

# Nebraska Cooperative Fish and Wildlife Research Unit—USGS

## REPORT OF ACTIVITIES September 2013 – September 2014

### *Ten Years of Education, Training and Research*



#### **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



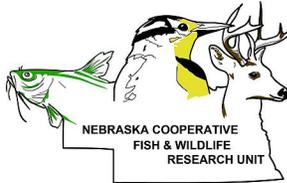
**USGS**  
*science for a changing world*

U.S. Fish &  
Wildlife Service

UNIVERSITY OF  
**Nebraska**  
Lincoln®



# Report of Activities September 2013 – September 2014



## **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

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

#### STAFF – UNIVERSITY OF NEBRASKA–LINCOLN

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Caryl Cashmere, Unit Staff Assistant  
Valerie Egger, Unit Administrative Assistant  
  
Christopher Chizinski, Research Assistant Professor and Coordinator, Angler Survey Project  
Caroline Jezierski, Coordinator, Nebraska Wind Energy and Wildlife Project  
Dustin Martin, Post-Doctoral Associate, Wildlife Ecologist  
Lindsey Messinger, Research Specialist, Wildlife Ecologist  
Allison Zach, Coordinator, Nebraska Invasive Species Program

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#### RESEARCH TECHNICIANS AND OTHER STAFF

Adela Annis	Jeremy Lohaus
Daniel Drimmel	Abram Lollar
James Dupuie Jr.	Nathan Meadows
Scott Fox	Cynthia Nelson
Alan Harrington	Cameron Oden
Colby Hause	Nicholas Salick
Kia Hayes	Katharine (Kat) Shiffler
Zachary Horstman	Andrea (Glenn) Skiles
Gabriella Jukkala	Curtis Twellman
Lauren Kiser	Lela Updegrave
Lucas Kowalewski	Chelsea Weithman
Colt Livingston	Alec Wong

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#### CREEL AND HUNTER SURVEY CLERKS

Marla Baglieri	Tina Helseth
Brian Bird	Debbie Hafer
Brandon Boehm	Jacob Klooster
Don Bohnenkamp	Stephanie Nefas
Daniel Brundrett	Brett Roberg
Katherine Crawley	Gerald Ryschon
Derek Danner	Amber (Fandrich) Schiltz
Jonathan Ewanyk	Jon Yates

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#### STUDENT WORKERS

Reece Allen	Cody Dreier	Garrett Hanquist	Victoria Simonsen
Lindsay Brown	Jacob Drozda	Chelsey Hookham	Anastasia Walkowiak-Esch
JoLeisa Cramer	Alex Engel	Elise Jarrett	Michael Winkler
Tanner Doescher	Quinton Granger	Baillie Luff	

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#### UNL UCARE STUDENTS

Lukas Mullins	Victoria Simonsen	Sarah Spier
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## CURRENT GRADUATE DEGREE CANDIDATES – UNIVERSITY OF NEBRASKA–LINCOLN

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### *Master of Science*

Nathan Bieber, School of Natural Resources, May 2014 – present

Emma Brinley Buckley, School of Natural Resources, November 2012 – present

Alexis Fedele, School of Natural Resources, August 2014 – present

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

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

Nathan Stewart, School of Natural Resources, January 2013 – present

Lyndsie Wszola, School of Natural Resources, August 2014 – present

### *Doctorate*

Hannah Birgé, School of Natural Resources, January 2013 – present

Nicholas Cole, School of Natural Resources, August 2014 – present

Lucía 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

Noelle (Chaine) Hart, School of Natural Resources, August 2011 – present

Michelle Hellman, School of Natural Resources, May 2013 – present

Amanda Lipinski, School of Natural Resources, August 2014 – present

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

Michael Whitby, School of Natural Resources, January 2014 – present

## GRADUATES, 2013–14

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Jason DeBoer, M.S., School of Natural Resources, UNL, May 2014

Robert Kill, M.S., School of Natural Resources, UNL, December 2013

Lucas Kowalewski, M.S., School of Natural Resources, UNL, May 2014

Jessica Laskowski, M.S., School of Natural Resources, UNL, May 2014

Dustin Martin, Ph.D., School of Natural Resources, UNL, December 2013

Kelly Turek, M.S., School of Natural Resources, UNL, May 2014

Ashley VanderHam, M.S., School of Natural Resources, UNL, August 2014

Justin Williams, M.S., School of Natural Resources, UNL, May 2014

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## COORDINATING COMMITTEE MEMBERS

