

# Nebraska Cooperative Fish and Wildlife Research Unit—USGS

## REPORT OF ACTIVITIES October 2011 – September 2012



### Cooperating Agencies

Nebraska Game and Parks Commission  
The Wildlife Management Institute  
University of Nebraska—Lincoln  
U.S. Fish and Wildlife Service  
U.S. Geological Survey (USGS) – Ecosystems Division



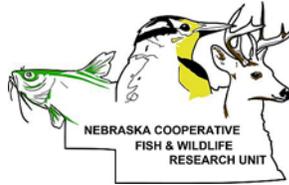
**USGS**  
*science for a changing world*

U.S. Fish &  
Wildlife Service

UNIVERSITY OF  
**Nebraska**  
Lincoln®



# Report of Activities October 2011 – September 2012



## **Nebraska Cooperative Fish and Wildlife Research Unit—USGS**

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## INTRODUCTION

The U.S. Geological Survey (USGS) Cooperative Research Units Program has been in existence for over 70 years as a partnership among USGS, state natural resource agencies, host universities, the Wildlife Management Institute, and the U.S. Fish and Wildlife Service. The first unit was founded at Iowa State University in Ames, Iowa. The program currently has 40 units in 38 states.

In 1960, the U.S. Congress gave statutory recognition to the program when they enacted Public Law 86-686, the Cooperative Research Units Act. The intent of the act was to “facilitate cooperation among the Federal Government, colleges, and universities, the States, and private organizations for . . . research and education relating to fish and wildlife, and for other purposes [by developing] coordinated, cooperative research and training programs for fish and wildlife resources. . . .”

The three-part mission of the Cooperative Research Units Program is focused on education, research and technical assistance.

- *Education.* Unit scientists teach graduate-level university courses and provide graduate students academic guidance, linking the research mission with student training.
- *Research.* Unit scientists conduct research that supports the needs of local cooperators and partners. Research can be of local, regional or national interests.
- *Technical Assistance.* Units provide technical assistance and training to state and federal natural resource managers, and to other natural resource managers as needed. Cooperators benefit from the expertise of unit scientists, cooperating university faculty, and biologists at state natural resource agencies.

In 2004, the Nebraska Cooperative Fish and Wildlife Research Unit became the newest state Cooperative Research Unit through a Cooperative Agreement signed by the U.S. Geological Survey, the University of Nebraska–Lincoln, the Nebraska Game and Parks Commission, the U.S. Fish and Wildlife Service and the Wildlife Management Institute.

## PERSONNEL AND COOPERATORS

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### UNIT PERSONNEL

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#### STAFF – U.S. GEOLOGICAL SURVEY, COOPERATIVE RESEARCH UNITS PROGRAM

---

Craig R. Allen, Unit Leader  
Joseph J. Fontaine, Assistant Unit Leader – Ecology  
Kevin L. Pope, Assistant Unit Leader – Fisheries

#### STAFF – UNIVERSITY OF NEBRASKA–LINCOLN

---

Caryl Cashmere, Staff Assistant  
Christopher Chizinski, Post-Doctoral Research Associate and Coordinator, Angler Survey Project  
Karie Decker, Coordinator, Nebraska Invasive Species Project  
Valerie Egger, Administrative Assistant  
Caroline Jezierski, Coordinator, Nebraska Wind and Wildlife Project  
Christopher Jorgensen, Science Coordinator, Rainwater Basin Joint Venture

#### RESEARCH TECHNICIANS

---

Naomi Alhadeff	Jonathan Knudsen
Nicholas Arneson	Lucas Kowalewski
Chris Dietrich	Natalie Luben
Lawrence (Dan) Drimmel	Steve Lurtz
Holly Evans	Danielle Rush
Amber Fandrich	Joseph Sbarro
Caitlyn Gillespie	Bethany Teeters
Kurt Gielow	Amy Vogrin
Michael Godin	Jacob Walker
Tim Hajda	Grant Wiemer
Anna Hicks	Kristin Young
Heather Hottovy	Brad Yuen
Shelby Klima	

#### STATEWIDE CREEL CLERKS

---

Don Bohnenkamp	Tim Onwiler
Kailee (Kay) Brown	Minnie Petsch
Michael Cavallaro	Bruce Porter
Jason Clark	Brett Roberg
Mathew Coll	Gerald Ryschon
Sean Farrier	Janice Spicha
Ron Grandi	Phil Stollberg
Dennis Liess	Jonathan Yates
Cathryn Niehoff	

#### STUDENT WORKERS

---

Reece Allen	Alex Engel	Isaac Mertens	Shelby Sidel
Nathan Baird	Garrett Hanquist	Jean Paul Montes	Victoria Simonsen
Levi Carlock	Bryce Hatfield	Patrick Nepp	Rachel Valenziano
Josiah Dallmann	Chelsey Hookham	Trisha Quon	Richard Wehmeyer
Michael Dedinsky	Hannah Hummel	Chris Shank	Ben Wilson
Taylor Dixon			

#### UNL UCARE STUDENTS

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Josiah Dallmann	Victoria Simonsen	Alec Wong
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## CURRENT GRADUATE DEGREE CANDIDATES

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### *Master of Science*

Carla (Knight) Bobier, School of Natural Resources,  
March 2009 – present

Jason DeBoer, School of Natural Resources, January  
2009 – present

Caitlyn Gillespie, School of Natural Resources,  
August 2012 – present

Brian Hammond, School of Natural Resources, May  
2012 – present

Michelle Hellman, School of Natural Resources,  
August 2009 – December 2012

Christopher Jorgensen, School of Natural Resources,  
January 2010 – December 2012

Robert Kill, School of Natural Resources, UNL,  
January 2011 – present

Lucas Kowalewski, School of Natural Resources,  
March 2010 – present

Jessica Laskowski, School of Natural Resources,  
August 2011 – present

Alexis Maple, School of Natural Resources, March  
2009 – present

Lindsey Messinger, School of Natural Resources,  
January 2012 – present

Peter Spirk, School of Natural Resources, January  
2009 – present

Ryan Stutzman, School of Natural Resources, January  
2010 – present

Kelly Turek, School of Natural Resources, January  
2012 – present

Ashley VanderHam, School of Natural Resources, June  
2011 – present

Chris Wiley, School of Natural Resources, August  
2011 – present

### *Ph.D.*

Noelle Chaine, School of Natural Resources, August  
2011 – present

Lucia Corral, School of Natural Resources, June 2012  
– present

Kent Fricke, School of Natural Resources, June 2011  
– present

Danielle Haak, School of Natural Resources, August  
2011 – present

Dustin Martin, School of Natural Resources, January  
2009 – present

Kristine Nemecek, School of Natural Resources,  
August 2006 – December 2012

Donald Pan, School of Biological Sciences, January  
2010 – present

Nicholas Smeenk, School of Natural Resources,  
August 2010 – present

Chad Smith, School of Natural Resources, August  
2007 – present

Shana Sundstrom, School of Natural Resources,  
August 2011 – present

Bethany Teeters, School of Natural Resources,  
August 2012 – present

Daniel Uden, School of Natural Resources, August  
2012 – present

## GRADUATES, 2011–12

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Lindsey Chizinski, M.S., School of Natural Resources,  
UNL, May 2012

Daniel Uden, M.S., School of Natural Resources,  
UNL, August 2012

Kody Unstad, M.S., School of Natural Resources,  
UNL, August 2012

Sam Wilson, M.S., School of Natural Resources,  
UNL, August 2012

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## COORDINATING COMMITTEE MEMBERS

---

### U.S. GEOLOGICAL SURVEY

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Cooperative Research Units Program  
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### NEBRASKA GAME AND PARKS COMMISSION

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## COOPERATORS

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### ORGANIZATIONS

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Benedictine College, Kansas	University of Nebraska Omaha (UNO)
BOKU, the University of Natural Resources and Life Sciences, Vienna, Austria	University of Florida
Bureau of Indian Affairs	University of New Mexico
Central Nebraska Public Power and Irrigation District	U.S. Army Corps of Engineers
Headwaters Corporation	U.S. Environmental Protection Agency (EPA) Alma, NE
Kansas Department of Wildlife and Parks	Cincinnati, OH
Michael Forsberg Photography	Omaha, NE
International Crane Foundation	U.S. National Park Service (USNPS) Great Plains Cooperative Ecosystems Studies Unit
International Institute for Applied Systems Analysis	U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS)
The Nature Conservancy	Forest Service, Rocky Mountain Research Station
Nebraska Association of Resource Districts	National Resource Conservation Service (NRCS)
Nebraska Bird Partnership	U.S. Fish and Wildlife Service (USFWS) Ecological Services, Nebraska Field Office
Nebraska Department of Agriculture	Fort Niobrara–Valentine National Wildlife Refuge
Nebraska Department of Environmental Quality	Habitat and Population Evaluation Team
Nebraska Educational Television	Nebraska Field Office
Nebraska Farm Bureau	Playa Lakes Joint Venture
Nebraska Forest Service	Prairie Pothole Joint Venture
Nebraska Game and Parks Commission (NGPC)	Rainwater Basin Joint Venture
Nebraska Natural Resources Districts	Region 6
Nebraska Public Power District	U.S. Geological Survey (USGS) Cooperative Research Units Program
Nebraska Weed Control Association	Cryospheric Studies
Pheasants Forever	Fort Collins Science Center
Smithsonian National Zoological Park Migratory Bird Center	Northern Prairie Wildlife Research Center
University of Nebraska Center for Public Policy	Sonoran Desert Research Station
University of Nebraska–Lincoln (UNL)	South Dakota Water Science Center
Department of Agricultural Economics	Nebraska Water Science Center
Department of Computer Science / Engineering	
Department of Earth and Atmospheric Sciences	
Department of Plant Pathology	
College of Law	
School of Biological Sciences	
School of Natural Resources	

## PEOPLE

---

Adam Kester, Wildlife Division, NGPC  
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Bruce Trindle, Wildlife Division, NGPC  
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Constance Miller, USDA NRCS  
Dan Snow, Nebraska Water Center, UNL  
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Mitch Coffin, Noxious Weed Program, Nebraska  
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Vicki Wohlers, USDA APHIS–PPQ  
Zac Brashears, Fisheries Division, NGPC

## MILESTONES and HIGHLIGHTS

### USGS POWELL CENTER ANNOUNCEMENT

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The U.S. Geological Survey (USGS) announced new science investigations including eight research projects funded by the USGS John Wesley Powell Center for Analysis and Synthesis (headquartered in Fort Collins, CO). The announcements were part of the “Big Data” event hosted by the American Association for the Advancement of Science and co-sponsored by the White House Office of Science and Technology Policy and the National Science Foundation. The Powell Center “catalyzes innovative thinking in Earth system science by providing scientists with a place and time for in-depth analysis, state-of-the-art computing capabilities, and collaborative tools. As a result, the Center accelerates scientific understanding and its inclusion into informed management options.” (USGS Press Release, 3/29/2012)

One of the Powell Center projects that uses “big data” is *Understanding and Managing for Resilience in the Face of Global Change*. This project, awarded to Craig Allen and Shana Sundstrom, will use Great Lakes deep-water fisheries and invertebrate annual survey data, and extensive data from the Great Barrier Reef.

### GRADUATING STUDENTS

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From October 2011–September 2012, four students in the Nebraska Coop Unit program graduated from the University of Nebraska–Lincoln with their master’s degrees—the most graduations in a single year since the Unit was started in 2004.

### STAFFING INCREASES

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Chris Jorgensen became the most recent addition to the Unit staff when he accepted the position of Rainwater Basin Joint Venture Science Coordinator. A record number of technicians and student workers (nearly 65) supported research activities during the past year. Including staff, technicians, and students, the Nebraska Unit was comprised of nearly 100 people this year.

### AUSTRIA

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Kristine Nemeč spent September 25–December 15, 2012 in Europe hosted by the International Institute for Applied Systems Analysis in Laxenburg, Austria as part of the NSF Integrative Graduate Education and Research Traineeship (IGERT) program. With four other IGERT students, she studied river restoration and management in Austria, Hungary, Poland, and Spain.

### MOBILE APPS

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Kevin Pope has been working with Shankar Lakshmanan, (M.S. CSE, 2012) and his graduate advisor, Dr. Ashok Samal in the UNL Department of Computer Science and Engineering, to develop an app that could be used for fish identification. Correctly identifying fish can be a challenge for anglers. An automated, mobile option would greatly increase accuracy of identification. This Android mobile app has the potential to assist anglers and others with identifying fish based on physical characteristics (e.g., shape, size and texture) that are extracted from photographs using image analysis software. A prototype has been completed; much work is still needed to develop an app ready for distribution. For his role in developing the app, Shankar was the recent winner of UNL’s Mobile App Contest.

The Missouri River Watershed Coalition took the lead in developing an “Early Detection and Distribution Mapping System” app for iPhone and Android phones. Development credits go to Chuck Barger and Rustico David, both with the University of Georgia. This app makes it easy to instantly report invasive species sightings from the field. Users can register for free, take photos, and hit the *Submit* button. The MRWC-EDDMapS app can be downloaded from [apps.bugwood.org](http://apps.bugwood.org). Karie Decker is vice president of the Coalition.

## VISIT TO USGS HEADQUARTERS

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In May 2012, Craig Allen and Valerie Egger made their first visit to USGS Headquarters in Reston, Virginia. They spent the morning visiting with staff and administrators at the Cooperative Research Units Headquarters, and also visited with staff and scientists with USGS International Travel, Contracting, Research and Equipment Development Grade and Evaluation, and the National Climate Change and Wildlife Science Center. They were finally able to “put a face with a name.”



Photo credit: Rita Raines

## THESES and DISSERTATIONS

### LINDSEY CHIZINSKI, M.S. MAY 2012

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*An Evaluation of Stocking and Habitat Influences on Channel Catfish in Lentic Ecosystems of the Great Plains*  
University of Nebraska–Lincoln. Advisor, Kevin Pope.

### DANIEL UDEN, M.S. AUGUST 2012

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*Agricultural Landuse Change Impacts on Bioenergy Production, Avifauna and Water Use in Nebraska’s Rainwater Basin*  
University of Nebraska–Lincoln. Advisor, Craig Allen.

### KODY UNSTAD, M.S. AUGUST 2012

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*Predictors of Insect Diversity and Abundance in a Fragmented Tallgrass Prairie Ecosystem*  
University of Nebraska–Lincoln. Advisor, Craig Allen.

### SAM WILSON, M.S. AUGUST 2012

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*River Otter (*Lontra canadensis*) Home Range, Habitat Use, Overnight Movement, and Survival in the Platte River of Nebraska*  
University of Nebraska–Lincoln. Advisor, Craig Allen.

## ALUMNI: WHERE ARE THEY NOW?

### ELIZABETH (BETH) FORBUS (M.S., 2007)

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Until just recently, Beth was living in Carlsbad, CA working for the U.S. Fish and Wildlife Service as the Endangered Species Listing Branch Chief. Three months ago she accepted a promotion to their headquarters in Arlington, VA (just outside of Washington, D.C.), working with conservation for endangered species.

### NATHAN (NATE) GOSH (M.S., 2008)

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Nate has moved on from the Missouri Department of Conservation where he worked following graduation. He is now a fish biologist with the U.S. Army Corps of Engineers, Missouri River Recovery Program based in Kansas City, Missouri. His main responsibilities involve working as part of the Habitat Assessment and Monitoring and Water Quality programs to evaluate shallow water habitat for native Missouri River fishes, including the pallid sturgeon.

## AWARDS and RECOGNITIONS

### TRAINEESHIPS AND FELLOWSHIPS

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**Michelle Hellman** and **Bethany Teeters** were awarded prestigious National Science Foundation IGERT Traineeships in support of their Ph.D. programs.

**Shana Sundstrom** won a Canadian National Sciences and Engineering Research Council of Canada Graduate Scholarship, tenable for three years. This award is analogous to a U.S. National Science Foundation Graduate Fellowship.

**Dan Uden** was awarded a prestigious Othmer Fellowship from UNL. The fellowship is designed to assist in recruiting exceptional students who are seeking a terminal degree such as a Ph.D.

### GUEST PROFESSORSHIP

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**Craig Allen** was nominated for, and awarded, the August T. Larsson Guest Professorship –with the Swedish University of Agricultural Sciences, Uppsala, Sweden.

### WMI ADMINISTRATIVE EXCELLENCE AWARD

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**Valerie Egger** was the recipient of the Wildlife Management Institute (WMI) annual Administrative Excellence Award. **Ken Williams**, USGS CRU Chief, presented the award and recognition plaque to Valerie on May 29, 2012 at the headquarters office of the USGS Cooperative Research Units Program in Reston, Virginia. The WMI annual Administrative Excellence Award is presented annually to recognize achievements in administrative excellence in the USGS Cooperative Research Units Program.



**Valerie Egger and Ken Williams**  
Photo credit: Rita Raines

### OTHER GRANTS AND AWARDS

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**Jason DeBoer** and **Chris Jorgensen** were each awarded a \$500 travel grant from the UNL David H. and Anne E. Larrick Memorial Travel Fund. The Larrick funds support graduate student travel to professional society meetings related to agricultural research.

