

Natural Legacy Conference 2019
Abstracts and Summaries



9th Annual Nebraska Natural Legacy Conference
October 9 – 10, 2019
Gering Civic Center, Gering, NE
ABSTRACTS AND SUMMARIES

**All abstracts and summaries are also available
at NebraskaNaturalLegacy.com**



Wednesday, October 9, 2019

Genetics and Bats Session <i>Clark and Smith; Bragg and Hayes; Connelly</i>	Pages 2–3
Avian Ecology Session <i>Gruntorad et al.; Leuenberger; Varner; Brenner and Jorgensen</i>	Pages 3–7
Environmental Education Session <i>St. Sauver; Day et al.; Rogers</i>	Page 7–8
Tree Invasions and Technology Session <i>Fogarty et al.; Ellerman et al.; Uden et al.; Ludwig et al.</i>	Pages 9–11
Citizen Science Session <i>Mayes and Lynch-O'Brien; Lamke et al.; Winkel; Dreier</i>	Pages 12–13
Landscape Scale Management Session <i>Schumacher et al.; Corman et al.; Roberts et al.; Prenosil</i>	Pages 13–14
<u>Poster Session</u> <i>Donovan et al.; Wheeler</i>	Page 15

Thursday, October 10, 2019

Plant Communities and Water Management Session <i>Locklear; Barnes and Twidwell; Caven et al.; Berge</i>	Pages 16–18
Sheep and Otters, and Light Pollution Session <i>Moberg et al.; McHale and Jenks; Malzahn et al.; Bernhardt</i>	Pages 18–21

**Conservation Genetics and Management of the Black Hills Redbelly Snake,
*Storeria occipitomaculata pahasapae***

Jessie Clark*¹ and Brian Smith¹

¹*School of Natural Sciences, Black Hills State University, 1200 University Street, Spearfish SD 57799-9008; e-mail: jessie.clark@yellowjackets.bhsu.edu, brian.smith@bhsu.edu*

ABSTRACT – Isolated populations of organisms are frequently considered at conservation risk because they have small ranges and therefore low population densities, and they may have low within population genetic variance as a result. The Redbelly snake, *Storeria occipitomaculata*, ranges across the eastern third of the United States, with an isolated subspecies, *S. o. pahasapae*, found only within the Black Hills of South Dakota and the Bear Lodge Mountains of Wyoming. The subpopulation is the western most population in North America. It is the only endemic reptile of South Dakota, and, was listed in the South Dakota Wildlife Action Plan as a species of greatest conservation need, it is monitored by the South Dakota Natural Heritage Program. The Black Hills redbelly snake is poorly known, and more data are needed to construct conservation strategies for long-term management and conservation. We are studying among- and within-population genetic variance to answer the question: are populations relatively isolated, with low genetic variance within populations, or is there higher gene flow amongst populations than might be expected for a species with fairly specific habitat needs, isolated from its conspecifics by hundreds of kilometers? Not only will this help determine management strategies for the Black Hills population, but it will also provide some insight on the natural history of this poorly-known animal.

Preserving the Genetics of Fragments of Fragments: Prairie Transplants

Tom Bragg*¹ and Barbi Hayes*²

¹*University of Nebraska – Omaha; e-mail: tbragg@unomaha.edu*

²*Hayes Environmental LLC; e-mail: bahayes@msn.com*

ABSTRACT – Tallgrass Prairie, which dominated much of the eastern Great Plains, has been lost to various activities leaving isolated remnants of this once vast ecosystem to persist in small patches. Even these remnants, though, have been trickling away as land use goals change. Starting in 1981, UNO's Glacier Creek Preserve, a restored tallgrass prairie (est. 1970), has been the focus of local university efforts to save small snippets of these prairie fragments with the goal being to preserve some of the local genetic diversity of macro (e.g. plant) and micro (e.g. microorganism) prairie species which is known to vary across ecosystems. While the visual focus of the project is above ground, the belowground biota are believed to be at least equally as important in this effort. Procedures vary depending on individual sites but all involve digging up either prairie sod (i.e. a small portion of a site) or particularly desirable individual plants at a site using hand shovels. These transplants are then moved to designated areas at Glacier Creek Preserve and their location recorded with a GPS. Sod transplants are also marked at each corner with a metal rod. To date sod transplants have been collected from 5 local sites ranging in size from 5 m² to 750 m². In addition, 6 local sites have been used to collect a variety of individual plants including grasses, such as

Natural Legacy Conference 2019
Abstracts and Summaries

prairie cordgrass (*Spartina pectinata*), and forbs, such as blue flag iris (*Iris versicolor*), Indian plantain (*Arnoglossum atriplicifolium*), and hoary puccoon (*Lithospermum canescens*). Seed collections from these threatened sites supplement transplants. In addition to protecting some small bit of prairie genetic diversity, these continuing efforts also benefit the Preserve by expanding its ecological diversity as we move to incorporating as many historic prairie species as remain available.

Bats of Nebraska: Species, Threats, and Current Research

Laura Connelly*¹

¹*University of Nebraska – Omaha*

ABSTRACT – Prior to the year 2000, intentional killing by humans caused the greatest proportion of mortality events in bats. Since 2000, white-nose syndrome and collisions with wind turbines have been the leading causes of mass mortality in hibernating and migrating bats, respectively. If action is not taken to mitigate the effects of white-nose syndrome and wind turbines, many bat populations in North American may face extinction. If bats were to disappear completely, it would have numerous negative effects on the entire ecosystem. Namely, insect populations left uncontrolled would consume plants and foliage at a rapid rate, leading to further problems.

This presentation provides a literature review of the natural history of Nebraska's bat species and threats to Nebraska's bat species. Current research on prairie bats, population and conservation genetics of bats, and white-nose syndrome in Nebraska will be highlighted.

