

---

**Abstracts**  
**Natural Legacy Conference 2018**

---

Abstracts are posted at [NebraskaNaturalLegacy.org](http://NebraskaNaturalLegacy.org)

(organized chronologically by conference agenda)

WILDLIFE HABITAT MANAGEMENT IN AND AROUND THE MIDDLE NIOBRARA  
BUL

Kelly Corman<sup>1</sup> and Will Inselman<sup>2</sup>

<sup>1</sup> *Northern Prairies Land Trust, 524 Panzer Street, Bassett, NE 68714; e-mail:*  
[kelly.corman@nebraska.gov](mailto:kelly.corman@nebraska.gov)

<sup>2</sup> *Nebraska Game and Parks Commission, 2200 N. 33<sup>rd</sup> Street, Lincoln, NE 68503; e-mail:*  
[will.inselman@nebraska.gov](mailto:will.inselman@nebraska.gov)

ABSTRACT.—The Middle Niobrara Biologically Unique Landscape is at the intersection of five plant communities: northern mixed-grass prairie, Sandhills prairie, Rocky Mountain pine woodland, northern boreal woodland, and eastern deciduous woodland. This diverse landscape provides a variety of habitats that benefit multiple species that are identified as at-risk in the Nebraska Natural Legacy Project. Wildlife habitat within the area is impacted by a number of stressors including invasive species, management that promotes uniform grassland structure, water diversions, land development, and altered fire occurrence. Neighboring Biologically Unique Landscapes face similar challenges. A partnership of Northern Prairies Land Trust and Nebraska Game and Parks Commission works with private landowners and other partner organizations in the area to enhance habitat for at-risk species. Ongoing public and private lands wildlife habitat management occurring in the area includes woodland thinning, eastern redcedar removal, prescribed fire, grazing management, grassland seeding, and stream fish pool-habitat enhancement. We will review several recent and ongoing restoration and enhancement projects in and around the Middle Niobrara Biologically Unique Landscape.

## RECOVERY OF THE NIOBRARA VALLEY PRESERVE AFTER WILDFIRE

Chris Helzer<sup>1</sup> and Amanda Hefner<sup>2</sup>

<sup>1</sup> *The Nature Conservancy, Eastern Nebraska Project Office, 1228 L Street, Suite 1, Aurora, NE 68818; e-mail: [chelzer@tnc.org](mailto:chelzer@tnc.org)*

<sup>2</sup> *The Nature Conservancy; Niobrara Valley Preserve, Nebraska; e-mail: [amanda.hefner@tnc.org](mailto:amanda.hefner@tnc.org)*

ABSTRACT.—In July 2012, a wildfire swept through the Middle Niobrara River Valley, amplified by areas of dense cedar and pine growth. Nearly 30,000 acres of The Nature Conservancy's (TNC) Niobrara Valley Preserve burned in that fire, along with many more acres on neighboring property. Over 6 years, TNC staff led documentation and a study of the recovery of the various ecosystems of the preserve from that major event. The research results, timelapse and drone photography, and stories of resilience and recovery will be presented. Although the fire caused great damage to people's homes and other infrastructure and created some dramatic ecological changes, there were also some very positive impacts. Clearly, eastern redcedar density was quickly and greatly reduced across a large swath of land, which pushed forward control efforts. Beyond that, TNC is learning a great deal about landscape recovery and about how to prepare for similar future events.

---

## TIME AND ENVIRONMENT INFLUENCE INCUBATION BY GREATER PRAIRIE-CHICKENS (*TYMPANUCHUS CUPIDO PINNATUS*) IN THE NEBRASKA SANDHILLS

Ian R. Hoppe,<sup>1,2</sup> Jocelyn Olney Harrison,<sup>1,3</sup> Edward J. Raynor IV,<sup>1,4</sup> Mary Bomberger Brown,<sup>1,5</sup> Larkin A. Powell,<sup>1</sup> and Andrew J. Tyre<sup>1</sup>

<sup>1</sup> *School of Natural Resources, University of Nebraska–Lincoln, 3310 Holdrege Street, Lincoln, NE 68583.*

<sup>2</sup> *Present address: 1965 County Road 18, Colon, NE 68018.*

<sup>3</sup> *Present address: 313 W 91<sup>st</sup> Street, Apt. 4B, New York, NY 10024.*

<sup>4</sup> *Present address: University of Nebraska–Lincoln, Department of Agronomy and Horticulture, Lincoln, NE 68583*

<sup>5</sup> *Corresponding author; e-mail: [mbrown9@unl.edu](mailto:mbrown9@unl.edu)*

