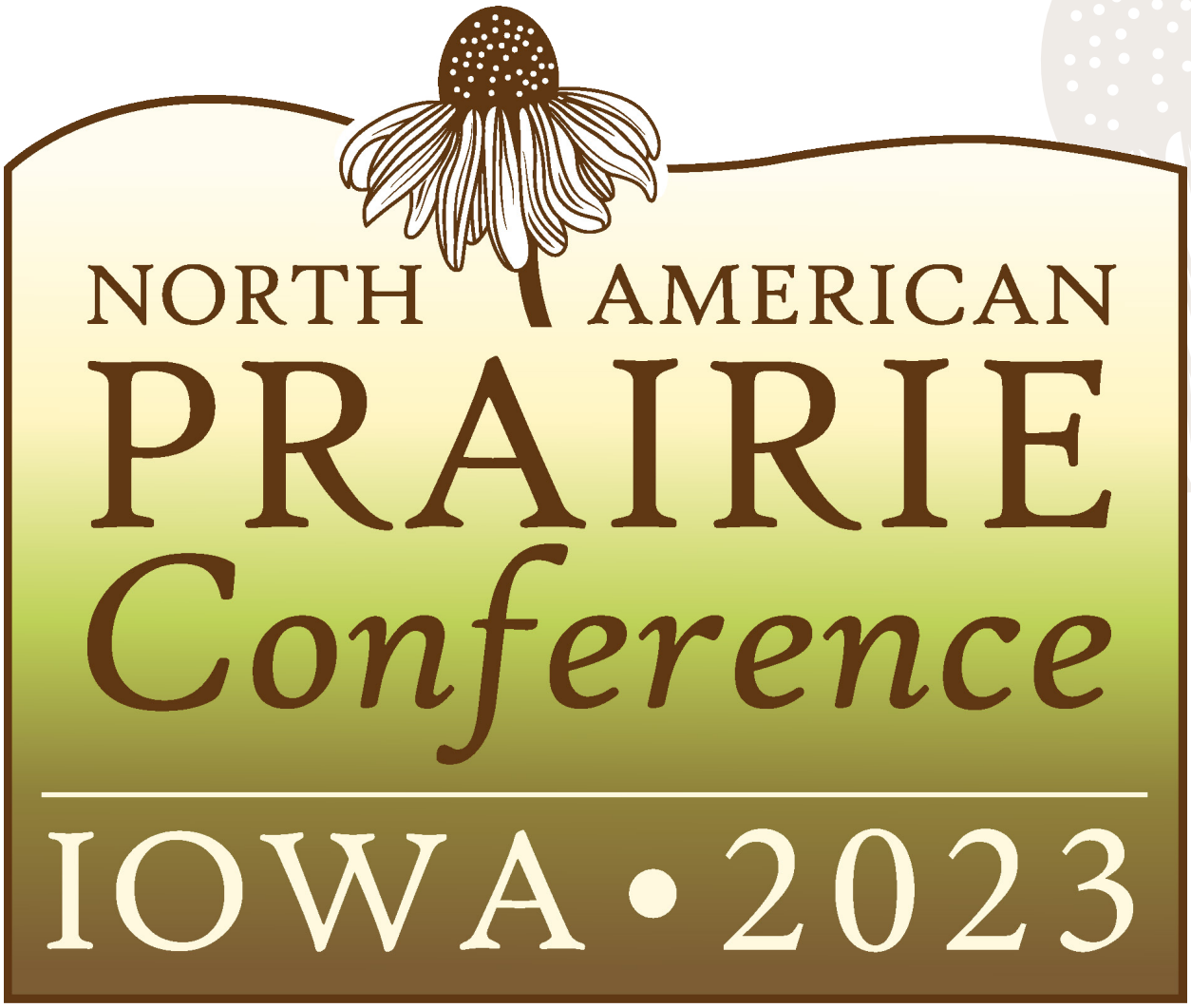
NORTH AMERICAN
PRAIRIE
Conference
IOWA • 2023

A message from your Chair

The evidence is clear. Interest and concern for prairie and grassland ecosystems is as strong as ever. When conference planning began again in summer 2022, we were very uncertain how many participants to expect and plan for in the budget. The number 350 surfaced and seemed like a reasonable goal. As I write this, the latest count is over 600 and the final count may reach 625 or more. Solid numbers for previous meetings are difficult to come by. The inaugural meeting in 1968 at Knox College attracted 120 prairie enthusiasts. The last three meetings in Iowa, in 1990, 2000 and 2010, were attended by approximately 530, 600 and 560 people respectively. Iowa's location in the heart of the tallgrass prairie seems to bring some advantages when it comes to participation.

That remarkable interest in prairie is well deserved and critically important. Grassland birds are among the fastest-declining bird species in the United States, with a 34% loss since 1970 (State of the Birds 2022). Insects are a major component of grassland ecosystems and research from around the world indicates grassland insect diversity is severely threatened. The phrase "insect apocalypse" has surface as a red flag for the observation that insects in general have declined by 75% in the last 50 years. A 2008 paper reporting on research in Illinois prairies concluded that snake diversity may have decline by as much as 70% since the mid-1800s. I could go on with more data for other taxa. Despite all the good work accomplished in protecting remnants and putting more prairie on the landscape in reconstructions, grassland biodiversity is still under siege. The importance of that biodiversity, both below and above ground, is compounded by its role in furnishing ecosystem processes and function that we know inform regenerative agriculture and provide mitigation and resilience in a world experiencing significant climate change. The Planning Committee understood these are important issues for prairie and grassland conservation. We have incorporated these and many other crucial issues into the conference.

We Iowans, like prairie folks in other states, are very proud of our prairie heritage. We love hosting the conference and inviting others to our home to share our prairie and its grandeur. It is our expectation that the tremendous knowledge, experience and simple plain love of prairie that has assembled here in Altoona will synthesize optimism, direction and confidence in going forward. Thank you for coming and being a part of this very special time and place.

Chair of the 2023 North American Prairie Conference
Professor of Biology, Drake University, Des Moines, Iowa
Botanical & Ecological Consulting

P.S. Our sponsors are instrumental towards making this conference a reality. Their support has helped this conference reach a larger audience. Please be sure to visit with them, express your gratitude, and thank them for their support.

Thank you, Sponsors!
Please visit their tables during the conference and thank them for their support!

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Schedule at a Glance

Monday, June 26

9:00 to 12:00 - Opening Plenary Session, Ball Room
9:00 to 9:40 Welcome
9:40 to 10:40 Keynote – Dr. Laura Jackson, Director Tallgrass Prairie Center, University of Northern Iowa
A Lost Cause? Bringing Prairie Back to the Corn Belt
10:40 to 10:55 Break
10:55 to 11:55 Keynote – Eric Lee-Mäder, Co-Director, Pollinator Conservation, Xerces Society
Farmers of Forty Centuries: Reconciling Agriculture & Ecology

12:00 to 1:00 – Lunch Buffet, Ball Room

Locations for Concurrent Sessions:
Symposia – Ball Room Paper Sessions (odd) – Skinner A Paper Sessions (even) – Skinner B

1:00 to 3:00 – Symposium A Prescribed Fire Seasonality: New Insights from Research on Fire Effects
Paper Session #1 – Prairie Through the Eyes of Diversity & Inclusion AND Private Land Projects
Paper Session #2 – Reconstruction and Planting Techniques
3:00 to 3:30 Break
3:30 to 5:30 – Symposium B Insects: What we don't know and how you can help!
Paper Session #3 – Prairie Floristics and Plant Communities
Paper Session #4 – Prairie and Regenerative Agriculture
6:00 to 7:30 – Poster Session
8:00 to 11:00 – Insect Night Lighting and Bat Netting at Yellow Banks Park. Sign up at the registration table.
Jim Durbin and Russ Benedict

Tuesday, June 27

7:30 to 5:30 – All day and half day field trips
5:30 to 8:30 – Barbecue, Music by Brad and Kate, Art Fair

Wednesday, June 28

7:30 to 9:30 – Symposium C Spirit of the Prairie: Connecting through Storytelling
Paper Session #5 – Insects and Other Invertebrates
Paper Session #6 – Ecology of Grazing and Herbivory
9:30 to 10:00 Break
10:00 to 12:00 – Symposium D What Prairie Can Teach Agriculture: Four Lessons
Paper Session #7 – Forum A Western Prairie Fringed Orchid Recovery
Paper Session #8 – Prairie for Beginners
12:00 to 1:00 – Lunch Buffet, Ball Room
1:00 to 3:00 – Symposium E Insect Apocalypse – Catastrophic Headlines to Meaningful Solutions
Paper Session #9 – Forum B On Common Ground: A Multidisciplinary Engagement in Iowa's Loess Hills
Paper Session #10 – Forum C Born in Crisis: The NRCS and Prairie Reconstruction and Management
3:00 to 3:30 Break
3:30 to 5:30 – Symposium F Savanna and Prairie Restoration in Central Iowa and Illinois
Paper Session #11 – Prairie Education
Paper Session #12 – Plant and Pollinator Ecology

6:00 to 8:00 Dinner Discussion Groups. Sign up at the registration table.

Thursday, June 29

7:30 to 9:45 Closing Plenary Session and Breakfast Banquet, Ball Room

7:30 to 7:40 Welcome

7:40 to 8:40 Keynote – Doug Ladd, Former Director of Conservation, *The Nature Conservancy in Missouri Saving the Soul of the Heartland*

8:40 to 9:45 The Future of NAPC and Lifetime Achievement Awards

10:00 to 12:00 – Symposium G Prairie and Grassland Resilience in the Face of Climate Change
Paper Session #13 – Prairie Art, Poetry and Literature
Paper Session #14 – Ecology of Fire AND Plant and Pollinator Ecology

12:00 to 12:30 Lunch options

12:30 to 2:30 – Symposium H Working to Sow the Seeds of Successful Prairies: Prairie Reconstruction Initiative!
Paper Session #15 – Prairie Culture and History AND Prairie Conservation and Policy
Paper Session #16 – Plant Biology and Ecology AND Invasive Species Management

2:30 – Conference Closes

Master Schedule

Monday, June 26

9 a.m.-12 p.m. Opening Plenary Session, **Bishop Ballroom**	Thomas Rosburg, Chair of the 2023 NAPC The Honorable Dean O'Connor, Mayor of Altoona, IA Jon Judson, NAPC Planning Committee and Iowa Prairie Network Tara Van Waus, Living Roadway Trust Fund Coordinator Keynote #1 Dr. Laura Jackson, A Lost Cause? Bringing Prairie Back to the Corn Belt Keynote #2 Eric Lee-Mäder, Farmers of Forty Centuries: Reconciling Agriculture & Ecology		
12-1 p.m.	Lunch Buffet: baked potato bar, **Bishop Ballroom**		
1-3 p.m.	**Paper Session #1** Prairie through Eyes Diversity/Inclusion & Private Land Projects **Skinner A**	**Paper Session #2** Reconstruction and Planting Techniques **Skinner B**	**Symposium A** Prescribed Fire Seasonality **Bishop Ballroom**
1-1:20 p.m.	Sikowis Nobiss, *End-stage Iowa: Big-ag's sacrifice zone and indigenous resistance*	Brian Wilsey, *Importance of persistence, priority effects, and species diversity in prairie establishment*	Thomas B. Bragg, *Trends in a 40-year-long fire seasonality and frequency experiment* (1:10 to 1:30)
1:20-1:40 p.m.	Ray Hamilton, *How to identify, acquire, and protect natural areas: Remote river corridor, prairies, savannas, fen, & algific talus slopes*	Chris Helzer, *Are reconstructed prairies de-fragmenting the landscape?*	Devan A. McGranahan, *Barriers to a summer fire regime in northern prairies: Ecological, physical, and social* (1:30 to 1:50)
1:40-2 p.m.	Jathan Chicoine, *Learning from bison: A story of a small farm's efforts to restore native ecosystems*	Scott B. Sauer, *What are we getting right, and what are getting wrong? Informed choices in prairie reconstruction and restoration*	Justin Thomas, *Floristic quality response to non-dormant season fire in Missouri and Kansas prairies* (1:50 to 2:10)
2-2:20 p.m.	Mary C. Damm, *Grazing for grassland birds*	Katherine C. Wynne, *The role of temporal dispersal patterns in building diverse tallgrass prairie plant communities*	Bethany Roberton, *Short-term impacts of seasonal burn treatments on plant diversity and pollinator recruitment in a tallgrass prairie* (2:10 to 2:30)
2:20-2:40 p.m.		Stephanie L Frischie, Prairie spring: Sowing seeds for floristic diversity and associated insect wildlife	Craig Maier, *Discussion, Questions and Answers* (2:30 to 3:00)
2:40-3 p.m.		Justin Meissen, *Promoting forbs in prairie reconstructions using grass selective herbicide*	

Monday, June 26

3-3:30 p.m.	Break		
3:30-5:30 p.m.	**Paper Session #3** Prairie Floristics and Plant Communities **Skinner A**	**Paper Session #4** Prairie and Regenerative Agriculture **Skinner B**	**Symposium B** Insects: What we don't know and how you can help! **Bishop Ballroom**
3:30-3:50 p.m.	Thomas Rosburg, *The vegetation and seedbank of a remnant sedge meadow in Madison County, Iowa*	Jeremy S. Giannone, *Phosphorus transport in soil: Locating and identifying a limiting element*	Jessica Petersen, *Insect conservation by accelerating learning* (3:35 to 3:55)
3:50-4:10 p.m.	Jordan Nikkel, *The postage stamp and beyond: The vascular flora of Marietta Sand Prairie (Marshall County, IA)*	Cornelia F. Mutel, *Tending Iowa's Land: How a vision became a book*	Chris Helzer, *Learning to see the prairie through the eyes of insects* (3:55 to 4:15)
4:10-4:30 p.m.	Thomas R. Thompson, *A long-term study of the impacts of patch-burn grazing with cattle (PBGC) as a prairie management tool on plant community response and vegetation structure response metrics in Missouri: Update on the first 5-years*	Thomas Rosburg, *Iowa's rich biodiversity legacy: A vision for the future*	Greg Courtney, *Aquatic insects of upper Midwest wetlands: A "well known" fauna that isn't* (4:15 to 4:35)
4:30-4:50 p.m.	William Norris, *Botanical studies of prairie remnants in the Iowa State Preserve System: Past, present, and future*		Jay Watson, *Native bees in our prairies, what's all the buzz about* (4:35 to 4:55)
4:50-5:10 p.m.	Daniel T. Deever, *Recruitment limitation of early- and late-flowering grassland forbs can be overcome with transplanting in prairie restorations*		Jim Durbin and MJ Hatfield (4:55 to 5:15)
5:10-5:30 p.m.			Megan O'Donnell, *Questions and Answers*
6-7:30 p.m.	Poster Session, **Salon 1 and 2**		
7:45-11 p.m.	Insect Night Lighting & Bat Netting, **Yellow Banks County Park** *Signup and Information at the Registration Table*		

Tuesday, June 27

7:30 a.m.-5 p.m.	All day field trips
7:30 a.m.-12 p.m	Half-day morning field trips
1:30-5 p.m.	Half-day afternoon field trips
5-8 p.m.	BBQ at the Meadows with cash bar
5-8 p.m.	Art Fair
5:30-7:30 p.m.	Music by Brad and Kate

Wednesday, June 28

7:30-9:30 a.m.	**Paper Session #5** Insects and other invertebrates **Skinner A**	**Paper Session #6** Ecology of Grazing and Herbivory **Skinner B**	**Symposium C** Spirit of the Prairie: Connecting through Storytelling **Bishop Ballroom**
7:30-7:50 a.m.	MJ Hatfield, *Reconstructed prairies: Are they functioning? What can insects tell us?*	Grace E. Thomas, *Effects of bison and cattle grazing on milkweeds and monarch butterflies*	Roger "Jake" Landers, *Doolittle Prairie, it's consequences* (7:40 to 7:55)
7:50-8:10 a.m.	Thomas P. Franzem, *Drivers of beetle occurrence and abundance in Alabama black belt prairies*	Abu Raihan, *Effects of grazing and burning on stream water chemistry for the King's Creek drainage basin on Konza Prairie*	Ray Young Bear, *Composing Meskwaki word-songs from stories as linguistic, cultural and literary contributions* (7:55 to 8:10)
8:10-8:30 a.m.	Russell Benedict, *Preference of plants as nectar sources by adult monarch butterflies (Danaus plexippus) in a tallgrass prairie reconstruction*	Fred Harris, *Plant species richness and brome responses differ over 5 years depending on stocking rate and fire frequency in two patch-burn grazing projects*	Ron Eckoff, *How to have an active and meaningful retirement* (8:10 to 8:25)
8:30-8:50 a.m.	MJ Hatfield, *Life on a little-known prairie (Thank you Howard Ensign Evans)*	Timothy L. Dickson, *Implications of cattle grazing common and showy milkweed species at least as much as surrounding grasses*	Ray Hamilton, *Codfish Hollow Hill Prairie: The discovery, management, and lessons of four decades of life with a remarkable natural area* (8:25 to 8:40)
8:50-9:10 a.m.	Genevieve Pugesek, *Bumble Bee Atlas: Regional collaboration to conserve pollinators using community science*	Thomas Rosburg, *Effects of cattle grazing on the species composition of prairie communities in northwest Iowa*	Nancy Grudens-Schuck, *Panel discussion with questions and answers* (8:40 to 9:30)
9:10-9:30 a.m.	Laura Fischer Walter, *Arthropod friends, foes, and frenemies among the prairie seed plots*	John Pearson, *Vegetation monitoring for adaptive management in a grazed tallgrass prairie*	
9:30-10 a.m.	Break		