Factors Affecting Sandhills Ranchers' Willingness to Engage in Conservation Practices

Matthew P. Gruntorad*¹, Katherine A. Graham¹, Nicole Arcilla², and Christopher J. Chizinski¹

¹*School of Natural Resources, University of Nebraska – Lincoln, Lincoln, NE, USA;*
e-mail: mgruntorad2@unl.edu

²*The Crane Trust, Wood River, NE, USA*

ABSTRACT – Nest success of grassland songbirds improves substantially if prairie-meadow hay harvest is delayed until after mid-July. However, hay harvested in the latter portion of the season is low in forage quality and may not provide enough nutrient content for spring-calving cows. In Vermont, dairy farmers were willing to increase songbird habitat quality in at least a portion of their property, and strategies were met with success when farmers harvested hay early, allowing birds opportunity to re-nest. In Nebraska, however, we know little about hay harvesting practices and the willingness of Nebraska hay producers to improve grassland songbird habitat. We surveyed ranchers and hay producers in Holt and Cherry counties to examine how wildlife knowledge, livestock production, and hunting activity affected willingness to alter haying practices for songbird and game bird conservation. Results suggested producers were just as likely to delay harvest to conserve songbirds as game birds, with 60% of respondents indicating they were either likely or very likely to delay harvest. Producers who were more knowledgeable about wildlife species and livestock producers were more willing to delay hay harvest for game and songbird conservation than less

Natural Legacy Conference 2019
Abstracts and Summaries

knowledgeable producers and non-livestock producers. Producers who engaged in a more hunting activities were less willing to delay hay harvest for the purposes of both game and songbird conservation. In the Nebraska Sandhills, a modest delay in harvest may be attainable by the majority of livestock producers, but special attention should be paid to the recreational hunting interests of hay producers. Additionally, efforts to further educate hay producers about the wildlife species residing in their prairie meadows may encourage producers to engage in conservation practices. Our work highlights the need to address differences in livestock production and hunting interest when working with prairie hay producers to conduct grassland bird conservation.

Establishing a Prairie Chicken Lek

Dan Leuenberger*¹

¹Member of: Nebraska Master Naturalists, Izaak Walton League of America, Pheasants Forever, Bluebirds Across Nebraska, National Rifle Association; e-mail: djlnbrgr@gmail.com

SUMMARY – I reside in Lincoln, NE but have ownership in part of the family farm where I grew up in Johnson County which is located in the southeast corner of Nebraska. On this property, my goal has been to improve the habitat for wildlife after obtaining ownership in 2007. The priority of this habitat improvement has a focus on upland birds. The property consists of 91 acres. Approximately 28 acres were originally enrolled in the Conservation Reserve Program (CRP) in 2007. I added about 7 more acres in 2009 and during the past two years, all of the remaining eligible cropland was enrolled into CRP.

The presentation would be of a power-point nature. One project that I am particularly proud of is to establish a prairie chicken lek. Although the great majority of prairie chickens can be found west of U.S. Highway 81 there is a small population in southeastern Nebraska. I have pictures of the work involved in establishing the prairie chicken lek and am prepared to talk about the development of this plot. This project was started in the 2018 year on some of the newly enrolled CRP with the help of the National Resources Conservation Service and the Farm Services Agency. Success was achieved the very first year last spring as prairie chickens were observed using the proposed lek area to display. I wrote an article about the prairie chickens on my property for the Lincoln chapter of the Izaak Walton League and have attached the article below.

Even though the presentation will deal primarily with prairie chickens, my principal objective in wanting to present at the Legacy Conference is to encourage people to try to provide habitat for wildlife. It does take a willingness to learn, plan and work to provide habitat. I have learned so very much about the needs of wildlife regarding insects, pollinators, food, space, cover, etc. and do feel the need to share some of my successes as well as failures.

See article from the Izaak Walton League on next page

Natural Legacy Conference 2019
Abstracts and Summaries

ESTABLISHING A PRAIRIE CHICKEN LEK IN SOUTHEAST NEBRASKA

Leuenberger, D. (2019, May). Establishing a Prairie Chicken Lek in Southeast Nebraska. *Ike News, The Izaak Walton League of America, Inc., Chapter 65, Lincoln, Nebraska*. Volume 19 Issue 5.

I have a small farm in Johnson County which is part of the family farm where I grew up. On this farm, I have been doing several projects mostly to improve habitat for upland birds. My interest in wildlife habitat has been spurred by lifetime of hunting birds, small game and big game in Nebraska and elsewhere. On the farm there were about 50 acres of cropland remaining that had not been converted to Conservation Reserve Program (CRP) that was converted in 2018. With the assistance of Natural Resource Conservation Service (NRCS) and Farm Service Agency (FSA) a plan was drawn up to try to establish a prairie chicken lek or display ground as there have been some prairie chickens in this area for quite a few years. About five acres on top of a hill was set up for the lek with nesting cover next to it and brood raising cover next to the nesting cover. The seeding for the lek is a mixture of clovers, alfalfa and short grasses although very little of the seeding sprouted in 2018 and was grown over with mostly weeds. Hopefully, the seeding will become more established during this and future years. Management included removing some tall cottonwood trees located about 125 yards from the lek area. The Cornhusker Chapter of Pheasants Forever did supply some monetary assistance for doing the tree removal. The purpose of this removal was to prevent hawks from landing in the branches to view possible prey. I was told that the chickens would not use the area if they could see hawks sitting in the trees. Another management tool was to have the lek area mowed by the first of March as the chickens do not like tall vegetation for the lek. I did mow it in October and was glad I did that since the snow and/or mud would have prevented mowing in January or February. I really did not expect to have prairie chickens use the area the very first year after being established and with the necessary management being in force for only one year.

I noticed that the prairie chickens were using the lek as a breeding ground during the latter part of March this year and was able to view them on several occasions. Pop-up blinds were used for concealment while viewing their dancing and listening to the male prairie chickens call with their eerie "booming" sounds. It was quite interesting to see and hear. The prairie chickens would arrive on the lek one-half hour before sunrise so we had to be in the blinds prior to that. My goal for next year is to build some permanent blinds for viewing as the wind gets quite strong at times on top of the hill and could blow pop-up blinds away. I did set up a trail camera where the chickens were located as it was always in the same area each morning. This picture was taken with the trail camera. This was done in early April. The winter was tough for the quail on my property but I was relieved to be able to view the prairie chickens.