**Jason DeBoer** was also the recipient of the 2011 Sander Travel award from the Walleye Technical Committee to attend Midwest Fish and Wildlife Conference, Des Moines, Iowa.

**Karie Decker** received the Presidential Award from the Nebraska Weed Association for being instrumental in the association's new approach to weed control in Nebraska.

**Kent Fricke** received a \$1,000 Nature Conservancy J.E. Weaver Award to assist with his research in the lower Niobrara River Valley in Nebraska.



**Karie Decker receiving her award from Bruce Rumsey**

**Chris Jorgensen** received a \$1,000 Pheasants Forever Wildlife Scholarship. This annual award is limited to students pursuing a graduate degree in the wildlife field at any accredited graduate school in the United States. Priority is given to applicants researching upland game bird life ecology, genetics, management and the support of upland hunting.

**Chris Jorgensen** and **Ryan Stutzman** were each awarded a \$300 North American Ornithological Conference Travel Award. The award is intended to support student travel, specifically those who are presenting their research at the North American Ornithological Conference in Vancouver, August 2012.

**Jessica Laskowski** and **Lindsey Messinger** were each awarded the Conservation Leaders for Tomorrow Scholarship. This scholarship enabled Jessica and Lindsey to attend a unique four-day workshop that combined round-table discussions and hands-on field exercises led by conservation professionals and veteran hunters.

**Ryan Stutzman** received the Meritorious Graduate Student Award from the UNL School of Natural Resources. Ryan also received the 2011 Midwest Fish and Wildlife Conference award, Best Wildlife Paper for “Stopover Decisions of Migratory Shorebirds: Are Agricultural Fields an Avian Gas-N-Go?”

## NEW STAFF INTRODUCTIONS

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**Caroline Jezierski** became coordinator for the Wind and Wildlife project in 2011 just as we were putting together last year’s annual report. Prior to joining the Nebraska Coop Unit, she worked throughout the west, from Baja to Alaska, as a field technician, a biologist, and a naturalist. Caroline received her master’s degree from the University of Alaska, Fairbanks.

**Chris Jorgensen** came to the Nebraska Coop Unit from Iowa, in January 2010, to pursue a master’s degree with Joseph (TJ) Fontaine. In May 2012, Chris accepted the position of science coordinator for the Rainwater Basin Joint Venture (RWBJV)—a joint UNL/RWBJV position. Chris is continuing to work toward completion of his master’s degree while in his new position.

## OUTREACH ACTIVITIES

Below is a *sample* of the many outreach activities that Unit staff and students participated in during the past year.

### NEBRASKA LEGISLATURE

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Karie Decker worked with Nebraska state senators to pass two legislative bills related to invasive species in Nebraska. One section formally created the Nebraska Invasive Species Council—an advisory group to help guide invasive species research, management, and future legislation. The other section prohibits the possession, import, export, purchase, sale or transport of aquatic invasive species. It also allows the Nebraska Game and Parks Commission to adopt and promulgate rules and regulations governing the inspection, decontamination, and treatment of watercraft capable of containing or transporting aquatic invasive species.

### MEDIA – RADIO, BILLBOARDS, AND MORE

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Throughout the spring of 2012, Karie Decker had the opportunity to interview for several TV and radio shows, and newspapers concerning invasive species in Nebraska. She participated in *The Outdoor Connection Radio Show* (out of North Platte) as well as *Earth to Lincoln Radio Show* and *Outdoor Nebraska Radio* in Lincoln. She was also interviewed by KMAT Omaha News Channel, and filmed a segment for Nebraska's popular TV show, *Backyard Farmer*. In addition, she produced several news articles or was interviewed in *The Omaha World Herald*, *Lincoln Journal Star*, *Salt Valley Lakes Magazine*, *NebraskaLand Magazine*, and *Harlan Holiday Magazine*. Through these outlets and other outreach programs, we are seeing a tremendous increase in invasive species awareness across Nebraska.

“Stop Aquatic Hitchhikers!” billboards are still in place in Omaha and at Lake McConaughy (near Ogallala) to boost the public's knowledge and awareness of invasive species in Nebraska.

### FISH IDENTIFICATION

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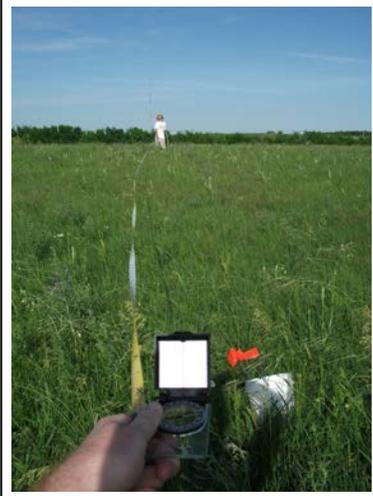
Carla Bobier and Natalie Luben manned fish identification booths at Nebraska Boat Sport and Travel Show (February), the Nebraska Game and Parks' Carp-O-Rama (June) and the Missouri River Outdoor Expo at Ponca State Park (September). Participants examined fish models and identify the species. Several products are designed to educate anglers about fish identification were evaluated for effectiveness.

### OTHER

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On June 26, 2012, the School of Natural Resources hosted a group of students from Jackson Elementary (Omaha, NE). Robert Kill and Noelle Chaine worked at the fish printing station, teaching kids about fish during an arts-and-crafts activity. Caroline Jezierski had a bird migration game that included Nebraska-specific information on migrating birds and the perils of migration (pollution, buildings, wind turbines, etc.). Most "birds" in the game did not survive—a harsh lesson.

## RESEARCH PROJECTS



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## ADAPTIVE MANAGEMENT FOR THE NEBRASKA NATURAL LEGACY PLAN

Principal Investigator(s): Craig R. Allen, Joseph J. Fontaine

Graduate Student(s): Kent Fricke, Ph.D.

Project Duration: June 2010 – July 2014

Funding: Nebraska Game and Parks Commission, U.S. Fish and Wildlife Service

Project Location: Lower Niobrara River, Nebraska

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The Nebraska Natural Legacy Plan (NNLP) is a conservation strategy that identifies conservation targets and management approaches to decrease threats to Nebraska's biodiversity. In cooperation with the Nebraska Game and Parks Commission, an adaptive management framework will be developed for the NNLP to:

1. Evaluate the effects of conservation activities;
2. Prioritize research and monitoring activities;
3. Develop innovative programs to improve the ability to inventory and monitor at-risk species;
4. Develop theoretical and empirical techniques that facilitate the integration of research and monitoring into the management programs of at-risk, non-game species, including consideration of the complex trade-offs between social, economic, and biological factors that may facilitate and constrain effective wildlife management.

The project will investigate aspects of invasive woody plant management in the Lower Niobrara River Valley in northern Nebraska. Species of interest include eastern red cedar, Russian olive, and common buckthorn. The current status of these species in the valley will be quantified and models reconstructing their invasion and establishment within the valley will be developed to identify vectors and barriers to invasion. Landowner perceptions of woody plant invasions and attitudes toward management techniques will be surveyed to determine the effectiveness of landscape management options. The effects of woody plant removal on vegetation and soil hydrology will be quantified in order to determine the effectiveness of removal techniques to improve wildlife habitat. Finally, the results of this study will be used to develop an adaptive plan for management of invasive woody plants in the Lower Niobrara River Valley. Fieldwork began in spring 2012 and will continue through fall 2014.



**Niobrara Valley**  
Photo: Craig Allen

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## AGRICULTURAL LANDUSE CHANGE IMPACTS ON BIOENERGY PRODUCTION, AVIFAUNA AND WATER USE IN NEBRASKA'S RAINWATER BASIN

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Daniel Uden, M.S. (2012)

Project Duration: August 2010 – September 2012

Funding: U.S. Geological Survey (RWO 14)  
Great Plains Landscape Conservation Cooperative

Project Location: Rainwater Basin Nebraska

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Rainwater Basin grasslands and wetlands provide essential habitat for grassland birds and waterfowl, respectively. Since European settlement, the landscape of the Rainwater Basin has been largely altered through the conversion of the prairie landscape to agriculture. As a result, grasslands and wetlands have substantially declined. Climate change could further impact grasslands and wetlands directly through temperature and precipitation changes, or indirectly by driving changes in landuse.

Switchgrass (*Panicum virgatum*) is promoted as a biofuel feedstock in the Great Plains, because it may be environmentally and economically superior to corn grain for the production of ethanol. Under projections for future climatic changes, switchgrass may also be more efficiently produced than traditional row crops on marginally productive agricultural lands. The ecological impacts of the conversion of annual row crops to switchgrass stands are not certain. Switchgrass stands could improve habitat for some grassland bird species if they replace annual row crops, but could worsen habitat if they replace native prairie.

This study developed biofuel-based landuse change scenarios for the Rainwater Basin, driven by soil and agricultural field characteristics and plausible changes in climate, policy, and demand for energy. For each scenario, we generated landcover maps of potential switchgrass distribution and calculated changes in major landcover classes. A customized version of the HABS (Hierarchical All Birds Strategy) model was utilized to assess individual species responses of grassland birds to predicted landuse changes. We also conducted an assessment of the feasibility of cellulosic ethanol production from switchgrass and corn stover in the service area of an existing ethanol plant. Finally, we used projected landcover under scenarios of future climate change to consider how the conversion of marginally productive row crop fields in areas with histories of irrigation limitations might impact regional groundwater withdrawals.

This study also developed predictive models explaining annual variation in Rainwater Basin wetland occurrence and flooded area at peak spring bird migration. An information theoretic approach and generalized linear mixed models were used to assess the contributions of individual wetland characteristics and local weather events to springtime wetland presence and flooded area.

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## ANGLER BEHAVIOR IN RESPONSE TO MANAGEMENT ACTIONS ON NEBRASKA RESERVOIRS

Principal Investigator(s): Kevin L. Pope

Post-Doctoral RA: Christopher Chizinski

Graduate Student(s): Carla Knight, M.S.  
Lucas Kowalewski, M.S.  
Alexis Maple, M.S.  
Dustin Martin, Ph.D.  
Peter Spirk, M.S.  
Chris Wiley, M.S.

Project Duration: January 2009 – December 2013

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

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Natural resource agencies invest substantial resources to recruit anglers. However, there is little understanding of human motives for participating in angling activities. Even less is known about the effects of management actions on angler participation.

Project goals are to understand 1) the participation patterns of anglers on local and regional scales, and 2) how participation patterns of anglers influence fish populations.

The project currently has six study components.

1. *Statewide Angler Survey*: Creel surveys are being conducted on Calamus Reservoir, Harlan County Reservoir, Lake McConaughy, Lewis and Clark Lake, Merritt Reservoir, and Sherman Reservoir from April through October, 2009–2013. These surveys provide continuation to long-term (>10–20 years) data sets that are valuable for assessment of temporal changes in angler participation. In particular, these extended data sets will allow for relational assessments of changes in angling participation with environmental conditions and management actions on large-scales.

In addition to the long-term assessments, creel surveys are being conducted at numerous smaller reservoirs. Effectively sampling smaller waterbodies is logistically difficult—there are fewer anglers to contact, which creates statistical issues due to small sample size. Small reservoirs to be sampled at least one year during this study include the Fremont State Lakes, TaHaZouka Park Lake, Gracie Creek Pond, Willow Creek State Recreation Area, Skyview Lake, Cottonmill Lake, Johnson Reservoir and Yanney Park Lake. These surveys will be used for assessment of current guidelines to sample small fisheries.



**Measuring fish during an angler survey**

Creel surveys are also being used to target some unique situations around the state. Our first unique situation occurred in the Republican River basin. Four reservoirs (Swanson, Enders, Red Willow, and Medicine Creek) are being surveyed during 2009–2013 to identify possible changes in angler participation following a major drawdown at Red Willow due to safety concerns over the dam, which restricted access for several months. Lessons learned from these reservoirs will aide in understanding other situations across the state when access to a fishery is restricted. Our second unique situation occurred in the upper basin of the Niobrara River. Box Butte Reservoir is being surveyed during 2010–2011 to quantify the participation patterns by spear fishermen following a change in the spear-fishing season and to identify changes in harvest of northern pike following a change in the size limit. Our third unique situation occurred in spring 2012 with the grand opening of Wanahoo Reservoir in

Wahoo, NE—rarely do brand new reservoirs open up. We are conducting surveys during 2012–2013 to quantify the impact of this new reservoir on the regional fishery, the spatial use of the reservoir by bank anglers, and how catch rates change when targeted fish become less naïve to angling.

2. *Regional Angler Survey*: An intensive year-round survey is being conducted on 20 reservoirs in the Salt Valley region of southeast Nebraska. This survey will provide baseline data necessary to develop a model predicting temporal and spatial participation by anglers. This model will be especially useful for understanding changes in fishing pressure at specific reservoirs as influenced by conditions at nearby reservoirs.

Intensive, year round sampling continues on the 20 Salt Valley reservoirs. During 2012, anglers were interviewed at Bluestem, Branched Oak, Killdeer, Meadowlark, Olive Creek, Wagon Train, and Wildwood reservoirs to gather data on angler effort, catch and harvest. Data from these reservoirs will be used along with data collected during 2009–2011 to assess participation patterns of anglers within the Salt Valley region. Data were also gathered during 2012 on all 20 Salt Valley reservoirs on angler effort to compare patterns of participation across the region on a monthly basis. Preliminary results indicate that the number of anglers harvesting fish is small across the region, whereas effort is great in most reservoirs, especially those within Lincoln.

An intensive sampling effort was also conducted during October 2011 following the rainbow trout stocking in Holmes reservoir. These data are being used to assess angler participation and catch rates on a daily time scale. Preliminary results indicate that these events increase angler effort for a period of 3–5 days and increase catch rates of rainbow trout for 1–2 days.

3. *Ability of Anglers to Identify Fishes*: A fish-identification quiz was first given in August 2010 to participants of a Family Fishing event hosted by the Nebraska Game and Parks Commission. Since then, this quiz has been given at the UNL NaturePalooza, Fremont Rural Living Expo, Triumph of Agriculture Expo, and Missouri River Outdoor Expo, and Carp-O-Rama at Pawnee Lake. Participants are asked to examine fish models and identify the species. Information gained will allow us to quantify anglers' current abilities to correctly identify fish species, and evaluate several different products designed to educate anglers about fish identification. Understanding anglers' ability to correctly identify fish is important for predicting the success of complex fishing regulations.



**Angler Survey Fish Models**

4. *Angling Pressure and Bluegill Parasites*: Catch-and-release angling is extremely popular on the reservoirs within Nebraska's Salt Valley watershed. Fish that are captured and released by anglers are often subjected to stressors that alter physiology, potentially altering fish behavior and ultimately fish fitness. Additionally, increases in angling pressure should correlate positively with catch-and-release events. Finally, fish can become more susceptible to infestation by parasites when stress compromises the fish's immune system. Thus, we predict that a positive relationship exists between angling pressure and rate of parasite infestation. To test this prediction, we will examine angling pressure and larval trematode (i.e., *Neascus* spp. and *Clinostomum* spp.) abundance in juvenile bluegill for 16 Salt Valley reservoirs.
5. *Angler Effects on Sexually-Dimorphic Fish Species*: Differences in harvest between male and female fish can alter sex-specific rates of recruitment, growth, and mortality, and hence, the overall health of a fish population. Detailed information (species, length, total weight, age, sex, liver weight, and gonad weight) on harvested walleye, white bass, and white crappie was collected from Sherman and Calamus Reservoirs during spring 2009 and 2010. Sex-selective harvest (female-biased) was evident for white bass and white crappie, but not for walleye.
6. *Estimates of Fish Population Size—An Important Link to Understanding Fish Harvest*: Fishery biologists routinely monitor relative abundance of fish populations by assessing catch-per-unit-effort in standardized gears; they also routinely monitor harvest by estimating total number of fish kept by anglers within a year. Unfortunately, it is

difficult to understand the effect of harvesting 20,000 walleye from a reservoir where only six walleye were captured in a gillnet set overnight during standard sampling. As such, we are working to obtain population size estimates for channel catfish in 10 Salt Valley reservoirs. In addition, we are investigating the applicability of techniques commonly used by wildlife biologists to estimate bird and mammal abundance, for estimating abundance of fish. Ultimately, information on fish population sizes will be linked with information on angler use and harvest.

Channel catfish population size estimates were successfully conducted in 2011 at East Twin, Holmes, Merganser, Wild Plum, and Yankee Hill reservoirs. These results will be combined with the ongoing channel catfish population size estimates being conducted in 2012 at Meadowlark, Olive Creek, Stagecoach, Wagon Train, and Wildwood reservoirs. Angler effort and harvest data collected in 2011 and 2012 at these reservoirs by the Regional Angler Survey will be analyzed in conjunction with these population size estimates to better understand the interactions between anglers and fish populations.