ABSTRACT.—Incubation involves behavioral decisions that highlight trade-offs between current and future reproductive success. To gain further insight into decisions made by female birds during incubation, we evaluated variation in off-bout duration and frequency among greater prairie-chickens (*Tympanuchus cupido pinnatus* Brewster, 1885). Prairie-chicken life history favors incubation behaviors that prioritize the success of the current breeding attempt over adult survival. Further, observations of incubation behavior suggest substantial commitments on the part of incubating females, who face decisions that are influenced by ambient conditions, body

condition, and predation risk. We monitored nest attendance behavior by females at 30 prairie-chicken nests in the Nebraska Sandhills, USA to identify proximate cues used to make behavioral decisions regarding incubation. We recorded 930 total incubation off-bouts. Females took  $1.9 \pm 0.7$  (SD) off-bouts/day, each with an average duration of  $43.3 \pm 24.1$  min. Off-bouts were shorter in duration at higher wind speeds, at lower ambient temperatures, at nests with less cover, and at those closer to roads. Females were most likely to leave the nest during the mid-morning and evening time periods, and off-bouts became less frequent later in the season. We did not observe any differences in incubation behavior between nests that failed and those that successfully hatched one or more chicks. Our results suggest that the outcomes of attendance decisions during incubation change with time and environmental factors, which emphasizes the complexity and risks associated with these decisions.

---

## SINGING IN THE RAIN: GREATER PRAIRIE CHICKENS AS AN UMBRELLA SPECIES IN THE MIXED GRASS PRAIRIE

Ben D. Wheeler<sup>1</sup> and Dana M. Varner<sup>2</sup>

<sup>1</sup> *Pheasants Forever and Quail Forever*, 1614 N 28th Street, P.O. Box 243, Ord, NE 68862; e-mail: [ben.wheeler@nebraska.gov](mailto:ben.wheeler@nebraska.gov)

<sup>2</sup> *U.S. Fish and Wildlife Service*, Wood River, NE 68883.

**ABSTRACT.**—The concept of an umbrella species is attractive to conservation biologists because of the management efficiency offered to a larger community of species by targeting habitat needs for just one species. Over the years, the umbrella species concept has come under scrutiny, because some species within the community can be underrepresented if their habitat needs do not align well with those of the designated umbrella species. We compared roadside Greater Prairie-Chicken lek survey data with grassland breeding bird data collected at the same location to determine how effectively Greater Prairie-Chickens serve as an umbrella species for other species in the central Nebraska mixed-grass prairie. Birds that had the greatest positive relationship with presence of Greater Prairie-Chickens include the Western Kingbird, Grasshopper Sparrow, Field Sparrow, Chipping Sparrow, and Upland Sandpiper. Birds that had the greatest negative relationship with Greater Prairie-Chickens were Horned Lark, Red-winged Blackbird, Song Sparrow, Common Yellowthroat, and Bell's Vireo. Delivering conservation focused on Greater Prairie-Chicken habitat might not meet the needs of these non-aligned species. Specific conservation initiatives might be needed to provide adequate habitat conservation for these species.

# POTENTIAL EXTENT OF EASTERN REDCEDAR WOODLANDS IN THE NEBRASKA SANDHILLS

Dillon T. Fogarty,<sup>1,3</sup> Dirac Twidwell,<sup>1</sup> and Craig R. Allen<sup>2</sup>

<sup>1</sup> *Department of Agronomy and Horticulture, University of Nebraska–Lincoln, Lincoln, NE 68583.*

<sup>2</sup> *U.S. Geological Survey, Nebraska Cooperative Fish and Wildlife Research Unit, University of Nebraska–Lincoln, NE 68583.*

<sup>3</sup> *Presenter; e-mail: [dillon.fogarty@huskers.unl.edu](mailto:dillon.fogarty@huskers.unl.edu)*