**Development of a Long-Term Monitoring Program for Waterfowl
in the Rainwater Basin Region**

Dana Varner*¹

¹*Rainwater Basin Joint Venture*

ABSTRACT – The Rainwater Basin Wetland region (RWB) of Nebraska is the focal point of spring waterfowl migration in the Central Flyway. Currently, over 85% of the historic wetland basins have been drained for agriculture production. Based on population objectives and waterfowl foraging requirements, the Rainwater Basin Joint Venture (RWBJV) estimates 60,000 acres of wetland habitat are needed to support migrating waterfowl, more than double the amount available in a typical year. Currently, the RWBJV partnership does not yet have survey-based, geospatial models that are needed to help prioritize those wetlands and wetland complexes that will best meet the needs of migrating waterfowl. To build these models, a better understanding of the local and landscape level factors that drive habitat selection by the various waterfowl guilds (dabbling ducks, diving ducks, geese) is needed. To help better target conservation efforts, the RWBJV partnership is developing a waterfowl monitoring protocol to be implemented each spring for the next 10 or more years. At sample wetlands, observers measure waterfowl abundance, local wetland conditions, and other variables. Each wetland is surveyed up to three times a week between sunrise and sunset from mid-February to mid-April. From 2017-19, we completed nearly 5,000 surveys on over 500 wetlands in the RWB. Preliminary results indicate that functional area (km²) within the historic footprint had the strongest positive relationship with abundance for dabbling ducks, diving ducks, and geese. Functional area (km²) within a 10-km radius of the historic footprint also correlated positively with ducks but not goose abundance. Future modeling efforts will examine effects of vegetation structure, human disturbance, and other variables. The resulting models will be used to develop decision support tools to highlight areas on the landscape that have higher probabilities of waterfowl use.

Distribution, Abundance, and Habitat Associations of Chuck-will's-widow (*Antrastomus carolinensis*) and Eastern Whip-poor-will (*Antrastomus vociferus*) in Eastern Nebraska

Stephen J. Brenner*¹ and Joel G. Jorgenson¹

¹*Nebraska Game and Parks Commission*

ABSTRACT – Nightjars are crepuscular or nocturnal insectivorous birds that are infrequently and inconsistently detected by traditional avian survey methods such as the Breeding Bird Survey (BBS). As a result, less is known about nightjars' abundance, distribution, and demographics throughout their range compared to more visible species, particularly in less populated areas with few observers such as Nebraska. We focused on two nightjar species that have suffered population declines throughout their core ranges, and both are species of concern in Nebraska: Eastern whip-poor-will (*Antrastomus vociferus*; hereafter EWPW) and Chuck-wills widow (*Antrastomus carolinensis*, hereafter CWWI). Both species, particularly EWPW, require upland woodlands and forest openings for breeding. However, habitat loss is considered one of the likely causes of observed population declines. Using survey protocols developed for specifically nightjars, we conducted 207 point counts along 22 driving routes throughout eastern Nebraska

Natural Legacy Conference 2019
Abstracts and Summaries

in order to establish baseline data on distribution, abundance, and land-cover associations of EWPW and CWWI in Nebraska. We detected 101 birds (36 CWWI, 65 EWPW) on our counts, with CWWI concentrated in the southeastern portion of Nebraska and EWPW more widely distributed throughout the state, particularly along river corridors. Land cover analysis at four different spatial scales indicate a negative relationship between nightjar presence and increasing row crop agriculture surrounding suitable oak-woodland habitats, particularly at the home range (500 m circle) and landscape (4 km circle) scales. Having established baseline abundance and distribution data for EWPW and CWWI in Nebraska, we will continue surveying for these species in 2020 in areas outside of the known breeding ranges based on the land cover-association data from this year's season.

**Let's Go Birding Together: Partnering with Non-Traditional Audiences
in Education & Conservation**

Jason St. Sauver*¹

¹*Audubon Nebraska*

SUMMARY – Conservation and Environmental Education have a long history of being less than inclusive. Jason “the Birdnerd” St. Sauver, creator of LGBT – Let’s Go Birding Together programming and Director of Education & Outreach with Audubon Nebraska, brings humor and years of experience working on Equity, Diversity, and Inclusion to the discussion of reaching new and non-traditional audiences in environmental education and conservation programming. The program includes both a presentation piece focusing on ideas, terminology, and tips on engagement as well as short discussion topics, activities, and time for questions and more discussion.

Civic Nebraska Field Guides to School Campuses and Native Prairies

Kent Day*¹, Chris Madden^{2,3}, Hannah Cornwell³, and Nico Lindell³

¹*Civic Nebraska; e-mail - kent.day@civicnebraska.org*

²*Upstream Weeds*

³*University of Nebraska – Omaha*

SUMMARY – This presentation involves two tools each designed to teach and excite younger students on collection, observation, and experimentation techniques for environmental studies. Extensions include data recording, citizen science participation, and longitudinal studies.

Native Prairie Field Guide

This project was designed to facilitate interaction between younger students and a habitat with which they are often unfamiliar, the native Nebraska prairie. The targeted student population is K-8 children who rarely, if ever, have the opportunity to observe, understand, and interact with the native Nebraska ecosystem including ground, air, water, and living things. This project has produced a replicable, adaptive tool for teachers and students to use in order to inform students about the prairie

Natural Legacy Conference 2019
Abstracts and Summaries

habitat and the interconnectedness of land, air, water, climate, living things, and the human footprint that may be there. They also practice with the tools necessary to explore those features. This tool is free to any teacher or parent in every corner of Nebraska. Civic Nebraska with funding from the Nebraska Environmental Trust through Public Information and Education grants and multiple partners have created an interactive, informative, and flexible guide for school field trips to native Nebraska prairie sites and other natural sites. The initial publication included 7 environmental interactions with expository information, an activity, and tools for each.

School Campus Field Guide

The key to Civic Nebraska's School Campus Field Guide is that can be used in shorter time frames than the Prairie Field Guide and it can be used in any school setting anywhere in Nebraska. The Field Guide is a companion document to the publication funded by NET through the PIE Grant in 2015. That Guide gives schools and after school programs a complete program including field tools to explore and assess native prairies. It was very successful and is still in use. The Campus Guide is the at-school version of that Field Guide. It is a series of environmental activities that can be completed in and around any school. It guides students through the exploration of an environment that young people don't often see as a habitat. It helps students to see the positive and negative footprints that people leave wherever they are and to participate in larger, citizen science programs. It is low cost and high impact. In that it uses a school campus as the habitat, it is completely replicable. All of the lessons and activities are posted on our website and are available at no cost. With this guide, students will begin to look at not only their school campus, but also their civic environment as places where plants and creatures of all kinds live and thrive. They will see the good and the bad that people can do to impact this habitat and bring that understanding to any place that they go. Most importantly, they will learn to make the observations, collect the data and samples, and use the tools that may be what turns them into future environmental advocates and scientists.