**Chris Wiley (left) and JP Montes (right) with channel catfish caught at Wildwood Lake**  
Photo credit: Michael Dedinsky

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## AQUATIC INVASIVE SPECIES (AIS) PREVENTION PROGRAM

Principal Investigator(s): Karie Decker, Craig R. Allen

Project Duration: April 2011 – June 2013

Funding: Nebraska Environmental Trust, USFWS Aquatic Nuisance Species Taskforce, Central Nebraska Public Power and Irrigation District

Project Location: Statewide Nebraska

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The Nebraska Invasive Species Project received a grant from the Nebraska Environmental Trust and the USFWS Aquatic Nuisance Species Taskforce to develop the multi-institutional Aquatic Invasive Species Prevention Program.

Goals are to:

1. decrease the risk of aquatic invasive species introduction into Nebraska by implementing a boat inspection and decontamination program,
2. increase public awareness of aquatic invasive species through an integrated outreach/education program,
3. continue aquatic invasive species monitoring efforts to help focus prevention efforts, and
4. increase local and regional collaboration in the prevention of aquatic invasive species.

In 2011, invasive species technicians conducted boat inspections and surveyed boaters in order to gauge public awareness of invasive species, to track where boaters are coming from and going to, and to educate boaters on aquatic invasive species prevention. Staff surveyed over 3,500 boaters from 18 different locations around the state. Survey results show that on average, 74% of boaters in Nebraska have heard of zebra mussels. The majority of interviewees in Central and Eastern Nebraska heard of aquatic invasive species via the media following the zebra mussel infestation at Zorinsky Lake in Omaha. However, few boaters seemingly take the time to inspect their boats for aquatic invasive species (averaging only 34% state-wide) suggesting a need to focus our education efforts.

In addition, it appears that at Lake McConaughy (in western Nebraska), nearly 50% of the boaters are from out-of-state (primarily Colorado, but also Iowa, Kansas, Wyoming, Oklahoma). In Central and Eastern Nebraska, only 16% of the boaters are from out of state—Kansas, South Dakota, Iowa, etc. The shaded areas on the map indicate where boaters are visiting from. States outlined in red have known zebra and/or quagga mussel infestations.

During 2011 surveys, technicians educated the public about the problems associated with aquatic invasive species and how to prevent their spread. Over 15,000 individuals were educated and trained on Nebraska's Clean, Drain, and Dry Protocol (which is also promoted in neighboring states, e.g., Colorado, Kansas, Iowa, Wyoming, South Dakota, etc.). Staff provided outreach at over a dozen fishing tournaments, targeting boaters coming from other states. In 2011, technicians completed over 350 voluntary watercraft inspections, and intercepted 2 high-risk boats that were subsequently decontaminated before launching into Nebraska waters. Voluntary watercraft inspections and decontaminations can help prevent the spread of aquatic invasive species by intercepting high-risk boats, and by educating the public during the inspection process.

In 2012, seven invasive species technicians are continuing with the aquatic invasive species prevention program. Warm weather spurred an increase in boating activity across the state. Over 700 boaters were educated about aquatic invasive species and conducted nearly 350 boat inspections so far. Monitoring and education efforts continue through August 2012. In April 2012, the reopening of Zorinsky Lake (near Omaha) was celebrated after the successful treatment for zebra mussels during the past two years.



Photo: Karie Decker

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## ASSESSING THE RELATIONSHIP BETWEEN STABLE ISOTOPES AND GRASSLAND BIRD PRODUCTIVITY ON GREAT PLAINS NATIONAL PARK SERVICE PROPERTIES

Principal Investigator(s): Larkin Powell, Craig R. Allen

Graduate Student(s): Sarah Rehme, M.S. (2010)

Project Duration: June 1, 2007 – May 1, 2012

Funding: U.S. Geological Survey Natural Resource Preservation Program (RWO 2)  
National Parks Service

Project Location: Three National Park Service Units in Kansas, Minnesota, Nebraska

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National Park Service (NPS) units in the Great Plains provide breeding habitat for many grassland birds. However, little is known about the quality of this habitat and more extensive study into the avian breeding ecology at these sites has been recognized as necessary. A short-term study on songbirds at three NPS properties complemented current NPS monitoring, providing an among-park comparison of nest success—a prohibitively labor-intensive and expensive process when conducted on a regional scale. Park managers need lower-cost data for informed decision-making; measuring site fidelity is a potentially less expensive means of monitoring breeding site quality.

The project used unique methods—stable isotope analyses of avian tissues—to evaluate variability in site fidelity of grassland birds at three NPS units in the Great Plains: Homestead National Monument, Nebraska; Pipestone National Monument, Minnesota; and Tallgrass Prairie National Preserve, Kansas. Birds that breed successfully at a location will often return to that location again (site fidelity). Current extrinsic markers used in monitoring site fidelity were inadequate for small birds; stable isotope analyses provided an alternative approach. This project evaluated the extent to which stable isotope analyses could be utilized to measure site fidelity in breeding grassland birds, specifically four target species: dickcissel (*Spiza americana*), grasshopper sparrow (*Ammodramus saviannarum*), eastern meadowlark (*Sturnella magna*), and western meadowlark (*Sturnella neglecta*).

All years of field research have been completed at all three sites. Grassland bird species richness was highest at Pipestone and Tallgrass. Grassland obligate nest success for both years was 39% at Homestead and 6–29% for target species at Tallgrass. No target species nests were found at Pipestone. Mean adult feather hydrogen ratios ( $\delta D$ ) were separable among study sites ( $P < 0.05$ ). Site fidelity tended to be higher at the large site, Tallgrass (63%), and lower at the small site, Homestead (50%). Mean blood  $\delta D$  values were 46% more depleted than mean  $\delta D$  feather values. Analyses of nest success, site species richness, avian density, site fidelity, and stable isotopes have been completed. Results were compiled and reported in a master's thesis available at: <http://digitalcommons.unl.edu/natresdiss/11>.



**Bird banding**  
Photo credit: Sarah Rehme



**Extraction of feather for analysis**  
Photo credit: Sarah Rehme



**Pipestone Prairie, MN**  
Photo credit: Sarah Rehme

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## BIOENERGETICS AND HABITAT SUITABILITY MODELS FOR THE CHINESE MYSTERY SNAIL (*BELLAMYA CHINENSIS*)

Principal Investigator(s): Kevin L. Pope, Valery Forbes (School of Biological Sciences)

Graduate Student(s): Danielle Haak, Ph.D.

Project Duration: August 2011 –

Funding: National Science Foundation IGERT Grant 0903469  
Nebraska Game and Parks Commission

Project Location: Southeast Nebraska

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Aquatic invasive species continue to spread throughout the USA at an alarming rate, and Nebraska is no exception. Maintaining ecosystem functions is a key component to preserving system resilience, but more information on how these functions are altered by specific invasive species is necessary.

The Chinese mystery snail (*Bellamya chinensis*) is an invasive freshwater snail already established in Nebraska, yet little is known about this species life-history traits and ecology or how it influences the native benthic community. Similar to other mollusk species, Chinese mystery snail populations commonly reach high densities shortly after establishment. Formulating an energy budget and examining how the Chinese mystery snail allocates energy to increase individual biomass and population density will provide an understanding of how this species directly (competing for habitat) and indirectly (eliminating benthic prey species preferred by fish) alters native biota. Additionally, this bioenergetics information can be combined with abiotic variables to develop a habitat suitability model that can be used to identify water bodies most susceptible to future invasions.



**Sampling for mystery snails**  
Noelle Chaine, Danielle Haak, Nick Smeenk  
Photo credit: Valerie Egger



**Chinese mystery snails**  
Photo credit: Valerie Egger



**Snails collected**  
Photo credit: Valerie Egger

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## BREEDING PHEASANT LIFE HISTORY AND BEHAVIORAL RESPONSES TO MANAGEMENT ACTIONS

Principal Investigator(s): Joseph J. Fontaine  
Graduate Student(s): Jessica Laskowski, M.S.  
Project Duration: September 2011 – August 2014  
Funding: Nebraska Game and Parks Commission  
Project Location: Southwestern Nebraska

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The native grasslands of the Great Plains serve as habitat for numerous wildlife species, but the intensification of agricultural practices and the subsequent alteration of the landscape has drastically reduced and fragmented remaining grasslands. The Conservation Reserve Program (CRP) has helped to mitigate habitat loss and slow the rate of population decline of grassland dependent species, but funding for, and subsequent enrollment in CRP is declining. Pheasants are an economically important species that responds well to CRP, but as acres of CRP decline, it is becoming increasingly important to develop new approaches to improve and stabilize pheasant populations.

Because pheasants are relatively short-lived, successful reproduction is paramount to population growth. The goal of this project is to better understand how management actions (e.g., habitat enhancement programs, harvest management) influence pheasant reproduction and subsequently pheasant population growth. We will employ an individualistic approach that considers behavioral and life history responses to management actions as a means of understanding pheasant population dynamics.

Radio-telemetry will be used to track breeding hen pheasants from 2012 to 2014 within Nebraska's Southwestern Focus on Pheasant Area, a site intensely managed to boost pheasant populations. Hen nesting site preferences and reproductive strategy (e.g., clutch size, egg size, incubation patterns) will be assessed in response to variable land-cover, hunting regimes and habitat enhancement. During our first field season we tracked 30 hen pheasants across 8 study sites (private lands enrolled in CRP and one Wildlife Management Area), including a variety of land-cover types and hunting pressure. Throughout the spring of 2013, we plan to increase our sample size as well as expand our study sites.



**Collared hen pheasant nesting in corn stubble**  
Photo: Kristin Young



**Measuring pheasant eggs**  
Photo: Lindsey Messinger



**Pheasant nest in CRP**  
Photo: Jessica Laskowski

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## CHINESE MYSTERY SNAIL (*BELLAMYA CHINENSIS*) ECOLOGY AND IMPACTS

Principal Investigator(s): Craig R. Allen, Kevin L. Pope, Karie Decker

Graduate Student(s): Noelle Chaine, Ph.D.  
Kent Fricke, Ph.D.  
Danielle Haak Ph.D.  
Michelle Hellman, M.S.  
Robert Kill, M.S.  
Kristine Nemecek, Ph.D.  
Nicholas Smeenk, Ph.D.  
Bruce Stephen, Ph.D.  
Daniel Uden, Ph.D.  
Kody Unstad, M.S.  
Ashley VanderHam, M.S.

Undergraduate Student(s): Alec Wong

Project Duration: Summer 2011 –

Funding: Nebraska Cooperative Fish and Wildlife Research Unit

Project Location: Southeast Nebraska

Website: <http://snr.unl.edu/invasives/mysterysnails.html>

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Chinese mystery snails (*Bellamya chinensis*) are an invasive aquatic species in North America, and populations have been found in southeast Nebraska reservoirs. Little is known about this species, but high densities suggest that there is the potential for considerable impacts on freshwater aquatic ecosystems. A group of researchers from the Nebraska Cooperative Fish and Wildlife Research Unit and the School of Natural Resources are collaborating to expand our understanding of Chinese mystery snails. Research includes both field and lab components, with fieldwork focused on southeast Nebraska reservoirs.

The goal of this project is to address research questions related to the invasive Chinese mystery snail. Aspects of the project include studies of life-history traits, habitat preferences, population size, movement capabilities, desiccation tolerance, feeding methods, possible predators, shell strength, mark retention, and distribution. Additionally, this project offers students an opportunity to conduct scientific investigation in a large team setting.

Thus far, we have produced some interesting results. Following a mark-recapture study at Wild Plum Lake, Lancaster County, in September 2011, we estimated that there were approximately 664 adult snails within a 127 m<sup>2</sup> transect (5.2 snails/m<sup>2</sup>), corresponding to an adult population size of approximately 250,000 snails in the littoral zone (<3 m in depth) and wet biomass of approximately 3,100 kg (643 kg/ha). A fecundity study assessment of 29 females yielded an average of 25 young per female with a maximum of 133 young in a given female. A mark retention study in the lab demonstrated that Chinese mystery snails marked with enamel paint did not completely lose a mark during the 181 day period. This result was further corroborated by finding marked snails 293 days after release at Wild Plum Lake.



**Marked snails**  
Photo credit: Valerie Egger

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## CONSERVATION THROUGH ADAPTIVE MANAGEMENT, RESILIENCE THINKING, AND OPTIMIZATION

Principal Investigator(s): Craig R. Allen, Melinda Harm Benson (University of New Mexico)

Graduate Student(s): Noelle Chaine, Ph.D.

Project Duration: August 2011 –

Funding: National Science Foundation IGERT Grant 0903469

Project Location: Statewide Nebraska, Middle Rio Grande Watershed (New Mexico)

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Adaptive management is an approach combining management actions and science to increase understanding of environmental systems. It is a structured, “learning by doing” method to management that embraces uncertainty and change. Resilience thinking acknowledges the presence of multiple stable states in nature and considers the extent to which a given system can absorb perturbation before shifting into a different organization of function and process. Central to resilience theory is the awareness of the ubiquity of surprise in social-ecological systems. Optimization is a conservation tool used to make transparent management decisions based on explicit values and objectives.

This project seeks to address some of the challenges of implementing natural resource management in the context of adaptive management, resilience, and optimization theories. There are three main research components.

- (1) The Platte River Recovery Implementation Program and the Middle Rio Grande Endangered Species Collaborative Program will be used to compare current attempts to implement adaptive management within large watersheds. Both programs are in place to protect federally-listed endangered species while also meeting human demands for water. This part of the project will investigate these programs by working with relevant stakeholders to help understand how planning can be transformed into successful application of adaptive management.
- (2) The Nebraska Natural Legacy Plan targets species and ecological communities of concern in Nebraska and intends to utilize an adaptive management framework, applied to biologically unique landscapes. This project will work in collaboration with Nebraska Game and Parks Commission to aid in the design of an adaptive management monitoring strategy.
- (3) Optimization, especially in the case of maximum yield, has been pointed to as the cause of reduced resilience in many social-ecological systems. However optimization itself is just a tool. The third component of this research project is to investigate if and how optimization can be applied to resilience problems—that is, can resilience be reasonably optimized?



**Platte River near Fremont, NE**  
Photo credit: Lorrie Benson

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## DYNAMICS OF RESILIENCE IN COMPLEX ADAPTIVE SYSTEMS

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Shana Sundstrom, Ph.D.

Project Duration: August 2012 – December 2015

Funding: U.S. Geological Survey Powell Center (RWO 16)

Project Location: Northwest United States and British Columbia, Canada

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Ecosystems are a type of complex system, and as such share general rules of behavior with other types of complex adaptive systems. Research across a wide variety of disciplines has uncovered rules of system dynamics that address features of self-organization and emergence. Work in the field of ecology has proposed that resilience may be an emergent phenomenon of complex adaptive systems, and in particular, social-ecological systems. Resilience is the amount of disturbance a system can absorb or buffer while staying organized around the same key structures, processes, and functions. As our understanding of non-linear dynamics and complex systems has grown in recent years, the concept of resilience has exploded, and a great deal of work has been done to understand how resilience emerges and what system components and interactions comprise resilience.

One of the key findings is summarized in the cross-scale resilience model, which proposes that the distribution of species and the functions they represent within and across the scales of an ecosystem plays a key role in system resilience. While most of the work has been explicitly focused on social-ecological systems, there is some tantalizing evidence to suggest that resilience and the cross-scale model may also be applicable to other types of complex adaptive systems, such as economies.

In a more applied exploration of these ideas, the role of species abundances, coupled with their distribution of function, is an element of the cross-scale model that remains unexplored.

This project has two objectives.

1. Explore the cross-scale model in greater detail at both ends of the research spectrum, building the theoretical foundations of the cross-scale model and thus its applicability to other complex adaptive systems, in order to expand understanding of the cross-scale model to incorporate species' abundances and potentially use it as a tool for identifying impending regime shifts.
2. Focus on improving our understanding of the relationship between cross-scale distributions, species' abundances, and regime shifts at a system level by using a comparison of a highly disturbed river basin system (the Lower Columbia River Basin, USA) against a less disturbed basin (the Fraser River Basin, Canada).

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## EVALUATING THE BENEFITS OF HIGHER DIVERSITY CRP PLANTINGS FOR AT-RISK SPECIES

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Bethany Teeters, Ph.D.

Project Duration: April 2011 – December 2013

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

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Land enrolled in the USDA Conservation Reserve Program (CRP) covers over a million acres in Nebraska. However, little attention has been given to the potential of CRP as a resource in the conservation of at-risk species. For policy and planning purposes, it is important to quantify the species composition of CRP plantings and the relative impacts of different grass and forb planting mixes on local diversity. For example, several designated at-risk butterfly species require specific plant species for successful reproduction. Additionally, forbs are needed as nectar sources for most adult species of butterflies. Landowners are not currently required to include any specific species in their CRP seeding mix, and forb diversity plantings vary.

The project objective is to evaluate potential habitat benefits of a variety of CRP planting mixes for at-risk species, including birds, butterflies, bees and fish.



**CRP Grassland**

Photo credit: Joseph J Fontaine

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## FREMONT STATE LAKES RENOVATION STUDY: THE EFFECTS OF ALUM APPLICATION AND FISHERY RENOVATION ON WATER QUALITY

Principal Investigator(s): Amy Burgin, Steve Thomas, Mark Pegg, Kevin L. Pope

Graduate Student(s): Brian Hammond, M.S.  
Christa Webber, M.S.