Wednesday, June 28

10 a.m.-12 p.m.	**Paper Session #7** Forum A Western Prairie Fringed Orchid Recovery **Skinner A**	**Paper Session #8** Prairie for Beginners AND Prairie Culture and History **Skinner B**	**Symposium D** What Prairie Can Teach Agriculture: Four Lessons **Bishop Ballroom**
10-10:20 a.m.	Dawn Marsh, *Overview of the western prairie fringed orchid and tracking progress towards recovery under the ESA* (10:10 to 10:25)	Russell Benedict, *Introduction to Prairies I*	Joe McGovern, *Permanent land protection to benefit prairie and agriculture* (10:10 to 10:35)
10:20-10:40 a.m.	Derek Anderson, *The Status of Platanthera praeclara in Minnesota* (10:25 to 10:40)	Russell Benedict, *Introduction to Prairies II*	Randall Jackson, *Grassland 2.0-Ecosystem functions of prairie are the goalposts for agriculture* (10:35 to 11:00)
10:40-11 a.m.	John Pearson and Mark Leoschke, *Western prairie fringed orchid in Iowa* (10:40 to 10:55)	Kara K. Holmstrom, *Converting turf to native prairie on a community college campus*	
11-11:20 a.m.	Steven Travers, *The pollination biology of Platanthera praeclara* (10:55 to 11:10)	MJ Hatfield, *Walk slow, look close: Meandering for insects*	W. Carter Johnson, *Restoring prairie on cropland for profit and services* (11:00 to 11:25)
11:20-11:40 a.m.	Jaspreet Kaur, *Microbial ecology: Implications for in situ and ex situ conservation* (11:10 to 11:25)	Kristen A. Greteman, Reconstructing the Lost Lakes: Using historical GIS in the Prairie Pothole Region	Lisa Schulte Moore, *Blurring the lines between preservationist and utilitarian views of grasslands with prairie strips* (11:25 to 11:50) Questions and Discussion
11:40 a.m.-12 p.m.	Roundtable discussion (11:25 to 11:55) Closing comments (11:55 to 12:00)	Chant Eicke, *Turning a County Poor Farm into a rich community asset*	
12-1 p.m.	Lunch Buffet: Italian pasta, **Bishop Ballroom**		

Wednesday, June 28

1-3 p.m.	**Paper Session #9** Forum B OCG: A multidisciplinary engagement in Iowa's Loess Hills **Skinner A**	**Paper Session #10** Forum C Born in Crisis: The NRCS and prairie reconstruction and management **Skinner B**	**Symposium E** Insect Apocalypse – Catastrophic Headlines to Meaningful Solutions **Bishop Ballroom**
1-1:20 p.m.	Brian Hazlett, *Introduction* (1:00 to 1:15)	James Cronin, *Introduction; Technical resources available to reconstruct and manage prairie*	Angella Moorehouse, Introduction
1:20-1:40 p.m.	Documentary film (1:15 to 1:45)	Kevin Kuhn, *Getting things done: Prairie reconstruction and management* (1:20 to 1:50)	*Panel Discussion and Questions and Answers with:* Carl Strang Heather Holm Eric Eaton Laura Rericha-Anchor
1:40-2 p.m.	Book readings by authors: (1:45 to 2:30)	Thomas Rosburg, *Ecological site data for Iowa's prairie ecosystems: An unprecedented guide for prairie restoration* (1:50 to 2:20)	
2-2:20 p.m.	John T. Price Melanie Krieps Mergen		
2:20-2:40 p.m.	Connie Mutel Scott Moats	Curt Bradbury, *Ecological Site Descriptions and their value in reconstructing and managing prairie*	
2:40-3 p.m.	Curt Bradbury, *Ecological Site Descriptions and their value in reconstructing and managing prairie*	James Cronin, *Questions and Answers* (2:50 to 3:00)	
3-3:30 p.m.	Break		

Wednesday, June 28

3:30-5:30 p.m.	**Paper Session #11** Prairie Education **Skinner A**	**Paper Session #12** Plant and Pollinator Ecology **Skinner B**	**Symposium E** Insect Apocalypse – Catastrophic Headlines to Meaningful Solutions **Bishop Ballroom**
3:30-3:50 p.m.	Kaytlan J. Moeller, *Mowing to monarchs: Engaging private landowners to convert turf to prairie*	Angella Moorehouse, *Using pollinator surveys to assess natural area quality in Illinois*	Thomas Rosburg, *Quantitative effects of goat browsing and tree cutting on vegetation in a savanna restoration* (3:40 to 4:05)
3:50-4:10 p.m.	Kelly D. Norris, *Practicing new naturalism: Prairie-forward plantings in public and private places*	Ashley B. Bennett, *Right-of-Way Prairies: How utility lands are supporting pollinators*	
4:10-4:30 p.m.	Aracely Newton, *The Missouri Western State University's John Rushin Teaching and Research Prairie: The first two years of multidisciplinary biology research in an outdoors applied learning laboratory*	Jessica Petersen, *Bee specialists of Minnesota prairies*	Bill Kleiman, *Tools and techniques in restoring savanna at Nachusa Grasslands* (4:05 to 4:30)
4:30-4:50 p.m.	Chris Helzer, *Poopy-tailed larvae, single mom bees, and other stories we all need to be telling our non-prairie friends*	Jennifer Hopwood, Understanding wildflower forage value: Diverse rangelands benefit livestock and pollinators	Perry Thostenson and Todd Gosselink, *Prairie and savanna rescues, restoration and management at Lake Red Rock*, Iowa (4:30 to 5:20)
4:50-5:10 p.m.	Ankita A. Sawant, *Mycorrhizas and native prairie restoration: Exploring the effects of mycorrhizal inoculum, seed origin, and phosphorus on plant performance*	"Ray A. Moranz, *Important nectar plants of the monarch butterfly, as reported to the Xerces Society's monarch nectar plant database"*	
5:10-5:30 p.m.			Scott Moats, *Questions and Answers* (5:20 to 5:30)
6-8 p.m.	Hosted Dinner Discussion Groups at a local restaurant - space is limited, sign-up at the registration table. Pay your own dinner. Topics include bison, grazing and fire, LBGTQ+ community & conservation work, pollination, insects, future of NAPC, collecting seed, prairie reconstruction.		

Thursday, June 29

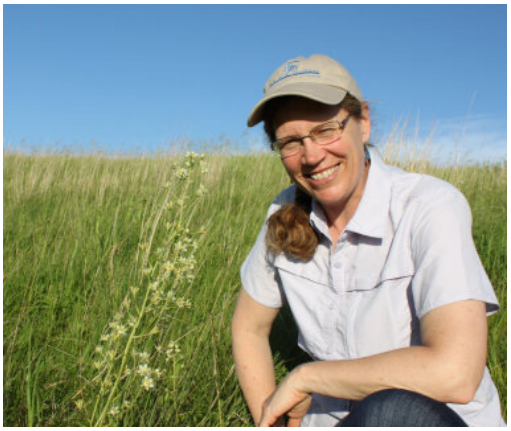
7:30-9:45 a.m. Closing Plenary Session and Breakfast Banquet, **Bishop Ballroom**	Thomas Rosburg, Chair of the 2023 NAPC The Honorable Frank Cownie, Mayor of Des Moines, IA Keynote #3 Douglas Ladd, Saving the Soul of the Heartland NAPC Planning Committee members - Joyce Hornstein, Daryl Smith, Pauline Drobney, John Pearson, Loren Lown		
10 a.m.-12 p.m.	**Paper Session #13** Prairie Art, Poetry and Literature AND Prairie Conservation and Policy **Skinner A**	**Paper Session #14** Ecology of Fire AND Plant and Pollinator Ecology **Skinner B**	**Symposium G** Prairie and Grassland Resilience in the Face of Climate Change **Bishop Ballroom**
10-10:20 a.m.	Erin Anfinson, *Tell the bees: An artist residency and exhibition with the Tallgrass Prairie Center*	Thomas Rosburg, *Spring fire effects on the forb community of a degraded sand prairie*	Brian Wilsey, *Restoration in the face of changing climate: Importance of persistence, priority effects, and species diversity* (10:05 to 10:30)
10:20-10:40 a.m.	Ethan Freese, *Storytelling in the Platte Basin's prairies*	Paul W Foreman, *The role of Aboriginal burning in the biogeography of the temperate grasslands of southeastern Australia*	Katharine Hogan, *Grassland plant communities in Nebraska restorations and remnants exhibit similar patterns and resilience over time* (10:30 to 10:55)
10:40-11 a.m.	Jessica Wiskus, *From Proust to Prairie: A brief phenomenological account of the role of the arts and letters in restorative ecology*	Michael J. Hansen, *University of Wisconsin-Madison class prepares students to serve on prescribed fire crews*	
11-11:20 a.m.	Marika Olynyk, *Lessons in change: 30 years of listening, learning, and managing northern tall-grass prairie*	Stephanie Paris, *On the wings of bees: Prairie strips benefit honey bee health*	Ashley Wojciechowski, *Looking above- and belowground: Restored prairie recovery from long-term disturbance and resilience in the face of global change* (10:55 to 11:20)
11:20-11:40 a.m.	Deborah Q. Lewis and William R. Norris, *The saga of an urban tallgrass prairie remnant in central Iowa: "It takes a village"*	Morgan Moore, *Developing reliable biomarkers of bee health to create strategies to mitigate bee declines*	Cole Dutter, *Prairie strips effects on soil and adjacent cropland soil*
11:40 a.m.-12 p.m.		Erika Ibarra-Garibay, *Occupancy, health, and habitat associations of rusty patched and American bumble bees in Iowa*	Emily Martin, *Questions and Answers*
12-12:30 p.m.	Lunch options: burrito bowl and drink (can be taken with you)		

Thursday, June 29

12:30-2:30 p.m.	**Paper Session #15** CANCELED **Skinner A**	**Paper Session #16** Plant Biology and Ecology AND Invasive Species Management **Skinner B**	**Symposium H** Prairie and Grassland Resilience in the Face of Climate Change **Bishop Ballroom**
12:30-12:50 p.m.		Thomas Rosburg, *Is Pedicularis lanceolata (swamp lousewort) a keystone species?*	Pauline Drobney, *The roots and vision of PRI. From the ground up!*
12:50-1:10 p.m.		Bret J. Lang, *Creating a native plant initiative for South Dakota*	Megan Benage, *Leaving a trail for others to follow. Write it down!* (12:40 to 1:00)
1:10-1:30 p.m.		Nathan M. Soley, *Ecological factors that extend flowering phenology in prairies*	Amanda McColpin, *Did you SucSEED? Monitor vegetation to measure reconstruction success* (1:00 to 1:20)
1:30-1:50 p.m.		Ann Marie R. Gunness, *Tradeoffs for birdsfoot trefoil management in a tallgrass prairie*	Ian Lane, *Prairie reconstruction data: Moving from the file cabinet to the cloud* (1:20 to 1:40)
1:50-2:10 p.m.			James Ellis, *Cross pollination. Sharing the knowledge and hiking ahead!* (1:40 to 2:00)
2:10-2:30 p.m.			Pauline Drobney, *Discussion, Questions and Answers (2:00 to 2:30)*
2:30 p.m.	2023 North American Prairie Conference Closes		

Plenary Session Keynotes
Ballroom

A Lost Cause? Bringing Prairie Back to the Corn Belt **Dr. Laura Jackson**
Director, University of Northern Iowa Tallgrass Prairie Center, Cedar Falls, IA

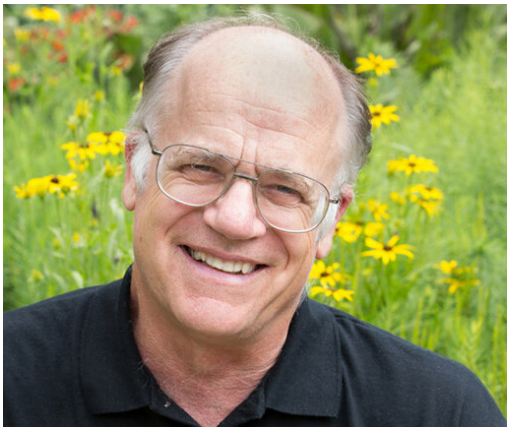


Laura Jackson is Professor of Biology at the University of Northern Iowa, and Director of the Tallgrass Prairie Center. She received a Bachelor's degree in Biology from Grinnell College, and a Ph.D. in Plant Ecology from Cornell University. She has taught courses in restoration ecology, conservation biology, and environmental studies. Her research has focused on the restoration of biological diversity in agriculture landscapes, and the dynamics of seeds and seedling establishment in tallgrass prairie restoration. She is co-editor with mother Dana Jackson of *The Farm as Natural Habitat: Reconnecting Food Systems with Ecosystems* (Island Press 2002).

Farmers of Forty Centuries: Reconciling Agriculture & Ecology **Eric Lee-Mäder**
Co-Director, Pollinator Conservation, Xerces Society for Invertebrate Conservation, Portland, OR

As Pollinator Program Co-Director, Eric manages staff focused on large-scale habitat restoration, conservation biocontrol, native seed research and development, and outreach to farmers, private businesses, and government agencies. His professional background includes commercial beekeeping, native seed production, and consulting for various specialty crop industries. Eric was previously assistant professor of extension at the University of Minnesota's Department of Entomology and is the author of a book on how to manage bees for the USDA's Sustainable Agriculture Research and Education (SARE) program. Eric regularly provides on-the-ground technical support to the NRCS and other conservation agencies. He is the lead author of numerous publications, including *Farming with Native Beneficial Insects and Attracting Native Pollinators*. He also currently owns/operates Northwest Meadowscapes, a native seed and habitat management company focused on the restoration of Native Pacific Northwest Prairies and Grasslands.

Saving the Soul of the Heartland **Douglas Ladd**
Former Director of Conservation, The Nature Conservancy in Missouri, St. Louis, MO



Doug has been involved with fire management, fire ecology, conservation planning, natural area assessment, and ecological management, restoration, and research, with particular emphasis on vegetation, ecological restoration, and fire ecology. His recent work has concentrated on vegetation and fire ecology of Midwestern prairies and woodlands. In addition to numerous articles and reports, Doug is the author of North Woods Wildflowers and Tallgrass Prairie Wildflowers, and coauthor of Discover Natural Missouri and Distribution of Illinois Vascular Plants. He is a research associate at the Missouri Botanical Garden, the Conservation Research Institute, and The Morton Arboretum. He serves as adjunct faculty at Washington University, on the advisory board of Shaw Nature Reserve, and is past president of the American Biological and Lichenological Society.

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.

Forums Program and Abstracts
Wednesday, June 28 | Skinner A and B

10:00 to 12:00
Paper Session 7, Skinner A
Forum A: Western Prairie Fringed Orchid Recovery, F1 Abstract

The western prairie fringed orchid (*Platanthera praeclara*) is federally protected under the Endangered Species Act as a threatened species and is found in moist tallgrass prairies in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and Manitoba, Canada. Main threats to the species include the conversion of remnant prairie to cropland, incompatible use of herbicides and pesticides, siltation, changes in hydrology, fire suppression, encroaching woody vegetation, and the spread of non-native, invasive plant species. In this 2-hour forum, we bring together a subset of researchers, resource managers, and practitioners leading recovery efforts for the orchid and attendees interested in learning more about the species and joining our ever-growing community working towards recovery of this stunning orchid. The forum will begin with an overview of western prairie fringed orchid recovery efforts, the status of the species across its range, the pollination biology of the orchid, and microbial ecology and implications for in situ and ex situ conservation. Presentations will be followed by an open discussion focused on current and future recovery needs, opportunities for involvement, monitoring and management questions, and the role of citizen science in evaluating the status of the species.

10:00 to 10:10 Introduction, Dawn Marsh, U.S. Fish and Wildlife Service, Minnesota-Wisconsin Field Office, Bloomington, MN

10:10 to 10:25 Dawn Marsh
Overview of the western prairie fringed orchid and tracking progress towards recovery under the ESA

10:25 to 10:40 Derek Anderson, Minnesota Department of Natural Resources
The Status of Platanthera praeclara in Minnesota

10:40 to 10:55 John Pearson and Mark Leoschke, Iowa Department of Natural Resources, Des Moines IA
Western prairie fringed orchid in Iowa

10:55 to 11:10 Steven Travers, North Dakota State University, Fargo, ND
The pollination biology of Platanthera praeclara

11:10 to 11:25 Jaspreet Kaur, University of Wisconsin - La Crosse, La Crosse, WI
Microbial ecology: Implications for in situ and ex situ conservation

11:25 to 11:55 Roundtable discussion, All

11:55 to 12:00 Wrap-up and closing thoughts, Dawn Marsh

1:00 to 3:00
Paper Session 9, Skinner A
Forum B: On Common Ground: A multidisciplinary engagement in Iowa's Loess Hills, F2 Abstract

Inspired by a similar event on Mount St. Helens, *On Common Ground* convened over two dozen artists, writers, and naturalists to the Iowa's northern Loess Hills during a weekend at Joy Hollow Girl Scout camp in early Fall 2021. Although not as famous as Mount St. Helens, the Loess Hills are an exceptional natural landscape and a worthy environment for interdisciplinary interaction. The landform, sculpted from the deepest deposits of wind-borne glacial silt in the United States, is home to a significant collection, both in size and number, of Iowa's remnant prairies. The group shared space and stories, participated in a prairie burn, and encountered a bison herd. Keynote facilitators were Dan O'Brien (*The Rites of Autumn; The Contract Surgeon; Buffalo for the Broken Heart*) and Connie Mutel (*Fragile Giants; The Emerald Horizon; A Sugar Creek Chronicle*). Although delayed a year by COVID-19, this place-based collaboration among the Arts, Humanities, and Sciences has inspired a 30-minute documentary, an anthology of poems, essays, and artwork, an indoor mural, and educational material. Our expanded session will include viewing the documentary, readings from anthology contributors, and a discussion among the audience and panel.