Linking Science Standards and Environmental Education

Lindsay Rogers*¹

¹*Nebraska Game and Parks Commission*

SUMMARY – Nebraska's new Career and College Ready Science Standards foster a deeper understanding of the process of science by asking students to investigate, critically think and engineer solutions. So how does this connect to environmental education. We will discuss the new state standards and learn how conservation and environmental education provide teacher, students and non-formal education the opportunities they need to develop this deeper understanding of science.

Outcomes of Grassland Conservation in Nebraska's Biologically Unique Landscapes

Dillon T. Fogarty^{1,2}, Dirac Twidwell¹, Caleb P. Roberts¹, Daniel R. Uden¹, Victoria Donovan¹,
and Craig R. Allen³

¹*Department of Agronomy & Horticulture, University of Nebraska – Lincoln, Keim Hall, Lincoln, NE 68583-0915, USA*

²*Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska – Lincoln, Hardin Hall, Lincoln, NE 68583-0961, USA*

³*Center for Resilience in Working Agricultural Landscapes, University of Nebraska – Lincoln, Keim Hall, Lincoln, NE 68583-0915, USA*

ABSTRACT – Tree invasions of grassland ecosystems have major consequences and halting and reversing invasion is a key conservation goal. Yet, traditional brush management practices are scrutinized for their inability to achieve these goals at broad-scales. In this study, we use innovative rangeland monitoring data (Jones et al. 2018) to provide the first assessment of grassland conservation outcomes for the Nebraska Natural Legacy Project, a statewide interagency effort aimed at halting and reversing trends of declining biodiversity. This assessment comes at a critical time; Nebraska is on the front lines of a biome-scale woody transition sweeping northward in the Great Plains. Here, we track trends of annual tree cover in grasslands from 2000-2017 across Nebraska, and Nebraska's ecoregions, biologically unique landscapes (BULs), and non-priority landscapes. Statewide tree cover tripled since 2000 and is now approaching one million acres. Tree cover also tripled in the Tallgrass Prairie, Mixedgrass Prairie, and Sandhills ecoregions; the Shortgrass Prairie was the only ecoregion with stable trends in tree cover. The majority of grassland BULs (17 of 21) showed positive trends in tree cover. BULs without increasing tree cover or where increases in tree cover were relatively small (>1%) occurred in western Nebraska where invasive trees remain rare. Overall tree cover increased slower in BULs compared to non-priority landscapes, but remained on an undesirable trajectory. No conservation landscapes reversed trends of invasion, but partnerships between landowner coalitions and natural resource agencies halted tree invasion in the Loess Canyons—the most heavily invaded landscape in Nebraska—and can provide a model for improving conservation investments in other BULs. Future tracking of management outcomes in tandem with co-production of new and innovative solutions will be increasingly important for ensuring the future of Nebraska's grasslands and the biodiversity they support.

Outcomes and Lessons from Cost-Share Restoration Projects in Nebraska

Hugh Ellerman*¹, Craig Allen², and Dirac Twidwell³

¹*Nebraska Fish and Wildlife Cooperative Research Unit at the University of Nebraska – Lincoln;
e-mail: hrellerman@gmail.com*

²*School of Natural Resources, University of Nebraska–Lincoln*

³*Department of Agronomy and Horticulture, University of Nebraska–Lincoln*

ABSTRACT – The Landowner Incentive Program (LIP) was designed to protect and restore habitats on private lands by offering technical and financial assistance to private landowners. In Nebraska, LIP projects often took the form of tree removals, however whether these publicly funded management actions yielded the intended results has yet to be determined. In the summers of 2018 and 2019, we revisited 15 LIP tree removals in two regions of the state to determine whether management objectives were reached. The first was a grassland restoration in southeast Nebraska where removals occurred in 2005 on pastureland in order to restore productive grasslands. The second was a bur oak regeneration project along the Niobrara River that cleared trees in 2012 to provide abundant light conditions to aid the regeneration of planted oak seedlings. These removals saw disparate outcomes. In southeast Nebraska, we found that eastern redcedar reestablished in 4 of the 7 problem sites while honey locust reestablished in 5 of the 9 problem sites. Eastern redcedar showed significant decreases in 2 of the 7 problem sites and honey locust showed significant decreases in 2 of the 9 problem sites. In the second set of LIP removals along the Niobrara River, 1 of the 6 sites yielded healthy bur oak saplings, while the other 5 sites showed either no oaks at all or only seedlings. In the two successful sites, 17.5% and 10% of oaks regenerated by the summer of 2019. Ultimately, most project outcomes did not align with their intended results, however there were also successes that cannot be overlooked. Differences seemed to hinge on management activities in the time since tree removal. Ultimately, tree removals alone cannot successfully restore a grassland or secure favorable habitat for oak regeneration. Careful selection of and communication with cost-share participating landowners should increase the efficacy of management activities so that restoration goals are met and funds are optimally allocated.

Screening for Vegetation Transitions

Daniel R. Uden*^{1,2}, Dirac Twidwell¹, Craig R. Allen^{2,3}, Matthew O. Jones⁴, David E. Naugle⁴, Jeremy D. Maestas⁵, and Brady W. Allred⁴

¹*Department of Agronomy and Horticulture, University of Nebraska–Lincoln, Lincoln, NE, USA*

²*School of Natural Resources, University of Nebraska–Lincoln, Lincoln, NE, USA*

³*Center for Resilience in Agricultural Working Landscapes, University of Nebraska–Lincoln, Lincoln, NE, USA*

⁴*W.A. Franke College of Forestry and Conservation, University of Montana, Missoula, MT, USA*

⁵*United States Department of Agriculture, Natural Resources Conservation Service, Portland, OR, USA*

ABSTRACT – Screening is a strategy for detecting undesirable change prior to manifestation of symptoms or adverse effects. Vegetation transitions (regime shifts) can have undesirable ecological and economic consequences, and the ability to spatially target transitions before they cause damage contributes to proactive land management. Critical theory–data–technology linkages now allow landscapes to be proactively screened for vegetation transitions. Screening complements ongoing efforts to diagnose (monitor) and manage (treat) transitions, such as woody plant encroachment and annual grass invasion. We present screening results for rangeland-dominated landscapes of Nebraska and other western U.S. states and link transition signals to species and community responses.