Project Duration: April 2012 –June 2014

Funding: Nebraska Department of Environmental Quality

Project Location: Fremont State Recreation Area, Douglas County, Nebraska

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The Fremont State Lake System (FLS) is made up of 20 sandpit lakes adjacent to the Platte River near Fremont, Nebraska and is used by 800,000 visitors annually. These lakes were created as early as the 1940's and many are now experiencing water quality problems related to eutrophication. High nutrient concentrations in the water column are driven primarily by internal loading from nutrient-rich sediments accumulated through deposition of leaves fallen from trees, shoreline vegetation, fish excrement, and decaying remains of fish and aquatic vegetation. Eight of the lakes in the Fremont State Lakes are on Nebraska's 2012 section 303(d) list of impaired waters with 30 different impairments. Recent renovations to Fremont Lake #20 and Carter Lake, through the application of aluminum sulfate (alum), produced an immediate and dramatic improvement to the water quality.

The goal of this study is to understand how physical drivers (e.g., lake-basin structure and groundwater flow) and biological drivers (e.g., fish community composition) interact to affect the longevity and effectiveness of alum additions for improving water quality. This will be addressed through three major tasks:

- 1) physical and chemical water quality monitoring,
- 2) analyzing the internal and external phosphorous (P) budgets, and
- 3) discerning how altered fish communities indirectly affect water-quality dynamics.

Fish community composition and structure data will be collected using a boat electrofisher and sediment traps to discern how alteration of the fish community affects rates of sedimentation and subsequent water quality. Certain lakes will have fish removed in addition to alum treatments, while others will receive no fish treatments. Using these methods will help determine which set of treatments will work best on these types of impaired lakes. Data will be collected on 16 lakes in 2012 prior to any fish removal or alum treatments, and again in 2013 after treatments have been made to determine how the treatments affected the fish communities and water quality. The information collected during this project will be useful in designing future lake renovation projects and developing long-term management plans for renovated lakes.

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## INDIRECT IMPACTS OF PREDATION AND WILDLIFE-FRIENDLY AGRICULTURAL PRACTICES ON PHEASANT BEHAVIOR AND POPULATION DYNAMICS

Principal Investigator(s): Joseph J. Fontaine, Larkin Powell

Graduate Student(s): Lindsey Messinger, M.S.

Project Duration: January 2012 – May 2015

Funding: Nebraska Game and Parks Commission

Project Location: Southwestern Nebraska

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Traditionally, wildlife managers have focused on the direct, consumptive impacts of predation on prey. However, the indirect impacts of predation and the risk of predation as perceived by prey are important in shaping prey morphology, physiology, and behavior. Indirect impacts of predation have been demonstrated in virtually all taxa and influence micro- and macro-habitat use, time allocation patterns, species distribution, population growth, and species interactions. By considering both direct impacts of predation (e.g., mortality) as well as indirect impacts (e.g., shifts in habitat selection, predator avoidance) wildlife managers may better predict how management actions effect wildlife populations.

In order to evaluate the non-consumptive impacts of predation risk, specifically, the behavioral responses prompted by perceived predation risk and the associated costs, we will evaluate behavioral responses of female ring-necked pheasants (*Phasianus clochicus*) to recreational hunting. This study system presents a unique opportunity to isolate and assess the indirect impacts of predation (i.e., stress caused by recreational hunting activities) in the absence of actual predation as hunter harvest is restricted to male pheasants only.

Because pheasants are a culturally and economically important game species in Nebraska and populations have been declining since the 1950s due to habitat loss and land use change, managers are interested in programs that will continue to support and increase existing pheasant populations. While lands enrolled in the Conservation Reserve Program (CRP) have been vital in supporting declining pheasant populations, participation in the program is expected to decline. Land managers in Nebraska are offering incentives to private landowners for employing wildlife friendly agricultural practices (e.g., grazing deferment, tall stubble height, and prescribed burning).

Our goal is to provide a better understanding of how pheasants use agriculturally-dominated landscapes and to identify the indirect impacts of recreational hunting on pheasant behavior and population dynamics (e.g., habitat use, distribution, and roost site selection) as well as evaluate the effectiveness and potential benefits of wildlife friendly agricultural practices within the Southwest Focus on Pheasants area in Southwestern Nebraska. Over the next three years, we will use radio-telemetry to track the movements and evaluate the behavior of hen pheasants during the hunting season as well as identify optimal and limiting conditions for pheasant survival during the fall and winter (hunting season).



**Pheasant hunting, southwest Nebraska**  
Photo: Jessica Laskowski



**Radio collared hen pheasant**  
Photo: Lindsey Messinger

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## INFLUENCE OF TROUT STOCKING ON TIER I/II FISHES

Principal Investigator(s): Kevin L. Pope, Mark Pegg  
Graduate Student(s): Kelly C. Turek  
Project Duration: May 2011 – April 2014  
Funding: Nebraska Game and Parks Commission  
Project Location: Statewide Nebraska

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Currently, the Nebraska Game and Parks Commission discourages stocking trout in streams that are home to tier I/II fishes because of concern for native fish communities. Tier I/II fishes, or species of concern, are species for which conservation actions are considered vital for survival. Specifically, there is concern that introduced trout will consume or outcompete (i.e., potentially harm) individuals of tier I/II fishes, which is prohibited by law.

The goal of this project is to gain a better understanding of the interactions between non-native trout and native species of concern in Nebraska headwater streams to better predict the outcomes of future trout stockings. The first objective of this project was to synthesize the current scientific knowledge of potential interactions between trout and tier I/II fishes to provide the necessary background information to either (a) predict the likely outcome of trout stockings or (b) design a controlled experiment to gain information necessary to make such a prediction. A literature review of trout influences on species of concern, as well as a field inventory of Nebraska trout streams, was completed during 2011. There is a lack of experimental studies that assess interactions between non-native trout and native tier I/II fishes. There were however, many cases of circumstantial evidence of negative interactions between non-native trout and native species. More definitive research is needed before conclusions can be made about the influences of stocking non-native trout on native species of concern.

Fifty-eight sites in headwater streams throughout Nebraska with historical non-native trout presence were assessed during 2011. Six species of concern were collected from these sites: blacknose dace *Rhinichthys atratulus*, finescale dace *Phoxinus neogaeus*, flathead chub *Platygobio gracilis*, northern redbelly dace *Phoxinus eos*, pearl dace *Margariscus margarita*, and plains topminnow *Fundulus sciadicus*. Thirty-five of the sites surveyed contained trout, 16 contained species of concern, and only 6 sites contained both trout and species of concern. It is unclear from this assessment whether non-native trout negatively influence species of concern. Therefore, we will use in-stream enclosures to assess the interactions between rainbow trout *Oncorhynchus mykiss*, a non-native trout species, and pearl dace, a native species of concern. The main objective is to experimentally determine if rainbow trout have a negative influence on pearl dace. Additionally, we will determine the relative effects of the influences of rainbow trout compared to the influences of creek chub *Semotilus atromaculatus*, a native fish predator of pearl dace.



**Rainbow Trout**  
Photo credit: Roger Tabor, USFWS

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## LOCAL AND LANDSCAPE CONSTRAINTS ON HABITAT MANAGEMENT FOR UPLAND BIRDS

Principal Investigator(s): Joseph J. Fontaine, Larkin Powell

Graduate Student(s): Christopher F. Jorgensen, M.S.

Project Duration: January 2010 – December 2012

Funding: Nebraska Game and Parks Commission

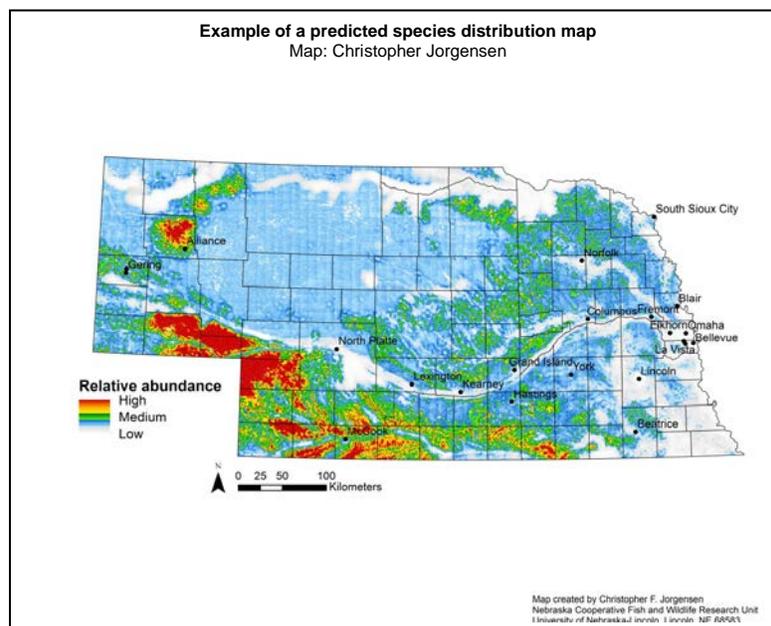
Project Location: Statewide Nebraska

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Throughout the Great Plains, changing land-use practices are resulting in large scale biodiversity loss and an ever increasing dependence on effective conservation and restoration efforts provided by private, state, and federal agencies. Yet, far too often local management efforts fail to demonstrate the desired outcome for wildlife populations. Understanding why management actions are unsuccessful is paramount, but past studies often fail to consider the importance of ecological mechanisms that act across multiple spatial and temporal scales. By exploring how grassland bird communities select habitat based on local vegetative composition as well as landscape attributes, we can gain perspective on why populations and communities fail to react to apparently suitable habitat improvements.

Using geographic information system spatial analysis tools, we are analyzing data from avian point count surveys and local vegetation assessments within a larger land cover layer of Nebraska. The resulting outputs are being employed to create species specific spatial models for Nebraska which identify key focus areas to implement management efforts with the goal of maximizing management benefits to grassland bird communities.

Over the 2010, 2011, and 2012 field seasons, roughly 3000 avian point count surveys were conducted on State Wildlife Management Areas, private properties enrolled in the Open Fields and Waters program, road transects and other private properties enrolled in CRP throughout much of Nebraska. In order to validate our spatially explicit species distribution models, this past field season we added 10 transects located in the panhandle, north-central, and north-eastern portions of the state. Analysis of habitat factors influencing upland species and other obligate grassland birds indicates that the surrounding landscape strongly affects local habitat suitability. Thus, the success or failure of conservation efforts on the ground may be determined by the landscape context.



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## MAKING ADAPTIVE MANAGEMENT MEANINGFUL: TRANSLATING SCIENCE LEARNING INTO POLICY DECISION-MAKING

Principal Investigator(s): Craig R. Allen, Kyle Hoagland

Graduate Student(s): Chad Smith, Ph.D.

Project Duration: July 2008 –

Funding: No external funding

Project Location: Platte River in Nebraska, Colorado, Wyoming

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Chad Smith continues his research into the gap between science and decision-making in adaptive management programs and tools to successfully bridge that gap.

The working title of his dissertation is “Making Adaptive Management Meaningful: Translating Science Learning into Policy Decision-Making.” Adaptive management has been and continues to be implemented around the country and world, yet few examples exist of programs successfully implementing all six steps (Assess → Design → Implement → Monitor → Evaluate → Adjust) of adaptive management. A key break point in this process seems to be synthesizing collected data and using that synthesis to tell a story about what data say in regard to key questions and hypotheses in a way that is useful to decision-makers and results in positive changes in management or policy.

Research will:

1. explore the science and policy interface in a comparative study of several adaptive management programs,
2. provide specific background on this issue as it relates to the Platte River Recovery Implementation Program,
3. showcase decision analysis other tools that can be used as decision support in the Platte River and other adaptive management programs, and
4. discuss opportunities for and challenges to bridging the science/policy gap.

Smith is applying learning from his research in the real world, serving as Adaptive Management Plan implementation coordinator for the Platte River Recovery Implementation Program. He is also co-lead of a small team writing an Adaptive Management Plan for the Middle Rio Grande Endangered Species Collaborative Program.

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## MISSOURI RIVER MITIGATION: IMPLEMENTATION OF AMPHIBIAN MONITORING AND ADAPTIVE MANAGEMENT FOR WETLAND RESTORATION EVALUATION

Principal Investigator(s): Craig R. Allen, Martin Simon (Benedictine College)

Graduate Student(s): Ashley VanderHam, M.S.  
Michelle Hellman, M.S.

Project Duration: July 1, 2009 – March 2014

Funding: U.S. Geological Survey (RWO 11)  
U.S. Army Corps of Engineers

Project Location: Missouri River Corridor of Iowa, Kansas, Missouri and Nebraska

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Data are being collected to determine what constitutes a successful wetland restoration, given the desired goals of the U.S. Army Corps of Engineers. Herpetofauna—primarily amphibians—are being used as indicators of wetland success. This will be accomplished by quantifying the occurrence and recruitment of amphibians at existing mitigation sites and formulating models of quality wetland restorations. These models will be used by managers in future restorations and for adaptive management approaches to the design of new wetland restorations. The study area is the Missouri River corridor of Iowa, Kansas, Missouri and Nebraska.

This project is a multi-institutional monitoring program that focuses on tightly linking monitoring with hypothesis testing in an adaptive framework. The design consists of frog call surveys to determine occupancy rates for a large number of wetlands on numerous restoration properties, coupled with intensive sampling of frogs, turtles and salamanders to assess abundance and recruitment on eight restored wetland complexes in four states. The focus areas for the Nebraska Coop Unit are three Missouri River wetland complexes located from Falls City to Omaha, Nebraska. Project collaborators at Benedictine College in Kansas are focusing on the Benedictine Wetlands in Kansas.

The third season of the Wetland Herpetofaunal Survey has been completed. Breeding anuran call surveys were conducted as well as tadpole dip-netting over three seasons in April, May and June 2012. In July 2012, turtle trapping was implemented to obtain species richness and abundance estimates. The fourth field season will begin April 2013.

The results will be used to create spatial models of the herpetofauna's distribution during the survey period.



**Snapping Turtle**  
Photo credit: Jessica Umberger



Credit: USGS

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## MONITORING, MAPPING, RISK ASSESSMENT, AND MANAGEMENT OF INVASIVE SPECIES IN NEBRASKA

Principal Investigator(s): Craig R. Allen  
Coordinator: Karie Decker  
Project Duration: January 1, 2010 – December 31, 2014  
Funding: Nebraska Game and Parks Commission  
Project Location: Statewide Nebraska  
Website: <http://snr.unl.edu/invasives/>

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Funding was provided by a federal-aid grant from the Nebraska Game and Parks Commission to:

- Provide outreach to and facilitate communication among stakeholders regarding biological invasions, and formalize the Nebraska Invasive Species Advisory Council through legislation, assist in additional legislation regarding invasive species as needed.
- Develop management tools including an invasive species adaptive management plan, a risk analysis for high-risk invasive species in Nebraska, a multi-agency prevention protocol for preventing the spread of invasive species (terrestrial and aquatic), identification of invasive species introduction pathways.

The Invasive Species Project coordinated monthly meetings for the Invasive Species Council, which focused efforts on developing new outreach tools, an Aquatic Invasive Species Prevention Protocol, and prioritized lists of invasive species in Nebraska. The new lists have been distributed across institutions and agencies, and are in use by various natural resource managers. We held a Nebraska Weed Management Summit in 2012 to promote the new lists, and are now using the USDA APHIS PPQ Weed Risk Assessment for priority species, representing a step towards building an *Early Detection and Rapid Response* capacity in Nebraska.

In April, the Nebraska Governor signed into law a new invasive species law prohibiting the possession or transport of aquatic invasive species. It also formally created the Nebraska Invasive Species Council. The Nebraska Invasive Species Project provided educational materials and attended meetings to inform state legislatures of current invasive species issues in Nebraska.

The Invasive Species Project developed several outreach tools and participated in a variety of outreach events in order to provide information regarding identification, prevention, and management of invasive species. An estimated 20,000 people have received invasive species information during the past year.

The Nebraska Invasive Species Project website (<http://snr.unl.edu/invasives/>) now receives over 250 visitors each week (representing 63 countries). We distributed five newsletters in 2011 to more than 700 organizational, agency, and landowner representatives. We also developed a packet of invasive species lesson plans and educational materials for GK-12 designed for the classrooms. These materials were presented at two teacher's conferences in October. Mass media helped to distribute invasive species information around the state—we developed and published articles in Nebraska's *Prairie Fire*, and interviewed for several newspaper articles (*Omaha World Herald*, *Lincoln Journal Star*, *Harlan County Journal*). We also interviewed for three radio shows (*NE Outdoor Radio*, *KFAB Omaha*, and *KQSK Chadron*).

In 2011 invasive species technicians monitored various Nebraska reservoirs for zebra mussel veligers. All samples from 2011 were negative for zebra/quagga mussel veligers, including the recently infested Zorinsky Lake (which was treated in 2010-2012). Sampling will continue throughout 2012. A watercraft decontamination protocol was developed for NGPC agency staff and is now required to help prevent the spread of Aquatic Invasive Species. The Invasive Species Project also helped provide guidance for several graduate students, including a publication with graduate students in Invasive Plant Science and Management.