1:00 to 1:15 Introduction, Dr. Brian T. Hazlett, Department of Biology, Director of the Center for Prairie Studies, Briar Cliff University, Sioux City, IA

1:15 to 1:45 Documentary film

1:45 to 2:30 Book readings by authors:

- Dr. John T. Price, Department of English, Director of the Creative Nonfiction Writing Program, University of Nebraska at Omaha, Omaha, NE
- Melanie Krieps Mergen, Singer-songwriter & Writer, Mason City, IA
- Connie Mutel, Senior Science Writer (retired), IIHR-Hydroscience & Engineering, University of Iowa College of Engineering, Iowa City, IA
- Scott Moats, Director of Lands/Fire Manager Iowa/Missouri, The Nature Conservancy, Westfield, IA

2:30 to 3:00 Questions and Answers, Discussion – Dr. Ryan Allen, Lumin Therapy, Sioux City, IA

1:00 to 3:00
Paper Session 10, Skinner B
Forum C: Born in Crisis: The NRCS and prairie reconstruction and management, F3 Abstract

For 90 years the Natural Resources Conservation Service (NRCS) has met the nation's natural resource challenges with technical innovation, demonstration of concept, and a strong determination to succeed. The Dust Bowl that followed a worldwide economic depression was a sobering crisis that upon closer examination, would serve as a launching point for continental-scale resource preservation and conservation. Hugh Hammond Bennett is well known for championing the cause of soil conservation. His famous 1935 testimony to Congress was well timed with the largest dust storm in U.S. history, which engulfed Washington, DC that day. As the first Chief of what would become the NRCS, Bennett was keen to recognize the consequences of what he called "land devegetation." Moreover, as a contemporary of Aldo Leopold and other champions of conservation at the time, Bennett knew the remedy to soil erosion would require a broader focus than preventing soil loss alone.

The loss of the North America's grasslands is a crisis that the NRCS is prepared to confront. Using science, and decades of experience, the NRCS has developed and continues to improve upon the concept of Ecological Site Descriptions (ESDs), which help conservation planners and their clients understand the ecological relationships between the current state of the land and management scheme to other potential states including the "reference state" that existed before European colonization. This two-hour forum will show participants the value ESDs have in reconstructing and managing North America's prairie.

1:00 to 1:10 Introduction to the NRCS, James Cronin, State Biologist, Iowa NRCS, Des Moines, IA

1:10 to 1:20 James Cronin
Technical resources available to reconstruct and manage prairie

1:20 to 1:50 Kevin Kuhn, Resource Conservationist, Iowa NRCS, Des Moines, IA
Getting things done: Prairie reconstruction and management

1:50 to 2:20 Dr. Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA
Ecological site data for Iowa's prairie ecosystems: An unprecedented guide for prairie restoration

2:20 to 2:50 Curt Bradbury, State Biologist, North Dakota NRCS, Bismarck, ND
Ecological Site Descriptions and their value in reconstructing and managing prairie

2:50 to 3:00 James Cronin, Questions and Answers

Paper Presentations and Abstracts

Monday, June 26

Paper Session 1 Prairie through the Eyes Diversity/Inclusion AND Private Land Projects
1:00 to 3:00, Skinner A, Moderator Sarah Nizzi

1:00 to 1:20 Sikowis Nobiss, Great Plains Action Society; sikowis@greatplainsaction.org
End-stage Iowa: Big-ag's sacrifice zone and indigenous resistance

1:20 to 1:40 Ray Hamilton, Prairie Enthusiast, Solon, IA; rayhamilton563@yahoo.com
How to identify, acquire, and protect natural areas: Remote river corridor, prairies, savannas, fen, & algific talus slopes

1:40 to 2:00 Jathan Chicoine, Native Prairie Bison, LLC, Ames, IA; jathan.chicoine@gmail.com
Racheal A. Ruble, Native Prairie Bison, LLC, Ames, IA
Learning from bison: A story of a small farm's efforts to restore native ecosystems

2:00 to 2:20 Mary C. Damm, Prairie Quest Farm, McGregor, IA; marydamm@gmail.com
Phil Specht, Prairie Quest Farm, McGregor, IA; demfarmer@alpinecom.net
Grazing for grassland birds

O1 ***End-stage Iowa: Big-ag's sacrifice zone and indigenous resistance,*** **Sikowis Nobiss**
This presentation provides an Indigenous perspective on the environmental catastrophe known as the State of Iowa where the water is poisoned, animals are dying, the soil is disappearing, and the landscape is turning into a desert. Indigenous concepts such as regenerative agriculture, sustainable land use, and compassion for the earth have been violently oppressed by an imperialist heteropatriarchy to make way for colonial-capitalist farming practices which are now killing us and wreaking havoc on the climate. The only way to heal this land is to adopt Indigenous ways of being and uplift an Indigenous regenerative economy.

O2 ***How to identify, acquire, and protect natural areas: Remote river corridor, prairies, savannas, fen, & algific talus slopes,*** **Ray Hamilton**
Ray has been involved with identification and site protection of over a dozen natural areas in Eastern Iowa. He has also written a guide to native prairie management, focusing on holistic management that preserves the integrity of both the highly visible and mostly unnoticed elements of the ecosystem. He will also talk about approach to potentially skeptical landowners, and key points for effective leadership of field trips.

O3 ***Learning from bison: A story of a small farm's efforts to restore native ecosystems,*** **Jathan Chicoine and Racheal Ruble**
Native Prairie Bison, LLC practices regenerative agriculture with a commitment to environmental, social, and economic sustainability. With a strong social mission that sees ourselves in the context of a larger inclusive system in which we all live, we place high value on collaboration. New understandings founded in scientific research reveal a need to increase biodiversity of native species, while understanding our interrelatedness and the interdependency of our ecosystems. How can we better restore our soil heath; preserve remnant species; increase the biodiversity of native plants and wildlife; and improve water quality and the land for future generations? Native species are uniquely adapted to their specific regions with a greater ability to survive extreme conditions, but what additional benefits do they provide? We will discuss restoration efforts on our 180-acre central Iowa farm with the assistance of a family herd of bison, a keystone species that continues to influence us for the better. Our efforts include protecting remnant prairie, oak savanna, and other native ecosystems along with returning marginal cropland to tall grass prairie and restoring oxbows and wetlands. We will share our observations on the role the bison play in the biodiversity of the land and discuss future plans.

O4 ***Grazing for grassland birds,*** **Mary Damm and Phil Specht**
Prairie Quest Farm is located in the Driftless Region of Northeast Iowa along the bluffs of the Upper Mississippi River and within the Effigy Mounds - Yellow River Forest Globally Important Bird Area, designated by the National Audubon Society. The majority of the farm is planted in a diverse mix of perennial cool-season grasses and legumes for rotationally grazed pastures. Over the past two decades, the farm has been managed for the production of forages for grass-fed beef and dairy cattle as well as habitat for breeding grassland birds. Grassland birds as a guild have declined by 53% since 1970 across the United States and Canada. Of obligate grassland bird species, 29 nest on private land 82% of the time, and 7 nest on private land 90% of the time. On our pasture-grassland, we developed an adaptive management grazing system based on the ecology of the tallgrass prairie. We replaced grazing and browsing bison and elk with cattle and established a grazing rotation that mimics movement of the native mammals. This managed grazing system creates a mosaic of plant heights and maturities resulting in habitat suited for breeding obligate grassland birds, especially Bobolinks, Eastern Meadowlarks, and Sedge Wrens.

Paper Session 2 Reconstruction and Planting Techniques
1:00 to 3:00, Skinner B, Moderator Laura Miner

1:00 to 1:20 Brian Wilsey, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA; bwilsey@iastate.edu. *Importance of persistence, priority effects, and species diversity in prairie establishment*

1:20 to 1:40 Chris Helzer, The Nature Conservancy; Wood River, NE; chelzer@tnc.org
Are reconstructed prairies de-fragmenting the landscape?

1:40 to 2:00 Scott B. Sauer, Down-to-Earth Ecological Consulting, LLC, Madison, WI; scottbsauer@yahoo.com
What are we getting right, and what are getting wrong? Informed choices in prairie reconstruction and restoration

2:00 to 2:20 Katherine C. Wynne, Department of Plant Sciences, Michigan State University, East Lansing, MI; Wynnekat@msu.edu. Lauren L. Sullivan, Department of Plant Sciences, Michigan State University, East Lansing, MI; llsull@msu.edu
The role of temporal dispersal patterns in building diverse tallgrass prairie plant communities

2:20 to 2:40 Stephanie L Frischie, The Xerces Society for Invertebrate Conservation, Portland OR; stephanie.frischie@xerces.org. *Prairie spring: Sowing seeds for floristic diversity and associated insect wildlife*

2:40 to 3:00 Justin Meissen, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; justin.meissen@uni.edu
Laura Jackson, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; laura.jackson@uni.edu
Promoting forbs in prairie reconstructions using grass selective herbicide

O5 ***Importance of persistence, priority effects, and species diversity in prairie establishment,*** **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.

O6 A*re reconstructed prairies de-fragmenting the landscape?*, Chris Helzer
The best hope for sustaining the viability of fragmented prairies is to reconstruct habitat around and between fragments. Enlarging and reconnecting tiny, isolated fragments makes them and their plant and animal communities more resilient. Measuring the success of that conservation strategy, though, requires a different kind of evaluation than is commonly used. Most evaluations of reconstructed prairies focus on how much they resemble nearby remnant (unplowed) prairies, usually focusing on plant communities and soil characteristics. However, if we're trying to make prairie fragments bigger and more connected, we need to measure whether animal species in remnants are using nearby reconstructed habitats. At The Nature Conservancy's Platte River Prairies in Nebraska, we have conducted inventories of bees, ants, small mammals, and grasshoppers to see if the species in remnants are being found in adjacent reconstructions. We've also evaluated the flower resources available to pollinators and have examined patterns of use by regal fritillary butterflies. These are early steps, but the results have been positive. We hope to inspire others to conduct and share the results of similar analyses at other sites.

O7 ***What are we getting right, and what are getting wrong? Informed choices in prairie reconstruction and restoration,*** **Scott Sauer**
Prairie management is as much a cultural exercise as it is a practical one. Choices we make in seed selection need to be based in science and informed research. It is evident that there is a persistent drift away from science and local knowledge toward convenience and uniformity in seed selection. This talk will present examples of this trend, as well as reconnecting us to the resources available to us in the practice of informed prairie reconstruction and restoration.

O8 ***The role of temporal dispersal patterns in building diverse tallgrass prairie plant communities*****, Katherine Wynne and Lauren Sullivan**
Establishing diverse plant communities is critical since diversity is linked to ecosystem health. However, recreating tallgrass prairies with high plant diversity has been challenging, especially for early-season species. Variation in species arrival may

influence plant community composition and diversity. Since prairies exhibit temporal patterns of seed dispersal, planting all species simultaneously could forgo phenological differences that promote species coexistence. Therefore, we investigated whether manipulating plant species' arrival according to natural dispersal phenology influences reconstruction outcomes. In 2021, we manipulated the arrival of 36 native tallgrass prairie species via seed additions of (i) species in the order of peak dispersal timing, (ii) early-dispersing species (first peak in dispersal activity before September 1st) followed by 18 late-dispersing species, (iii) 18 late-dispersing species followed by 18 early-dispersing species, (iv) all species simultaneously. Additionally, we had a negative control that had no seed additions. One year later, we found that differences in seeding treatment influenced the diversity and composition of reconstructed communities. Species arriving later had less cover than when seeded with priority, particularly for early-dispersing species. Overall, our study provides evidence of priority effects in reconstructed grasslands and suggests that the timing of seed additions post-disturbance influences restoration outcomes.

O9 ***Prairie spring: Sowing seeds for floristic diversity and associated insect wildlife*****, Stephanie Frischie**
Vascular plant species are the matrix of North American prairie systems. The majority of herbaceous species bloom in summer and fall, but a substantial number of species in the prairie flora bloom in the spring. These early-flowering species are typically underrepresented in prairie reconstructions and the seed mixes that they are grown from. The absence of early blooming species limits the potential conservation impact of projects with goals that include classic restoration to reference ecosystems, maximizing native diversity, and rare species conservation of plants or wildlife, especially pollinators.
Featuring a suite of illustrative species and an inspirational example of a case study of a tallgrass prairie reconstruction in Indiana, this talk will present the main factors that influence the availability and inclusion of spring flowering species for seed addition: biological, economic, cultural, timing of restoration activities, seed ecology. The final section of the talk will summarize the ongoing work of Xerces and partners to identify important plants for invertebrates and improve the availability and use of those plants in habitat. This includes a habitat suitability assessment for regal fritillary butterflies and their host plant genus of Viola and a native seed cost research project with the Tallgrass Prairie Center.

O10 ***Promoting forbs in prairie reconstructions using grass selective herbicide*****, Justin Meissen and Laura Jackson**
Many prairie reconstructions become grass dominated and lose forb abundance over time, limiting their utility to conserve biodiversity or provide habitat for pollinators and other wildlife. Widespread prairie management techniques like spring burning used in reconstructions enrolled in the Conservation Reserve Program (CRP) tend to exacerbate the issue of grass overabundance. We investigated another management option approved for use in CRP reconstructions, grass-selective herbicide application, to prevent or delay the process of warm-season grass dominance while improving the diversity and abundance of forbs and floral resources. We conducted an experiment assessing the effects of grass-selective herbicide on plant community composition in existing prairie research plots (established 2015) with seed mixes varying in grass to forb seeding ratio (grass dominated, grass/forb balanced, forb dominated). Compared to controls, grass-selective herbicide (Clethodim) application increased flower and forb abundance the year following treatment. Herbicide effects on flower density appeared more prominent in grass dominated and grass/forb balanced seed mixes. We found no lasting impact of herbicide on grass abundance or diversity of forbs and floral resources. Using grass-selective herbicide as a management option resulted in modest promotion of forb growth, though it remains unclear whether these effects will be temporary or long-lasting.

Paper Session 3 Prairie Floristics and Plant Communities
3:30 to 5:30, Skinner A, Moderator Codi Sharkey

3:30 to 3:50 Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA; thomas.rosburg@drake.edu
The vegetation and seedbank of a remnant sedge meadow in Madison County, Iowa

3:50 to 4:10 Jordan Nikkel, Iowa State University, Ames, IA; jjnikkel@iastate.edu
Elizabeth K. McMurchie, Iowa State University, Ames, IA; mcmurch@iastate.edu
William R. Norris, Western New Mexico University, Silver City, NM; william.norris@wnmu.edu
Deborah Q. Lewis, Curator of the Ada Hayden Herbarium, Iowa State University, Ames, IA; dlewis@iastate.edu
The postage stamp and beyond: The vascular flora of Marietta Sand Prairie (Marshall County, IA)

4:10 to 4:30 Thomas R. Thompson, Missouri Department of Conservation, Jefferson City, MO; tom.thompson@mdc.mo.gov
A long-term study of the impacts of patch-burn grazing with cattle (PBGC) as a prairie management tool on plant community response and vegetation structure response metrics in Missouri: Update on the first 5-years

4:30 to 4:50 William Norris, Western New Mexico University, Silver City, NM; william.norris@wnmu.edu
Thomas Rosburg; Department of Biology, Drake University, 2507 University Ave., Des Moines, IA
John Pearson, Iowa Department of Natural Resources, Des Moines, IA
Botanical studies of prairie remnants in the Iowa State Preserve System: Past, present, and future

4:50 to 5:10 Daniel T. Deever, Iowa State University, Ames, IA; ddeever@iastate.edu
Nathan M. Soley, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA
Brian J. Wilsey, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA
Recruitment limitation of early- and late-flowering grassland forbs can be overcome with transplanting in prairie restorations

O11 ***The vegetation and seedbank of a remnant sedge meadow in Madison County, Iowa*****, Thomas Rosburg**
Sedge meadows are among the rarest ecosystems in Iowa and the Midwest. During a floristic survey and ecological assessment of Paule Preserve in Madison County in 2018 and 2019, two sedge meadow ecosystems were identified and their species composition measured. One was fairly high quality, while the other was substantially degraded by reed canary grass. A study was initiated in 2019 to investigate the effects of prescribed fire, mowing, and herbicide on the restoration of the degraded sedge meadow. In the summer of 2019, the baseline plant communities were observed on 32 treatment plots. Later in the fall, seedbank samples were collected from the same plots and a seedling assay was completed in 2020. This paper will describe and discuss the vegetation of both ecosystems and the seedbank community of the reed canary/sedge meadow. The Floristic Quality Index ranged from 27.4 for the more degraded ecosystem to 34.0 for the higher quality one. Top species in the vegetation included Amorpha fruticosa, Calamagrostis canadensis, Carex tribuloides, Carex cristatella, Phalaris arundinacea and Persicaria punctata. Top species in the seedbank were Phalaris arundinacea, Rorippa palustris, Carex species, Verbena hastata and Lycopus americanus.

O12 ***The postage stamp and beyond: The vascular flora of Marietta Sand Prairie (Marshall County, IA)*****, Jordan Nikkel, Elizabeth McMurchie, William Norris, Deborah Lewis**
An ongoing survey of the vascular flora of the Marietta Sand Prairie State Preserve (Marshall County, IA), began in 2022. Purchased in 1983, the Marietta Sand Prairie initially consisted of a “postage stamp” of 17 acres that was dedicated as a state preserve the following year. Marietta expanded in 2006 with the addition of about 212 acres, which is not included in the preserve, that features sand prairie, old fields, and wetlands. Sand prairies are considered globally rare, with only 116 acres (47 ha) of this habitat type currently protected in Iowa preserves. In 2022, we collected specimens in the preserve and the later addition that represent over 280 different vascular plant species, subspecies, or varieties across about 195 genera and 78 families, with several of these being rare or threatened. This project will continue through 2023 and 2024 and is expected to locate many additional species. Ultimately, this project will record many previously undocumented plant species here, some of which may be invasive or nonnative. These findings will be published in a scientific journal and will also be reported to land managers in order to help inform management decisions at this vestige of unique and increasingly rare habitat.