Effects of Regime Shift on the Endangered American Burying Beetle in Nebraska’s Loess Canyons

Alison K. Ludwig*¹, Daniel R. Uden¹, and Dirac Twidwell¹

¹*University of Nebraska – Lincoln, Department of Agronomy and Horticulture;
e-mail: alison.ludwig@huskers.unl.edu, duden2@unl.edu, dirac.twidwell@unl.edu*

ABSTRACT – The Loess Canyons of south-central Nebraska is undergoing regime shift from grassland to eastern redcedar (*Juniperus virginiana*) forest. Remote sensing has shown that tree cover has increased over the past several decades, while perennial cover has been in decline. Recent land management actions have attempted to slow or stop this regime shift. The Loess Canyons are also one of the last refuges of the federally-endangered American burying beetle (*Nicrophorus americanus*), the largest species of carrion beetle in North America. The Nebraska Game and Parks Commission has monitored populations of the beetle in the Canyons for over a decade. While some populations have been sustained over that time period, others have been in decline. Using remote sensing data and cloud computing to quantify land cover composition over time and across scale, we will examine relationships between land cover shifts and the beetle populations.

Citizen Scientists of Nebraska: A Network Focused on Increasing and Improving Citizen Science in Nebraska and Beyond

Alie Mayes*¹ and Louise Lynch-O'Brien*²

¹*Nebraska Game and Parks Commission*

²*University of Nebraska – Lincoln*

SUMMARY – Citizen Science is a rapidly growing field that is helping researchers across the globe to conduct scientific research. To help keep up with this trend in Nebraska, a regional network called Citizen Scientists of Nebraska was formed 2019. This network is working to provide a platform for communication, collaboration, and resource-sharing for program facilitators, educators, and the general public to increase awareness and participation in regional citizen science efforts.

The Nebraska Bumble Bee Atlas

Katie Lamke*¹, Rich Hatfield¹, Jennifer Hopwood¹, Rae Powers¹, and Doug Golick²

¹*Xerces Society*

²*University of Nebraska-Lincoln*

SUMMARY – The Nebraska Bumble Bee Atlas is a brand new community science project aimed at tracking and conserving the state's native bumble bees. The goal is to gain a better understanding of the distribution of Nebraska's bumble bees in order to design and enact more effective conservation measures. The Atlas is a collaborative effort between the University of Nebraska-Lincoln and the Xerces Society for Invertebrate Conservation, and supported by the Nebraska Environmental Trust.

Audubon's Climate Watch Community Science Project

Anne Winkel*¹

¹*Audubon Nebraska*

SUMMARY – In 2014, Audubon released the Audubon Birds and Climate Change Report, which highlighted the risks that climate change poses to birds across North America. In response, Audubon developed a community science project, Climate Watch, that over the past 4 years has been helping strengthen our understanding of how birds are currently responding to climate change. Since 2016, more than 1,200 skilled volunteers from across the U.S. have collaborated with Audubon scientists by testing the predictions of target species' mid-2020s climate model projections through on-the-ground monitoring. Audubon uses these structured surveys, conducted both in winter and summer, to analyze the relationship between climate suitability and where bird species occur, and to directly test hypotheses about bird responses to climate change.

Natural Legacy Conference 2019
Abstracts and Summaries

Monarchs, Milkweeds, and More

Cody Dreier*¹

¹*Nebraska Game and Parks Commission*

SUMMARY – Pollinators are currently having a tough time in America. About ¼ of our bumble bee species are facing dramatic population losses. Monarch butterfly populations have been declining for at least 15 years and the species has been petitioned to be listed as threatened in 2020. Both Game and Parks and Iowa State University have developed ways to track milkweed (monarch caterpillar food) for monarch conservation, but need public engagement for the tools to be successful. Other organizations have also implemented pollinator projects for the public to get involved with in Nebraska and beyond.

Management of Nebraska’s Biologically Unique Landscapes at the Landscape Scale

Kyle Schumacher*¹, Cassidy Wessel², and Scott Wessel²

¹*Northern Prairies Land Trust; e-mail: kyle.schumacher@nebraska.gov*

²*Nebraska Game and Parks Commission*

ABSTRACT – Conservation of Nebraska’s unique natural resources is dependent on strategically managed areas of critical habitat across the state. This includes the Verdigris/Bazile Biologically Unique Landscape in the northeast part of Nebraska. This area plays a vital role in providing quality habitat for wildlife species of greatest conservation need recognized by the Natural Legacy Project. Habitat improvement incentive programs for the BUL have existed since the initial State Wildlife Action Plan in 2005. These programs have annually yielded around 15 projects averaging 110 acres in size. However, the 701,655 acre BUL has around 440,000 acres of rangelands, 84,000 acres of forests, and 16,000 acres of wetlands. Given our historic scale of impact, we have struggled to address landscape scale habitat degradation and loss in the Verdigris-Bazile BUL. The integrity of this unique region is threatened by eastern red cedar encroachment, nonnative cool-season grass invasion, lack of fire across the landscape, land conversion to production agriculture, homogenous grazing practices, and energy development among other pressures. We have drafted a planning document for the Verdigris-Bazile BUL that addresses these stressors and provides a pathway for upscaling our impact through the entire BUL. Our goal through this document is to transform the BUL into a resilient ecosystem capable of supporting a diverse community of wildlife and plants at multiple scales. Our methods will prioritize and strategically locate conservation efforts to meet this goal, and the framework of our approach can easily be applied to other BUL’s across the state.

It's Here, Now What? Conservation and Climate Change in the Middle Niobrara BUL

Jen Corman*¹, Melissa Panella², Katherine Crawley², and Sam Wilson²

¹*Northern Prairies Land Trust; e-mail: jen.corman@nebraska.gov*

²*Nebraska Game and Parks Commission; e-mail: melissa.panella@nebraska.gov, katherine.crawley@nebraska.gov, sam.wilson@nebraska.gov*

SUMMARY – At a recent NGPC Climate Adaptation Workshop, we reviewed how climate change is affecting ecosystems in north-central Nebraska and how it may interact with conservation challenges in the region as it progresses. We will present strategies we identified at the workshop to proactively adapt our wildlife conservation work on private lands in the Middle Niobrara BUL.