ABSTRACT.—Eastern redcedar (*Juniperus virginiana*; hereafter redcedar) invasion of temperate grasslands leads to woody regime shifts that are associated with a loss of native biodiversity, water resources, wildfire regulation, and herbaceous forage production. Therefore redcedar invasion represents an environmental crisis, affecting many sectors of social ecological systems dependent on grasslands. However, Nebraska straddles redcedar's western range boundary and it is unclear whether invasion can occur in areas of Nebraska that have not yet experienced widespread woody regime shifts. This is problematic for environmental decision making, because it is important to know where to allocate resources to prevent loss of grassland resources. Moreover, planting eastern redcedar in windbreaks is associated with localized benefits and is often incentivized by public agencies but at the same time may contribute to invasion of grasslands. Thus, reducing uncertainty regarding where redcedar invasion can occur and become problematic would help guide decision making. The objective of this study is to provide an empirically-derived approximation of the potential extent of redcedar woodlands in the Nebraska Sandhills and test for precipitation threshold hypothesized to limit redcedar invasion. To assess the potential for redcedar invasion across the Sandhills, we used a network of 44 publicly owned properties throughout the Sandhills and used remotely sensed imagery to quantify the occurrence and density of incipient redcedar trees at each property. Incipient redcedar occurrence and density were then related to mean annual precipitation to derive a threshold limiting redcedar invasion in the Sandhills. Field verification of remotely collected redcedar data indicated a high accuracy for redcedar identification; however, we were unable to detect redcedar trees below a height of 2 m, and therefore tree density estimates underestimate incipient redcedar density. Redcedar density ranged from 0 to >100 trees per ha and was significantly and positively related to mean annual precipitation. From the binary (present or not present) occurrences of incipient redcedar trees, the most arid site with incipient redcedar trees (McConaughy State Recreation Area) received an average of 430 mm precipitation per year. Given the biology of redcedar, the presence of incipient trees indicates that there is potential for an area to support a redcedar woodland, because redcedar invasion has not been documented to stop invading at intermediate levels of cover (i.e., savanna). Therefore, based on a hypothesized precipitation threshold, our results indicate that a majority of the Sandhills ecoregion is capable of supporting redcedar woodlands. Observed densities across the Sandhills indicate that the rate of invasion varies from east to west with the lowest rates expected in western regions. Results from this study reflect current evidence and is therefore expected to underestimate the potential future extent of redcedar woodlands in the Sandhills as environmental conditions (e.g., atmospheric CO<sub>2</sub> concentrations, mean annual temperature, etc.) continue to change. Results here

provide a first approximation of the potential extent of redcedar woodlands in the Sandhills and reduce key uncertainties to improve environmental decision making in the Sandhills.

---

## GRASSLAND AND WOODLAND RESTORATION WORK IN THE VERDIGRIS-BAZILE BIOLOGICALLY UNIQUE LANDSCAPE

Jennifer Corman<sup>1</sup>

<sup>1</sup> *Northern Prairies Land Trust, 86502 Grove Lake Road, Royal, NE 68773; e-mail: [jen.corman@nebraska.gov](mailto:jen.corman@nebraska.gov)*

ABSTRACT.—The Verdigris and Bazile Creek Watersheds in northeast Nebraska harbor vulnerable tallgrass and mixed-grass prairie as well as oak woodlands. Northern Prairies Land Trust and Nebraska Game and Parks Commission have partnered to implement the Nebraska Natural Legacy Project by restoring and enhancing grasslands and woodlands in the Verdigris-Bazile Biologically Unique Landscape (BUL). We will review some of the on-going restoration projects in the BUL, including the Niobrara State Park Legacy Demonstration Site, where park managers provide publicly accessible examples of land management practices that sustain biological diversity.

---

## WORKING LANDS FOR WILDLIFE – A LEVERAGED APPROACH FOR BEEF, BIRDS, AND BEETLES IN NEBRASKA’S SANDHILLS

Ryan Lodge<sup>1</sup>

<sup>1</sup> *Pheasants Forever, Inc. and Quail Forever, 1105 S Street, Neligh, NE, 68756; e-mail: [ryan.lodge@ne.usda.gov](mailto:ryan.lodge@ne.usda.gov)*

ABSTRACT.—The Working Lands for Wildlife (WLFW) initiative is a program that is available through the Natural Resources Conservation Service. The program dedicates funding to 10 counties in the eastern Sandhills to help landowners receive technical and financial assistance for improving rangeland health, controlling eastern redcedars, and implementing prescribed fire. It also addresses resource concerns and restores habitats that benefit Greater Prairie-Chickens, American burying beetles, and other grassland dependent species. I will be covering what the WLFW initiative is, what we have done since inception, what the process is, and how partners support the initiative.

---

## "OUT OF SEASON" FIRE IN SOUTHEAST NEBRASKA BULS

Kent Pfeiffer<sup>1</sup>

<sup>1</sup> *Northern Prairies Land Trust, 5109 W. Scott Road, Beatrice, NE 68310; e-mail: [kent.pfeiffer@nebraska.gov](mailto:kent.pfeiffer@nebraska.gov)*

ABSTRACT.—Biologists working through the Legacy Program have been promoting prescribed fire to private landowners since 2004. While we were successful at increasing landowner interest in and ability to conduct fires, it quickly became obvious that, if we hoped to see fire applied at a meaningful scale in Biologically Unique Landscapes, some traditional ideas regarding prescribed fire needed to change. "Burn season" being limited to late spring was one of our fire targets. By encouraging landowners to think about burning throughout the year, we have greatly expanded the window of opportunity for prescribed fire and discovered other, unexpected, benefits of burning "out of season."

