaborative Landscape Design focused on agroecological solutions that are truly regenerative.

S11 Restoring prairie on cropland for profit and services, W. Carter Johnson
A seven-year experiment on a 500-acre working farm converted from row crops to tall grass prairie and functional wetlands showed that profits from marketing grassland products (forage, native seed, prairie-raised beef) were competitive with those from grain. Annual gross income increased from $0 when conversion began to $140,000 in year five. Net return increased from a loss of $9,000 in year one to $60,000 in year five. Profits were split evenly among sales of hay, seed, and beef. The highest net returns in uplands were from combined harvests of seed and the haying of the remaining straw. Wetlands were more profitable than uplands on a per acre basis, due to better wetland grass production and the high value of wetland plant seed. The resilience of prairie was evident during a drought year when the net return was positive and nearby corn fields were brown in mid-summer. Grassland restoration on less productive cropland could be especially attractive to a landowner, or if crop prices and cropland profitability decline. Other income streams not evaluated, such as hunting fees, carbon credits/offsets, and biofuels, could make the profit gap between grassland and row crops more favorable for grassland farmers.

S12 Blurring the lines between preservationist and utilitarian views of grasslands with prairie strips, Lisa Schulte Moore
To be an ecologist in the Anthropocene is to live in "a world of wounds," with threats to the things we love far outnumbering causes for celebration. Yet, so many of us are engaged in efforts to preserve, conserve, and restore what we can. In this presentation I will share my experience engaging in with farmers, rural communities, businesses, and government through transdisciplinary teamwork to preserve biodiversity, conserve soil, and restore ecological function to agricultural landscapes. The process has involved blurring the traditional lines between preservationist and utilitarian views of grasslands, and working with farmers and farmland owners to install and monitor prairie strips, a private lands conservation practice. While my experience is distinctly midwestern, some lessons about the roles of data and engagement facilitating successful collaboration may be more broadly applicable to working lands restoration efforts elsewhere.

1:00 to 3:00 Symposium E
Insect Apocalypse – How to Shift from Catastrophic Headlines to Meaningful Solutions
Host: Illinois Nature Preserves Commission

In this panel discussion insect experts from different areas with diverse backgrounds will engage with the audience and answer questions related to on-the-ground solutions for the long-term survival of our native insect diversity. Topics will include climate change (increased temperatures, extended seasons, irregular weather events), habitat loss (food, shelter), pesticides, competition from introduced insects and plants, and human socio-economic issues.

Moderator: Angella Moorehouse, Illinois Nature Preserves Commission, Springfield, IL.
1:00 to 1:20 Introduction and Plan, Angella Moorehouse
1:20 to 3:00 Panel Discussion with questions from the moderator and audience

Speakers:
Dr. Carl Strang, Retired Ecologist and Educator from DuPage County, Illinois. Carl's regional survey of singing insects in the Chicago region has revealed profound impacts of habitat alteration and pointed to the influence of climate change on the distribution and abundance of this ecologically diverse group of species. His book, *Singing Insects of the Chicago Region*, provides identification and ecological information for 32 crickets, 35 katydids, 26 grasshoppers and 12 cicadas. wildlifer@aol.com

Heather Holm, Author/Consultant, Minneapolis, MN. Heather lectures on pollinator conservation and has published books and articles on bees, flower-visiting wasps and other pollinators. With a background in plant ecology her focus is on insect-floral associations and nesting behavior. contact@pollinatorsnativeplants.com

Eric Eaton, Writer/Author and Entomologist, Leavenworth, KS. Eric is author of *Insectpedia, and Wasps: The Astonishing Diversity of a Misunderstood Insect*, both from Princeton University Press. He is also lead author of the *Kaufman Field Guide to Insects of North America*, and co-author of *Insects Did It First* with Gregory S. Paulson.
bugeric247@gmail.com

Laura Rericha-Anchor, Wildlife Biologist, Forest Preserve District of Cook County, Elk Grove Village, IL. Laura is coauthor of the *Flora of the Chicago Region: A Floristic and Ecological Synthesis*. She is currently working on two faunistic monographs, one on the more than 500 bee species and one on the ants of the southern Lake Michigan region.
laura.anchor@cookcountyil.gov

3:30 to 5:30 Symposium F
Savanna and Prairie Restoration in Central Iowa and Illinois
Host: U.S. Army Corps of Engineers and The Nature Conservancy

This symposium will focus on tools and techniques used by state, county, federal and private agencies. The methods include prescribed fire, grazing with goats, mechanical treatment of woody vegetation, and herbicides. The methods used to "discover" remnant prairies and savannas will be discussed, along with management strategies and invasive species control. Working definitions of savanna, canopy cover and associated herbaceous understory will be discussed.