Large-Scale Resilience Management in Nebraska and Beyond: Outcomes and Successes for Wildlife, Wildfire Prevention, and Water

Caleb P. Roberts^{1*}, Dirac Twidwell¹, Daniel R. Uden¹, Dillon T. Fogarty¹, and Craig R. Allen²

¹*University of Nebraska – Lincoln, Agronomy & Horticulture, Lincoln, NE; e-mail: croberts6@unl.edu*

²*University of Nebraska – Lincoln, School of Natural Resources, Lincoln, NE*

ABSTRACT – Wildlife conservation is increasingly turning to broad-scale planning horizons and the co-production of science, policy, and management to leverage resources and scale-up conservation investments. Large-scale resilience management is based on principles derived from hierarchy theory and prioritizes conservation investments that secure broad-scale patterns before implementing localized management actions. Motivating such efforts has proven extraordinarily challenging in the Great Plains, where woody plant encroachment is continuing to spread and detrimentally impact multiple rangeland resources. Here, we introduce pioneering efforts to bridge new metrics from spatial resilience theory with new technological and computational capabilities in rangeland monitoring. We demonstrate how these new spatial tools are capable of screening for vegetation transitions before symptoms are evident for wildlife, livestock, and other important ecosystem services in rangelands. We then provide examples where these new tools have motivated the scaling-up of private lands conservation in the Great Plains and discuss the initial outcomes to wildlife, livestock, water, and wildfire prevention.

USDA Programs and the Nebraska Natural Legacy Project

Jenny Prenosil*^{1,2}

¹*Pheasants Forever Inc.*

²*Quail Forever*

SUMMARY – An overview of USDA Farm Bill programs available to landowners in Nebraska. Summaries of wildlife projects within those programs as well as how each of these programs aids in habitat development or management for many of the Nebraska Natural Legacy species will be discussed.

**Post-Fire Management Alters Structural and Community Characteristics
of Eastern Ponderosa Pine Forest**

Victoria M. Donovan¹, Caleb P. Roberts*^{1,2}, Carissa Wonkka¹, David Wedin³, Dirac Twidwell¹

¹*University of Nebraska – Lincoln, Department of Agronomy & Horticulture, Lincoln, Nebraska 66583-0915; e-mail: victoria.donovan@huskers.unl.edu*

²*Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, Lincoln, Nebraska 66583-0984*

³*University of Nebraska – Lincoln, School of Natural Resources, Lincoln, Nebraska 68583-0961*

ABSTRACT – Increasing wildfires in western conifer forests has led to debates surrounding the application of post-fire management. There is a lack of consensus on whether post-fire management assists or hinders managers in achieving goals tied to habitat conservation, fuels management, and forest regeneration. We contrast structural and community characteristics across unburned ponderosa pine forest, severely burned ponderosa pine forest, and severely burned ponderosa pine forest treated with post-fire management in eastern ponderosa pine forest of Nebraska’s Pine Ridge. Live tree density was 3 times greater in treated sites compared to untreated sites, suggesting increases in tree regeneration following tree planting; however, natural regeneration was evident in both unburned and untreated burned sites. Wildland fuels management greatly reduced snags and coarse woody debris in treated burned sites. However, there were no tree cavities, an important wildlife habitat feature, in treated burned sites. Untreated burned sites had an average of 27 ± 7.68 cavities per hectare. We found almost double the avian species richness in untreated burned sites compared to treated burned sites (22 species versus 12 species). Unburned forests and untreated burned areas had the same species richness, but hosted unique avian communities. Our results indicate clear trade-offs between habitat conservation and fuel management with regard to post-fire management application.

A History of the Loup TREX

Ben Wheeler^{1,2}

¹*Pheasants Forever*

²*Quail Forever*

ABSTRACT or SUMMARY – ***Not Submitted***

Sandsage Prairie: Ecology and Biodiversity of the “Cinderella Sandhills”

James H. Locklear*¹

¹*Lauritzen Gardens*

SUMMARY – NEBRASKAland writer Jon Farrar once referred to the sandsage prairie region of the southwestern part of the state as the “Cinderella Sandhills,” always in the shadow of the Nebraska Sandhills to the north. Sandsage prairie is a shrub-steppe ecological association unique to the Great Plains in which sand sagebrush, *Artemisia filifolia*, is the dominant and diagnostic element. Associated with dunefields from Wyoming into New Mexico, sandsage prairie is a plant community of conservation concern in Nebraska and several other Great Plains states. This presentation will highlight recently-published research on the composition, structure, and dynamics of sandsage prairie vegetation and the biodiversity and ecosystem functions it supports.

The Lost History of Eastern Redcedar Management for Cedar-Apple Rust in Nebraska

Conor D. Barnes*¹ and Dirac Twidwell²

¹*School of Natural Resources, University of Nebraska – Lincoln, Lincoln, NE;*
e-mail: conor.barnes@huskers.unl.edu

²*Department of Agronomy and Horticulture, University of Nebraska – Lincoln, Lincoln, NE*

ABSTRACT – Charles Bessey, a prominent 19th-century scientist and tree planting advocate, identified a single tradeoff to planting Eastern redcedar in Nebraska: it is a host for cedar-apple rust, a type of fungus that negatively impacts apple production. Though Bessey recommended planters avoid placing the two types of trees near each other, many orchardists nonetheless followed their non-orchardist neighbors and planted cedar windbreaks to protect their valuable apple trees. The result was one of the most severe infestations of cedar-apple rust in the country. Windbreaks on neighboring properties made simply removing cedars from orchard owners’ land ineffective, so to save the apple industry the Legislature set up the first cedar management policy in Nebraska. The Cedar Rust Law required the removal of all cedar trees within two miles of apple orchards of a certain size, regardless of whether a landowner had apple trees or not. While courts in Nebraska, other states, and even the U.S. Supreme Court consistently upheld such laws, eventually the policy was abandoned with the introduction of fungicides that could treat cedar-apple rust. Nonetheless, the cedar rust saga provides important lessons as stakeholders grapple with how to manage Eastern redcedar today. First, the cedar rust saga demonstrates the societal and economic importance of considering landscape-scale impacts. Second, cedar management should be viewed not just through an engineering lens, as recent efforts have, but a policy one as well. Finally, the state’s cedar-apple rust experience emphasizes the need for local stakeholder involvement and self-organization, a skill well applied by the orchardists who suffered significant economic harm from the cedar-apple rust outbreak.