---

## HABITAT MANAGEMENT AND SURVEY EFFORTS FOR BATS IN THE PINE RIDGE BIOLOGICALLY UNIQUE LANDSCAPE

Erin Divine<sup>1</sup> and Erin Considine<sup>2</sup>

<sup>1</sup> *Bird Conservancy of the Rockies, 430 E 2<sup>nd</sup> Street, Chadron, NE 69337; e-mail: [erin.divine@nebraska.gov](mailto:erin.divine@nebraska.gov)*

<sup>2</sup> *U.S. Forest Service, Pine Ridge Ranger District, 125 N. Main Street, Chadron, NE; e-mail: [econsidine@fs.fed.us](mailto:econsidine@fs.fed.us)*

ABSTRACT.—The Pine Ridge Biologically Unique Landscape (BUL) is a rocky escarpment that rises several hundred feet from the surrounding plains in Sioux, Dawes, and Sheridan counties in northwest Nebraska. Being a pine-dominated escarpment within the Great Plains grassland, the Pine Ridge supports many at-risk species that are not generally found in non-forested regions, including western bat species. Concern about the continuing threat of White Nose Syndrome (WNS) and other threats to bats has led to bat species, such as the federally listed northern long-eared bat (*Myotis septentrionalis*) and other species identified in the Nebraska Natural Legacy Project, being identified as conservation targets for the Pine Ridge BUL. Conservation actions include habitat improvement and surveys for bats. Our habitat improvement objectives include enhancing multiple aspects of habitat by improving their foraging areas, addressing the need for a diverse forest, incorporating the need for clean water, open areas, edges, and roost locations, and minimizing potential threats to habitat. Project sites will also be monitored pre- and post-implementation using AnaBat Express™ and Wildlife Acoustic SM4Bat stationary passive acoustic bat detectors to assess bat use on the sites. Additional sites across the Pine Ridge will be surveyed acoustically as well as through mist netting to assess changes in species composition over time, timing of spring emergence, and to

test for WNS. This multi-partner effort will help to improve habitat and increase our knowledge of bat species in the Pine Ridge.

---

## LEGACY IN ENVIRONMENTAL EDUCATION DISCOVERY (LEED)

Monica Macoubrie<sup>1,3</sup> and Jamie Bachmann<sup>2</sup>

<sup>1</sup> *Nebraska Game and Parks Commission, 2200 N. 33<sup>rd</sup> Street, Lincoln, NE 68503.*

<sup>2</sup> *Nebraska Game and Parks Commission, Northeast District Office, 2201 N. 13<sup>th</sup> Street, Norfolk, NE 68701*

<sup>3</sup> *Presenter: e-mail: [monica.macoubrie@nebraska.gov](mailto:monica.macoubrie@nebraska.gov)*

ABSTRACT.—The annual LEED (Legacy in Environmental Education Discovery) Educator Workshop is in its eighth year. Each year Nebraska Project WILD, Nebraska Natural Legacy Project, and Northern Prairies Land Trust host a workshop in a different BUL around the state. This is a 2-day intensive, hands-on workshop that caters to formal and informal classroom educators. During these workshops, topics specific to the state’s Biologically Unique landscapes (BULs) are the focus. Local resource professionals are invited to deliver presentations and lead activities for specific BULs. The goal is for teachers to take this information back to their classrooms and teach about their local areas and Nebraska’s BULS.

---

## MONITORING OF INTERIOR LEAST TERNS AND PIPING PLOVERS ON THE NIOBRARA NATIONAL SCENIC RIVER

Gordon Warrick<sup>1</sup>

<sup>1</sup> National Park Service, Niobrara National Scenic River, 214 W. Highway 20, Valentine, NE 96201; e-mail: [gordon\\_warrick@nps.gov](mailto:gordon_warrick@nps.gov)

ABSTRACT.—The Federally Endangered Interior Least Tern and Threatened Piping Plover find their western-most breeding distribution along the Niobrara River within the “scenic river” portion managed by the National Park Service. Niobrara National Scenic River staff have conducted annual surveys to monitor the breeding numbers of these two species in the “scenic river” since 2002. Since my tenure began prior to 2016, we have additionally monitored nests and determined nest initiation dates in an effort to better understand breeding chronology, track nest success and estimate fledge ratios. In 2016, a minimum of 24 terns and 12 plovers were thought to have nested in the area; 21 nesting attempts by either species were documented. Numbers were lower in 2017, with a minimum of 17 and 10 terns and plovers, respectively, and 12 nests monitored. Failed nests mostly succumb to bank erosion, overtopping by high flow events, and predators. Fledge ratios may not support the average numbers of adults of both species breeding in the area.