O13 ***A long-term study of the impacts of patch-burn grazing with cattle (PBGC) as a prairie management tool on plant community response and vegetation structure response metrics in Missouri: Update on the first 5-years,*** **Thomas Thompson**
In 2015 the Missouri Department of Conservation (MDC) began a long-term study (15 years) to determine the impacts of Patch Burn Grazing with cattle (PBGC) on the plant community composition and plant species populations, as well as vegetation structure at five MDC managed prairies. The plant community response study is primarily looking at plant community metrics (e.g., diversity, mean C) and specific plant species populations (occupancy/relative frequency), and the vegetation structure response study is primarily looking at vegetation structure metrics (e.g., visual obstruction, litter depth, percent cover functional groups) and GPS-collared cattle locations. Additionally, as part of this adaptive management study, a priori decision triggers were established for the different plant community and vegetation structure response metrics by an MDC team composed of relevant managers, natural history biologists, scientists, and supervisors. Data were summarized, analyzed, and evaluated based on these decision triggers. Results will be discussed for the first 5-year period. Both studies provide evidence, as well as opportunities, to adapt PBGC to meet management objectives and to adapt and improve monitoring and assessments (i.e., decision triggers) to help inform evidenced-based management decisions on remnant tallgrass prairie.

O14 ***Botanical studies of prairie remnants in the Iowa State Preserve System: Past, present, and future,*** **William Norris, Thomas Rosburg, and John Pearson**
Twenty seven prairie remnants are currently protected in the Iowa State Preserves system. Representing a broad range of tallgrass and mid-grass prairie types and ranging in area between 1.2 ha and 319.7 ha, these 27 prairie remnants have collectively been the focus of at least 80 botanical studies since 1940 (e.g., floristic surveys, conservation assessments, ecological studies). Data from these studies occur in a wide range of formats, including herbarium voucher specimens, surveyor notes, unpublished technical reports, university theses and dissertations, and published floras. For only 13 of these 80 studies is there indication that herbarium voucher specimens were collected to thoroughly document the flora, and no data base of voucher specimens deposited in Iowa herbaria currently exists to allow for easy relocation of such specimens. Furthermore, only seven of these 27 prairie remnants are the focus of readily available published floras. Floristic data have important uses in academic studies and applied biology. We propose that the long tradition of floristic studies of Iowa prairie remnants, including the collection of supporting voucher specimens, be resumed. We also argue that it is time for creation of an on-line data base to document plant specimens documented in Iowa herbaria.

O15 ***Recruitment limitation of early- and late-flowering grassland forbs can be overcome with transplanting in prairie restorations,*** **Daniel Deever, Nathan Soley, and Brian Wilsey**
One important goal in prairie restorations is to have forb species that flower throughout the growing season (i.e., a range of flowering phenology). We conducted an experiment to test whether three early- and three late-flowering forb species are seed or recruitment limited, if mowing can influence this limitation, and if forb additions will impact overall plant diversity in ongoing restorations. The experiment was conducted at two restorations in northern Iowa and one in southern Minnesota, USA using a split-plot design.

Throughout the course of the study biomass of early- and late-flowering forbs was much higher when they were added as transplants than when added as seeds. Survivorship across life stages indicated that the transition from seed to adult had lower survivorship probabilities (0.6%) than the transition from transplant (juvenile) to adult (75%). The relative abundance of target forb species (pi) was significantly higher when transplants were added than when seeds were added, and was higher in late-flowering species than in early-flowering species. Our results indicate that early- and late-flowering species are recruitment limited, not seed limited, and that diversity is lower when these species are missing in restorations. We recommend transplanting a rich mix of forbs to overcome recruitment limitation and ensure flowering occurs throughout the growing season.

Paper Session 4 Prairie and Regenerative Agriculture
3:30 to 5:30, Skinner B, Moderator Laura Miner

3:30 to 3:50 Jeremy S. Giannone, University of Minnesota, Minneapolis, MN; giann077@umn.edu
Phosphorus transport in soil: Locating and identifying a limiting element

3:50 to 4:10 Cornelia F. Mutel, Senior Science Writer (retired), IIHR-Hydroscience & Engineering, University of Iowa College of Engineering, Iowa City, IA; connie-mutel@uiowa.edu
Tending Iowa's Land: How a vision became a book

4:10 to 4:30 Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA; thomas.rosburg@drake.edu
Iowa's rich biodiversity legacy: A vision for the future

O16 ***Phosphorus transport in soil: Locating and identifying a limiting element,*** **Jeremy Giannone**
The phosphorus (P) cycle is not well understood. While carbon (C) and nitrogen (N) have gas phases, P does not. Phosphorus runoff in waterways and its shortage are both understood since their causes are due to agricultural demands. Fertilizers increase the rate of phosphorus in the soil leading to greater runoff which then accumulates in the surrounding bodies of water. 1 From an economic perspective the phosphorus availability and food prices have a direct correlation. The instability of phosphate prices may have direct causation to the instability of the food and agriculture markets. 2 In order to deal with these issues, P transfer from sediment through soil must be understood.
Unlike C and N, P does not have a gas phase at atmospheric pressure which makes the exchange difficult to study. Information on the composition and dynamics of soil phosphorus (P) remains limited, but is integral to the understanding of soil biogeochemical cycles. 3 This research will combine the analytical techniques of FT-IR and NMR to expand the knowledge of P in soil biogeochemistry. Learning how P transfers from sediment through soil will both clarify how the P cycle operates and yield foresight to agriculture markets.

O17 ***Tending Iowa's Land: How a vision became a book,*** **Cornelia Mutel**
Iowa 1820: Heart of the mid-continental Tallgrass Prairie, a biome of tremendous diversity, abundance, and resilience.
Iowa today: Topsoil depth cut in half, river pollution among the nation's greatest, natural systems severely depleted.
How do we address such massive environmental loss? In part, through education. The book Tending Iowa's Land: Pathways to a Sustainable Future, published in 2022 by the University of Iowa Press, was written to educate environmental science students and engage general readers. Sixteen scientists describe Iowa's intensifying problems with soils, water, climate change, and biodiversity loss. Their chapters alternate with personal essays by a dozen Iowa farmers and others active in environmental efforts. These enliven the book and turn its focus from problems toward solutions. All the authors use first-person stories to captivate and entertain readers, and all emphasize positive attitudes and suggestions for a more sustainable future.

Tending Iowa's Land – the first compilation addressing the state's diverse major environmental challenges – presents the scientific basics, feeds our hopes, and fosters personal and community engagement. Come hear how we created this book, how its themes evolved into clear messages, and how working on this book transformed many authors' attitudes toward our environmental dilemmas.

O18 ***Iowa's rich biodiversity legacy: A vision for the future,*** **Thomas Rosburg**
Iowa was once home to incredible numbers of plant and animal species, supported by landscapes featuring an array of midgrass and tallgrass prairies, marshes, fens, sedge meadows, oak savannas, woodlands and forests. Native Americans lived on and utilized these ecosystems sustainably for generations. After just 100 years of Euro-American occupation and agriculture, much of that biological legacy was gone. Considering the extensive loss of its native landscapes – at least 99.5% of prairie, 92% of wetlands, and 75% of forest and woodlands – it's remarkable Iowa has any semblance of its rich legacy of biodiversity left. While the loss of species crafted by millions of years of evolution is alarming, equally concerning is the direct effect it continues to have on impaired ecosystem functions and processes. It's our native biodiversity that provides ecosystem services, those intangible outcomes of nature that benefit the lives of humans in so many ways. It's biodiversity that can mitigate and restore the damage done to our soil, water and air. The book Tending Iowa's Land is a call to action to repair Iowa's degraded soils, water, air and biodiversity. This paper, based on a chapter from the book, envisions a future where agriculture and biodiversity are mutually sustainable.

Wednesday June 28

Paper Session 5 Insects and other Invertebrates
7:30 to 9:30, Skinner A, Moderator Russ Benedict

7:30 to 7:50 MJ Hatfield, Coldwater Creek Biological Field Station, Cresco, IA; mjhatfield@oneota.org
Reconstructed prairies: Are they functioning? What can insects tell us?

7:50 to 8:10 Thomas P. Franzem, Department of Biological Sciences, University of Alabama, Tuscaloosa, AL; tfranzem@crimson.ua.edu
Paige F.B. Ferguson, Department of Biological Sciences, University of Alabama, Tuscaloosa, AL; pfferguson@ua.edu
Drivers of beetle occurrence and abundance in Alabama black belt prairies

8:10 to 8:30 Russ Benedict, Central College, Pella, IA; benedictr@central.edu
Emma Clodfelter, Central College, Pella, IA
Cameron Coles, Cornell University, Ithaca, NY
Tristan Murphy, University of Northern Iowa, Cedar Falls, IA
Jack Sytsma, Kansas State University, Manhatten, KS
Madison Zink, Central College, Pella, IA
Preference of plants as nectar sources by adult monarch butterflies (Danaus plexippus) in a tallgrass prairie reconstruction

8:30 to 8:50 MJ Hatfield, Coldwater Creek Biological Field Station, Cresco, IA; mjhatfield@oneota.org
Life on a little-known prairie (Thank you Howard Ensign Evans)

8:50 to 9:10 Genevieve Pugesek, The Xerces Society for Invertebrate Conservation, Portland OR; genevieve.pugesek@xerces.org
Katie Lamke, The Xerces Society for Invertebrate Conservation, Portland OR
Rich Hatfield, The Xerces Society for Invertebrate Conservation, Portland OR
Elaine Evans, University of Minnesota, Minneapolis, MN
Bumble Bee Atlas: Regional collaboration to conserve pollinators using community science

9:10 to 9:30 Laura Fischer Walter, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; laura.walter@uni.edu. *Arthropod friends, foes, and frenemies among the prairie seed plots*

O19 ***Reconstructed prairies: Are they functioning? What can insects tell us?*** **MJ Hatfield**
Two traditional methods for determining the quality of prairie reconstructions are native plant species richness and average coefficient of conservatism. But these measures of success are based on a single trophic level, the bottom. With prairie reconstructions, given time and effort, we can add and amend plant species to increase species richness. Other groups, in this case insects, generally need to show up on their own. Considering the isolation of most of our reconstructions, this cannot be taken for granted. The next step in measuring planted prairie success should be to document the diversity of insect arrivals. In reconstructions, flowering native plants are attracting pollinators, the monarch being a well-documented example. The monarch showcases the interdependence of an insect and its specific hostplants, milkweeds. Without milkweeds there would be no monarchs. Native plants, their flowers, leaves, stems, roots and seeds, are attracting host specific insect larvae and nymphs. Can documenting these host specific insects help determine the success of our plantings? I will present some examples of 'plant it and they will come' as to offer a model for which we can begin to measure the success of restoring function to the landscape through documenting interactions between plants and animals.

Type of Presentation: Oral paper
For oral presentations only: Insects and other invertebrates

O20 ***Drivers of beetle occurrence and abundance in Alabama black belt prairies,*** **Thomas Franzem and Paige Ferguson**
Insects are vital components of grasslands; they structure plant communities, alter soil conditions, translocate nutrients, and enhance carbon sequestration. Understanding how grassland insects respond to habitat features and management practices can inform and enhance conservation of grasslands, however grassland insect ecology, especially for non-pollinator taxa, is poorly resolved. We investigated how Scarab (Scarabaeidae) and Carabid (Carabidae) beetle occupancy and abundance was impacted by local habitat features and management practices in Black Belt Prairies of Alabama. We collected beetles from 24 sampling sites in 2019, and generated occurrence and abundance data to construct single-species occupancy models for 50 taxa and a multi-family abundance model. We utilized Stochastic Search Variable Selection to identify covariates associated with occupancy or abundance and estimate the effect size of those covariates. We found that vegetation diversity was positively associated with occupancy probability for 28% of modelled taxa. Further, density of invasive fire-ant mounds was negatively associated with 20% of modelled species. Further, land-cover influenced occupancy, but the direction of the relationship varied between species. Our models did not identify any covariates as associated with carabid abundance, but basal area had a negative influence on scarab abundance. These results can inform future grassland and insect conservation.

O21 ***Preference of plants as nectar sources by adult monarch butterflies (Danaus plexippus) in a tallgrass prairie reconstruction,*** **Russ Benedict, Emma Clodfelter, Cameron Coles, Tristan Murphy, Jack Sytsma, and Madison Zink**
Monarch butterflies have declined in population recently in North America. As part of a solution, landowners are encouraged to grow prairie plants, but the preference of foraging adults is poorly known. We observed feeding monarchs in 2018-2020 in Marion County, Iowa; measurements were taken of plants used and other flowers available. We observed 364 feeding events; monarchs chose flowers from six plant families with Asteraceae having the most feedings, followed by Asclepiadaceae. At the species level, 32 plants were used for nectaring; compass plant, common milkweed, sawtooth sunflower, New England aster, butterfly milkweed, and false sunflower were the most frequently used. To design plantings to benefit monarchs, including several members of Asteraceae and Asclepiadaceae in the seed mix is an obvious recommendation. But based on the breadth of plants used by monarchs, several other design factors are important to consider. In particular, given the increasing frequency of severe weather, planting prairies with high species richness likely will assure access to nectar for monarchs (and other species) even if one plant species has a poor growing season. Furthermore, given changes in timing of migration of monarchs, it is important to include early and late-blooming plants to provide nectar during migration.

O22 ***Life on a little-known prairie (Thank you Howard Ensign Evans),*** **MJ Hatfield**
By the late 1800's plant species in our prairies were reasonably well documented. Now, a century and a half later, many insects in our remnant prairies remain undocumented and unknown. Given that our prairie remnants often have good plant diversity, including rare plants, might these prairies also have good insect diversity including rare insects?
Insects are often host specific with phytophagous/plant feeding insects requiring plants of a specific family or genus. You may not see the insect, larvae or adults, but certainly you may notice plant herbivory or sign of insects such as leaf mines, flower petals woven together, or stem galls. Although I use common names, when available, please note some of the insect binomial names: Papaipema baptisiae, P. silphii, Amorphicola pallida, Walshia amorphella, Phytomyza anemonivora, Periploca ceanothiella, and Stigmella ceanothi, examples of insects whose genus or species epithet reflect a close relationship to their host plant.

There may well be a treasure trove of insect diversity in our remnants, yes, even undescribed species. Discovery awaits. You are invited to spend 15 minutes as we walk slow and look closely, to reconnect or meet a few of the insects living and feeding in our small but rich prairie remnants.

O23 ***Bumble Bee Atlas: Regional collaboration to conserve pollinators using community science,*** **Genevieve Pugesek, Katie Lamke, Rich Hatfield, and Elaine Evans**
For bumble bees and other insect pollinators, lack of data can create major hurdles in documenting current species distributions and understanding drivers of declines. Community science programs offer an opportunity to fill these information gaps and provide baseline data essential for conservation.
In this presentation, we provide an overview of the Bumble Bee Atlas program, a collaborative effort by the Xerces society and their partners to engage community scientists to help track and conserve pollinators throughout the United States. Atlas projects have provided a framework for systematic, effort-based surveys across multiple regions of the United States. To date, over 3,000 participants have dedicated countless hours observing more than 43,000 bumble bee observations across 28% of the land area of the continental United States.
The data from these projects have helped guide conservation action and decision-making. For example, data gathered in the Nebraska BBA has been transformed into bumble bee habitat management guidance, and the Pacific Northwest BBA

data has informed Washington state's new Bumble Bee Conservation Strategy. Further, Atlas data is used to directly inform Species Status Assessments for bumble bees petitioned for protection under the Endangered Species Act.

O24 ***Arthropod friends, foes, and frenemies among the prairie seed plots,*** **Laura Fischer Walter**
The Plant Materials Program at the University of Northern Iowa produces stock seed, developed from Iowa remnant collections, for the native seed industry. Native prairie seed in our program, as in the commercial market, is often produced in single-species rows or plots. Though this is a somewhat artificial system, arthropods that are naturally associated with prairie plant species, along with introduced insect species, are often drawn to these concentrations of host plants. Sometimes, this is in conflict with the goals of seed production, at other times it is clearly a benefit, and in many cases, it gets complicated. I will share examples that highlight what we are learning from observing and interacting with arthropods in the prairie seed plots.