**Invasive species staff attended a variety of outreach events in 2011-2012**  
Photo: Karie Decker

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## POLLINATOR ASSEMBLAGES IN SOUTHEAST PRAIRIES AND SANDSTONE PRAIRIES BIOLOGICALLY UNIQUE LANDSCAPES

Principal Investigator(s): Craig R. Allen, Chris Helzer (The Nature Conservancy)

Graduate Student(s): Bethany Teeters, Ph.D.  
Christopher Wood, M.S. (UNO)

Project Duration: June 2009 – June 2015

Funding: Nebraska Game and Parks Commission, National Science Foundation

Project Location: Southeast Nebraska, Pawnee County

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The Southeast Prairies Biologically Unique Landscape (BUL) is part of the Southeast Nebraska Flagship Initiative, a partnership that includes The Nature Conservancy, Northern Prairies Land Trust, Spring Creek Prairie Audubon Center and the Nebraska Game and Parks Commission. The implementation of Flagship Initiatives—including that in the Southeast Prairies BUL—follows from the Nebraska Legacy Plan to implement a proactive approach to conserving non-game wildlife and biological diversity in an adaptive management framework. The overall goal is to determine how to most effectively and efficiently manage prairies while maintaining critical plant-insect relationships indicative of system functioning.

This project aims to evaluate the current and potential viability of ecological systems within priority landscapes. It began as a pilot study in 2011 conducted by Bethany Teeters in which the bee assemblages were compared between extremely isolated prairie fragments and large, well-connected fragments. This was a continuation of Chris Wood's work in which habitat factors that influence the structure of the pollinator community in the southeast prairies were examined. His goal was to determine which factors have the greatest impact on abundance and species richness in tallgrass prairie fragments. As most remnant prairie fragments are privately owned, this knowledge will be useful when approaching landowners about management techniques that benefit both agriculture and prairie conservation. After all, the majority of angiosperms are dependent upon pollinators for reproduction, including prairie forbs. Understanding population viability for various pollinator taxa and how that status differs across the landscape will help improve land management strategies that support conservation efforts.

Research currently focuses on bees as a key insect group that provides an important ecosystem service: pollination. Future research will include other insect pollinator groups, such as skippers and other Lepidoptera. Chris Wood is in the process of analyzing his data, after having identified all of his captured pollinator species from 2009 and 2010. Bethany Teeters will continue work on pollinator diversity in remnant tallgrass prairie and other grassland ecosystems in the coming years. Specifically, the abundance and species richness of bees and other pollinators will be compared between CRP land, pasture, and remnant prairie, as these are the dominant grassland types in the area and vary considerably in the diversity and availability of floral resources for pollinators. The goal is to evaluate the functioning of ecosystem services and identify important factors that influence the pollinator community in this landscape. Such information will be valuable for making appropriate land management and conservation recommendations.

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## POPULATION ASSESSMENT OF CHANNEL CATFISH IN NEBRASKA

Principal Investigator(s): Kevin L. Pope

Graduate Student(s): Lindsey Chizinski, M.S. (2012)

Project Duration: January 2008 – January 2012

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

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Channel catfish (*Ictalurus punctatus*) is an important sport fish, particularly in the Great Plains. In Nebraska, a majority of anglers target channel catfish, and fishing activities are a vital part of the state's economy. Lentic water bodies provide the primary fishing opportunity for catfish anglers in Nebraska. Despite the popularity and economic importance of channel catfish, little is known of its population dynamics or habitat requirements, and existing studies often profile river populations.

Current standards for sampling channel catfish in lentic systems often yield inadequate catch to assess populations. The objective of this study was to utilize a recently developed sampling method, tandem-set hoop nets, to collect channel catfish in sufficient quantities to describe the effects of stocking and habitat variability on populations in lentic ecosystems. Three lentic ecosystems common to the Great Plains were considered: sand pits, flood-control reservoirs, and irrigation/power-generation reservoirs.

The influence of stocking on abundance and condition of channel catfish varied with ecosystem type. In sand pits, stocking negatively influenced fish condition, and only stocking on an annual basis positively influenced abundance. In flood-control reservoirs, stocking did not influence fish condition, but was associated with greater abundance. In irrigation/power-generation reservoirs, stocking did not influence fish condition or abundance. Additionally, there was evidence that mortality and growth rates varied with ecosystem type. In general, channel catfish from irrigation/power-generation reservoirs were predicted to experience slower growth and lower mortality, whereas channel catfish from sand pits were predicted to experience the fastest growth and highest mortality.

Catch rates of channel catfish were substantially less in this study compared to previous records of tandem-set hoop net surveys, but hoop nets were more efficient than the current standard gear, experimental gill nets, at capturing channel catfish. That is, 100 channel catfish could be captured with fewer sets of hoop nets than gill nets. However, catch rates and size structure of channel catfish in tandem-set hoop nets varied within the sampling season and between years. Furthermore, length-frequency distributions of channel catfish were dissimilar between hoop nets and gill nets.

This project was completed with a thesis submission and successful defense during January 2012.

**Hoop nets**  
Photo credit: Lindsey Chizinski



**Removing catfish spine**  
Photo credit: Lindsey Chizinski



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## POPULATION ASSESSMENTS OF TEMPERATE BASSES IN NEBRASKA RESERVOIRS

Principal Investigator(s): Kevin L. Pope, Christopher J. Chizinski

Graduate Student(s): TBD

Project Duration: August 2012 – June 2014

Funding: Nebraska Game and Parks Commission

Project Location: Southeastern Nebraska

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Branched Oak and Pawnee reservoirs are two waterbodies in eastern Nebraska that provided important local fisheries for nearly half of Nebraska's population. Littoral species of fish, such as black crappie, bluegill and largemouth bass, dominated the angler catch early in the life of these reservoirs. However, sedimentation and erosion have substantially altered the habitat of these reservoirs, which resulted in shift from clear-water littoral habitat to turbid-water limnetic habitat. These habitat changes caused a shift in the sportfish community from one dominated by shallow-water species such as black crappie, bluegill and largemouth bass, to one dominated by open-water species such as walleye and white bass. In addition to habitat changes, introductions of the white perch into these reservoirs have caused additional changes in the fish communities and their associated dynamics. Since their introduction, white perch numbers have increased precipitously over the last 15 years resulting in populations of stunted white perch. Elimination of the stunted status for these white perch populations through increased stocking of predators has been unsuccessful to date.

This study will provide an in depth analysis of the white perch populations in these two Nebraska reservoirs. Specifically, we will estimate the biomass of each white perch population and quantify the spatiotemporal (daily and seasonally) distribution of white perch in both reservoirs. We are currently recruiting a M.S. student for this project.

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## PREDICTING VARIATION IN SPRINGTIME WETLAND OCCURRENCE AND FLOODED AREA IN NEBRASKA'S RAINWATER BASIN

Principal Investigator(s): Craig R. Allen, Scott Taylor (NGPC), Andy Bishop (Rainwater Basin Joint Venture)

Graduate Student(s): Daniel Uden, Ph.D.

Project Duration: August 2010 –

Funding: Nebraska Game and Parks Commission  
USGS Great Plains Landscape Conservation Cooperative

Project Location: Rainwater Basin, Nebraska

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The Rainwater Basin region of south-central Nebraska is a critical stopover location for migratory waterfowl and shorebirds along the Central Flyway. Rainwater Basin wetlands serve as spring staging areas where birds rest, feed and pair before resuming northward migrations. Since 19th Century European settlement, approximately 90% of wetlands in the region have been altered through conversion to agriculture and many remnant wetlands are severely degraded by agricultural practices. Despite these losses, remnant and restored wetlands continue to serve as important spring migratory waterfowl and shorebird stopover locations.

The majority of Rainwater Basin wetlands are ephemeral in nature and the occurrence and degree of springtime wetland inundation varies between locations and years. Inundation is believed to be driven by individual wetland characteristics, surrounding landuse and local weather events; however, it is unclear exactly how individual factors and their interactions impact wetland flooding.

We employed generalized linear mixed models to explain variance in the occurrence and flooded area of Rainwater Basin wetlands in 2004 and 2006–2009, using individual wetland characteristics and suite of weather related variables. Both springtime wetland occurrence and flooded area were negatively influenced by row crop agriculture, proximity to irrigation reuse pits, increased hydric footprint shape complexity, and increased autumn and winter mean maximum temperatures. Alternatively, more hydric soils, increased precipitation and a greater number of winter days when the maximum temperature never rose above freezing increased wetland occurrence and flooded area. Predictive models could assist managers in assessing and providing springtime stopover habitat to migratory avifauna.

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## RECRUITMENT OF WALLEYE AND WHITE BASS IN IRRIGATION RESERVOIRS

Principal Investigator(s): Kevin L. Pope

Graduate Student(s): Jason DeBoer, M.S.  
Robert Kill, M.S.  
Ryan Lueckenhoff, M.S. (2011)  
Dustin Martin, M.S. (2008)

Project Duration: September 2006 – August 2013

Funding: Nebraska Game and Parks Commission

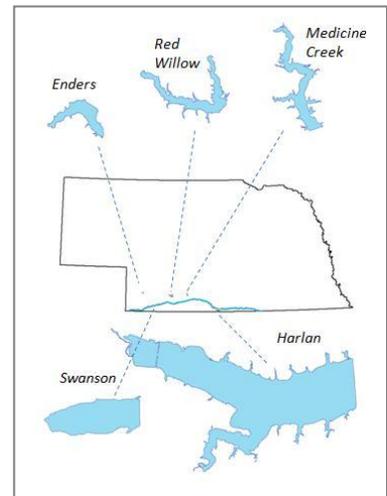
Project Location: Enders Reservoir, Medicine Creek Reservoir, Red Willow Reservoir, and Swanson Reservoir, Nebraska

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The five reservoirs within Nebraska's Republican River watershed (Swanson, Enders, Red Willow [also referred to as Hugh Butler Lake], Medicine Creek [Harry Strunk Lake], and Harlan County) were built primarily for flood control and irrigation, resulting in large in-reservoir water-level fluctuations within and among years. These reservoirs also provide important fisheries for anglers in southwest Nebraska, with walleye and white bass being of particular importance. However, continued annual stockings of walleye are necessary because natural production is limited. In contrast, white bass populations are self-sustaining within these reservoirs, although recruitment is extremely erratic (i.e., weak or missing year-classes are common) in all but Harlan County Reservoir.

The purpose of this project is to gain an understanding of the factors affecting recruitment of walleye and white bass in irrigation reservoirs. The primary foci are documenting the relative importance of spawning habitats and determining when the suspected recruitment bottleneck for walleye and white bass occurs in southwest Nebraska irrigation reservoirs. This information is vital for understanding reservoir fish ecology in semi-arid regions.

Data collection is nearly complete for this project, and sample processing is well underway. We will assess temporal and spatial trends in larval fish abundance from the last four years, and compare these trends to trends in abundance of zooplankton—the primary prey of larval walleye and white bass—to understand how predator-prey interactions in these systems affect fish production. We are also building mathematical models to gain insight into the interactions of abiotic and biotic factors in regulating recruitment of walleye and white bass.



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## THE RELATIONSHIP BETWEEN DIVERSITY AND ECOLOGICAL FUNCTIONS

Principal Investigator(s): Craig R. Allen, Chris Helzer (The Nature Conservancy), LaReesa Wolfenbarger (UNO)

Graduate Student(s): Kristine Nemeč, Ph.D.

Project Duration: July 1, 2005 – June 30, 2012

Funding: James S. McDonnell Foundation  
Nebraska Game and Parks Commission  
The Nature Conservancy  
The National Science Foundation IGERT Program

Project Location: Central Platte River Valley, Nebraska

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Restoration of grasslands is an important ongoing management activity on many public lands in Nebraska. This project is investigating the relationship between species diversity in prairie restorations and ecological functions at relatively large spatial and temporal scales utilizing restorations along the Platte River in south central Nebraska. The relationship between restoration diversity and ecological functions (e.g., pollination, soil development, resistance to invasion and herbivore control) remains poorly understood. Invasion by aggressive plant species, erosion of diversity over time, and failure to withstand drought or other disturbances are all possible results of unsuccessful restorations. This project seeks to understand how grassland plant diversity affects the provision of ecological services.

We have identified existing high diversity restorations and low diversity remnant grasslands (pastures) as large scale study sites (approximately 100 acres). We also established twenty-four 0.75-acre plots which are planted to six replicates each of four treatments:

- high diversity sites of about 100 species normally planted by The Nature Conservancy, and at double the normal seeding rate; and
- sites using the Natural Resources Conservation Service CP25 seed mix (15 species) at normal and half-normal seeding rates.

These sites are currently being used to assess plant invasion resistance among the treatments, and to assess soil development, herbivory levels, and predatory invertebrate communities.

All data analysis for the project has been completed. Herbivory levels of two native perennial forbs, *Solidago canadensis* and *Ratibida columnifera*, did not differ significantly among the treatments in 2010 and 2011. Diversity was a significant effect in explaining the levels of soil nutrients, with low diversity plots containing higher amounts of nitrate and ammonium than the high diversity plots in 2008 and 2009.



Photo Credit: Kristine Nemeč



Photo Credit: Kristine Nemeč

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## RAINWATER BASIN JOINT VENTURE SCIENCE

Principal Investigator(s): Craig R. Allen, Andy Bishop (Rainwater Basin Joint Venture Partnership)

Coordinator: Christopher Jorgensen

Project Duration: May 2012 –

Funding: Rainwater Basin Joint Venture

Project Location: Nebraska

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The Management Board of the Rainwater Basin Joint Venture (RWBJV) is committed to implementing the Strategic Habitat Conservation Business Model. This science-based model requires a commitment of resources and time to develop a strong biological foundation for delivering conservation planning, design research and monitoring to the appropriate sites. To fulfill this commitment, the University of Nebraska–Lincoln hired Christopher Jorgensen as the Rainwater Basin Joint Venture (RWBJV) Science Coordinator. The position is housed in the Nebraska Cooperative Fish and Wildlife Research Unit and is funded by the Rainwater Basin Joint Venture.

As science coordinator, Chris will help plan, implement, and develop science-based conservation programs in Nebraska's Rainwater Basin and mixed-grass prairie region. He is working with other RWBJV personnel to develop predictive models and decision support tools that aid in identifying types of habitat and locations where conservation is likely to benefit migratory birds and other wildlife. In addition, Chris is in charge of monitoring and evaluating the success of ongoing and past conservation projects, and is collaborating with other researchers from various federal, regional, and state conservation organizations and agencies to expand knowledge of the region's conservation needs.

The RWBJV is a partnership composed of conservation agencies, local government bodies, non-profit organizations, and individuals, each contributing their expertise and resources to the protection and restoration of wetland habitat and other native habitats in Nebraska's Rainwater Basin and mixed-grass prairie region.

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## RIVER OTTER HOME RANGE AND HABITAT USE

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Sam Wilson, M.S. (2012)  
Amy Williams, M.S. (2011)

Project Duration: May 1, 2006 – December 31, 2010

Funding: Nebraska Game and Parks Commission

Project Location: Platte River, Nebraska

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River otters (*Lontra canadensis*) are native to Nebraska but were extirpated by the early 1900s. River otters became reestablished in Nebraska following their reintroduction in the mid 1980s and early 1990s by the Nebraska Game and Parks Commission (NGPC). The species is currently listed as threatened in Nebraska. Despite the high profile of the reintroduction and the otters' role as a flagship species, relatively little is known about river otter ecology in Nebraska. In order to provide information for management, research was conducted to determine home range, habitat use, overnight movement distance, and annual survival of river otters in the central Platte River of Nebraska.

Eighteen river otters were trapped, implanted with telemetry transmitters, and tracked during 2006–2009. Researchers obtained 996 telemetry locations and constructed 13 annual home ranges. Male home ranges were larger than female home ranges. Habitat use was determined by comparing used versus available habitats using compositional analysis. Open water was used more than any other habitat type in all three comparisons tested.

Nineteen overnight movements were recorded (465 total telemetry locations) for four river otters during 2007–2008. Movements during January–February, when NGPC conducts winter bridge surveys, were lower than during the rest of the year. Annual survival was 100% as no river otter mortalities were detected during the study period.

River otters in the central Platte River select open water over other habitat types, exhibit reduced movements during winter months, and have high annual survival. This information will be used by NGPC to assess the status of river otters in Nebraska and direct management efforts for the species.

This project was completed with a thesis submission and successful defense during July 2012.



**Sam Wilson and Kent Frick releasing an implanted otter**

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## SOUTHEAST PRAIRIES AND SANDSTONE PRAIRIES BIOLOGICALLY UNIQUE LANDSCAPE RESEARCH

Principal Investigator(s): Craig R. Allen, Chris Helzer (The Nature Conservancy), Jarren Kuipers (NPLT), Gerry Steinauer (NGPC)

Graduate Student(s): Kody Unstad, M.S. (2012)  
Christopher Wood, M.S. (UNO)

Project Duration: June 2008 – June 2013

Funding: Nebraska Game and Parks Commission

Project Location: Southeast Nebraska

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The Southeast Nebraska Flagship Initiative is a partnership that includes The Nature Conservancy, Northern Prairies Land Trust, Spring Creek Prairie Audubon Center and the Nebraska Game and Parks Commission. The implementation of Flagship Initiatives—including that in the Southeast Prairies Biologically Unique Landscape (BUL)—follows from the Nebraska Legacy Plan to implement a proactive approach to conserving non-game wildlife and biological diversity in an adaptive management framework. The overall goal is to most effectively and efficiently manage prairies, while maintaining critical plant-insect relationships indicative of system fluctuation.