---

## THE EASTERN REDCEDAR SCIENCE LITERACY PROJECT

Christine H. Bielski,<sup>1,3</sup> Dirac Twidwell,<sup>1</sup> and Craig R. Allen<sup>2</sup>

<sup>1</sup> *University of Nebraska-Lincoln, Department of Agronomy and Horticulture, Lincoln, NE 68583.*

<sup>2</sup> *U.S. Geological Survey, Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, University of Nebraska, Lincoln, NE 68583.*

<sup>3</sup> *Presenter; e-mail: [christine.bielski@huskers.unl.edu](mailto:christine.bielski@huskers.unl.edu)*

ABSTRACT.—Scientists have reached a clear consensus that eastern redcedar (*Juniperus virginiana*) is one of the greatest threats to human well-being, flora, and fauna of the Great Plains. Despite decades of research findings, only 36% of residents feel eastern redcedar is a problem (based on a 2016 statewide survey in Nebraska), showing a clear need for increased scientific literacy. As scientists, we feel an ethical responsibility to disseminate decades of research findings to the general public, politicians, K-12 educators, natural resource professionals, city planners, and the next generation of scientists. We conducted one of the most in-depth scientific critiques of literature on the spread and impacts of eastern redcedar for purposes of environmental outreach and based our review on four guiding principles adapted from leading international authorities on ecosystem assessment and climate change research. To insure an objective, open, and transparent review process, a second round of peer review was conducted by the most knowledgeable group of scientific experts on the spread and impacts of eastern redcedar. The facts provided by this educational science-based project (see [cedarliteracy.unl.edu](http://cedarliteracy.unl.edu)) should be used to question existing land management practices, to critique existing government policies and future proposals, and to hopefully create a more literate and informed society.

---

## ESTIMATING MILKWEED (*ASCLEPIAS*) ABUNDANCE AND RICHNESS ON EASTERN NEBRASKA GRASSLANDS

Mercy Dinwiddie,<sup>1,5</sup> Kristal Stoner,<sup>2</sup> Carissa L. Wonkka,<sup>3</sup> Gerry Steinauer,<sup>4</sup> and Melissa Panella<sup>2</sup>

<sup>1</sup> *Nebraska Wildlife Federation, Lincoln, NE.*

<sup>2</sup> *Nebraska Game and Parks Commission, 2200 N. 33<sup>rd</sup> Street, Lincoln, NE 68503.*

<sup>3</sup> *University of Nebraska-Lincoln, Department of Agronomy and Horticulture, Lincoln, NE 68583*

<sup>4</sup> *Nebraska Game and Parks Commission, Aurora, NE.*

<sup>5</sup> *Presenter; e-mail: [mercy.dinwiddie@nebraska.gov](mailto:mercy.dinwiddie@nebraska.gov)*

ABSTRACT.—The monarch butterfly (*Danaus plexippus*) is one of the Midwest's most iconic pollinators; however, because of an 84% population decline, it was petitioned for listing under the Endangered Species Act in 2014. Eastern Nebraska forms part of the breeding grounds for this species and is considered to be in the North Core Monarch Conservation Unit. Restoring monarch butterfly population numbers will require creating, restoring, and managing habitat,

using techniques that increase the abundance of milkweed across many land management types. In 2016, the Nebraska Monarch and Pollinator Initiative set a goal of establishing 125 million milkweed (*Asclepias*) stems across the state. In order to complete this task efficiently and effectively, it is necessary to study how different land management techniques affect the establishment of *Asclepias* on a variety of habitat types. The objective of this study was to compare eight different land management techniques on a variety of property types in order to determine abundance and richness of *Asclepias* per hectare. A total of 130 properties were surveyed. A negative binomial model was used to analyze *Asclepias* spp. per hectare. A likelihood ratio test showed that there was a significant difference between site types, and multiple comparisons revealed that high-diversity planting sites and wildlife management areas had more *Asclepias* spp. per hectare. The assessment of milkweed on a variety of land types is paramount for implementing the conservation plan for the monarch butterfly in Nebraska. This study is part of a broader effort to examine the monarch butterfly breeding grounds and will be completed in 2018.

---

## CHANGING THE TRAJECTORY OF OUTDOOR PARTICIPATION IN NEBRASKA

Micaela Rahe<sup>1</sup> and Jeff Rawlinson<sup>2</sup>

<sup>1</sup> *National Wild Turkey Federation; e-mail: [mmahe@nwtf.net](mailto:mmahe@nwtf.net)*

<sup>2</sup> *Nebraska Game and Parks Commission; e-mail: [jeff.rawlinson@nebraska.gov](mailto:jeff.rawlinson@nebraska.gov)*

ABSTRACT.—A strong land ethic is critical to the well-being of any society. People who cherish the great outdoors and participate in time honored activities such as hunting, fishing, wildlife viewing and park-going exemplify a strong land ethic. Today, the recruitment, retention and reactivation (R3) of these trustees of Nebraska’s natural resources is more critical than ever before. Together, they have an economic impact of >\$2.4 billion annually in Nebraska, and they foster the land ethic so important to our way of life. Let’s come together to learn how we can work as a team to increase support for conservation efforts and innovative partnerships.