Paper Session 6 Ecology of Grazing and Herbivory
7:30 to 9:30, Skinner B, Moderator John Pearson

7:30 to 7:50 Grace E. Thomas, University of Nebraska at Omaha, Omaha, NE; gracethomas@unomaha.edu
Effects of bison and cattle grazing on milkweeds and monarch butterflies

7:50 to 8:10 Abu Raihan, Division of Biology, Kansas State University, Manhattan, KS; aburaihan@ksu.edu
Walter K. Dodds, Division of Biology, Kansas State University, Manhattan, KS
Effects of grazing and burning on stream water chemistry for the King's Creek drainage basin on Konza Prairie

8:10 to 8:30 Fred Harris, Minnesota Department of Natural Resources, Saint Paul, MN; fred.harris@state.mn.us
Dustin Graham, Minnesota Department of Natural Resources, Saint Paul, MN
Plant species richness and brome responses differ over 5 years depending on stocking rate and fire frequency in two patch-burn grazing projects

8:30 to 8:50 Timothy L. Dickson, Department of Biology, University of Nebraska at Omaha, Omaha, NE; tdickson@unomaha.edu
Brittany Poynor, Department of Biology, University of Nebraska at Omaha, Omaha, NE
Chris Helzer, The Nature Conservancy; Wood River, NE
Implications of cattle grazing common and showy milkweed species at least as much as surrounding grasses

8:50 to 9:10 Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA; thomas.rosburg@drake.edu
Effects of cattle grazing on the species composition of prairie communities in northwest Iowa

9:10 to 9:30 John Pearson, Iowa Department of Natural Resources, Des Moines, IA; John.Pearson@dnr.iowa.gov
Vegetation monitoring for adaptive management in a grazed tallgrass prairie

O25 ***Effects of bison and cattle grazing on milkweeds and monarch butterflies,*** **Grace Thomas**
Monarch butterflies have experienced massive population declines and are being considered for listing under the U.S. Endangered Species Act. This has inspired conservation efforts to mitigate this phenomenon. One of the primary conservation efforts has been to try to increase milkweed (Asclepias spp.) abundance. Milkweeds are the required host plant for monarch caterpillars, and the spread of row-crop agricultural lands has contributed to the deterioration of milkweeds. Previous research by my advisor, Timothy Dickson, also indicates that cattle grazing dramatically decreases milkweed abundance, which is important because 34% of the continental USA is grazed by livestock, primarily cattle. However, bison grazing, which occurs on many conservation sites and some beef production sites, may have a lower negative effect on milkweed than cattle grazing. In my project, I will compare and quantify grazing impacts on milkweed densities and juvenile monarch abundances among bison-grazed, cattle-grazed, and ungrazed lands. The project will build upon previous research by comparing juvenile monarch abundance between grazed and ungrazed lands and by comparing lands grazed by bison and cattle.

O26 ***Effects of grazing and burning on stream water chemistry for the King's Creek drainage basin on Konza Prairie,*** **Abu Raihan and Walter Dodds**
Fire and grazers were key factors in maintaining historic tallgrass prairie, but their impact on water quality in streams is not adequately understood. We analyzed long-term water chemistry data from sites nested within Kings Creek watershed located on Konza Prairie Biological Station. The objectives were: 1) Analyze decadal-scale water quality data (1983-2020) to examine how stream dissolved organic carbon (DOC), nitrate, TP, SRP, and inorganic and volatile suspended solids (ISS and VSS) have responded over time. 2) Investigate the drivers of the long-term water quality dynamics in the Kings Creek drainage basin against different grazing (bison or cattle), biotic, and abiotic factors.

We used MANCOVA on watersheds with varied burn and grazing regimes to determine drivers of streamwater NO3-, DOC, SRP, ISS, and VSS concentrations. NO3- ($F=6.5$, $p<0.013$) and DOC ($F=47.4$, $p<0.001$) increased significantly over time, and NO3- ($F=37.6$, $p<0.001$) concentration was related to burning frequency across grazed watersheds, but not bison or cattle. ISS and VSS were significantly lower in areas with less frequent burning and less grazing. This suggests that both burning and grazing have a negative impact on water quality and can lead to increased levels of suspended solids. Paired sample t-tests between bison grazed and ungrazed watersheds showed significantly higher levels of NO3- ($p<0.001$), SRP ($p<0.001$), and TP ($p<0.001$) in grazed watersheds.

O27 ***Plant species richness and brome responses differ over 5 years depending on stocking rate and fire frequency in two patch-burn grazing projects,*** **Fred Harris and Dustin Graham**

We monitored plant species richness and smooth brome frequency/cover in two long-term patch-burn grazing projects in western Minnesota with different cattle stocking rates over 5 years. Chippewa Prairie has a stocking rate of 0.3 AUM/acre across 1,500 acres in 5 burn units. Hole in the Mountain Wildlife Management Area has a stocking rate of 0.9 AUM/acre across 530 acres in 3 burn units. We utilized pairs of permanent grazed/burned and ungrazed/burned plots established before grazing started. In the light stocking rate site, we see no differences in changes over time in native and non-native plant species richness between grazed and ungrazed plots. Smooth brome greatly increased in frequency and cover in both grazed and ungrazed plots with a higher increase in ungrazed. In the higher stocking rate site, grazed plots had a trend of greater native plant richness and a significantly greater increase in non-native richness than ungrazed plots. Smooth brome increased in frequency in both grazed and ungrazed plots but decreased in cover more in grazed plots. In this case, the higher stocking rate and fire frequency seems to have greater effects in limiting smooth brome density, without limiting native richness, but with a significant increase in non-native species.

O28 ***Implications of cattle grazing common and showy milkweed species at least as much as surrounding grasses,*** **Timothy Dickson, Brittany Poynor, and Chris Helzer**

Most people assume cattle avoid milkweeds due to toxic compounds. However, our study in Nebraska suggests that cattle graze common milkweed (Asclepias syriaca L.) and showy milkweed (Asclepias speciosa Torr.) at least as much as the surrounding grass. We also found milkweed abundance is 74x lower in fields grazed by cattle than adjoining ungrazed fields. Finally, we found that clipped common milkweeds contained 5x fewer monarch butterfly (Danaus plexippus L.) eggs than non-clipped common milkweeds. Monarch butterfly abundance has declined steeply over the past 30 years, and we are examining follow-up questions related to other species of milkweeds and differences between cattle and bison grazing. However, based on current results the following implications seem reasonable: First, cattle regularly grazed common and showy milkweeds with no apparent effects on their health, suggesting that efforts to control normal densities of these species are unnecessary for livestock producers. Second, land grazed by cattle can support far higher milkweed abundances than current levels, meaning studies of better methods for cattle and milkweed coexistence are needed. Third, common and showy milkweeds may be limited more by grazing than by planting efforts, suggesting efforts to plant milkweeds in grazed areas should perhaps focus on other species.

O29 ***Effects of cattle grazing on the species composition of prairie communities in northwest Iowa,*** **Thomas Rosburg**

An examination of the effects of cattle grazing (within a prescribed fire regime) on tallgrass prairie was conducted at Kirchner Prairie from 2012 to 2016. Two cattle grazing regimes were investigated – historic chronic overgrazing (grazing vs. haying) and contemporary conservation grazing (grazing vs. exclosure). Plant species' responses were measured with frequency and density. Vegetation quality and composition were measured with 31 variables.

Historic overgrazing yielded the most significant effects. Plots historically overgrazed had lower richness and density of native forbs and graminoids, greater density of non-native forbs and graminoids, and a lower FQI than plots historically hayed. Far fewer grazing effects were attributable to conservation grazing. The density and frequency of non-native grasses was higher in the grazed plots. Also the mean conservatism of native graminoids was lower on the grazed plots. Conservation grazing on the area historically hayed increased the richness of high conservative species, whereas its use on the area with historic overgrazing decreased the richness of high conservative species. Among 57 plant species examined, 48 exhibited no difference between graze and control plots. Five species were identified as a grazing increaser, and four as a grazing decreaser. Although not quantified, grassland structural heterogeneity was increased by cattle grazing.

O30 ***Vegetation monitoring for adaptive management in a grazed tallgrass prairie,*** **John Pearson**

Prescribed grazing was initiated in 2013 at Kirchner Prairie, an 80-acre tallgrass prairie remnant in northwest Iowa. An intensive 5-year seminal study (Rosburg 2017) between 2012 and 2016 examined vegetation in paired grazed and ungrazed plots within the pasture. To provide ongoing feedback about vegetation trends to managers after that study ended, low-intensity vegetation monitoring was conducted in 2018, 2020, and 2022. Rapid assessments of floristic composition and cover were obtained with releves in two grazed and two ungrazed 400 m2 plots established by Rosburg in the pasture and with seventy-five 1m2 quadrats distributed broadly across both the pasture and an adjacent large exclosure.

The releves showed little difference between grazed and ungrazed treatments: of 50 species detected, 29 had the same level of qualitative abundance, 13 showed slightly greater abundance in ungrazed plots (including Bromus inermis and

Sporobolus heterolepis), and 8 showed slightly greater abundance in grazed plots (including Eryngium yuccifolium and Baptisia bracteata). Of 117 species detected in the quadrats, 80 showed no consistent differences between the pasture and exclosure, 11 showed greater cover in the exclosure (including Zizia aurea and Helianthus rigidus), and 12 showed greater cover in the pasture (including Bromus inermis, Rosa, and Baptisia bracteata).

Paper Session 7 - Forum A Western Prairie Fringed Orchid Recovery
10:00 to 12:00, Skinner A, Moderator Dawn Marsh
See the program for Forums

Paper Session 8 Prairie for Beginners AND Prairie Culture and History
10:00 to 12:00, Skinner B, Moderator Russ Benedict

10:00 to 10:20 Russ Benedict, Central College, Pella, IA; benedictr@central.edu
Introduction to Prairies I

10:20 to 10:40 Russ Benedict, Central College, Pella, IA; benedictr@central.edu
Introduction to Prairies II

10:40 to 11:00 Kara K. Holmstrom, Northeast Iowa Community College, Calmar and Peosta, IA; holmstromk@nicc.edu
Jessie L. Joyner, Northeast Iowa Community College, Calmar and Peosta, IA;
Converting turf to native prairie on a community college campus

11:00 to 11:20 MJ Hatfield, Coldwater Creek Biological Field Station, Cresco, IA; mjhatfield@oneota.org
Walk slow, look close: Meandering for insects

11:20 to 11:40 Kristen A. Greteman, Department of History, Iowa State University, Ames, IA; kristengreteman@gmail.com
Reconstructing the Lost Lakes: Using historical GIS in the Prairie Pothole Region

11:40 to 12:00 Chant Eicke, Senior Project Manager, Natural and Cultural Resources, Impact7G, North Liberty, IA; ceicke@impact7g.com
Jackson Axley, Field Technician, Impact7G, North Liberty, IA
Geoffrey S. Mouming, Project Manager, Restoration, Impact7G, North Liberty, IA
Turning a County Poor Farm into a rich community asset

O31 ***Introduction to Prairies I,*** **Russ Benedict, First author affiliation: Central College**
What is a prairie? Where are they found and why? What organisms dominate prairies, and what the heck is a forb? Why is fire important in prairies? What is the history of prairies in North America? The answers to these questions and more will be discussed in this illustrated talk geared towards those who are newcomers to the amazing world of prairies (or want a refresher).

O32 ***Introduction to Prairies II*****, Russ Benedict**
In this second session introducing people to prairies, we will discuss more of the complex interactions that keep prairies healthy (what are rhizomes, root nodules, and mycorrhizae??) and dive into the conservation issues facing North America's grasslands. Participants do not need to attend the first section to benefit from part two.

O33 ***Converting turf to native prairie on a community college campus,*** **Kara Holmstrom and Jessie Joyner**
Northeast Iowa Community College (NICC) has two campuses in Calmar and Peosta, Iowa. NICC received an Iowa Department of Agriculture and Land Water Quality Initiative grant and a Dubuque County Conservation Mowing to Monarchs grant to convert turf to native prairie at both locations. The objectives were to:
1. Improve water and soil quality by reducing and filtering stormwater runoff
2. Attract pollinators by reintroducing native species
3. Provide educational opportunities to students, staff and visitors about the benefits of native plants
Locations were chosen for ability to reduce runoff and increase visibility near highly-trafficked areas. In Calmar, the 13,000 sq. ft. prairie meadow and two 300 sq. ft. pocket prairies are located on a slight slope down to a parking lot. In Peosta, seven pocket prairies will be planted on parking lot berms and an additional pocket prairie will surround the National Education Center for Agricultural Safety welcome sign. Native plants have been selected to be low maintenance, attractive to pollinators and the general public, with continuous bloom throughout the growing season. Signage identifying each species will be placed at each location for educational purposes as well as for easy identification and ongoing conservation efforts.

O34 ***Walk slow, look close: Meandering for insects,*** **MJ Hatfield**
Prairies are fascinating; they have much to teach us about life, life all around us. First we learn the plants, after all isn't that the very definition of prairies? Then we learn birds and butterflies, Monarchs, Red Admirals, Fritillaries, and now the Rusty Patched Bumblebee. But what about the other 98% of insects? Swat that fly, smash that mosquito! Plants, how many do you recognize, common names will do, 10, 20, 50? Estimates of the numbers of insect species is 10X the number of plants. So if you know 10 plants, do you know 100 insects?
With plants you first learn their flowers, then their leaves, overall shape, what the seed looks like and when they're ready to collect. Guess what? With some insects you don't even have to see the insect to know what it is. Think goldenrod gall fly, Eurosta solidaginis. You know the plant, you recognize the stem gall, therefore you know the insect (but probably not the parasitoids or insects sharing the gall) Please join me for a power point meander (not as good as a field walk) through prairies as we look for insects. But there are requirements: Walk Slow, Look Close, and Be Curious.

O35 ***Reconstructing the Lost Lakes: Using historical GIS in the Prairie Pothole Region,*** **Kristen Greteman**
A massive de-centralized and uncoordinated undertaking to drain the northern Iowa landscape of its lakes for agricultural use took place during the beginning of the twentieth century. Today the overwhelming landscape feature is the farm field. Seemingly simple-looking from the surface, these fields are complex, designed systems of infrastructure that include miles of subterranean tile drainage within the rural built environment.
Lake Cairo, located in Hamilton County, is one example of this process. Drained by 1911, the county conservation board called for the revitalization of the lake as a national wildlife refuge in the 1960s. This call went unacted. Now, with the threat of the climate crisis and calls for rewilding, regeneration of the historical landscape can remake what was unmade. Through the process of deep mapping, this paper constructs a spatial narrative combining General Land Office surveys from the 1850s with soil series data to reconstruct the historical landscape of the prairie pothole ecosystem of Iowa. By shifting the ecology and land use, and reframing the consequences of past actions, Lake Cairo could, once again, affect the communities, economy, and the environment of Iowa one-hundred and ten years later.

O36 ***Turning a County Poor Farm into a rich community asset,*** **Chant Eicke, Geoffrey Mouming, and Jackson Axley**
Johnson County, Iowa's Historic Poor Farm is a 200-acre multi-use historic site that includes approximately 60 acres of prairie, old field, and woodland areas, much of which was largely left unmanaged for the past 50 years. The County needed a comprehensive, yet actionable multi-year management plan for these areas, that balanced many objectives:
• Natural resource assets and issues
• Restoration best management practices
• Stakeholder engagement
• Historic considerations
• Opportunities for public interaction
• Grant opportunities
• Realistic Cost
• Concrete and actionable recommendations
To meet this need, Impact7G undertook a thorough examination of existing resources, stakeholders, and an inventory of natural area assets and issues to build a framework and foundation for a 7 year restoration and management plan, now in the 2nd year of implementation.

Paper Session 9 - Forum B On Common Ground: A multidisciplinary engagement in Iowa's Loess Hills
1:00 to 3:00, Skinner A, Moderator Brian Hazlett
See the Program for Forums

Paper Session 10 - Forum C Born in Crisis: The NRCS and prairie reconstruction and management
1:00 to 3:00, Skinner B, Moderator James Cronin
See the Program for Forums

Paper Session 11 Prairie Education
3:30 to 5:30, Skinner A, Moderator Codi Sharkey

3:30 to 3:50 Kaytlan J. Moeller, Dubuque County Conservation, Peosta, IA; kaytlan.moeller@dubuquecountyiowa.gov
Mowing to monarchs: Engaging private landowners to convert turf to prairie

3:50 to 4:10 Kelly D. Norris, Kelly D. Norris, LLC, Des Moines, IA; gardens@kellydnorris.com
Practicing new naturalism: Prairie-forward plantings in public and private places

4:10 to 4:30 Aracely A. Newton, Department of Biology, Missouri Western State University, St. Joseph, MO; anewton4@missouriwestern.edu

Cary D. Chevalier, Department of Biology, Missouri Western State University, St. Joseph, MO
Csengele Barta, Department of Biology, Missouri Western State University, St. Joseph, MO
The Missouri Western State University's John Rushin Teaching and Research Prairie: The first two years of multidisciplinary biology research in an outdoors applied learning laboratory

4:30 to 4:50 Chris Helzer, The Nature Conservancy; Wood River, NE; chelzer@tnc.org
Poopy-tailed larvae, single mom bees, and other stories we all need to be telling our non-prairie friends

4:50 to 5:10 Ankita A. Sawant, Department of Biological Sciences, North Dakota State University, Fargo, ND; ankita.sawant@ndsu.edu
Laura Aldrich-Wolfe, Department of Biological Sciences, North Dakota State University, Fargo, ND
Mycorrhizas and native prairie restoration: Exploring the effects of mycorrhizal inoculum, seed origin, and phosphorus on plant performance

O37 ***Mowing to monarchs: Engaging private landowners to convert turf to prairie,*** **Kaytlan Moeller**
Mowing to Monarchs (M2M) is a program created in 2020 in Dubuque County. The M2M program provides accessible training & information and an experience base to guide urban and suburban homeowners in successfully adding high-value native plants into their yards. We offer a combination of workshops, private coaching, planting guides, and funding for native pollinator planting in lawns. Mowing to Monarchs has changed the focus of one Iowa county to bring a larger light to what your lawn can do for nature. From a new gardener to experienced conservationist 80% of our participants continued adding native species into their yard after participating in the M2M program. These native pocket prairies have even provided crucial habitat for sensitive pollinators including the Rusty Patch Bumblebee. Maybe you can bring M2M to your community?

O38 ***Practicing new naturalism: Prairie-forward plantings in public and private places,*** **Kelly Norris**
In recent years, the shift towards ecologically driven, managed landscapes has created new opportunities at the interface of horticulture and ecology. While many conservation messages appeal to individual responsibility and action, the collective impact of site-specific, ecologically oriented public- and commercial-scale vegetation has increased in awareness and value. There has never been a more vital time for cross-disciplinary collaboration, particularly considering recent paradigm-shifting studies that illuminate the conservation value of small parcels in urban areas. Planting designer, artist and hort-ecologist Kelly Norris will undertake a vibrant exploration of his recent and future work translating Midwestern native plant communities into designed landscapes. His presentation will emphasize recent projects in the Upper Midwest, their origins and the relative success or progress of each project to date.