Despite providing many services, the tallgrass prairie and its ecological community is one of the most endangered ecosystems in North America. Remaining habitat exists as remnants in a highly-fragmented landscape. To make informed conservation decisions, we need to better understand the effects of this fragmentation. Using the ecologically important insect groups, ants and ground beetles, this study provides baseline data on the biological diversity of southeast Nebraska prairies and investigates what management, landscape, and habitat characteristics affect them. Pitfall trap sampling was conducted in 23 tallgrass remnants scattered throughout the Southeast Prairies Biologically Unique Landscape in 2010 and 2011. Multi-model inference was used for analysis of the data.

Twenty-eight species of ants were collected with the majority being grassland-obligates. With a positive correlation, model selection results indicate that Shannon diversity of grassland ants is best predicted by the average number of grass species per m<sup>2</sup> while their abundance is positively associated with the amount of nearby hay meadow. Most ants belonged to the Opportunist and Cold Climate Specialist functional groups. A comparison with prior studies indicates this functional group composition to be most similar to cool-temperate forests. Though different habitats, their cooler climates likely produce this similar composition.

Nineteen species of ground beetles were collected, with two species comprising nearly 95% of the collection. These two species are incapable of flight, a physiological factor that may contribute to their high abundances by leaving them hidden from predators. As with grassland ants, the strongest predictor of Shannon diversity for ground beetles was the average number of grass species per m<sup>2</sup>.

Results suggest that ants and ground beetles are non-randomly distributed in relation to landscape, habitat, and management factors. High abundances of grassland-obligate ants are associated with high amounts of hay meadow suggesting these areas may be a priority for ant conservation. Results also suggest that sites with more grass species sustain more diverse communities of ants and ground beetles, information that can be incorporated into relevant conservation decisions.



Grasslands in SE Nebraska

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## STOPOVER DECISIONS OF MIGRATORY SHOREBIRDS: AN ASSESSMENT OF HABITAT, FOOD, BEHAVIOR AND PHENOLOGY

Principal Investigator(s): Joseph J. Fontaine, Susan Skagen (USGS Fort Collins Science Center)

Graduate Student(s): Ryan Stutzman, M.S.  
Caitlyn Gillespie, M.S.

Project Duration: January 2010 - January 2013

Funding: U.S. Geological Survey National Climate Change and Wildlife Science Center RWO 12)

Project Location: Nebraska, North Dakota, South Dakota

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The wetlands of the Great Plains are increasingly altered by changing conditions, but remain an important stopover and breeding habitat for a variety of migratory bird species, including 37 species of shorebirds. Although shorebirds use highly altered wetlands, the extent to which these habitat decisions represent true preference and are adaptive remains unclear. Furthermore, it remains unknown how agricultural expansion is affecting mid-continental shorebird populations

To identify the influence of changing land-use practices and local phenology on avian habitat preferences, surveys were conducted for migrating and breeding shorebirds from April to June of 2010 and 2011 in three counties in north-central South Dakota. Our results show that migratory shorebirds prefer highly-altered, agricultural wetlands, which have lower invertebrate (food) abundance than do grassland wetlands. However, by examining migrant behavior, we were able to identify other potential selection pressures that may be shaping stopover habitat selection and may be acting as a buffer against the negative effects of such a choice. We found that individuals have a higher foraging rate and search effort at preferred habitats, indicating that foraging efficiency, rather than food availability, is the limiting factor in this system.



We also examined the influence of local phenologic factors on shorebird migration and invertebrate abundance to compare potential sensitivity of each to climate change and other phenologic factors. We found that shorebird migration coincides with invertebrate food resources, indicating that migrants may be sensitive to climate-driven changes in food resource phenology.

The initial phase of the project is in the final stages, as we are currently preparing manuscripts for publication with a targeted submission date of early fall 2012. In the coming spring we will begin testing some of the patterns we have found using large scale experiments.



**Shore birds**  
Photo credit: Joseph Fontaine

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## TESTING FOR THE PRESENCE OF THE CHYTRID FUNGUS (*BATRACHOCHYTRIUM DENDROBATIDIS*) IN AMPHIBIAN POPULATIONS ACROSS NEBRASKA

Principal Investigator(s): Craig R. Allen, Ted LaGrange (NGPC)

Graduate Student(s): Nick Smeenck, Ph.D.

Project Duration: August 2010 – May 2014

Funding: Nebraska Game and Parks Commission  
U.S. Environmental Protection Agency (EPA)

Project Location: Statewide Nebraska

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Many worldwide amphibian population declines and mass mortality events have been attributed a fungal infection chytridiomycosis (chytrid) caused by the fungal zoospore *Batrachochytrium dendrobatidis* (Bd). Although the exact mechanism by which mass mortalities occur from chytrid is unknown, it is hypothesized that the chytrid fungus infects keratinized epidermal cells of postmetamorphic frogs with death caused by: 1) disruption of osmoregulation; 2) the absorption of a fungal toxin; 3) or a combination of these factors. Concern over the potential ecological consequences of such rapid and drastic extinctions has led to an increase in effort studying the potential effects of emerging infectious disease on amphibian populations. Furthermore, scientific and technological advances in non-invasive techniques to detect the chytrid fungus have changed the ability of researchers and managers to track the distribution of and measure the population fluctuations and declines caused by infectious disease such as chytrid.

The chytrid fungus is known to occur in Nebraska and has been found in amphibian populations located in eastern Nebraska as well as along the Central Platte River. Although sporadic testing for the chytrid fungus in populations of native amphibians has occurred in Nebraska, a statewide survey has never been conducted. This lack of knowledge pertaining to the current distribution of chytrid the state must be rectified. Doing so will not only allow researchers to know where chytrid is currently found in the state, but also aid in the development of predictive models and help in the understanding of factors that may help or mitigate the further spread of chytrid.

Therefore, it is the primary goal of this study to determine the current extent of chytrid in Nebraska by swabbing larval amphibians and collecting water samples from 110 populations statewide. Using PCR, the samples will be tested for the presence of Bd zoospores. The presence/absence of chytrid in amphibian populations will be used to model the distribution of chytrid based on environmental covariates associated with wetland condition and amphibian call surveys. The results of these models will be used to develop predictive maps of the potential spread of chytrid based on important environmental and anthropogenic variables.

During the spring and summer of 2011 and 2012, researchers visited wetlands in eastern and central Nebraska. During site visits, tadpoles were captured using dip nets. At those sites where tadpoles were captured, each individual was swabbed using a sterile swab. In 2011, samples were collected at nearly 20 sites. Unfortunately, due to an early spring in 2012, sampling was not as successful and samples were collected from only a few sites. During the spring and summer of 2013 and spring of 2014, researchers will focus on collecting chytrid samples from additional wetland sites.



**Grace Kostal and Nathan Baird Testing for Chytrid Fungus**  
Credit: Craig Allen

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## UNDERSTANDING AND MANAGING FOR RESILIENCE IN THE FACE OF GLOBAL CHANGE

Principal Investigator(s):	Craig R. Allen, Shana Sundstrom, Kirsty Nash (James Cook University, Australia)
Graduate Student(s):	Shana Sundstrom, Ph.D. Kirsty Nash, Ph.D.
Project Duration:	August 2012 – December 2015
Funding:	U.S. Geological Survey, Powell Center for Analysis and Synthesis (RWO 16)
Project Location:	Global

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Resilience science provides a conceptual framework and methodology for quantitatively assessing the ability of a system to remain in a particular state. Probable non-linear ecological responses to global change, including climate change, require a clear framework for understanding and managing resilience. However, much of the resilience research to date has been qualitative in nature, and frameworks developed for the implementation of resilience science have been either vague or focused on the social component of social-ecological systems. Attempts to quantify resilience and operationalize the concept include the cross-scale resilience model, discontinuity theory and the early detection of leading indicators of regime shifts. More work is needed to support the effective use of resilience theory for managing ecological systems. We propose to address gaps in the science of ecological resilience in order to develop a usable framework for the implementation of resilience science by natural resource managers. We will do this by accomplishing a series of related but discrete tasks.

1. The first is to synthesize the current state of discontinuity research, the language barriers to communicating complex systems science and discontinuities, and the key criticisms of discontinuity theory in order to present a defined direction for how these criticisms could be addressed and/or tested.
2. The second task is to determine whether changes in species abundance can be a leading indicator of system-level regime shifts and an indication of the location of scale breaks within the scales of a system, and test the hypothesis that the location of species with the highest variance in abundance will be non-random.
3. The third task is to develop a new conceptual model of the relationship between biodiversity, scale and resilience that accounts for abundance and functional response diversity.
4. The fourth task is a synthesis of our discussions and basic research and would culminate in the development of a resilience framework for managers.

To accomplish these goals we will develop a working group of international team of scientists working in a broad range of social-ecological systems. Working group meetings will be arranged to collaboratively address these tasks.

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## WETLAND CONDITION ASSESSMENT

Principal Investigator(s): Craig R. Allen, Ted LaGrange (NGPC)

Graduate Student(s): Nick Smeenck, Ph.D.

Project Duration: August 2010 – May 2014

Funding: Nebraska Game and Parks Commission  
U.S. Environmental Protection Agency (EPA)

Project Location: Statewide Nebraska

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Since 1867, Nebraska has lost nearly 35% of its wetland resources, which equates to a loss of over one million acres of wetlands across the state. As of 2005, only 3% of remaining wetlands in Nebraska were owned by state, federal, or other conservation and management organizations. Although the quantity of these wetlands is known, the quality of the remaining, privately owned wetlands is less well understood.

As an extension of the U.S. Environmental Protection Agency's (EPA) National Wetland Condition Assessment (NWCA), eleven wetland complexes will be visited, many in recognized Biologically Unique Landscapes, and wetland conditions will be measured in ten individual wetlands in each complex. One wetland in each complex will be what is considered the "reference standard" in terms of condition for wetlands in each complex, which provides a reference point to which other wetlands in that complex are compared. The data collection methods conform to those developed by the EPA, in which three levels of assessment are used to quantify wetland condition including landscape assessment, intensive on-site assessment focusing on vegetative, soil, and hydrologic characteristics and amphibian presence, and a rapid assessment method (USA-RAM) developed by the EPA.

The primary goal of this wetland condition assessment project is to quantify the condition of important wetland resources in Nebraska and aid in the development of wetland-specific, rapid assessment methods and state-wide wetland management strategies. The knowledge gained will be increasingly important as many federal and state easements protecting privately owned wetlands come to an end, allowing federal and state agencies to target areas of wetlands for protection where the most gains can be recognized.

Data collection began in April 2011. In the spring of 2011 and 2012, anuran call surveys were conducted to determine amphibian presence in 50 wetlands located in six wetland complexes (Eastern saline, Missouri River, Central Platte River, Cherry County, Elkhorn headwaters, and Rainwater Basins). Oral swabs were collected from tadpoles in wetlands in order to detect the presence of the chytrid fungus, a disease known to cause significant amphibian population declines. During the summer of 2011, researchers conducted assessments at 12 wetland sites associated with the EPA's National Wetland Condition Assessment. In addition, during the summers of 2011 and 2012 researchers conducted wetland condition assessments at 70 wetland sites located in eastern and central Nebraska. During the spring and summer of 2013, amphibian surveys will be completed as well as condition assessments of 40 additional sites associated with four other wetland complexes.



**Walking to a remote sampling site**  
Photo credit: Craig Allen



**Establishing survey plots in the Sandhills**  
Photo credit: Craig Allen



**Nick Smeenck**  
Photo credit: Craig Allen

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## WIND AND WILDLIFE PROJECT

Principal Investigator(s):	Craig R. Allen, Joseph J. Fontaine
Coordinator:	Caroline Jezierski
Graduate Student(s):	Lucía Corral, Ph.D.
Project Duration:	March 2011 – February 2014
Funding:	Nebraska Game and Parks Commission
Project Location:	Statewide Nebraska
Website:	<a href="http://snr.unl.edu/renewableenergy/wind/">http://snr.unl.edu/renewableenergy/wind/</a>

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Wind energy is a growing sector of the renewable energy industry. Although it is considered green energy because no greenhouse gases are emitted during operation, the potential implications to local flora and fauna resulting from increasing wind power development remain largely unknown. This project facilitates communication among stakeholders regarding wind power development. It identifies and implements priority research and monitoring efforts. The overall goal is to develop management tools which will improve wind power siting decisions in order to mitigate negative impacts on local flora and fauna.

During the winter of 2011–2012, the Nebraska Wind Energy and Wildlife Project website was developed (<http://snr.unl.edu/renewableenergy/wind/>). Google Analytics was added at the end of February 2012 and, as of July 2012, the website had been visited over 874 times by 585 unique users from 45 states and 64 countries. More than 60 individuals from a diverse array of stakeholders have subscribed to the listserv developed in January 2012 to disseminate Nebraska wind energy and wildlife information. Emails are sent out via the listserv approximately every two weeks and contain Nebraska-specific information, including Legislative Bill updates, and nation-wide wind and wildlife news. A newsletter, *Wind Energy and Wildlife* (<http://www.scoop.it/t/wind-energy-and-wildlife>), was developed and has been actively curated since early January 2012. Included in the newsletter are electronic newspaper articles from around the world related to wind energy and wildlife including national policy, research updates, and Nebraska-specific stories. A two-sided, full color informational handout entitled *Wind Energy Development and Wildlife in Nebraska* was developed and has been handed out at several outreach events. Outreach/education booths have been set up at several events intended for families and professionals, such as county zoning administrators; notepads, pens, and other items with the newly designed project logo and website information have been handed out at events. The coordinator was a guest lecturer in four different undergraduate/graduate level university courses in Nebraska and Iowa and has been encouraging colleges and university with wind energy programs to integrate environmental siting and wildlife concerns into their curriculum. Links to the archived listserv messages, the electronic newsletter, the informational handout, and other project materials are on the project website.

The Nebraska Wind Energy and Wildlife Project developed a one-page survey that was included in the Nebraska Annual Social Indicators Survey (NASIS) distributed during the summer of 2012. The goal of the survey is to gauge support for wind energy development in different landscapes, identify level of concern about potential impacts of wind energy development on wildlife, and establish a willingness to pay for wind energy developments that are planned in a manner that reduces impacts on wildlife resources. Survey results will be available in the fall of 2012.

The Project has been reviewing current research related to wind energy and wildlife and been working with University of Nebraska faculty members, and biologists and ecologists from the Nebraska Game and Parks Commission, the U.S. Fish and Wildlife Service,



**Wind Turbines**  
Photo credit: Joseph Fontaine

wind energy development companies, and environmental consulting groups on identifying research gaps and developing wind power site development and operation requirements. For example, the coordinator is working with Nebraska bat experts to develop more detailed bat assessment guidance recommendations for wind energy development projects.

The Nebraska Wind and Wildlife Working Group was formed to develop guidance for wind energy development in the state in the spring of 2009. The coordinator reconvened the group and other invited stakeholders in the first half 2011. The format of the group has evolved since its inception and a new structure consisting of sub-working groups with specific expertise has been developed.

## PROFESSIONAL ACTIVITIES

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### TEACHING

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#### JOSEPH FONTAINE

##### March 2012: *Writing for Publication*

This two-day workshop for post-docs assisted participants in overcoming the challenges of scientific writing by exposing them to the structure of scientific publication and how key steps in the presentation of their science can improve their ability to reach a diverse audience. The session covered the development of a scientific manuscript—from conception to submission and ultimately to publication.

##### Spring 2012: *Scientific Writing*

This class was designed to help students learn the intricacies of scientific writing from developing proposals and writing manuscripts, to participating in the peer review process. The course included some lectures but primarily involved discussion of techniques, writing assignments, and peer review of fellow students as well as published and unpublished works of others. Because the course required weekly writing assignments, it was geared toward students looking to produce a document (e.g., proposal, thesis/dissertation, journal article) during the semester.

#### KRISTINE NEMEC

##### May 2012: *Tallgrass Prairie Restoration*

This course covered tallgrass prairie restoration techniques, with a focus on Nebraska. Students learned how to design a restoration by working in groups to create a mock seeding plan.

#### KEVIN POPE

##### Spring 2012: *Quantitative Fish Techniques*

This course provided information necessary to address scientific and management questions. It was designed to increase students' understanding of current fishery assessment practices. Emphasis was placed on quantitative assessments of populations (e.g., recruitment, growth, and mortality), communities (predator-prey interactions) and ecosystems (biostressors). At the completion of this course, students were able to apply current quantitative methods used in fishery data analysis, effectively communicate statistical ideas, and critique scientific studies—in particular, to identify strengths and weaknesses of statistical assessments.