---

## SURVIVAL AND GROWTH OF PLAIN POCKETBOOK *LAMPSILIS CARDIUM* FRESHWATER MUSSELS IN RESPONSE TO FREQUENT SAMPLING

Lindsay Ohlman<sup>1</sup>

<sup>1</sup> *School of Natural Resources, University of Nebraska, Lincoln, NE 68583; e-mail: [lohlman@unl.edu](mailto:lohlman@unl.edu)*

ABSTRACT.—Freshwater mussels (family Unionidae) are highly imperiled in the U.S. and conservation of these aquatic invertebrates is increasing across the Midwest. In Nebraska, a reintroduction plan was initiated for the Plain Pocketbook *Lampsilis cardium* that has led to

propagation and released of >10,000 mussels into several streams since 2016. Mark-recapture sampling is currently being conducted to determine population dynamics and evaluate success of the project, but this means mussels may be disturbed multiple times per year. The burrowing nature of mussels requires them to be extracted from sediment and removed from water to collect tag and length data. Some studies suggest disturbances related to sampling, such as handling, aerial exposure, and depth changes can cause reduced growth and even mortality. However, there is little research on the extent, specifically the frequency of sampling, that would cause this to occur. This study quantifies the effect of different sampling rates on the survival and growth of subadult Plain Pocketbook mussels during a 12-week experiment. Sixty propagated mussels from the same cohort were randomly allocated into control (no sampling) or one of three treatment groups that were sampled 1) every other week, 2) once per week, or 3) twice per week. This study found no significant differences in growth rates between control and treatment group mussels because of sampling frequency ( $df = 1,3$ ;  $F = 0.643$ ;  $P = 0.61$ ), and no mortality was observed. These results provide support that the current monitoring regime is being implemented without detriment to survival or growth of Plains Pocketbook mussels, and that population estimates can be derived without concern from this potential bias.

---

INSIGHTS INTO THE LANDSCAPE THROUGH NATURAL HISTORY RESEARCH:  
PRAIRIE FIRES ARE TO SWAINSON'S HAWKS (*BUTEO SWAINSONI*) WHAT  
COTTONWOOD SAVANNAS ARE TO NORTH AMERICAN BEAVERS (*CASTOR  
CANADENSIS*)

Andrew J. Caven<sup>1</sup>

<sup>1</sup> Crane Trust, 9325 South Alda Road, Wood River, NE 68883; e-mail:  
[acaven@cranetrust.org](mailto:acaven@cranetrust.org)

ABSTRACT.—The Great Plains ecosystem was historically structured by periodic natural disturbances including drought, wildfire, and pulses of grazing, to which endemic wildlife would have had to adapt. Today we are left with a coarse understanding of what the Great Plains looked like and how it functioned before largescale agricultural and industrial development fragmented the landscape and disrupted cyclical disturbances. Here, we describe two research projects linking habitat management to changes in vertebrate foraging behavior along the Big Bend of the Platte River in central Nebraska. Research into the rate of detection of raptor species during controlled burns as compared to during systematic monitoring surveys suggests that some species, in particular Swainson's Hawks (*Buteo swainsoni*), are actively drawn to spring controlled burns for foraging opportunities. Our research into North American beaver (*Castor canadensis*) foraging behavior upon plains cottonwoods (*Populus deltoides*) suggests that they preferentially target cottonwoods in areas that have been cleared of dense lower canopy riparian tree species such as eastern redceder (*Juniperus virginiana*), Russian olive (*Elaeagnus angustifolia*), and white mulberry (*Morus alba*). Beavers were also more likely to forage on trees closer to water, smaller in circumference, and without poison ivy infestation. We argue that results from natural history focused investigations can provide valuable lines of evidence to inform applied conservation

research and improve our understanding of ecosystem processes. However, such results can be understood only in reference to broader bodies of work and should be applied thoughtfully.

---

## RETHINKING ECOLOGICAL MONITORING, BOUNDARIES, AND CONSERVATION GOALS IN AN ERA OF GLOBAL CHANGE

Caleb P. Roberts,<sup>1,2,5</sup> Craig R. Allen,<sup>3</sup> David G. Angeler,<sup>4</sup> and Dirac Twidwell<sup>1</sup>

<sup>1</sup> *University of Nebraska, Department of Agronomy and Horticulture, Lincoln, Nebraska 68583.*

<sup>2</sup> *Nebraska Cooperative Fish and Wildlife Research Unit, School of Natural Resources, Lincoln, Nebraska 68583.*

<sup>3</sup> *U.S. Geological Survey, Nebraska Cooperative Fish and Wildlife Research Unit, Lincoln, Nebraska 68583.*

<sup>4</sup> *Swedish University of Agriculture Sciences, Department of Aquatic Sciences and Assessment, Uppsala, Sweden PO Box 7050.*