Vegetation Community Composition within Bison Wallows in a Lowland Tallgrass Prairie

Andrew J. Caven*¹, Joshua D. Wiese¹, Aurora Fowler², and Dustin H. Ranglack³

¹*Platte River Whooping Crane Maintenance Trust, Wood River, Nebraska;*
e-mail: acaven@cranetrust.org, wiesejd@lopers.unk.edu

²*Nova Southeastern University, Fort Lauderdale, Florida; e-mail: afowler3567@gmail.com*

³*Department of Biology, University of Nebraska at Kearney, Kearney, Nebraska;*
e-mail: ranglackdh@unk.edu

ABSTRACT – Vegetative diversity and structural heterogeneity in tallgrass and mixed-grass ecosystems is maintained by recurring disturbance regimes. Bison wallow both for social display and physical maintenance. Wallowing provides a unique disturbance that alters localized vegetative communities. Ideally, wallowing adds diversity to a landscape by providing space for early successional species, reviving buried seed banks, and creating topographic microsites. However, exotic-invasive plant species are often disturbance dependent and have become increasingly problematic to grassland managers in recent decades. To determine if wallows are providing a space for a native early successional plant communities and/or serving as a vector for exotic-invasive species we assessed vegetative community composition within active bison wallows as compared to the community outside of them within a 143 acre pasture rotationally grazed by 45-65 bison from 2015 to 2017. We used a quadrat ocular cover estimation method to capture the vegetation community composition within and 5 m outside of 20 active wallows during both the 2016 and 2017 growing seasons. We also recorded wallow area, depth, percent actively re-wallowed from 2016 to 2017, species richness outside wallows, flooding frequency, and soil type at each site to examine the factors impacting species richness within wallows. We used two-tailed Welch-Satterthwaite t-tests to compare the percent cover of 114 species of vascular plants within and outside of wallows. We used generalized linear models with a Poisson distribution and Akaike Information Criterion corrected for small sample sizes (AICc) to assess the structural, physical, and hydrological characteristics associated with species richness inside wallows. Nineteen species of vascular plants were more abundant within wallows, 21 species were more abundant outside of wallows, 35 species demonstrated no significant difference, and there was insufficient data to categorize the response of 37 species. Species in the grass (Poaceae) and sedge (Cyperaceae) families tended to be more abundant outside of wallows while species in the sunflower (Asteraceae), goosefoot (Amaranthaceae + Chenopodiaceae), and spurge (Euphorbiaceae) families were more abundant inside wallows. Interestingly, exotic species composed similar percentages of the vegetative community inside wallows (28.6%) and outside wallows (35.7%). Hydrologically, 15.8% of species that were more abundant outside of wallows were classified as a wetland plants (Facultative Wetland or Obligate) while 0% inside wallows were. Species that were more abundant outside of wallows overwhelmingly had a perennial lifecycle (89.5% perennial, 5.3% biennial, and 5.3% annual) while only 5.6% of species that were more abundant inside were perennial (77.8% annual and 16.7% biennial). The top model predicting species richness within wallows included both wallow area and depth as independent variables, which were both positively associated with species richness. Our results suggest that bison wallows may help sustain some disturbance dependent vegetative components within lowland tallgrass prairies without greatly increasing the risk of invasive species spread.

Water Management in Western Nebraska

John Berge*¹

¹*North Platte Natural Resources District*

ABSTRACT – The North Platte Natural Resources District (NPNRD) is a conservation district in western Nebraska encompassing 3.5 million acres over 4 and 1/3 counties. The District includes a severely overappropriated portion of the North Platte River and the Pumpkin Creek Basin. This designation requires that we incrementally get back to a post-1997 level of groundwater development and return an annual amount of 8,000-acre feet of water annually to the North Platte River in perpetuity.

NPNRD has taken great pride in its efforts to meet obligations by reducing consumptive use water within the District while maintaining the social and economic welfare of the District. In addition to placing a moratorium on new well drilling, allocations of water use, certification of all groundwater uses, and metering groundwater uses, NPNRD has also permanently retired groundwater irrigated acres throughout the District, including nearly 3900 in the Pumpkin Creek Basin and nearly 2000 in the North Platte River Valley. The NRD has also leased nearly 800 surface and co-mingled acres, including a surface water intentional recharge project on Enterprise Irrigation District.

NPNRD has also instituted several programs to promote the reduction of consumptive use of water within the District. The Encouraging Producer Innovation through Conservation (EPIC) program provides a bonus incentive payment to landowners in the District to renew expiring federal conservation program contracts and provides grants to landowners that propose innovative agricultural practices to realize water savings or enhanced water quality. These options include allocation buy-down, soil health and wildlife conservation. NPNRD also administers a robust cost-share program with a heavy emphasis on water management technologies, telemetry, variable speed/rate irrigation and soil moisture probes. We are also on the leading edge of research related to climate mitigation.

This presentation will focus on our efforts to integrate technology into our regulatory framework and incentive programs.

Reproductive Success, Survival, and Cause-Specific Mortality of Bighorn Sheep in Nebraska

Emily Moberg*¹, Jonathan Jenks¹, Will Inselman², and Todd Nordeen³

¹*Department of Natural Resource Management, South Dakota State University, 1390 College Avenue Box 2140B, Brookings, SD 57007*

²*Nebraska Game and Parks Commission, 2200 N 33rd St, Lincoln, NE 68503*

³*Nebraska Game and Parks Commission, 299 Husker Road, Alliance, NE 69301*

ABSTRACT – Reintroduced bighorn sheep (*Ovis canadensis*) in Nebraska have been facing a devastating pneumonia epizootic resulting in variable ewe reproductive success and poor or no lamb recruitment in many of the herds. From 2015-2017, no lamb recruitment was observed in the three Northern subherds of the Pine Ridge and as many as 60% of adults died. In 2018, three of 26 lambs born in the Pine Ridge survived past 90 days. This finding was in stark contrast to the healthier southern herds