O39 ***The Missouri Western State University's John Rushin Teaching and Research Prairie: The first two years of multidisciplinary biology research in an outdoors applied learning laboratory,*** **Aracely Newton, Cary Chevalier, and Csengele Barta**
The radical decline of prairies has prompted a high scientific interest in prairie restoration and management, laying the basis of today's science-informed management practices. Missouri Western State University (MWSU), the State of Missouri's designated Applied Learning Institution, in collaboration with the Missouri Department of Conservation and private land conservationists, has become the championing higher education institution in on-site prairie restoration in Missouri, with the restoration of a 30-acre plot on its campus, to a conservation prairie. The John Rushin Teaching and Research Prairie today serves as model prairie ecosystem designed to facilitate scientific research and education in an applied learning, outdoors setting for students, faculty, and the community. The current work, as part of a long-term ecological and eco-physiological study framework, focuses on an initial, two-year, multidisciplinary effort established by a group of faculty members of the Department of Biology at MWSU, to provide undergraduates with an integrated, field-based multidisciplinary applied research experience as basis for in-class and out of class research experiences in nature conservancy and to contribute to public education.

O40 ***Poopy-tailed larvae, single mom bees, and other stories we all need to be telling our non-prairie friends,*** **Chris Helzer**
While we prairie people understand the attraction and intrigue of our favorite habitat, many of our friends and neighbors don't yet. They see prairies as flat, boring, grassy areas with nothing going on. Their lack of interest and support is probably the greatest threat to prairie conservation we face. It's up to us to share our passion and stories with others to bring them into the fold. We all know good stories about prairie species and communities. These are some of my favorites (accompanied by photographs), along with an urgent plea for you to tell your own.

O41 ***Mycorrhizas and native prairie restoration: Exploring the effects of mycorrhizal inoculum, seed origin, and phosphorus on plant performance,*** **Ankita Sawant and Laura Aldrich-Wolfe**
Arbuscular mycorrhizal fungi (AMF) may play a role in native prairie restoration, but the extent to which restoration sites

lack appropriate AMF and different native plants depend on mycorrhizas is still not well understood. First, the effectiveness of restoration site and native prairie AMF were compared for Gaillardia aristata. Second, plant performance was compared between uninoculated and inoculated plants fertilized with high and low phosphorus for, G. aristata, Echinacea purpurea, Bouteloua curtipendula, Symphotrichum laeve, Dalea candida, and Monarda fistulosa. Finally, plant performance was compared among seedlings inoculated at germination, at transplantation, and uninoculated seedlings for three of these species.

In greenhouse experiments, all plants performed better when inoculated with soil containing AMF than when grown in AMF-free soil. However, for the restoration site tested, no difference in performance was detected between plants inoculated with native prairie and restoration soil. E. purpurea performed better when inoculation was delayed until transplant, while B. curtipendula and S. laeve performed equally better when inoculated before and at transplant. The importance of AMF for many prairie plants is clear, but in restorations the need to import inoculum, timing of inoculation with AMF, and site phosphorus availability require further investigation, particularly in the field.

Paper Session 12 Plant and Pollinator Ecology
3:30 to 5:30, Skinner B, Moderator Karen Viste-Sparkman

3:30 to 3:50 Angella Moorehouse, Illinois Nature Preserves Commission, Springfield, IL; angella.moorehouse@illinois.gov
Jason T Bried, Illinois Natural History Survey, Champaign, IL
Ray Geroff, Division of Natural Heritage, Illinois Department of Natural Resources, Springfield, IL
Using pollinator surveys to assess natural area quality in Illinois

3:50 to 4:10 Ashley B. Bennett, Electric Power Research Institute, Washington, DC: abennett@epri.com
Tim W. Lohner, American Electric Power, Columbus, OH; twlohner@aep.com
Amy J. Toohey, American Electric Power, Columbus, OH; ajtoohey@aep.com
Shana Byrd, Dawes Arboretum, Newark, OH; sbyrd@dawesarb.org
Holly M. Latteman, Dawes Arboretum, Newark, OH; hmlatteman@dawesarb.org
Right-of-Way Prairies: How utility lands are supporting pollinators

4:10 to 4:30 Jessica Petersen, Minnesota Department of Natural Resources, St. Paul, MN; jessica.d.petersen@state.mn.us
Nicole Gerjets, Minnesota Department of Natural Resources, St. Paul, MN
Rachel Kranz, Minnesota Department of Natural Resources, St. Paul, MN
Gerda Nordquist, Minnesota Department of Natural Resources, St. Paul, MN
Bee specialists of Minnesota prairies

4:30 to 4:50 Jennifer Hopwood, Xerces Society for Invertebrate Conservation, Portland, OR; jennifer.hopwood@xerces.org
Rae Powers, Xerces Society and USDA NRCS, NE and SD; rae.powers@xerces.org
Sarah Hamilton Buxton, Xerces Society and USDA NRCS, ND and MT; sara.hamiltonbuxton@xerces.org
Understanding wildflower forage value: Diverse rangelands benefit livestock and pollinators

4:50 to 5:10 Ray A. Moranz, Xerces Society and USDA NRCS, Stillwater, OK; ray.moranz@xerces.org
Important nectar plants of the monarch butterfly, as reported to the Xerces Society's monarch nectar plant database

O42 ***Using pollinator surveys to assess natural area quality in Illinois,*** **Angella Moorehouse, Jason Bried, and Ray Geroff**
The establishment of Floristic Quality Assessment, by Swink and Wilhelm (1979), provided an entirely new way to qualify how we grade the quality of plant communities. Within Illinois, efforts to determine remnant-dependent insects and create quality assessment tools have been made for various insect groups (Ron Panzer), butterflies (Michael Jeffords), and leafhoppers (Adam Wallner). For the past 5 years protected natural areas in west-central and central Illinois have been surveyed to document pollinator-plant associations with the intention to develop a site quality assessment and ranking method for pollinating insects. Twelve consistently managed high quality sites were selected and compared to 11 lesser quality sites with little or no management to determine the ecological conservatism of each species. We compare the site contributions to beta diversity to identify sites with relatively unique community composition. Combining the mean conservatism score with the local beta diversity scores, we hope to provide a novel site ranking system to improve pollinator protection and management. Our goal is to create a list of remnant-dependent indicator insects to evaluate prairies and other terrestrial communities for their importance to pollinators and other flower-visiting insects.

O43 ***Right-of-Way Prairies: How utility lands are supporting pollinators,*** **Ashley Bennett, Tim Lohner, Amy Toohey, Shana Byrd, Holly Latteman**
Rights-of-way can make a substantial contribution to species conservation by providing critical food and nesting resources. The Electric Power Research Institute has initiated research evaluating the conservation potential of ROWs and the impact

different vegetation management practices have on right-of-way habitat and species of conservation concern such as pollinators. One area of research under evaluation is advancing the use of regionally appropriate native seed mixes on utility ROWs. The objectives of this study included evaluating whether a native seed mix could achieve federal and state revegetation standards, provide habitat for pollinators, and reduce cover of undesirable plant species. For this project, six plots were established in 2017 on a right-of-way located in Ohio followed by five years of vegetation and pollinator monitoring. Study results documented the native seed mix met revegetation standards providing 70% cover within the first growing season and less than 0.1% bare soil by the second growing season. Vegetation monitoring documented the establishment of 23 out of the 25 seeded species included in the mix, while pollinator monitoring recorded an increase in butterfly, bee, and beneficial insect groups across the study. The potential for expanding the use of native seed mixes on utility rights-of-way will be discussed.

O44 ***Bee specialists of Minnesota prairies,*** **Jessica Petersen, Nicole Gerjets, Rachel Kranz, and Gerda Nordquist**
Bees are incredibly diverse and provide important ecological services such as pollination. However, baseline information about distribution and abundance or even species lists are often lacking leading to an inability to inform conservation. The Minnesota Biological Survey recently completed the first statewide bee survey from 2015-2022. Of the more than 500 bee species in Minnesota, we documented many species that we can now associate with prairie habitat and provide conservation recommendations for. Some prairie associated bees are oligolectic on specific prairie plants. These bee species may be most vulnerable and in need of conservation. Without their plant hosts, these bees cannot survive. We will highlight some oligolectic bees and the prairie plants upon which they depend and provide a vision for future work on ways to monitor oligolectic bees in prairies.

O45 ***Understanding wildflower forage value: Diverse rangelands benefit livestock and pollinators,*** **Jennifer Hopwood, Rae Powers, and Sarah Hamilton Buxton**
Forbs are an integral component of native rangelands and livestock often feed on wildflowers. However, little information is available about the forage quality and mineral content of native rangeland forbs and shrubs, though native grasses are well studied.
Many ranchers view wildflowers as undesirable, not considering them to be valuable livestock forage, or viewing them as competitors to grasses, particularly wildflowers that appear after disturbances like flooding or drought. Ranchers may believe that native wildflowers are noxious weeds or that they are toxic to their livestock. While a small number of native forbs can be a health threat to cattle and other livestock under certain circumstances, the vast majority are neither a health threat or problematic weeds. Ranchers spend time and money spraying to remove all forbs, unaware of their value or how to recognize problematic species. The Xerces Society, in collaboration with Natural Resources Conservation Service and North Dakota State University, collected data on the nutrient and mineral content of common rangeland wildflowers palatable to cattle in the Northern and Central Great Plains. We will present preliminary results from 2021 and 2022, as well as plans to disseminate this information to ranchers.

O46 ***Important nectar plants of the monarch butterfly, as reported to the Xerces Society's monarch nectar plant database,*** **Ray Moranz**
Many conservationists, farmers and gardeners are working to restore habitat for the monarch butterfly. It is well-known that monarch larvae feed only on milkweeds, thus most monarch habitat plantings include milkweeds. However, it is also important to provide nectar plants to sustain monarch adults. Unfortunately, the nectar plant preferences of adult monarchs are less well-known. Since 2015, the Xerces Society for Invertebrate Conservation has been compiling data on monarch nectar plant use throughout the United States in its Monarch Nectar Plant Database. From 2015 to 2022, most of the data were obtained from monarch experts. However, in April 2023, the database became part of a community science project that solicits observations and monarch photos from the general public. In this presentation, Dr. Moranz will summarize findings on monarch nectar plant use in the Midwest and Great Plains. He will indicate which plant species have been reported most frequently as monarch nectar sources, but will also point out important data gaps, and will ask the audience to help us eliminate those data gaps by submitting their observations to the database.

Thursday, June 29

Paper Session 13 Prairie Art, Poetry and Literature AND Prairie Conservation and Policy
10:00 to 12:00, Skinner A, Moderator Laura Jackson

10:00 to 10:20 Erin Anfinson, Department of Art and Design, Middle Tennessee State University, Murfreesboro, TN; erinanfinson@gmail.com
Tell the bees: An artist residency and exhibition with the Tallgrass Prairie Center

10:20 to 10:40 Ethan Freese, School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE; efreese2@unl.edu

Storytelling in the Platte Basin's prairies

10:40 to 11:00 Jessica Wiskus, Simon Silverman Phenomenology Center, Duquesne University, Pittsburgh, PA; wiskus@gmail.com
From Proust to Prairie: A brief phenomenological account of the role of the arts and letters in restorative ecology

11:00 to 11:20 Marika Olynyk, Nature Conservancy of Canada, Toronto, Ontario; marika.olynyk@natureconservancy.ca
Tim Teetaert, Nature Conservancy of Canada, Toronto, Ontario
Cary Hamel, Nature Conservancy of Canada, Toronto, Ontario
Lessons in change: 30 years of listening, learning, and managing northern tall-grass prairie

11:20 to 11:40 Deborah Q. Lewis, Curator of the Ada Hayden Herbarium ,Iowa State University, Ames, IA; dlewis@iastate.edu
William R. Norris, Western New Mexico University, Silver City, NM; william.norris@wnmu.edu
Jimmie D. Thompson, deceased
The saga of an urban tallgrass prairie remnant in central Iowa: "It takes a village"

O47 ***Tell the bees: An artist residency and exhibition with the Tallgrass Prairie Center,*** **Erin Anfinson**
My recent body of artistic work was created from a 2021 artist residency at the Tallgrass Prairie Center, in Cedar Falls, Iowa. Over the course of several months I visited prairie restoration sites and, unexpectedly, many Victorian-era township cemeteries where some of the few remaining original prairie remnants can be found. I grew up in northeastern Iowa and was already aware of the astonishing scale and speed at which the tallgrass prairie system had diminished. The sense of wonder and discovery I expected to find during my residency was instead underscored by a swell of ambiguous grief. I worked through a new lens of ecological grief and anxiety about the loss of the prairie ecosystem, the challenges of contemporary restoration efforts, and the consequences of using neonicotinoid pesticides that contaminate the soil, water, and, ultimately, contribute to pollinator decline. The photos, videos, plant specimens, soil samples, and prairie ash I collected during the residency were used to create a new body of work that was exhibited in a solo exhibition called, Tell the Bees, at the Waterloo Center for the Arts in Waterloo, Iowa. Examples of these works in macrophotography, encaustic, pattern design, and video can be viewed at http://www.erinanfinson.com/tell-the-bees-2022.html

O48 ***Storytelling in the Platte Basin's prairies,*** **Ethan Freese**
Platte Basin Timelapse (PBT) is an innovative conservation storytelling project that has been in motion since 2011. The project has more than sixty timelapse cameras throughout the Platte River Basin in Nebraska, Colorado, and Wyoming. Along with its network of timelapse cameras, PBT produces a variety of multimedia stories and teaches classes on conservation storytelling at the University of Nebraska-Lincoln (UNL).
PBT has produced a number of stories about prairie ecosystems in the Platte Basin. These include a story about efforts by ranchers to reintroduce fire in the Nebraska Sandhills and an ESRI StoryMap about a large prairie restoration corridor in eastern Nebraska. Currently, PBT is working on a film, with UNL's Center for Grassland Studies, about Nine-Mile Prairie, a remnant tallgrass prairie outside Lincoln, Nebraska. This presentation will give a brief overview of the Platte Basin Timelapse project, then focus on PBTs specific storytelling efforts in the prairies of the Platte Basin. (plattebasintimelapse.com)

O49 ***From Proust to Prairie: A brief phenomenological account of the role of the arts and letters in restorative ecology,*** **Jessica Wiskus**
If it is not a lack of scientific knowledge that holds us back from restoring prairie on a significant scale, could it be a limit of imagination? For, when we speak about prairie, we speak about the restoration of an ecological system that we, in our own lifespans, have never fully experienced—never fully known—as our own.
Yet it is precisely a past that we have never known—a past that, in the present, comes forth retroactively—that the arts of literature and music can express. Taking Proust's madeleine and petite phrase (from Remembrance of Things Past) as exemplars, this presentation explores:
Prairie not only as an ecological space but as a dynamical, temporal ecology
· A brief phenomenological account of the past as retroactively fruitful for the present
· The role of the arts and letters toward renewing our sense of restoration, not by means of content (i.e. not by being about prairie) but by means of the temporal forms they cultivate.
Perhaps restoration of prairie depends not only upon scientific knowledge but also upon a certain change of orientation, one that the arts might inspire by leading us toward greater recognition of the living implications of past dynamical forms.

O50 ***Lessons in change: 30 years of listening, learning, and managing northern tall-grass prairie,*** **Marika Olynyk, Tim Teetaert, and Cary Hamel**
The Manitoba Tall Grass Prairie Preserve is over 11,000 acres of northern tall-grass prairie and savanna, wet meadows,

and forests, located in southern Manitoba, Canada. Established in 1989, this dynamic ecosystem is managed to maintain its biodiversity by a partnership of conservation agencies. We use a suite of management techniques including grazing, prescribed fire, haying, restoration, invasive species control, and brush management. Conservation objectives are to promote ecosystem health with a diversity of habitats and successional stages, while balancing the specific needs of the rare species these habitats support. Recurring challenges include increased woody cover, shifting availability of resources, conflicting management needs of biodiversity targets, knowledge gaps regarding management effectiveness, coordinating amongst multiple partners, and integrating with surrounding communities. To address challenges, management decisions are informed by an adaptive approach, incorporating the results of species and ecosystem monitoring, research studies, management effectiveness assessments, a climate-change adaptation process, a multiple species-at-risk planning approach, and building relationships with local community partners. Looking forward, we continue to test ways to better enact recurring disturbance management across multiple management units, to better collaborate among partners, to increase links to local culture and economic development, and to address emerging issues like climate and hydrological change.

O51 ***The saga of an urban tallgrass prairie remnant in central Iowa: "It takes a village",*** **Deborah Lewis, William Norris; Jimmie Thompson**
Ames High School Prairie (AHP) in central Iowa protects 4 ha of tallgrass prairie within an urban matrix. AHP, grazed but never plowed while privately owned and almost completely open from the early 19th century through the 1930's, was acquired by the Ames, IA School District in 1959 with subsequent management overseen by The Nature Conservancy (1970-2019) and the Iowa Natural Heritage Foundation (current). Dozens of volunteer land stewards, high school and college students, TNC summer interns, and private contractors (collectively, "The Village") have over the years undertaken management of the preserve to control encroaching woody plants and invasive herbaceous plant species, reseed reopened areas with locally collected seed, etc. Damage to the prairie in 1995 caused by heavy equipment driven across it by municipal workers accessing a broken sewer line within a drainage way in an adjacent floodplain forest provided the impetus for AHP to be designated as an Iowa state preserve in 1997. As a vegetation remnant, AHP protects almost 150 native tallgrass prairie taxa (8th highest documented from 27 Iowa state preserves that feature prairie), maintains an example of historically abundant (but now scarce) tallgrass prairie vegetation and provides citizens an opportunity to experience prairie.