<sup>5</sup> *Presenter; email: [caleb.powell.roberts@gmail.com](mailto:caleb.powell.roberts@gmail.com)*

**ABSTRACT.**—In this era of rapid global change, examples of historic ecological systems shifting or shrinking and novel systems appearing are on the rise. As such, it is becoming increasingly clear that assumptions of stationary ecological systems and management for the status quo are insufficient to meet conservation goals. To illustrate this point, we provide examples of continental and local ecological regime shifts (e.g., within the Great Plains and Nebraska) across the past half century. We then discuss emerging methods for identifying and quantifying early warnings of regime shifts and options for revising conservation goals in that account for ecological surprise and uncertainty. We show that managing for or attempting to restore a given location to the historic regime after the historic regime has moved past or collapsed is effectively managing for the “ghost of regimes past” and will become increasingly difficult and costly because of the mismatch between the scale of management versus the scale of the regime forcing via positive feedbacks. Additionally, we show that assuming the continued flow of desired ecosystem services (e.g., livestock grazing, grassland biodiversity) can be maintained by site-scale management is unlikely to produce meaningful or lasting results.

# THE LEGACY OF COMMON LAW IN NEBRASKA: LEGAL OBSTACLES TO GRASSLAND MANAGEMENT FOR RESILIENCE

Conor Barnes<sup>1,3</sup> and Dirac Twidwell<sup>2</sup>

<sup>1</sup> *University of Nebraska-Lincoln School of Natural Resources, Lincoln, NE 68583.*

<sup>2</sup> *University of Nebraska-Lincoln, Department of Agronomy and Horticulture, Lincoln, NE 68583*

<sup>3</sup> *Presenter; e-mail: [conor.barnes@huskers.unl.edu](mailto:conor.barnes@huskers.unl.edu)*

ABSTRACT.—The “common law” is a form of judge-made law developed over the course of centuries through accumulated case decisions (*Wheaton v. Peters*, 1834). Despite its age, many concepts found in the common law remain valid as they are incorporated into judicial decisions or federal and state statutes. As a result, these legal concepts continue to influence land management decisions even when they embrace principles at odds with modern land management practices. For example, at common law a landowner’s rights in a plot of land are virtually absolute, both spatially and temporally, and are bound only by contract, property, and tort law (Eagle 2008). Through legal instruments such as a deed, a landowner can even influence land management well after the landowner is deceased. For grassland management on the Great Plains, legacy restrictions imposed by a former landowner can force subsequent landowners to maintain the status quo because of reduced flexibility in their management options, which in turn reduces system resiliency (Holling and Meffe 1996). However, the nature of common law provides opportunities as well as challenges. Since common law is created over time by deciding cases, it allows for incremental evolution as judges introduce new concepts into the common law and abolish outdated ones. Going forward, educating judges, lawyers, and landowners who work with these legal instruments on modern land management science may help push the common law from outdated assumptions of stationarity in land management to law that provides greater flexibility to adapt to future novel conditions.

---

## TESTING THE USE OF ARTIFICIAL ESCAPE DENS BY SWIFT FOX (OR A LOT OF OTHER CRITTERS) IN NORTHWESTERN NEBRASKA

Melissa Marinovich

<sup>1</sup> *Nebraska Game and Parks Commission, 2200 N. 33<sup>rd</sup> Street, Lincoln, NE 68503; e-mail: [melissa.marinovich@nebraska.gov](mailto:melissa.marinovich@nebraska.gov)*

ABSTRACT.—The Nebraska Department of Transportation (NDOT) is in various stages of designing and building the Nebraska portion of a large 4-lane expressway that would reach from Canada to Mexico, called the Heartland Expressway. This project has been around for decades and pieces get designed and built as traffic increases, need arises, and funding is secured. Currently, a portion of the project is being constructed south of Alliance. This portion ends at the intersection of US-385 and L62A, which also happens to be in the middle of one of the state’s largest prairie dog complexes. This landscape provides suitable habitat for one of Nebraska’s state-listed endangered species, swift fox (*Vulpes velox*). As part of the environmental review process for this segment of highway improvements, avoidance and mitigation measures are being

implemented to protect swift fox, such as moving a portion of the existing roadway out of the prairie dog town to re-connect it. One of the mitigation measures being implemented is the installation of artificial escape dens at locations of suitable habitat near the roadway. These types of dens have been installed to protect swift fox and a similar species, kit fox, in Texas and California to protect foxes from their main predators, coyotes. Prior to installation for the project, biologists at NDOT were curious to see if these artificial escape dens would actually be used by swift fox, so they decided to install four “test” dens in an area where swift foxes are more densely populated and have been documented using the roadway Right-of-Way (ROW) on a regular basis. Four locations were chosen along NDOT ROW within swift fox range in northwest Nebraska. The locations were chosen based on surrounding habitat and likelihood of swift fox in the area (based on Natural Heritage database recorded sightings within the past 5 years). Two locations were developed north of Crawford, along Nebraska Highway 71, and two were developed north of Chadron, along US Highway 385. Along each of the highways, two separate sites were set up with either a 20-ft tunnel or a 10-ft tunnel. Wildlife cameras were set up on either end to capture photos of any animals investigating the den pipes. Photos were retrieved throughout the monitoring period by a combination of NDOT personnel and Chadron State College students. The escape dens and cameras were installed on September 21, 2017 and cameras removed on April 3, 2018. While no swift foxes were caught on camera (they are just too darn fast!), the escape dens were definitely used by a variety of other wildlife and could certainly be used by swift fox, if the opportunity arises.