Natural Legacy Conference 2019
Abstracts and Summaries

found in the Wildcat Hills where 38 of 73 lambs born in 2018 survived. Previous research has found population dynamics to vary among herds within geographic regions highlighting the importance of estimating demographic parameters and disease prevalence in multiple herds within a region and understanding metapopulation dynamics. Our study will shed light on survivability and illuminate how management can allocate resources to best help Nebraska bighorn sheep populations. A need exists to more specifically quantify ewe reproductive success, determine cause-specific mortality in lambs, and determine what respiratory pathogens may be prevalent in herds to begin to discuss potential treatment options. Fifty-nine ewes have been captured throughout the first two years of this three year study via helicopter net-gun. Thirty ewes have been captured in the Pine Ridge and twenty-nine in the Wildcat Hills. Captured sheep were aged, fitted with Global Positioning System (GPS) collars, and had blood and swabs collected for disease and DNA testing. Ewes that tested positive for a primary pathogen associated with pneumonia, *Mycoplasma ovipneumoniae* (*M. ovi*), two consecutive years were removed to evaluate the effects of the chronic shedder hypothesis on lamb survival. Ewes that were confirmed pregnant via ultrasound were fitted with vaginal implant transmitters (VIT). All sheep were monitored and visually observed weekly. During lambing season, VITs were checked daily to determine parturition. Neonates were captured by hand and fitted with expandable very high frequency (VHF) collars, sexed, weighed, and tested for disease. Collared lambs were monitored daily for 90 days after capture. Mortality signals were investigated as soon as possible to determine cause of death and any remains were collected, weighed, and submitted for necropsy. To date, 70 lambs have been radio collared, 24 of which are still alive and continuously monitored. Pregnancy rates, number of live births, and ratio of lambs to ewes will be used to estimate reproductive success. Factors influencing survival rates include predation risk, exposure to disease, and efficacy of disease treatment, which will be quantified to determine specific causes of mortality. Results of this study will assess techniques for pneumonia elimination within the herds of the Pine Ridge region of Nebraska.

Disease Prevalence in Domestic Sheep in Western Nebraska: Implications for Bighorn Sheep Conservation, Domestic Sheep Fitness, and Coexistence

Laura A. McHale*¹ and Jonathan Jenks¹

¹South Dakota State University, 1390 College Avenue, Brookings, SD 57007 USA;
e-mail: laura.mchale@sd.state.edu, jonathan.jenks@sdstate.edu

ABSTRACT – Respiratory disease is a major cause of mortality in Nebraska bighorn sheep (*Ovis canadensis*), threatening the success of the state’s bighorn sheep restoration efforts. *Mycoplasma ovipneumoniae* is a bacterial pathogen often associated with respiratory disease in wild sheep as well as closely related domestic sheep (*Ovis aries*). Whereas domestic sheep tend to be asymptomatic carriers of the pathogen, bighorn sheep often develop acute pneumonia and experience high rates of mortality when exposed to *Mycoplasma ovipneumoniae*. Attempts to treat bighorn sheep exposed to *Mycoplasma ovipneumoniae* are expensive, labor intensive and have showed no long-term benefits. However, treating the pathogen in easily accessed domestic sheep herds may prove to be less costly and more beneficial to both species. Our objectives are to (1) collect nasal and throat swabs from domestic sheep in the Pine Ridge and Wildcat Hills of western Nebraska; (2) compare and map *Mycoplasma ovipneumoniae* strains found in domestic and wild sheep to investigate spatial prevalence and potential avenues of transmission;

(3) investigate operation-specific factors that may be correlated with pathogen presence or disease severity in domestic sheep; (4) compare weight, condition, reproductive success, rate of gain and other variables in domestic sheep in which *Mycoplasma ovipneumoniae* is detected versus not detected; and (5) conduct a human dimensions survey to gauge domestic sheep owners willingness to participate and support future bighorn sheep conservation initiatives and strategies to promote co-existence of both wild and domestic sheep. We will present findings from the first year of the study which includes test results of 155 nasal and throat swabs from 332 domestic sheep sampled from 33 operations in western Nebraska.

Characteristics of a River Otter (*Lontra canadensis*) Maternal Den and Preliminary Results from an Off-Channel Habitat Use Study in the Central Platte River Valley, NE

Jenna Malzahn*¹, Andrew J. Caven¹, and Joshua D. Wiese¹

¹Platte River Whooping Crane Maintenance Trust, Wood River, Nebraska;
e-mail: jmalzahn@cranetrust.org, acaven@cranetrust.org, jwiese@cranetrust.org

ABSTRACT – River otters (*Lontra canadensis*) encompass a broad geographic range including coastal, riverine, and lacustrine systems. However, knowledge of reproductive behavior and structural den characteristics remain relatively sparse in the literature. Distinctions between terms den, den site, natal den, and maternal den are often ambiguous in literature, obscuring our understanding of river otter's young-rearing behavior. Natal dens provide parturition sites, while maternal dens provide sites that proceed weaning and are subsequent to and exclusive of parturition. Our report discusses observations of reproductive behavior and describes structural and site characteristics of a river otter's maternal den in the Central Platte River Valley (CPRV), Nebraska. Observations of parental behavior, such as the transportation of young to the maternal den and aquatic acclimation, were recorded via direct or video surveillance. The selected den consisted of a metal pipe on the bank of an excavated perennial pond within close distance to anthropogenic features, such as a cottage, dormitory, and office, but a considerable distance to the Platte River. Factors that may have influenced this move to a maternal den include protection from predators and disturbances, age of young, and proximity to resources. This represents the first detailed description of a maternal den in the Great Plains.

Preliminary data of note from an on-going remote camera study, examining the off-channel habitat use patterns of river otters in the CPRV, will be included as well. This data suggests consistent river otter use of both excavated ponds and perennial sloughs. Initial finding also indicates that active grazing, by either bison or cattle, may decrease river otter site use. Based on these preliminary findings, the increase in deep pond habitat, resulting from sand and gravel extractions over the last several decades, may have assisted in providing reintroduced river otters additional habitat.

Bright Ideas for Nebraska's Wildlife

Michael Bernhardt*¹

¹*Nebraska Game and Parks Commission*

ABSTRACT – Light pollution and its effect on wildlife has been a long standing concern, but has only relatively recently been studied. The effects of lighting the night can greatly vary from species to species. So species are driven away due to light pollution, some are drawn in, and some species have shifted their behavior patterns entirely. In the past Halogen, low pressure sodium, or high pressure sodium vapor blubs have been used when outdoor lighting is needed. Now however, LED lights have become the desired choice. LED light are longer lasting, more efficient to operate, and can be much brighter that traditional lighting.

There are several photosensitive threatened and endangered species within the state of Nebraska. The main species associated with lighting are American Burring beetle (ABB) and Salt Creek Tiger Beetle (SCTB) Currently we recommend the use of sodium vapor lighting for ABB and SCTB, since the color temperature (Kelvin) and wavelength (nm) of these lights are known to have the least amount of impact on these species. The current concern with the sodium vapor bulbs is that they are going out of production. In my work with the conservation of Nebraska's threatened and endangered species, I have identified the need to come out with regulations regarding the use of LED lighting in sensitive habitats and for wildlife friendly LED options in general.