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## GRADUATE COMMITTEE SERVICE

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### CRAIG ALLEN

- Christina Hoffman (Ph.D., School of Natural Resources, UNL)
- Wayne Ohnesorg (Ph.D., Entomology, UNL)
- Bruce Stephen (Ph.D., School of Natural Resources, UNL)
- Christopher Wood (M.S., Biology, UNO)
- Prabhakar Shrestha (Ph.D. Agricultural Economics, UNL)

### JOSEPH FONTAINE

- Michelle Biodrowski (M.S., Biology, UNO)
- Jason DeBoer (M.S., School of Natural Resources, UNL)
- Robert Kill (M.S., School of Natural Resources, UNL)
- Irina Skinner (M.S., Department of Wildlife Ecology and Conservation, University of Florida)

### KEVIN POPE

- Aaron Blank, (M.S., School of Natural Resources, UNL)
- Jeremy Hammen (Ph.D., School of Natural Resources, UNL)
- Nicholas Hogberg (M.S., School of Natural Resources, UNL)
- Lindsey Messinger (M.S., School of Natural Resources, UNL)
- Shankar Lakshmanan (M.S., Department of Computer Science and Engineering, UNL) (Graduated May 2012)
- Mathew Rugg (M.S., School of Natural Resources, UNL)
- Kirk Steffensen (M.S., School of Natural Resources, UNL)
- Christopher Uphoff (M.S., Department of Biology, University of Nebraska at Kearney) (Graduated May 2012)

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## PROFESSIONAL AND FACULTY SERVICE

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### CRAIG ALLEN

- Associate Editor (Macro and Landscape Ecology), *Ecology and Society*
- Board of Directors, The Resilience Alliance
- Midwest Fish and Wildlife Board of Directors
- Steering Committee and Scientific Committee, Nebraska Bird Partnership
- Fellow, Center for Great Plains Studies
- Core Team, Invasive Plants State Technical Committee, Natural Resources Conservation Service (NRCS)
- Associate, Center for Grassland Studies, University of Nebraska
- Alternate committee member, Institutional Animal Care and Use Committee, UNL
- Working group member, USGS Adaptive Management Working Group
- Missouri River Mitigation, Herpetofauna Monitoring and Evaluation Subcommittee
- Southeast Nebraska Flagship Initiative, Research and Evaluation Steering Committee
- Scientific Committee, Nebraska Natural Legacy Plan
- Program Committee, Soil and Water Conservation Society – Adaptive Management Technical Lead. 2011-2012.
- Co-organizer, special feature for the journal *Ecology and Society* “Law and social-ecological resilience.” To be published 2012.
- Nominated and awarded, The August T. Larsson Guest Researcher Programme, Guest Professorship – 2012, Swedish University of Agricultural Sciences, Uppsala, Sweden.
- Technical Committee, Rainwater Basin Joint Venture

### KEVIN POPE

- Associate Editor, *Transactions of the American Fisheries Society*
- Book Editorial Advisory Board, American Fisheries Society
- Graduate Committee, UNL School of Natural Resources

#### JOSEPH FONTAINE

- Society for Ornithology, Committee on Governance and Establishment
- Awards Committee, American Ornithological Union
- Assistant Secretary, Cooper Ornithological Society
- Student Presentation Awards Committee, Cooper Ornithological Society
- Scientific Committee, Nebraska Partnership for All-Bird Conservation
- Scientific Committee, Nebraska Natural Legacy Plan
- Adaptive Management Plan Creative Team, Nebraska Natural Legacy Plan
- Technical Committee, Rainwater Basin Joint Venture

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#### OTHER PROFESSIONAL SERVICE

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#### CHRISTOPHER CHIZINSKI

- Secretary, Post-Doctoral Advisory Council, University of Nebraska–Lincoln

#### KARIE DECKER

- Vice president, Missouri River Watershed Coalition
- Nebraska Aquatic Invasive Species Committee
- Nebraska Environmental Trust Grant Review Committee
- Search Committee, Rainwater Basin Joint Venture Coordinator
- Local committee, 2011 AFO/COS/WOS Joint Annual Conference, Kearney, NE
- Working group member, Zorinsky Lake Zebra Mussel Task Force
- Expert witness, Nebraska Legislative Session
- Graduate Student Presentation Award Committee, Cooper Ornithological Society
- Graduate Student Presentation Award Committee, Midwest Fish and Wildlife

#### VALERIE EGGER

- Staff Advisory and Professional Development Committee (SAPDC), UNL School of Natural Resources
- SAPDC liaison, UNL School of Natural Resources Faculty Advisory Committee
- Editor, USGS *Coop Catch-up* newsletter
- Founders' Day Committee, University Association for Administrative Development

#### CAROLINE JEZIERSKI

- Planning Committee, National Wind Coordinating Collaborative Wind Wildlife Research Meeting IX
- Nominating Committee, Renewable Energy Working Group, The Wildlife Society
- Planning assistance, Nebraska Wind Conference 2012

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#### TRAINING ASSISTANCE, WORKSHOPS AND OUTREACH ACTIVITIES

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#### CARLA (KNIGHT) BOBIER

- Angler Fish Identification Booth. Nebraska Boat Sport and Travel Show. Lincoln, NE, February 2012.
- Angler Fish Identification Booth. Carp-O-Rama, Pawnee State Recreation area near Emerald, NE, June 2012.
- Angler Fish Identification Booth. Missouri River Outdoor Expo, Ponca State Park, NE, September 2012.

#### CARYL CASHMERE

- Co-presenter. UNL School of Natural Resources Travel Workshop, November 2011. Lincoln, NE.
- Co-presenter. UNL Forms and Processes. Statewide Creel Clerk Workshop, March 2012 Lincoln, NE.

#### CHRISTOPHER CHIZINSKI

- Statewide Creel Clerk Workshop, March 2012. Lincoln, NE.
- Co-Instructor. Motorboat Operators Certification Course (MOCC), Brookings, SD, May 2012.

- Co-Instructor. Motorboat Operators Certification Course (MOCC), Madison, WI, June 2012.

#### JASON DEBOER

- As a member of the Cornhusker Student Subunit of American Fisheries Society, assisted Nebraska Game and Parks Commission by performing trash cleanup at Pawnee State Recreation Area, October 2011.
- Assisted with Nebraska Game and Parks Commission Outdoor EXPO at Fort Kearney State Recreation Area, May of 2012.

#### KARIE DECKER

- Education/Outreach Booth. Missouri River Expo. Ponca State Park, NE, October 2011.
- Invited Presentation. Native and non-native plants across Nebraska's changing landscapes. Mahoney State Park, NE, October 2011.
- Invited Presentation. Careers in invasive species. UNL School of Natural Resources Professional Development Seminar. Lincoln, NE, October 2011.
- Presentation. AIS Prevention Program in Western Nebraska, Lake McConaughy Public Meeting. Ogallala, NE, October 2011.
- Education/outreach booth. NaturePalooza, University of Nebraska-Lincoln Natural History Museum. Lincoln, NE, November 2011.
- Conference Organization. Nebraska Weed Management Conference. Kearney, NE, January 2012.
- Educational Article. Aquatic invasive species prevention. *Harlan Holiday Magazine*. Alma, NE, January 2012.
- TV Interview. Status update, Zorinsky Lake. KMAT Omaha News Channel. Omaha, NE, February 2012.
- Education/Outreach Booth. Nebraska Boat Sport and Travel Show. Lincoln, NE, February 2012.
- News Article. Nebraska legislative update: invasive species prevention. *Lincoln Journal Star*. Lincoln, NE, February 2012.
- Educational Article. Nebraska invasive species project 2012. UNL School of Natural Resources newsletter. Lincoln, NE, February 2012.
- Invited Presentation. AIS management on private lakes. Lake Ventura Association Annual Meeting. Lake Ventura, NE, March 2012.
- Invited Presentation. AIS prevention in 2012. Nebraska Game and Parks Commission Southwest District Meeting. Lexington, NE, March 2012.
- Training Presentation. Aquatic invasive species in Nebraska: 2012 changes. Statewide Creel Clerk Workshop. Lincoln, NE, March 2012.
- Invited Presentation. Legislative update concerning aquatic invasive species. Nebraska Lakes Association Annual Meeting. Mahoney State Park, NE, March 2012.
- Training Presentation. Using EDDMapS for EDRR. Nebraska Weed Control Association Spring Training. Hastings, NE, April 2012.
- Presentation. AIS Prevention Program in Western Nebraska, Lake McConaughy Public Meeting. Ogallala, NE, April 2011.
- Educational Article. Invasive Species Project helps fight growing and costly problem. *Water Current*, Nebraska Water Center Publication. Lincoln, NE, April 2011.
- Presentation. Invasive Species Council and legislative updates. Riparian Vegetation Management Task Force Meeting. Grand Island, NE, April 2011.
- Educational Article. Invasive species prevention in Nebraska. *Center for Invasive Plant Management Newsletter*. Bozeman, MT, April 2012.
- Presentation. Invasive species awareness. Nebraska Optimist Club. Lincoln, NE, April 2012.
- Education/Outreach Event. Zorinsky Lake Reopening Event. Zorinsky Lake, NE, April 2012.
- Radio Show. Reporting invasive species sightings in Nebraska. *Earth to Lincoln* radio show. Lincoln, NE, April 2012.
- Educational Article. Early Detection, Rapid Response: Nebraska Invasive Plant Watch List. *Nebraska Department of Agriculture Pesticide and Noxious Weed Newsletter*. Lincoln, NE, May 2012.
- Educational Article. On the invasive species battle front. *Nebraskaland Magazine*. Lincoln, NE, May 2012.
- Radio Interview. AIS update, Zorinsky Lake sampling. *Outdoor Nebraska Radio*. Lincoln, NE, May 2012.
- Educational Article. AIS Prevention in Nebraska. *Voice of the Salt Valley Lakes Magazine*. Lincoln, NE, May 2012.
- Training. Invasive species outreach and watercraft inspection/decontamination. UNL invasive species crew. Lincoln, NE, May 2012.
- TV Show Segment. Japanese knotweed and other horticultural invasives. *Backyard Farmer*. Lincoln, NE, May 2012.
- Radio Show. Preventing the spread of AIS. *The Outdoor Connection* radio show. North Platte, NE, May 2012.

- Keynote Speaker. Challenges to Nebraska's natural resources; invasive species. Nebraska Izaak Walton League State Convention. Grand Island, NE, June 2012.
- Education/Outreach Booth. Annual Clean Boat Event. Lewis and Clark Reservoir, NE, June 2012.
- Education/Outreach Booth. Waterfest. Lincoln, NE, June 2012.
- Invited Presentation. New AIS laws and regulations. Nebraska Game and Parks Commission Fisheries Management Section Meeting. Lexington, NE, June 2012.
- Education/Outreach Booth. Platte River Prairies Field Day. Aurora, NE, July 2012.

#### VALERIE EGGER

- Co-presenter. UNL School of Natural Resources Travel Workshop, Lincoln, NE, November 2011.
- Co-presenter. UNL Forms and Processes. Statewide Creel Clerk Workshop. Lincoln, NE, March 2012.

#### DANIELLE HAAK

- Co-Chair. UNL School of Natural Resources Graduate Student Association, April 2012–April 2013.
- Volunteer. Lincoln Children's Zoo, April 2012–present.
- Water Quality Event Supervisor, Science Olympiad, April 2012.
- Volunteer Judge. Lincoln Public School/Pfizer Science Fair, March 2012.
- Volunteer Judge. University of Nebraska Southeast Regional Science Fair, Lincoln, NE, March 2012.
- EnvironMentors/Upward Bound Mentor. University of Nebraska–Lincoln, November 2011–April 2012.

#### CAROLINE JEZIERSKI

- Outreach/Education Booth. Nebraska Wind Energy Development and Wildlife, Annual Nebraska Cooperative Fish and Wildlife Research Unit Coordinating Meeting. October 2011. Lincoln, NE.
- Guest Lecture. Wind Energy Development and Wildlife in Nebraska, Environmental Planning and Policy class (CRPL 470/870). October 2011. Lincoln, NE.
- Guest Lecture. Wind Energy Development and Wildlife in Nebraska, Environmental Impact Assessment class (CRPL 470/870). October 2011. Lincoln, NE.
- Guest Lecture. Wind Energy Development and Wildlife in Nebraska, Wind Energy Systems class (ELEC 430). November 2011. Lincoln, NE.
- Presentation. Wind Energy Development and Wildlife in Nebraska, The Izaak Walton League of America Annual Meeting. January 2012. Lincoln, NE.
- Radio Interview. Nebraska Wind Energy and Wildlife Project, *Earth to Lincoln*, KZUM. February 2012. Lincoln, NE.
- Outreach/Education Booth. The Rainwater Basin Joint Venture Annual Informational Seminar. February 2012. Hastings, NE.
- Outreach/ Education Booth. The Council Bluffs Home Improvement and Landscaping Show. February 2012. Council Bluffs, IA.
- Invited Presentation. Wind Energy Development and Wildlife in Nebraska, Rivers and Wildlife Celebration, March 2012. Kearney, NE.
- Outreach/Education Booth. Planning for Wildlife When Zoning for Wind Energy, Nebraska Annual Planning Meeting. March 2012. Grand Island, NE.
- Outreach/Education Booth. Nebraska Wind Energy and Wildlife, UNL Weatherfest. March 2012. Lincoln, NE.
- Outreach/Education Booth. Nebraska Wind Energy and Wildlife, Lincoln Earth Day. April 2012. Lincoln, NE.
- Guest Lecture. Wind Energy and Wildlife, Iowa State University Research Experience for Undergraduates in Wind Energy Science, Engineering, and Policy. July 2012. Ames, Iowa.

#### ROBERT KILL

- Volunteer Judge. University of Nebraska Southeast Regional Science Fair, Lincoln, NE, March 3, 2012.

#### NATALIE LUBEN

- Angler Fish Identification Booth. Nebraska Boat Sport and Travel Show. Lincoln, NE, February 2012.
- Angler Fish Identification Booth. Carp-O-Rama, Pawnee State Recreation area near Emerald, NE, June 2012.
- Angler Fish Identification Booth. Missouri River Outdoor Expo, Ponca State Park, NE, September 2012.

#### KEVIN POPE

- Co-Instructor. Motorboat Operators Certification Course (MOCC), Brookings, SD, May 2012.

CHRIS WILEY

- Volunteer, Nebraska Game and Parks at Outdoor Discovery Program, Ft. Kearney, NE, May 2012.

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## PEER-REVIEWED PUBLICATIONS

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- Allen, C. R., A. S. Garmestani, and S. Sundstrom. 2012. Resilience. Pages 335-339 in *Encyclopedia of Sustainability*, Volume 5, Ecosystem Management and Sustainability. Berkshire Publishing Group, MA.
- Allen, C. R., G. S. Cumming, A. Garmestani, P. D. Taylor, and B. Walker. 2011. Managing for resilience. *Wildlife Biology*: 17:337-349.
- Allen, C. R., J. J. Fontaine, and A. Garmestani. 2012. Adaptive management of natural resources. Pages xx in *Encyclopedia of Sustainability Science and Sustainability*. Springer.
- Allen, C. R., J. J. Fontaine, K. L. Pope and A. S. Garmestani. 2011. Adaptive management for a turbulent future. *Journal of Environmental Management* 92:1334- 1345.
- Allen, C. R. and L. H. Gunderson. 2011. Pathology and failure in the design and implementation of adaptive management. *Journal of Environmental Management* 92:1379-1384.
- Angeler, D. G., C. R. Allen, and R. K. Johnson. 2012. Insight for resilience from spatiotemporal discontinuities of biomass at local and regional scales. *Ecology and Society*: in press.
- Bajer, P. B., C. J. Chizinski, J. Silbernagel, and P. W. Sorensen. 2012. Variation in micro-predator abundance explains recruitment of a mobile invasive fish, the common carp, in a naturally unstable environment. *Biological Invasions*, DOI: 10.1007/s10530-012-0203-3.
- Bajer, P. G., C. J. Chizinski, and P. W. Sorensen. 2011. Use of radio-tagged 'Judas' fish to track and remove winter aggregations of common carp in Midwestern lakes. *Fisheries Management and Ecology*, 18: 497-505.
- Chizinski, C. J., A. Peterson, J. Hanowski, C. R. Blinn, G. Niemi, and B. Vondracek. 2011. Breeding bird response to partially harvested riparian management zones. *Forest Ecology and Management* 261:1892-1900.
- Decker, K. L., C. J. Conway, and J. J. Fontaine. 2012. Nest predation, food, and female age explain seasonal declines in clutch size. *Evolutionary Ecology*.
- Decker, K. L., C. R. Allen, L. Acosta, M. Hellman, C. Jorgensen, R. Stutzman, K. Unstad, A. Williams, and M. Yans. 2012. Land use, landscapes and biological invasions. *Invasive Plant Science and Management* 5:108-116.
- DeBoer, J. A., K. L. Pope, and K. D. Koupal. In press. Environmental factors regulating the recruitment of walleye *Sander vitreus* and white bass *Morone chrysops* in irrigation reservoirs. *Ecology of Freshwater Fish*.
- Dolph, C., D. Huff, C. J. Chizinski, and B. Vondracek. 2011. Implications of community concordance for assessing stream health at three nested spatial scales in Minnesota, USA. *Freshwater Biology* 56:1652-1669.
- Fontaine, J. J. 2011. Improving our legacy: Incorporation of adaptive management into state wildlife action plans. *Journal of Environmental Management* 92:1403- 1408.
- Fontaine, J. J., E. Arriero, H. Schwable, and T. E. Martin. 2011. Nest predation and circulating corticosterone levels within and among species. *Condor*: 113:825-833.
- Garmestani, A. S., and C. R. Allen. 2012. Panarchy. Pages xx in A. H. El-Shaarawi and W. W. Piegorsch, editors. *Encyclopedia of Environmetrics*. John Wiley and Sons, Chichester, UK.
- Garmestani, A. S., C. R. Allen, and C. S. Holling. 2012. Cross-scale morphology. Pages xx in A. H. El-Shaarawi and W. W. Piegorsch, editors. *Encyclopedia of Environmetrics*. John Wiley and Sons, Chichester, UK. In press.
- Gosch, N. J. C., and K. L. Pope. 2011. Using consumption rate to assess potential predators for biological control of white perch. *Knowledge and Management of Aquatic Ecosystems*: 403, 2:1-9.
- Huff, D. D., L. M. Miller, C. J. Chizinski, and B. Vondracek. 2011. Mixed-source reintroductions lead to outbreeding depression in the second generation descendants of a native North American fish. *Molecular Ecology*, 20: 4246-4258.