---

## TRUMPETER SWAN FIDELITY AND MOVEMENTS IN THE NEBRASKA SANDHILLS

Mark P. Vrtiska<sup>1,2</sup> and Julia Nawrocki<sup>1</sup>

<sup>1</sup> *Nebraska Game and Parks Commission, 2200 N. 33<sup>rd</sup> Street, Lincoln, NE 68503.*

<sup>2</sup> *Presenter; e-mail: [mark.vrtiska@nebraska.gov](mailto:mark.vrtiska@nebraska.gov)*

ABSTRACT.—Trumpeter Swans in the Sandhills of Nebraska are considered a tier-one species in the Nebraska Natural Legacy Project. Few data exist about fidelity and movements of Trumpeter Swans between breeding or post-breeding wetlands to fall staging and winter grounds and between wintering areas. The objectives of this study were to document movements of Trumpeter Swans from breeding or post-breeding sites to wintering sites, and document movements within and between wintering sites. Beginning in 2014, 27 adult Trumpeter Swans have been captured in the Nebraska Sandhills and fitted with neck collars with Global Positioning System (GPS), solar powered-transmitters attached. Collared swans typically have remained near their breeding wetlands through late fall early winter, and move when severe cold fronts cause lakes in the Sandhills to freeze. They then moved to their respective wintering rivers. The largest movement to date was a non-breeding male that wintered along the Kansas-Oklahoma border southeast of Dodge City, KS. Another swan captured in western Cherry County, NE moved eastward to the Calamus River and reservoir. Movements within the wintering period have been limited with some swans moving from one wintering location to another. In mid-December and mid-January 2014, three swans had moved slightly north, one of which returned

to its original breeding wetland. We hypothesize that the warming weather that occurred during these time periods had caused this movement. Most females with cygnets returned to their respective breeding wetlands in February/March. They resided on or near their breeding wetlands throughout February, March and April.

---

PRESENT AND FUTURE THERMAL ENVIRONMENTS AVAILABLE TO SHARP-  
TAILED GROUSE IN AN INTACT  
GRASSLAND

Edward J. Raynor,<sup>1,2,3</sup> Larkin A. Powell,<sup>1</sup> and Walter H. Schacht<sup>2</sup>

<sup>1</sup> *School of Natural Resources, University of Nebraska–Lincoln, Lincoln, NE.*

<sup>2</sup> *University of Nebraska–Lincoln, Department of Agronomy and Horticulture, Lincoln, NE 68583*

<sup>3</sup> *Presenter; e-mail: [edwardraynor@gmail.com](mailto:edwardraynor@gmail.com)*

**ABSTRACT.**—Better understanding animal ecology in terms of thermal habitat use has become a focus of ecological studies, in large part because of the predicted temperature increases associated with global climate change. To further our knowledge on how ground-nesting endotherms respond to thermal landscapes, we examined the thermal ecology of Sharp-tailed Grouse (*Tympanuchus phasianellus*) during the nesting period. We measured site-specific iButton temperatures (TiB) and vegetation characteristics at nest sites, nearby random sites, and landscape sites to assess thermal patterns at scales relevant to nesting birds. We asked if microhabitat vegetation characteristics at nest sites matched the characteristics that directed macrohabitat nest-site selection. Grouse selected sites sheltered by dense vegetation for nesting that moderated TiB on average up to 2.7°C more than available landscape sites. Successful nests were positioned in a way that reduced exposure to thermal extremes by as much as 4°C relative to failed nests with an overall mean daytime difference ( $\pm$ SE) of  $0.4 \pm 0.03^\circ\text{C}$ . We found that macrohabitat nest-site selection was guided by dense vegetation cover and minimal bare ground as also seen at the microhabitat scale. Global climate projections for the year 2080 suggest that TiB at nest sites may approach temperatures currently avoided on the landscape, emphasizing a need for future conservation plans that acknowledge fine-scale thermal space in climate change scenarios. These data show that features of grassland landscapes can buffer organisms from unfavorable microclimatic conditions and highlight how thermal heterogeneity at the individual-level can drive decisions guiding nest site selection.