Moderator: Scott Moats, Director of Lands/Fire Manager Iowa/Missouri, The Nature Conservancy, Westfield, IA.
3:30 to 3:40 Introduction, Scott Moats
3:40 to 4:05 Dr. Thomas Rosburg, Biology Department, Drake University, Des Moines, IA. thomas.rosburg@drake.edu
Quantitative effects of goat browsing and tree cutting on vegetation in a savanna restoration

4:05 to 4:30 Bill Kleiman, Project Director, Nachusa Grasslands, The Nature Conservancy, Franklin Grove, IL.
bkleiman@tnc.org
Tools and techniques in restoring savanna at Nachusa Grasslands

4:30 to 5:20 Perry Thostenson, Natural Resource Specialist, U.S. Army Corps of Engineers, Lake Red Rock, Knoxville, IA. perry.m.thostenson@usace.army.mil and Dr. Todd Gosselink, Wildlife Biologist, Iowa Department of Natural Resources, Knoxville, IA. todd.gosselink@dnr.iowa.gov
Prairie and savanna rescues, restoration and management at Lake Red Rock, Iowa

5:20 to 5:30 Questions and Answers, Closing, Scott Moats

Abstracts:

S13 Quantitative effects of goat browsing and tree cutting on vegetation in a savanna restoration, Thomas Rosburg

Chichaqua Bottoms Greenbelt is the centerpiece of conservation in Polk County, with over 8,300 acres of wetlands, prairies, woodlands, and old Skunk River oxbows. General Land Office surveys and historical photos suggest savanna and open oak woodland were formerly present in many areas where forests now occur. Between 2006 and 2011, field research was completed to investigate savanna restoration methods and success. A forestry mower was used to remove woody vegetation and open up the understory. Goat browsing was utilized to control and eliminate resprouting and establishment of woody seedlings. Vegetation and microclimate measurements were made on three treatment plots – control (no restoration work), forestry mower cut, and forestry mower cut followed by goat browsing. Goat browsing increased light, air and soil temperatures, and wind speed. It also decreased relative humidity. Many changes in the plant community were attributed to goat browsing. Tree density, shrub richness, and buckthorn (*Rhamnus cathartica*) shrub/sapling density were decreased. In the herb layer, jumpseed (*Persicaria virginiana*) and white avens (*Geum canadense*) were decreased. Goat browsing produced an increase in sedge (*Carex*) richness and total frequency, total graminoid frequency, total herb density and frequency, and exotic herb richness. The use of goats provided positive outcomes despite less than ideal conditions for goat browsing.

S14 Tools and techniques in restoring savanna at Nachusa Grasslands, Bill Kleiman

For 35 years Nachusa Grasslands has been working to bring health to oak woodlands. We have been pushing hard on brush, ignoring garlic mustard, blasting honeysuckle, olive and mesophytics, using frequent fire, collecting and planting seed. This talk will consider the big picture and the nitty gritty of oak woodland/savanna restoration and stewardship.