Paper Session 14 Ecology of Fire AND Plant and Pollinator Ecology
10:00 to 12:00, Skinner B, Moderator Daryl Smith

10:00 to 10:20 Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA; thomas.rosburg@drake.edu
Spring fire effects on the forb community of a degraded sand prairie

10:20 to 10:40 Paul W Foreman, Department of Environment and Genetics, School of Agriculture, Biomedicine and Environment, La Trobe University, Bundoora, Victoria, Australia; 89042577@students.latrobe.edu.au
The role of Aboriginal burning in the biogeography of the temperate grasslands of southeastern Australia

10:40 to 11:00 Michael J. Hansen, University of Wisconsin-Madison Arboretum, Madison, WI; michael.hansen@wisc.edu
Jeb Barzen, University of Wisconsin-Madison and Private Lands Conservation, LLC, Madison, WI
University of Wisconsin-Madison class prepares students to serve on prescribed fire crews

11:00 to 11:20 Stephanie Paris, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; snparis@iastate.edu. Amy L. Toth, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; amytoth@iastate.edu. Randall P. Cass, Department of Extension to Agriculture, Iowa State University, Ames, IA; randall@iastate.edu
On the wings of bees: Prairie strips benefit honey bee health

11:20 to 11:40 Morgan Moore, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; mimoore@iastate.edu. Amy L. Toth, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; amytoth@iastate.edu
Developing reliable biomarkers of bee health to create strategies to mitigate bee declines

11:40 to 12:00 Erika Ibarra-Garibay, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; egaribay@iastate.edu. Kelsey N. Shepherd, Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA; kelshep@iastate.edu. Anna M. Tucker, Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University, Ames, IA: tuckera@iastate.edu. Amy L. Toth, Department of Ecology, Evolution, and Organismal Biology, Iowa State University, Ames, IA; amytoth@iastate.edu
Occupancy, health, and habitat associations of rusty patched and American bumble bees in Iowa

O52 ***Spring fire effects on the forb community of a degraded sand prairie,*** **Thomas Rosburg**
Big Sand Mound is a unique geological landscape located in southeast Iowa, near the confluence of the Iowa and Mississippi Rivers. The site protects rolling sand prairies, sand barrens, upland and floodplain forests, and wetlands. The objectives of this research were:
1) Determine forb diversity and abundance in a sand prairie at Big Sand Mound.
2) Investigate the effect of spring fire on the diversity, abundance and flowering of forbs.
A prescribed burn was conducted on April 7, 2017 in an area that had not been burned for 9 years. Half of the area was not burned. Burn and control plots, each 25x100 m, were established adjacent to one another in May. The frequency of forb species was measured in May, July and September and compared between the burn and control plots. There were 66 forb species observed. A group of spring-blooming annual species exhibited a clear decrease due to the fire. The response to fire among other sand prairie forbs was mixed and depended on the species and date. Six species exhibited a decrease, 3 species an increase and 8 species no difference. Reproductive activity of forbs was either compromised or not affected by the spring burn.

O53 ***The role of Aboriginal burning in the biogeography of the temperate grasslands of southeastern Australia,*** **Paul Foreman**
There has long been a debate about the origin of the temperate grasslands south–eastern Australia – historians have long been convinced they were 'created' by frequent Aboriginal burning (or fire–stick farming), while ecologists have defaulted to climate–edaphic explanations, pointing out that historic accounts are sparse and ambiguous. This debate mirrors those from similar environments globally (such as North America) where consensus has long since emerged that indigenous burning played a major role in prairie ecology. However, this issue of the human influence on grasslands has become an increasingly cogent cultural and political question as 'developed' colonial countries grapple with their past. I developed a framework to test for the 'fingerprint' of Aboriginal burning to help build consensus around a more holistic understanding of grassland biogeography. I used archival benchmarking to establish that widespread grasslands occurred where trees were expected; phytoecology to show that their existence can be linked to fire and; ethnology and archaeology to demonstrate that humans largely controlled fire regimes. Support for fire–stick farming also places greater significance on the role of human agency in both the past and future of temperate grasslands as part of an urgent, shared cultural and biodiversity conservation responsibility.

O54 ***University of Wisconsin-Madison class prepares students to serve on prescribed fire crews,*** **Michael Hansen and Jeb Barzen**
The Wisconsin Prescribed Fire Needs Assessment (Hmielowskl et al. 2016) concluded that approximately 1 million acres need to burn annually to maintain the state's fire-dependent plant communities. However, the total number of acres being burned annually is significantly short of that mark. Successfully overcoming the deficit will require numerous improvements in how prescribed fire operations are conducted in Wisconsin. One of those improvements will be an increased capacity of those implementing prescribed fires. Toward that end, since 2019 several partners have been working together to train more young people in the use of prescribed fire through a class offered at the University of Wisconsin – Madison. This presentation will discuss the main components of the class (fire ecology instruction in the classroom, NWCG entry-level firefighter certification, live-fire training exercises, and serving on prescribed fire crews in southern Wisconsin), its successes and challenges, as well as the possibilities of expanding it. Additionally, we hope the class could perhaps be used as a model for other universities and colleges interested in offering something similar to get more young people involved in prescribed fire, and thus increasing our capacity and helping to accomplish our prescribed fire goals.

O55 ***On the wings of bees: Prairie strips benefit honey bee health,*** **Stephanie Paris, Amy Toth, and Randall Cass**
As Iowa's landscape has shifted from prairie to farmland, pollinators must work harder to find food, including the non-native honey bee. Integrating strips of prairie flowers and grasses into farms provides better resources to pollinators. We set up an experiment to understand how prairie strips impact foraging by honey bees in managed apiaries. To do this, we paint-marked day-old bees, introduced them to hives, and collected them at different ages while foraging, comparing hives at farms with and without prairie strips. Then we inspected their wings for wear (tattered edges) and assigned a wing wear score. We found that wing wear correlates with age—older bees are more worn. Interestingly, we also found that prairie strips bees had more wing wear, suggesting that hives at prairie strips produce bees with a longer lifespan. This adds to a body of research showing prairie strips support more productive honey bee hives.

O56 ***Developing reliable biomarkers of bee health to create strategies to mitigate bee declines,*** **Morgan Moore**
In recent years there have been large declines in bee populations documented across the globe. Bumble bees are of particular concern in the Midwest, and loss of prairie habitat due to agricultural intensification is a possible driver. However, while bee conservationists have solid data on bumble bee population trends, we lack robust methods for assessing the actual health of individual bees. These are needed to assess health trends under environmental change or evaluate the effectiveness of habitat restoration. We are developing a panel of bumble bee health indicators, which can be measured

non-destructively in the field. We collected over 700 individuals from six species of bumble bees in central Iowa, ranging from common to imperiled. We assayed a panel of body condition indicators (BCI, including wing asymmetry, wing wear, mass, and size). Our sites incorporated different primary landscape types including agricultural, forest, grassland/prairie, and developed. Preliminary results indicate BCI can vary by landscape type, thus bumble bee species may differ in which habitat types support the best health outcomes. Our long-term goal is to combine these data with information on stress and disease states, making BCI a useful tool to track bee health across landscapes, species, and over time.

O57 ***Occupancy, health, and habitat associations of rusty patched and American bumble bees in Iowa,*** **Erika Ibarra-Garibay, Kelsey Shepherd, Anna Tucker, and Amy Toth**
Bee declines are a global problem and jeopardize the persistence and stability of natural and agricultural landscapes. The Midwest is a critical area for bee conservation where there are ongoing efforts to protect bees through prairie habitat restoration and federal protection of species that utilize prairie habitat (such as the rusty patched bumble bee, Bombus affinis). However, there are still knowledge gaps preventing effective bumble bee conservation, including understanding their occurrence, habitat needs, and overall health. To address these, we are engaged in a multi-year project evaluating the importance of local and landscape level habitat factors on the distribution, occupancy, and health of B. affinis and another imperiled bumble bee species, B. pensylvanicus. In 2022, we visited 43 sites across Iowa, many of which were restored prairies, to assess their habitat features and the presence of target species, and measured body size and health indicators. B. pensylvanicus was detected at 37% of sites, while B. affinis was detected at 9% of sites. Most sites with imperiled bumble bees were restored prairies with large patches of blooming native flowers, and riparian corridors for B. affinis. These results can assist government agencies, land managers, and landowners create and maintain pollinator habitats.

Paper Session 15 CANCELED
12:30 to 2:30, Skinner A

Paper Session 16 Plant Biology and Ecology AND Invasive Species Management
12:30 to 2:30, Skinner B, Moderator Thomas Rosburg

12:30 to 12:50 Thomas Rosburg, Department of Biology, Drake University, Des Moines, IA; thomas.rosburg@drake.edu
Is Pedicularis lanceolata (swamp lousewort) a keystone species?

12:50 to 1:10 Bret J. Lang, South Dakota State University, Brookings, SD; bret.lang@sdstate.edu
Lora B. Perkins, South Dakota State University, Brookings, SD
Creating a native plant initiative for South Dakota

1:10 to 1:30 Nathan M. Soley, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA; nsoley@iastate.edu. Daniel Deever, Iowa State University, Ames, IA; ddeever@iastate.edu
Brian Wilsey, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA; bwilsey@iastate.edu
Ecological factors that extend flowering phenology in prairies

1:30 to 1:50 Ann Marie R. Gunness, Natural Resources Science and Management, University of Minnesota, Minneapolis, MN; rogo0043@umn.edu. Marcella Windmuller Campione, Department of Forest Resources, University of Minnesota, Minneapolis, MN; mwind@umn.edu
Tradeoffs for birdsfoot trefoil management in a tallgrass prairie

O58 ***Is Pedicularis lanceolata (swamp lousewort) a keystone species?,*** **Thomas Rosburg**
As a hemiparasite that forms relatively small populations, Pedicularis lanceolata passes two of three criteria needed to qualify as a keystone species. The third requirement is if the presence of P. lanceolata sufficiently limits the growth and competition of more abundant species to facilitate greater diversity?
This question was investigated in a reconstructed wet prairie in western Iowa during 2020. In May 124 genets of P. lanceolata were marked and mapped with GPS. Three sample periods were used, one each in June, July and August, to randomly select a genet to sample. A circular quadrat was established within 25 cm of the genet's base. All biomass (except P. lanceolata) was clipped, sorted to species, dried and weighed to provide species abundance. The number of P. lanceolata ramets present and the diameter of the quadrat were recorded. Randomly located control quadrats (no P. lanceolata) were also sampled. A total of 26 P. lanceolata quadrats and 6 control quadrats were sampled. Correlation was used to test for associations between P. lanceolata density and 14 variables that reflect community structure and diversity. Evidence was found that suggests P. lanceolata has positive impacts on structure and richness in the wet prairie community.

O59 ***Creating a native plant initiative for South Dakota*****, Bret Lang and Lora Perkins**

Historically, the landscape of the northern Great Plains was a diverse mosaic of plant communities within tallgrass, mixed grass, and shortgrass prairie ecosystems. However, the last century has seen drastic changes within the landscape, leading to massive declines in native plant populations and widespread habitat fragmentation. At the Native Plant Initiative (NPI), our aim is to increase native plant diversity in all types of landscapes in the northern Great Plains, while expanding our knowledge of native plants and the systems that influence them. We then pass this knowledge on to stakeholders in the native plant materials system.

This presentation discusses the NPI's ongoing efforts to better understand and improve all components of the native plant material system. This includes increasing public knowledge of both the natural and production sides of the native plant industry through research related to soil health, native seed germination, monarch oviposition preferences, and seed production. Additionally, I will discuss our outreach efforts with the public, including native plant sales, native plantings in public areas, and nature photography. Lastly, I will share with you our future goals at the NPI including increasing native seed production in the northern Great Plains and improving our conservation seed storage capacity.

O60 ***Ecological factors that extend flowering phenology in prairies,*** **Nathan Soley, Daniel Deever, and Brian Wilsey**

The sequential flowering of plant species throughout a growing season is a characteristic of prairies and the goal of many pollinator restoration projects. Here, we test the hypotheses that extended flowering is due to: 1) the presence of early and late-flowering species, 2) a greater number of forb species in a seed mix, 3) mowing, and 4) an intermediate grass-forb (GF) ratio in a seed mix. We tested hypotheses 1-3 by adding early and late-flowering forbs at different richness levels to restorations, and we tested hypothesis 4 by seeding a restoration with different GF ratios. Flowering niche breadth was used to calculate the evenness of flowering across months. Flowering niche breadth increased linearly with the number of early and late-flowering forb species added ($p < 0.05$) and mowing had a marginally significant effect on increasing flowering niche breadth ($p < 0.06$). Plots seeded with intermediate GF ratios had significantly greater flowering niche breadth (quadratic, $p < 0.05$). Taken together, our results indicate that flowering can be extended in tallgrass prairie with additions of a larger number of early and late flowering species and by including a seed mix with high functional diversity with an intermediate mixture of grasses and forbs.

O61 ***Tradeoffs for birdsfoot trefoil management in a tallgrass prairie,*** **Ann Marie Gunness and Marcella Windmuller Campione**

Management in a tallgrass prairie is largely a multifaceted approach, utilizing multiple management strategies to assist the recovery of a degraded ecosystem in order to tip the scales of resilience. Management strategies of both prescribed fire and herbicide treatment are common strategies used for reducing invasive species populations and promoting native vegetation. At the University of Minnesota Landscape Arboretum, the Natural Resource Management team utilizes a variety of techniques including herbicide and prescribed fire to both manage invading non-native species as well as encourage native plant species. One invading species in particular, birdsfoot trefoil (Lotus corniculatus), proves to be an aggressive invasive species and it can form dense mats in prairies and stifle desirable native species if not actively treated. To dive deeper on the effects of herbicide, prescribed fire, and its tradeoffs among management for birdsfoot trefoil, a split plot design was laid out in an affected area of a tallgrass prairie to look at how treatments influence birdsfoot trefoil and native prairie species diversity in a tallgrass prairie. Preliminary results show birdsfoot trefoil responds well to herbicide control, but fire can actually increase populations.

Poster Presentations and Abstracts
Monday, June 26 | Salon 1 & 2

Poster 1 - Tracy Rosenberg, Abbey Grasslands of the Prairie Coteau LLC; tracyarosenberg@gmail.com

P1 *Restoration of former Blue Cloud Abbey's 980 acre remnant northern tallgrass prairie*

Blue Cloud Abbey, a Benedictine monastery, situated on the east flank of the Coteau des Prairies, settled in South Dakota in the 1950's to serve Sioux indigenous tribes. In 2012, Blue Cloud Abbey closed due to an aging population of monks. In 2013, they sold their 980 acres of remnant rangeland and hay meadows to former Iowan, Tracy Rosenberg. Rosenberg, born and raised on an Iowa farm, had witnessed her family's century farm undergo conversion to cropland throughout the 60s and 70s. In midlife, she sought to purchase prairie remnant (scant in her home state) which led her to the monks at Blue Cloud. For the past decade, Rosenberg has been restoring the remnants which had formerly been heavily utilized by livestock ranching and left compacted, degraded, and eroded. In 2022, she was awarded the national Women in Conservation (NRCS WiN) Conservationist of the Year, and awarded Society of Range Management (SRM) Excellence in Range Management for Region 1 of South Dakota for her restoration efforts on the former Blue Cloud Abbey land, now Abbey Grasslands of the Prairie. Though not formally educated in ecology, Rosenberg owes her restoration success to mentorship from many supportive agencies and prairie enthusiasts.

Poster 2 - Roberta Bumann, Minnesota Master Naturalist; Winona, MN; rmbumann@gmail.com
Gabe Ericksen, LandSpirit Design Landscaping, Inc., Winona, MN; gtericksen@gmail.com
Amanda Gentry, Winona County Soil & Water Conservation District, Lewiston, MN; amandagentry@winonaswcd.com
Joshua Lallaman, Saint Mary's University of Minnesota, Department of Biology, Winona, MN; jlallaman@smumn.edu

P2 *Bringing back the rusty patched bumblebee through a Minnesota Lawns to Legumes Demonstration Neighborhood Project*

Located in the Driftless Area in southeastern Minnesota, Pleasant Valley is a diverse ecological habitat with a verified population of Rusty Patched Bumblebees (RPBB). In 2020, Healthy Lake Winona selected Pleasant Valley for a community project and received a Lawns to Legumes Demonstration Neighborhood (L2L-DN) grant, a Minnesota state-funded grant to assist homeowners to plant native plants for at-risk pollinators. The aims of this project were to:

1) Provide habitat for RPBB and other pollinators by creating a network of pollinator habitats.
2) Construct a demonstration neighborhood of pollinator habitat using best practices for ecological landscaping.

A team was formed to work with homeowners to install 4 types of pollinator plantings. Outcomes were collected on 1) selected metrics on all projects, 2) observations for RPBB and other pollinators during each year of the project, and 3) a homeowner satisfaction survey. Thirty-seven (37) out of 47 homeowners completed 40 projects adding 8.41 acres of new pollinator habitat during the 3 years of the grant. RPBBs were observed at 4 sites in 2020, 7 sites in 2021, and 11 sites in 2022. In a survey, homeowners reported satisfaction with project support, helpful feedback on plants supporting pollinators, and support for continued networking.