- Kessler, A. C., J. W. Merchant, C. R. Allen, and S. D. Shultz. 2011. Invasive plants impacts on sandhill crane (*Grus canadensis*) roosting habitat. *Invasive Plant Science and Management*: 4:369–377.
- Kolasa, J., C. R. Allen, J. Sendzimir, and C. A. Stow. 2012. Predictions and retrodictions of the hierarchical representation of habitat in heterogeneous environments. *Ecological Modeling*: in press.
- Kowalewski, L. K., A. P. Maple, M. A. Pegg, and K. L. Pope. In press. Latitudinal influence on age estimates derived from scales and otoliths for bluegill. *North American Journal of Fisheries Management*.
- Martin, D. R., B. M. Pracheil, J. A. DeBoer, G. R. Wilde, and K. L. Pope. 2012. Using the internet to understand angler behavior in the Information Age. *Fisheries* (Bethesda). In press.
- Martin, D. R., L. A. Powell, and K. L. Pope. 2012. Habitat selection by adult walleye during spawning season in irrigation reservoirs: a patch occupancy modeling approach. *Environmental Biology of Fishes*: 93:589-598.
- Nemec, K., C. R. Allen, A. Alai, G. Clements, A. Kessler, T. Kinsell, A. Major, and B. J. Stephen. 2011. Woody invasions of urban parks and trails and the changing face of urban forests in the Great Plains, USA. *American Midland Naturalist* 165:241-256.
- Nemec, K. T., Trager, J. C., Manley, E., and Allen, C. R. Five new records of ants (*Hymenoptera: Formicidae*) for Nebraska. *The Prairie Naturalist*: 44(1):63-65.
- Porath, M. T., L. D. Pape, L. K. Richters, K. L. Pope, and M. A. Pegg. 2011. Influence of throat configuration and fish density on escapement of channel catfish from hoop nets. Pages 563-571 in P. H. Michaletz and V. H. Travnicek, editors, *Conservation, ecology, and management of catfish: the second international symposium*. American Fisheries Society, Symposium 77, Bethesda, Maryland.
- Rehme, S. E., L. A. Powell, and C. R. Allen. 2011. Mutlimodel inference and adaptive management. *Journal of Environmental Management* 92:1360–1364.
- Richters, L. K., and K. L. Pope. 2011. Catch of channel catfish with tandem-set hoop nets and gill nets in lentic systems of Nebraska. Pages 573-580 in P. H. Michaletz and V. H. Travnicek, editors, *Conservation, ecology, and management of catfish: the second international symposium*. American Fisheries Society, Symposium 77, Bethesda, Maryland.
- Skagen, S. K., J. J. Fontaine, R. Stutzman, V. Steen, C. Melcher, J. Stamm, G. Clow, M. Anderson, P. Norton, N. Niemuth, J. M. Friedman, R. Gleason, and B. Tangen. 2011. Avian conservation in the Prairie Pothole Region, Northern Great Plains: Understanding the links between climate, ecosystem processes, wetland management, and bird communities. *USGS Fact Sheet FS11-3030*.
- Sundstrom, S., C. R. Allen and C. Barichiev. 2012. Species, functional groups, and thresholds in ecological resilience. *Conservation Biology*: 26:305-314.
- Wilde, G. R., and K. L. Pope. In press. Worldwide trends in fishing interest indicated by internet search volume. *Fisheries Management and Ecology*.
- Wilson, S., and C. R. Allen. 2011. River otter home rand and habitat use. Final Report, State Wildlife Grant T-45-R. 38pp.

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## PRESENTATIONS AT SCIENTIFIC MEETINGS

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- Allen, C. R. 2011. Assessing resilience in social-ecological systems. Swedish University of Agricultural Sciences, Uppsala, Sweden. (invited)
- Allen, C. R. 2011. Assessing resilience in social-ecological systems. Annual meeting of the Wildlife Society, Waikoloa, Hawaii. (invited presentation and panel member)
- Allen, C. R. 2011. Ecosystem services, resilience and our changing climate. Climate, water and Ecosystems, 2011 Law and Water Conference. Lincoln, Nebraska. (invited)
- Allen, C., Chaine, N., Fricke, K., Haak, D., Hellman, M., Kill, R., Nemec, K., Pope, K., Smeenk, N., Stephen, B., Uden, D., Unstad, K. and VanderHam, A. 2011. Abundance and habitat affinity of an invasive snail species, the Chinese Mystery Snail (*Bellamya chinensis*), in a southeast Nebraska reservoir. Midwest Fish and Wildlife Conference, Des Moines, Iowa.

- Chaine, N., D. M. Haak, K. Hart, and T. Spanbauer. 2012. The Conservation Reserve Program and the future of rural Nebraska: An interdisciplinary case study. Rural Future Conference, Lincoln, Nebraska.
- Chizinski, C. J., K. L. Pope, and J. J. Schuckman. 2012. Partitioning angler effort in a complex system. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska. (poster)
- Chizinski, C. J., K. L. Pope, and J. Schuckman. 2011. Partitioning angler effort in a complex system. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Chizinski, L. K., K. L. Pope, and C. J. Chizinski. 2011. The influence of stocking and habitat variability on channel catfish populations in Nebraska. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- DeBoer, J. A., and K. L. Pope. 2011. Water, walleye and corn: a conundrum in an arid landscape. 3rd Annual Meeting, Water for Food Conference, Lincoln, Nebraska. (poster)
- DeBoer, J. A., D. R. Martin, K. L. Pope, B. M. Pracheil and G. R. Wilde. 2011. A LK @ 2DAYS ANGLR: How technology reveals patterns in the internet age. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- DeBoer, J. A., K. L. Pope, and K. D. Koupal. 2011. Recruitment of walleye and white bass in irrigation reservoirs. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- DeBoer, J. A., T. M. Stevens, and K. L. Pope. 2011. Comparison of three techniques to estimate population size of largemouth bass. Joint Annual Meeting, Centrarchid, Esocid and Walleye Technical Committees, North Central Division of the American Fisheries Society, Dubuque, Iowa.
- Decker, K. L. 2011. Incorporating invasive species into GK-12 curriculum. Nebraska Association of Teachers of Science Conference. Fremont, Nebraska.
- Decker, K. L. 2011. Aquatic invasive species awareness in Nebraska. Midwest Fish and Wildlife Conference. Des Moines, IA.
- Decker, K. L. 2012. Changes to aquatic invasive species awareness in Nebraska. 100th Meridian Missouri River Basin AIS Panel Conference. Rapid City, South Dakota.
- Decker, K. L. 2012. Early detection and rapid response in Nebraska: EDDMapS. Nebraska Weed Control Association Annual Conference. North Platte, Nebraska.
- Decker, K. L. 2012. USDA/PPQ Weed Risk Assessment: a Nebraska case study. Missouri River Watershed Coalition Spring Conference. Sturgis, South Dakota. (invited)
- Decker, K. L. 2012. Nebraska Invasive Species Council: The who, what, why and where. Nebraska Weed Management Conference. Kearney, Nebraska.
- Decker, K. L. 2011. Early detection and rapid response in Nebraska. Missouri River Watershed Coalition Fall Conference. Miles City, Montana. (invited)
- Decker, K.L. 2011. Invading nature (and your classroom): Nebraska's invasive species. Nebraska Alliance for Conservation and Environmental Education Conference. Nebraska City, Nebraska.
- Decker, K. L. 2011. Invasive species prevention among sportsman's groups. Nebraska Natural Legacy Seminar. Grand Island, Nebraska.
- Decker, K. L., C. R. Allen, L. G. Pearlstine, D. P. Wojcik, and W. M. Kitchens. 2011. Gap and anti-gap: spatial distribution of native and non-native ant species richness in Florida. Waikoloa, Hawaii. (poster)
- Fontaine, J. J. 2012. Changing climates and changing landscapes: A migrant bird's dilemma. Department of Natural Resource Ecology and Management Seminar, Iowa State University, Ames, Iowa.
- Fontaine, J. J. and K. L. Pope. 2011. Non-game research through the Nebraska Cooperative Fish and Wildlife Research Unit. Nebraska Game and Parks Commission Natural Legacy Project Conference, Grand Island, Nebraska.
- Fontaine, J. J. and R. J. Stutzman. 2011. Changing climates and changing landscapes: A migrant bird's dilemma. Special symposium on climate change. Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- Fontaine, J. J. and R. J. Stutzman. 2012. The interplay of climate and land-use change: Implications for a long distance migrant. Special symposium on migration phenology. North American Ornithological Conference, Vancouver, B.C., Canada.
- Fricke, K. A., N. M. Chaine, C. Allen, J. J. Fontaine, S. Taylor, R. Schneider, and K. Stoner. 2012. Implementing adaptive management in Nebraska. Annual Conference of the Nebraska Chapter of The Wildlife Society. Ponca, Nebraska.

- Fricke, K. A., R. Jessen, S. Wessel, C. Allen, J. J. Fontaine, S. Taylor, R. Schneider, and K. Stoner. 2012. Adaptive management study on the Lower Niobrara River Valley. Annual Conference of the Nebraska Chapter of The Wildlife Society, Ponca, Nebraska.
- Haak, D., V. Forbes, and K. L. Pope. 2012. Assessing zebra mussel habitat suitability in Nebraska reservoirs. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska. (poster)
- Haak, D. M., K. Hart, and T. Spanbauer. 2012. The Conservation Reserve Program and the future of rural Nebraska: an interdisciplinary case study. Rural Future Conference, Lincoln, Nebraska.
- Jeziarski, C. M. 2011. Nebraska Wind and Wildlife Alliance. Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Jorgensen, C. F. 2012. If you build it will they come? Managing species in tomorrow's landscapes. Invited symposium, University of Nebraska-Lincoln, School of Natural Resources, Lincoln, Nebraska.
- Jorgensen, C. F., L. A. Powell and J. J. Fontaine. 2011. From patches to landscapes: how spatial scale constrains avian responses to grassland management. Nebraska Game and Parks Commission Natural Legacy Project Conference, Grand Island, Nebraska.
- Jorgensen, C.F., L. A. Powell and J. J. Fontaine. 2011. From patches to landscapes: how spatial scale constrains avian responses to grassland management. Special symposium on grassland bird management. Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- Jorgensen, C.F., L. A. Powell and J. J. Fontaine. 2012. From patches to landscapes: how spatial scale constrains avian responses to grassland management. North American Ornithological Conference, Vancouver, B.C., Canada.
- Jorgensen, C.F., L. A. Powell and J. J. Fontaine. 2012. If you build it will they come? Managing pheasants in tomorrow's landscapes. Nebraska Pheasants and Quail Forever State Habitat Meeting, Kearney, Nebraska.
- Kill, R. A., B. Tenhumberg, and K. L. Pope. 2012. Modeling effects of predation and deformation on eggs of walleye *Sander vitreus* at Red Willow Reservoir, Nebraska. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska. (poster)
- Kill, R. A., K. L. Pope, and B. Tenhumberg. 2011. Temperature gradient on the dam of Red Willow Reservoir, Nebraska, and implications for walleye egg development and larval survival. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Kill, R. A., and K. L. Pope. 2012. To stock or not to stock: that is the question. Joint Annual Meeting, Centrarchid, Esocid, and Walleye Technical Committees, North Central Division of the American Fisheries Society, Hayward, Wisconsin.
- Kill, R. A., B. Tenhumberg, and K. L. Pope. 2011. Modeling effects of predation and deformation of walleye eggs in Red Willow Reservoir, Nebraska. Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Kill, R. A., B. Tenhumberg, and K. L. Pope. 2011. Modeling effects of predation and deformation of walleye eggs in Red Willow Reservoir, Nebraska. Nebraska Chapter American Fisheries Society Annual Meeting, Gretna, Nebraska. (poster)
- Lakshmanan, S., A. Samal, K. L. Pope, and K. L. Hurley. 2012. A mobile application for the identification of different types of fish species. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska.
- Martin, D. R., and K. L. Pope. 2011. Can we predict angler effort on a regional scale from online fishing forum activity? 6th World Recreational Fishing Conference, Berlin, Germany. (poster)
- Martin, D. R., and K. L. Pope. 2011. Maintaining resilience of regional fisheries through angler management. 6th World Recreational Fishing Conference, Berlin, Germany.
- Martin, D. R., and K. L. Pope. 2011. Managing anglers to maintain resilience of a regional fishery and enhance anglers' connections with natural resources. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- Martin, D. R., and K. L. Pope. 2012. Spatial and temporal variation in catch rates following trout stocking. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska.
- Nemec, K. T., C. R. Allen, S. D. Danielson, and D. A. Wedin. 2012. Effect of diversity and seeding density on ecosystem services in grassland restorations. International Association of Landscape Ecology and a Community on Ecosystem Services, in Portland, Oregon.

- Nemec, K. T., C. R. Allen, S. D. Danielson, and D. A. Wedin. 2012. Responses of predatory invertebrates to plant diversity and seeding density in experimental tallgrass prairie restorations. North American Prairie Conference, Winnipeg, Canada.
- Pope, K. L., and D. R. Martin. 2011. Maintaining resilience of regional fisheries through angler management. 14th World Lake Conference, Austin, Texas.
- Pope, K. L., D. R. Martin, and C. R. Allen. 2012. Spatial resilience of regional fisheries. 6th World Fisheries Congress, Edinburgh, Scotland.
- Pope, K. L., D. R. Martin, and G. R. Wilde. 2011. Angler choice of terminal tackle and water depth. 6th World Recreational Fishing Conference, Berlin, Germany.
- Stevens, T. M., J. A. DeBoer, and K. L. Pope. 2011. Comparison of three techniques to estimate population size of largemouth bass. 17th Annual Undergraduate Research Conference, University of Nebraska–Lincoln, Lincoln, Nebraska. (poster)
- Stevens, T., J. A. DeBoer, and K. L. Pope. 2011. Comparison of three techniques to estimate population size of largemouth bass. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Stutzman, R. J., S. K. Skagen and J. J. Fontaine. 2011. Avian migration in the face of an altered landscape and a changing climate. Special symposium on climate change. Midwest Fish and Wildlife Conference, Des Moines, Iowa.
- Stutzman, R. J., S. K. Skagen and J. J. Fontaine. 2012. Avian migration in the face of an altered landscape and a changing climate. North American Ornithological Conference, Vancouver, B.C., Canada.
- Turek, K. C., M. A. Pegg, K. L. Pope, and S. Schainost. 2011. The distribution of six species of concern in Nebraska headwater streams. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Turek, K. C., M. A. Pegg, K. L. Pope, and S. Schainost. 2012. The distribution of six species of concern in Nebraska headwater streams. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska. (poster)
- Uden, D., C. R. Allen. 2012. Potential impacts of biofuel production and landuse change on grassland bird abundance. Daniel Uden, Craig Allen, Qingfeng Guan, Rob Mitchell, Tim McCoy and Jill Liske-Clark. Landscape Ecology Annual Meeting, Rhode Island.
- Wilde, G. R., and K. L. Pope. 2011. Use of Google Insights for Search in fisheries. 6th World Recreational Fishing Conference, Berlin, Germany.
- Wiley, C. L., K. L. Pope, and K. L. Hurley. 2011. Response of angler creel to advanced-sized channel catfish stockings. 72nd Annual Meeting, Midwest Fish and Wildlife Conference, Des Moines, Iowa. (poster)
- Wiley, C. L., K. L. Pope, and K. L. Hurley. 2012. Length distributions of channel catfish that were available, harvested and caught at an urban reservoir. Annual Meeting, Nebraska Chapter of the American Fisheries Society, Gretna, Nebraska. (poster)
- Wiley, C. W., K. L. Pope and K. L. Hurley. 2011. Length distributions of channel catfish that were available, harvested and caught at an urban reservoir. Midwest Fish and Wildlife Conference, Des Moines, Iowa.