S15 Prairie and savanna rescues, restoration and management at Lake Red Rock, Iowa, Perry Thostensen and Todd Gosselink

An early goal of the Lake Red Rock Project (US Army Corps of Engineers and Iowa Department of Natural Resources) was to plant trees and shrubs in former agricultural fields. Some of these included non-native, invasive species due to their perceived wildlife habitat benefits. However, invasive woody plants in Iowa woodlands are now a common problem. Invasive bush honeysuckle (*Lonicera morrowii*) is especially common in woodlands, with autumn olive (*Elaeagnus umbellata*) proliferating in more open fields adjacent to wildlife management areas where the aggressive invasives were planted from the 1970s through the 1990s. About ten years ago Lake Red Rock COE and IDNR began to update the Master Plan, including resource management. New stewardship goals were established to restore the best of remnant communities, re-establish prairies where possible and eliminate non-native-invasive species. Over the past 5 years, we have tackled these invasive plants at the Lake Red Rock Project and surrounding DNR Wildlife Management Area in central Iowa. Methods included mechanical removal, spot spraying, aerial spraying, and prescribed fire. Over 1,500 acres of woodland habitat were successfully treated for invasive removal. The most effective and feasible method was the aerial spraying, followed by prescribed burning the years following. This seminar focuses on how historic landscapes were assessed, evaluated and planning accomplished for the next twenty-five to fifty years.

Thursday

10:00 to 12:00 Symposium G
Prairie and Grassland Resilience in the Face of Climate Change
Host: Iowa Natural Heritage Foundation

Prairies and grasslands are icons of resiliency, but how will they adapt to the challenges of our changing climate? Four experts will discuss the potential that lies within prairie communities to not only adapt but to be part of the answer in mitigating climate change.

Moderator: Emily Martin, Conservation Programs Coordinator, Iowa Natural Heritage Foundation, Des Moines, IA.
10:00 to 10:05 Introduction, Emily Martin
10:05 to 10:30 Dr. Brian Wilsey, Professor in Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA. bwilsey@iastate.edu
Restoration in the face of changing climate: Importance of persistence, priority effects, and species diversity

10:30 to 10:55 Dr. Katharine Hogan, Post-doctoral Fellow, Evidence-based Restoration Lab, Department of Biological Sciences, Northern Illinois University, DeKalb, IL. katharine.hogan@huskers.unl.edu
Grassland plant communities in Nebraska restorations and remnants exhibit similar patterns and resilience over time

10:55 to 11:20 Ashley Wojciechowski, Ph.D. Candidate, Baer Ecology Lab, Kansas Biological Survey and Center for Ecological Research, University of Kansas, Lawrence, KS. ashley.wojciechowski@ku.edu

Looking above- and belowground: Restored prairie recovery from long-term disturbance and resilience in the face of global change

11:20 to 11:45 Dr. Cole Dutter, Post-doctoral Fellow, Soil-Plant Interactions, Department of Agronomy, Iowa State University Ames IA. cdutter@iastate.edu
Prairie strips effects on soil and adjacent cropland soil

11:45 to 12:00 Questions and Answers, Emily Martin

Abstracts:

S16 Restoration in the face of changing climate: Importance of persistence, priority effects, and species diversity, Brian Wilsey

Prairies are extensive, surprisingly biodiverse, highly altered by humans, and not as well protected as other biome types. Restoration provides an opportunity to increase local biodiversity. Here, I report on the Iowa Climate Assessment on issues that will become increasingly important to the science and practice of restoration ecology. First, the global change dilemma. Restorations typically target species that were dominant before the Industrial Revolution, in effect, looking back in time. However, increasing atmospheric CO2 and methane, temperature, and nutrients, which are already having significant effects, will result in novel conditions that are unlike the past. Biotic introductions have occurred concurrently with climate change, altering the seed bank and propagule pressure from surroundings. Designing seed mixes with high diversity will increase the likelihood that species will be present that respond favorably to changes. Second, the importance of stochastic processes due to priority effects have been supported recently and have challenged the deterministic assembly model. Target species establishment could be improved by changing the order of introduction. Finally, prairies provide many ecosystem services to society, including nutrient capture, food production, carbon storage, tourism and recreation, nectar and pollen production, and education as outdoor science laboratories.