Poster 3 – Seth Breeding, High School student, Winterset, IA; sgbreeding2004@gmail.com
Max Breeding, High School student, Winterset, IA

P3 Madison County private prairie inventory

This poster will be about a prairie inventory and observational study. It is a scientific poster about the biodiversity of species in Madison County Prairies. The inventory was taken during the summer of 2022 from late June through early October. We observed plants, pollinators, and any other prairie life we found interesting. The purpose was to document how healthy the landowner's prairie was, as he was curious if he could do anything to better maintain the land. The prairie we documented was located in Madison County south of the small town of Peru in Walnut Township. The prairie consisted of tallgrass planted prairie, a woodland remnant, an Oak Savannah, and a remnant prairie. The inventory consisted of us going out every two weeks and observing and documenting new species that we found, taking pictures of the species and marking the species location. We posted the pictures on iNaturalist to ensure our identifications were correct. Also, we compiled the data into

a spreadsheet and turned the spreadsheet into a Shutterfly book and Poster. We inventoried 200 species with 136 plant species, 52 insect species , 5 fungus species, 3 arachnid species, 3 bird species, and 1 mammal species.

Poster 4 - Erin M. Garrett, University of Illinois Extension, Urbana, IL; emedvecz@illinois.edu

P4 Increasing the public's grass identification skills

Many overlook grass identification because it is considered too challenging. With increasing popularity of prairie restoration, planting grasses in home landscapes, and spread of invasive grasses, being able to identify grasses is important. Extension Educator Erin Garrett created a series of grass identification resources to make the process approachable and achievable. Her intended audience is natural resource managers, landowners, plant enthusiasts, and Extension volunteers. She developed the Which Grass is Which? Webinar Series, comprised of 5 programs. She uses field identification practices rather than microscopes and includes her own detailed photography. Garrett delivers this programming through in-person presentations, hikes, webinars, and YouTube recordings. She distributed a needs assessment and based on the responses, increased asynchronous materials by starting a blog, building website content, and creating 1-minute videos of how to identify individual grasses. In four years, she reached 1,750 participants through direct programming, garnered over 17,000 views of her recorded webinars, generated 9,500 views of her blog posts in one year, and received 2,500 views of her short videos in three months. Feedback received on evaluations exhibits the success of these resources in increasing grass identification knowledge and likelihood of participants putting their new skills to use.

Poster 5 – Melissa A. Duda, Chicago Botanic Garden, Northwestern University, Evanston, IL; melissaduda2024@u.northwestern.edu
Andrea T. Kramer, Chicago Botanic Garden, Northwestern University, Evanston, IL
Jeremie B. Fant, Chicago Botanic Garden, Northwestern University, Evanston, IL

P5 Common pollinators of two gentian species and their hybrid, Gentiana x billingtonii

Natural hybridization involves successful mating between individuals from two species. For rare species, hybridization may accelerate extinction rates through the loss of traits that make that species unique, but paradoxically, it can also allow a species to gain traits to adapt to changing conditions. I investigated hybridization between two species of Gentian, G. puberulenta, a dry prairie species considered rare in some of its range, and G. andrewsii, a common species found in mesic prairies. These two species co-occur at many sites, but their hybrid (Gentiana x billingtonii) only occurs at a subset of sites. Minimal research exists for this hybrid complex, but some stewards are actively removing hybrid plants. For my study, I asked what conditions promote hybridization between these taxa at some sites but not others. I conducted pollinator observations and collected flowering phenological data. I found that masked bees (Hylaeus spp.) visit all taxa of gentian more often than any other pollinator, suggesting that this pollinator promotes hybridization. I found an overlap of ~2.5 weeks among all taxa, suggesting Hylaeus spp. moving pollen between taxa may result in hybridization. This study can inform land managers seeking to understand the risk of extinction in rare species displaying hybridization

Poster 6 - Ethan D. Rose, Michigan State University. East Lansing, MI; roseetha@msu.edu
Lauren L. Sullivan, Michigan State University, East Lansing, MI
Eric W. Seabloom, University of Minnesota, Minneapolis, MN
John L. Orrock, University of Wisconsin-Madison, Madison, WI

P6 Rainfall, herbivory, and nutrients modify seed predation patterns in North American grasslands

Large-scale climate patterns are known to influence the abundance of organisms and their interactions. However, studies examining large-scale climate effects on biotic interactions are limited in scope and mechanisms remain elusive. Relationships between climate and trophic interactions may be sensitive to top-down effects like herbivory and bottom-up effects like nutrient limitation. We quantified the effects of herbivory and nutrient limitation on climate-granivory relationships by measuring predation of Avena sativa seeds and vegetative biomass across temperate North America using a standard experimental design including N, P, and K addition as well as herbivore exclosure treatments. We hypothesized that 1) herbivory reduces seed predation by removing vegetative cover for granivores, 2) nutrient addition increases seed predation by increasing vegetation, and 3) treatment effects are influenced by large-scale precipitation patterns. We found a significant effect of N addition on seed removal, as well as N x precipitation and herbivore x precipitation interactions. This study is the first to examine how climate, herbivory, and nutrients structure seed predation at the continental scale. An additional study will examine top-down effects on plant community structure from reintroduced bison, a keystone herbivore, and bottom-up effects from moisture availability throughout the climatically diverse and endangered tallgrass prairie ecosystem.

Poster 7 – Andrew Olson, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; andy.olson@uni.edu

P7 Towards widespread adoption of prairie conservation strips

The Tallgrass Prairie Center's ongoing project, "Towards widespread adoption of prairie conservation strips," aims to increase the expertise of professional farm managers, landowners, and farmers in implementing prairie conservation strips to address the negative impacts of Upper Midwest corn-soybean agriculture on soil and water quality, biodiversity, and rural communities. Despite the increasing disconnection of landowners from the land they own, with around half of cropland in the contiguous United States being rented and 80% of rented acres owned by non-operator landowners, the case studies presented in this poster offer an in-depth guide to various prairie installation implementations across several Midwestern farms. The poster showcases landowner, farmer, and farm manager perspectives, along with compelling images and financial information, to illustrate the practical aspects of planting prairie on a farm. With more than 85% of Iowa being cropland, the state offers a significant opportunity for prairie restorations. This poster provides valuable insights and practical guidance for those interested in adopting prairie conservation strips on their farms.

Poster 8 - Bret J. Lang, South Dakota State University, Brookings, SD; bret.lang@sdstate.edu
Marissa A. Ahlering, The Nature Conservancy, Vermillion, SD; mahlering@tnc.org
Francis A. Chaves - South Dakota State University, Brookings, SD; francis.chavesrodriguez@sdstate.edu
Brandon J. Clark - South Dakota State University, Brookings, SD; brandon.clark@jacks.sdstate.edu
Maribeth Latvis - South Dakota State University, Brookings, SD; maribeth.latvis@sdstate.edu
Lora B. Perkins - South Dakota State University, Brookings, SD; lora.perkins@sdstate.edu

P8 Minding the gap: Seed availability in the Northern Great Plains

The restoration of prairies in North America's northern Great Plains region relies heavily on seeds. The native seed market in this region, however, is underdeveloped with few seed suppliers, low species representation, low seed inventories, and seeds with unknown provenances. Evidence suggests that for some plant species, nonlocal provenances are not always adapted to local climatic conditions potentially leading to outbreeding depression or poorly adapted populations. A recent restoration project identified 287 native plant species suitable for restoration in an upland prairie site in eastern South Dakota. However, after a comprehensive search of commercially available seeds, it was discovered that a sizable portion of the species targeted for restoration was not available. This study assesses native seed availability for species native to eastern South Dakota.

We discovered that only 201 of the 287 species (70.0%) were commercially available. Forb species were the most underrepresented having 164 out of 242 species (67.8%) available followed by grasses and sedges with 37 out of 45 species (82.2%) available. Additionally, only 34 species (19.1%) were produced or collected within the restoration site's seed transfer zone. We believe this experience highlights an opportunity to expand native seed production within the region.

Poster 9 - Brooke L Burris, Kansas State University, Division of Biology, Manhattan, KS; blburris@ksu.edu
Walter Dodds, Kansas State University, Division of Biology, Manhattan, KS
Emily Burnett, Kansas State University, Division of Biology, Manhattan, KS
Md Abu Rihan, Kansas State University, Division of Biology, Manhattan, KS
Madison Morello, Kansas State University, Division of Biology, Manhattan, KS

P9 Riparian and stream influences of bison and cattle grazing in tallgrass watersheds

Riparian zones are a key controller of water quality in all biomes including grasslands dominated by large ungulate grazers. We sampled 13 different sites with various grazing (bison and cattle) treatments for riparian vegetation coverage, sediment size, and fecal matter in the riparian and up to 100 m from the stream channel. Cattle grazing in areas with riparian tree cover had more open soil than bison or ungrazed areas. Streams with cattle also had smaller stream sediment sizes, and amount of fecal matter within 10 and 100 m of stream channel. Low intensity cattle and bison grazing had similar effects and both grazers were more likely to excrete farther from stream sites and on less steep areas. Bison fecal material was more common in spring areas of streams with year-round water availability.

Poster 10 - Alec J. Glidden, Kansas State University, Division of Biology, Manhattan, KS; aglidden@ksu.edu
Jeff Taylor, Research Staff, Kansas State University, Division of Biology, Manhattan, KS; jht@ksu.edu
John Blair, Kansas State University, Division of Biology and Director, Konza Prairie Biological Station, Manhattan, KS; jblair@ksu.edu

P10 Long-term plant community responses to season of fire

Tallgrass prairies are a disturbance dependent ecosystem that requires recurring fires to maintain a grassland state. Timing of fire affects plant community responses, but few studies have compared effects of fire in different seasons over multiple decades. We analyzed 29-years of data from the Konza Prairie Biological Station to determine plant community responses to dormant and growing season fires (fall, winter, spring, and summer fires each replicated on two watersheds). Dormant season fires were annual while summer fires were biennial. Canopy cover of all species was recorded in five 10-m2 plots along 50-m transects (4 upland and 4 lowland transects per watershed). Both burn season and topographic position influenced community composition and change over time. Spring burning decreased the cover of cool-season graminoids, enhanced the dominance of warm-season grasses, and reduced the cover of native forbs. Summer burns increased cover of cool-season graminoids, reduced cover of warm-season grasses, and produced higher forb cover and richness. Effects of winter and fall burns generally were intermediate relative to spring and summer burns. Our study demonstrates that timing of fires influences the trajectory of native plant communities and prescribed fires in different seasons should be considered for specific management goals.

Poster 11 - Caitlyn M. Sims, Missouri Botanical Garden, St. Louis, MO; csims@mobot.org
James P. Faupel, Missouri Botanical Garden, St. Louis, MO; jfaupel@mobot.org
Owen J. Kathriner, Forest Park Forever, St. Louis, MO; owenkathriner@gmail.com

P11 Botanical inventory of early successional species following pipeline construction along a dynamic urban creek in the Midwest

Litzsinger Road Ecology Center (LREC) is a 15.78 hectare (39 acre) private, educational facility of the Missouri Botanical Garden located outside of St. Louis, MO. Beginning in 2019, a 2 hectare (5 acre) section of the property was destroyed for the installation of a sewer pipeline. This area comprised a section of bottomland woodlands and reconstructed prairie. A vascular plant inventory of the pipeline path was conducted immediately following the completion of the sewer project in August 2022 and Spring 2023. The goals of these surveys were (1) to observe the succession of species within the first year of the fallow pipeline path and (2) to serve as the baseline for a new reconstruction and vegetation monitoring project that will continue throughout the remaining 2023 growing season and following years. The combined inventories found 208 species, of which 126 (60.58%) were native and 82 (39.42%) were introduced. The total mean C-value was 1.6 and the native C-value was 2.6. The species composition of the path has fundamentally changed with C-values considerably lower than the surrounding reconstructed habitats. Plans of native plant introduction and management for invasive species will certainly influence plant communities over time following prairie reconstruction of the pipeline path.

Poster 12 - Junior J Francois, University of Illinois Chicago, Chicago, IL; jfrano3@uic.edu
Gavin McNicol, University of Illinois Chicago, Chicago, IL; gmcnicol@uic.edu

P12 Effects of microtopography on soil greenhouse gas fluxes and soil biogeochemistry in a remnant prairie

Tallgrass prairie conversion for agriculture in the Midwest has contributed to climate warming via soil greenhouse gas (GHG) emissions. In this study we ask: Are remnant prairie soils GHG sources or sinks? How does microtopography and season affect the GHG sink or source? Our study focused on the James Woodworth Prairie (JWP), a 2-hectare untilled tallgrass prairie in Chicago. We established a transect across the prairie microtopography from lower to higher elevation, and four chambers at each plot to collect gas and soil samples. Gas samples were collected bi-weekly from July to November 2022, while soil samples were taken once in November, spanning a 0 to 50 cm depth.
Our findings reveal that JWP soils function as a source of CO2 (mean = 1.95 mgC-CO2 m-2 d-1), with higher fluxes in summer and fall and lower fluxes in winter. In contrast, soils act as a sink for CH4 (mean = -1.02 µgC-CH4 m-2 d-1) and N2O (-0.13 µgN-N2O m-2 d-1), with relatively consistent fluxes across seasons. We found that microtopography influences greenhouse gas fluxes, with lowland areas favoring positive CH4 and N2O fluxes and lower CO2 flux, while upland areas favor higher CO2 flux and CH4 and N2O uptake.

Poster 13 - Brianna L. Hull, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; hullb@uni.edu
Mallory K. Sage, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA

P13 Green Iowa AmeriCorps: Developing land stewardship through professional practice, An example from members serving at the Tallgrass Prairie Center

The Tallgrass Prairie Center (TPC) is associated with the University of Northern Iowa and houses four programs that serve all of Iowa and beyond through the work of seven permanent staff. Since 2019 the TPC has served as a host site for two full-time 11-month and two part-time three-month Green Iowa AmeriCorps (GIA) land and water stewards. The Center's staff were previously limited in the amount of research, land management, outreach, and education they could perform. GIA members have been capacity builders for the Center through volunteer recruitment, volunteer event planning, educational

programming, assistance with land management, and the creation of outreach and education materials. Members also receive regular professional development training to expand their skills, including certification in chainsaw maintenance, safety, and use; water quality testing; prescribed burning; and pesticide application. Through their work at the TPC, GIA members have completed 236 outreach events with 479 volunteers, and 114 education events reaching 8659 participants between September 2019 and May 2023. Members have completed a variety of land management projects including the removal of invasive species, suppression of noxious weeds, removal of woody vegetation, and assistance with planting thousands of native prairie plants for the Plant Materials program.

Poster 14 - Jeremy S. Giannone, University of Minnesota, Minneapolis, MN; giann077@umn.edu

P14 Phosphorus transport in soil: Locating and identifying a limiting element

The phosphorus (P) cycle is not well understood. While carbon (C) and nitrogen (N) have gas phases, P does not. Phosphorus runoff in waterways and its shortage are both understood since their causes are due to agricultural demands. Fertilizers increase the rate of phosphorus in the soil leading to greater runoff which then accumulates in the surrounding bodies of water. 1 From an economic perspective the phosphorus availability and food prices have a direct correlation. The instability of phosphate prices may have direct causation to the instability of the food and agriculture markets. 2 In order to deal with these issues, P transfer from sediment through soil must be understood.

Unlike C and N, P does not have a gas phase at atmospheric pressure which makes the exchange difficult to study. Information on the composition and dynamics of soil phosphorus (P) remains limited, but is integral to the understanding of soil biogeochemical cycles. 3 This research will combine the analytical techniques of FT-IR and NMR to expand the knowledge of P in soil biogeochemistry. Learning how P transfers from sediment through soil will both clarify how the P cycle operates and yield foresight to agriculture markets.

Poster 15 - Laura Fischer Walter, Tallgrass Prairie Center, University of Northern Iowa, Cedar Falls, IA; laura.walter@uni.edu

P15 The evolving roles of the Plant Materials Program at the Tallgrass Prairie Center

High quality prairie restoration requires genetically diverse, regionally adapted seed. Commercial production of native seed enables restoration at scales beyond the size of an individual project and promotes restoration at the institutional level. To make more species of regionally adapted native prairie seed available and affordable for seedings along Iowa's federal, state, and county highways, a plant materials program was initiated in 1990 at the University of Northern Iowa, in partnership with several agencies. The program has released 89 species of Iowa source stock seed, developed from remnant prairie collections, to growers for commercial production of source-identified seed. Several functional groups are represented: warm season and cool season grasses, sedges, legumes, forbs, and prairie shrubs. As the program and native seed market have matured, the Plant Materials Program has taken on a coordinating role among native seed stakeholders. Communication can partially offset the challenges of a volatile and unpredictable seed market. We discuss the evolving role of the Plant Materials Program in supporting a healthy market for diverse, regionally appropriate native seed.

Poster 16 - Mary Damm, Prairie Quest Farm, McGregor, IA; marydamm@gmail.com
Marc Bogonovich, Oceaneditors, Hong Kong; marc.bogonovich@gmail.com

P16 Prairie microgeography: The study of the tangled prairie

We introduce the term microgeography to highlight an aspect of plant community ecology that has received little attention. Plant ecologists commonly study spatial patterns and measure richness and diversity at scales ranging from continents to communities to plots. However, plant ecologists less regularly examine these patterns at a scale less than a square meter. Microgeography considers the spatial structure of plants at a geographical scale of centimeters and documents a variety of patterns including species richness of a single point, spatial arrangement of plants with respect to neighboring conspecifics and other species, and species composition similarity over distances of centimeters. We used a microgeographical approach to examine the spatial structure of native and reconstructed tallgrass prairies in Iowa. Using a 0.5 m2 point-intercept frame with intercepts 10 cm apart, we recorded all species present at each of 49 points. We sampled seven frames in each of three native and two reconstructed black-soil prairies. We found that the two prairie types differ in spatial structure. Native prairies have greater species richness than reconstructed prairies all the way down to a single point. Native prairies also have lower similarity than reconstructed prairies between neighboring points at distances of centimeters.