S17 Grassland plant communities in Nebraska restorations and remnants exhibit similar patterns and resilience over time, Katharine Hogan

Many biotic and abiotic factors impact restored and remnant (unplowed) grassland communities, but large, observational studies of the relative effects of multiple factors are rare. This study investigates the effect of disturbance-based management (prescribed fire and grazing), time, and soil characteristics on the plant communities of 15 restored and 15 remnant grassland sites in south-central Nebraska. Species diversity increased slightly in remnants and restorations over time, and species diversity and composition were driven by dominant soil texture (sand) and time (sampling year). Management did not impact species diversity but significantly impacted community composition, likely by varying habitat heterogeneity. While the effect of drought could not be directly quantified from observational data, these grasslands also exhibited no visible changes to the worst single-year drought in recorded Nebraska history in 2012. This study suggests that 1) multiple factors drive grassland communities, 2) different elements of ecological organization (diversity vs. composition of species) are impacted by factors that persist over different time scales (soil texture vs. seasonal management), and 3) managers may have more control over community composition over time as opposed to the diversity of species within any given remnant or restoration

S18 Looking above- and belowground: Restored prairie recovery from long-term disturbance and resilience in the face of global change, Ashley Wojciechowski

Restoration aims to facilitate recovery of ecosystems that have been degraded by anthropogenic or natural disturbances. A decadally restored prairie that experimentally manipulated heterogeneity in soil resource availability was used to assess recovery of ecosystem functioning (i.e., productivity), compare resilience of restored and native prairies to drought, and test whether environmental heterogeneity enhances resilience of restored prairie. We measured resilience as the proportional change in aboveground net primary productivity (ANPP) during and following drought (sensitivity and legacy effects, respectively) relative to average ANPP. In non-drought years, total ANPP was similar between native and restored prairie, but native prairie had higher grass ANPP and lower forb ANPP compared to restored prairie. Sensitivity of total ANPP to drought was similar in restored and native prairie, but grasses in restored prairie were more sensitive to drought. Post-drought legacy effects were more positive with a less variable legacy response of forb ANPP in restored prairie, and higher forb ANPP in the post-drought year in the heterogeneous soil treatment. This suggests productivity and drought sensitivity in tallgrass prairie can be restored within decades and higher forb productivity associated with greater environmental heterogeneity in restorations promotes greater resilience to drought.

S19 Prairie strips effects on soil and adjacent cropland soil, Cole Dutter

Prairie strips (PS) can have disproportionate ecological benefits compared to the amount of land they occupy. These benefits include improved water quality, reduced soil movement, improved nutrient retention, and more abundant and diverse wildlife. Converting just 10% of a field to PS can reduce water runoff by 37%, and in turn, reduce sediment loss by 95% and phosphorus loss by 77%. Groundwater nitrate concentrations can be reduced by 72%. In this paper, we address the long-term impacts of PS on adjacent soil and crop health. We specifically assessed soil nutrients, soil plant analysis (SPAD), which estimates

chlorophyll content in leaves as an index of plant health, and yield along transects in corn (*Zea mays*) and soybean (*Glycine max*). Transects in the cropland extended 3 m upslope and 9 m downslope of 12-year-old PS. We also sampled transects in paired control watersheds that were similar to treatment watersheds in terms of geomorphology and cropping-history, but without PS. We found that PS affected nutrient availability, SPAD levels were decreased near the PS compared to control watersheds, but harvest yield was not significantly different. Overall, we show evidence for no impacts on adjacent crops but significant impacts on nutrient distribution. PS are a federally recognized conservation practice (CP-43) under the Conservation Reserve Program. Understanding the effects of PS on the adjacent crop environment is important to evaluating their overall contributions to agriculture.

12:30 to 3:00 Symposium H
Working Together to Sow the Seeds of Successful Prairies: Join the Prairie Reconstruction Initiative!
Host: Prairie Reconstruction Initiative Advisory Team

The Prairie Reconstruction Initiative (PRI) is blazing a trail for managers to learn from each other and overcome the uncertainties in prairie reconstruction. Don't have a map? We'll give you one in this session!

Moderator: Pauline Drobney, Prairie & Savanna Biologist; retired U.S. Fish & Wildlife Service, Prairie City, IA.
1:00 to 1:10 Introduction, Pauline Drobney
The roots and vision of PRI. From the ground up!

1:10 to 1:30 Megan Benage, Southern Region Ecologist, Minnesota Department of Natural Resources, New Ulm, MN. Megan.benage@state.mn.us
Leaving a trail for others to follow. Write it down!

1:30 to 1:50 Amanda McColpin, PRI Project Coordinator, U.S. Fish & Wildlife Service Contractor, Prairie City, IA. Amanda_mccolpin@fws.gov
Did you SucSEED? Monitor vegetation to measure reconstruction success

1:50 to 2:10 Ian Lane, I&M Data Manager, U.S. Fish & Wildlife Service, Bloomington, MN. Ian_Lane@fws.gov
Prairie reconstruction data: Moving from the file cabinet to the cloud

2:10 to 2:30 James Ellis, Natural Areas Coordinator, University of Illinois, Champaign, IL. jellis@illinois.edu
Cross pollination. Sharing the knowledge and hiking ahead!

2:30-3:00 Discussion, Questions and Answers, Pauline Drobney

Abstracts:
S20 The roots and vision of PRI. From the ground up!, Pauline Drobney
Prairie reconstruction is critically needed for conservation of a once vast ecosystem that is now largely absent in much of its former range. Prairie reconstruction results can range from excellent to poor with many landing in the middle of the scale. The Prairie Reconstruction Initiative (PRI) is a group of practitioners and researchers motivated to learn what practices consistently lead to success by learning from one another. The vision of the PRI is that reconstructions should be biologically diverse, ecologically functional, resist invasion by non-native plants, and cost-effective to manage.

S21 Leaving a trail for others to follow. Write it down!, Megan Benage
Prairie reconstruction is a complex science. Practitioners are often faced with daily challenges as we work to understand this once vast ecosystem. We must ensure learning is not lost when people retire or walk onward on their path, and one of the first steps is writing down what you have done! Consider this your trail of breadcrumbs (or tick trefoil seeds) for all the prairie practitioners that come after you. We want to ensure this trail is easy to follow, so the Prairie Reconstruction Initiative (PRI) team built a database where practitioners can add a standard set of foundational site information and monitoring information so we can continue to learn through time. Foundational site information includes pre-planting site history, planting information including seed mixes, and ongoing management. Knowing this information can strengthen our understanding of how our reconstruction choices affect reconstruction success.

S22 Did you SucSEED? Monitor vegetation to measure reconstruction success, Amanda McColpin
Vegetation monitoring provides an objective assessment of prairie reconstruction success. The Prairie Reconstruction Initiative (PRI) monitoring protocol can be conducted in a reasonable amount of time and yields data necessary for understanding prairie reconstruction outcomes. The protocol consists of two complementary vegetation monitoring methods: a meandering walk and nested frequency plots. The meandering walk provides a relatively complete species list and is fairly quick and

easy to conduct. The nested frequency plots provide quantitative frequency of occurrence data for comparisons across reconstructions or over time. Both methods generate data to identify trends within a reconstruction and guide management decisions. Database contributors have the option to enter monitoring data into the PRI database, which allows them to evaluate their monitoring data in the context of history, planting, and management data. Using the standardized monitoring protocol, we have the power to learn together!

S23 Prairie reconstruction data: Moving from the file cabinet to the cloud, Ian Lane

Prairie reconstruction is a logistically intense process that generates hordes of data that, if tracked, could potentially help us learn to implement reconstructions better. The Prairie Reconstruction Initiative (PRI) seeks to create a digital community of contributors that brings prairie reconstruction data together into one accessible location under a common lexicon. In this talk I will outline the structure and vision of the PRI database as an interactive online community capable of answering big questions about prairie reconstructions and how you too can become a contributor!

S24 Cross pollination. Sharing the knowledge and hiking ahead!, James Ellis

Prairie reconstruction projects are scattered across a wide geography and community of practice. Sharing reconstruction stories of success and failure is important to learn how to consistently plant prairies that meet conservation objectives and goals. Over the past ten years, hundreds of practitioners have participated in Prairie Reconstruction Initiative (PRI) story-sharing, including in-person and site-specific field days, webinars, and virtual (online) field days. As we look to the future, we're excited to collaborate and engage with the prairie reconstruction community to learn from your planting and monitoring data! As we hike ahead, we look forward to discoveries that will empower people to learn about their own reconstructions and amplify our collective ability to make reconstructions better.