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### U. S. GEOLOGICAL SURVEY

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Box 25046, MS 406  
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### THE WILDLIFE MANAGEMENT INSTITUTE

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### U.S. FISH AND WILDLIFE SERVICE

Stephen Torbit, Assistant Regional Director for Science Applications  
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(303) 236-4602

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## COOPERATORS

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### ORGANIZATIONS

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Bard College, New York	University of Nebraska Omaha (UNO)
Benedictine College, Kansas	University of New Mexico
BOKU, the University of Natural Resources and Life Sciences, Austria	U.S. Army Corps of Engineers
Centre for Systems Solutions, Poland	U.S. Department of Agriculture (USDA)
Central Nebraska Public Power and Irrigation District	Animal and Plant Health Inspection Service (APHIS)
Chadron State College, Nebraska	Forest Service, Nebraska National Forest
Emory University, Georgia	National Resource Conservation Service (NRCS)
Michael Forsberg Photography	U.S. Environmental Protection Agency (EPA)
Headwaters Corporation	Cincinnati, OH
International Institute for Applied Systems Analysis, Austria	Omaha, NE
National Socio-Environmental Synthesis Center (SESYNC)	U.S. Fish and Wildlife Service (USFWS)
The Nature Conservancy	Ecological Services, Nebraska Field Office
Nebraska Association of Resource Districts	Fort Niobrara-Valentine National Wildlife Refuge
Nebraska Bird Partnership	Habitat and Population Evaluation Team
Nebraska Department of Agriculture	Playa Lakes Joint Venture
Nebraska Department of Environmental Quality	Prairie Pothole Joint Venture
Nebraska Educational Television	Rainwater Basin Joint Venture
Nebraska Forest Service	Region 6
Nebraska Game and Parks Commission (NGPC)	U.S. Geological Survey (USGS)
Nebraska Natural Resources Districts	Cooperative Research Units Program
Nebraska Public Power District	Fort Collins Science Center
Nebraska Weed Control Association	John Wesley Powell Center for Analysis and Synthesis
Pheasants Forever	Nebraska Water Science Center
Swedish University of Agricultural Sciences, Sweden	U.S. National Park Service (USNPS)
Towson University, Maryland	Great Plains Cooperative Ecosystems Studies Unit
University of Florida	Wyoming Game and Fish
University of Idaho	
University of Illinois at Urbana-Champaign	
University of Minnesota	
University of Nebraska Center for Public Policy	
University of Nebraska at Kearney (UNK)	
University of Nebraska-Lincoln (UNL)	
College of Law	
Department of Agricultural Economics	
Department of Agronomy and Horticulture	
Department of Computer Science / Engineering	
Department of Earth and Atmospheric Sciences	
Department of Plant Pathology	
Nebraska Water Center	
School of Biological Sciences	
School of Natural Resources	
Water for Food Institute	

## PEOPLE

Jeff Abegglen, USDA Forest Service  
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Barbara Cosens, University of Idaho  
Brian Crabtree, Nebraska Weed Control Association  
Nichole Cudworth, Wyoming Game and Fish  
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Graeme Cumming, University of Cape Town, South Africa  
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Phillip Dobesh, USDA Forest Service  
Jim Douglas, Director, NGPC  
Darrol Eichner, Fisheries Division, NGPC  
Sebastian Elbaum, Department of Computer Science and Engineering, UNL  
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Brian Fath, Towson University  
Valery Forbes, School of Biological Sciences, UNL  
Michael Forsberg, Michael Forsberg Photography  
Patricia Freeman, School of Natural Resources, UNL  
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Eric Zach, Wildlife Division, NGPC  
Sandra Zellmer, College of Law, UNL  
Gene Zuerlein, Environmental Sciences Division,  
NGPC

## MILESTONES AND HIGHLIGHTS

### 10<sup>TH</sup> ANNIVERSARY!

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This year marks the 10th anniversary of the Nebraska Cooperative Fish and Wildlife Research Unit. Craig R. Allen has been the unit leader since the beginning along with administrative assistant, Valerie Egger. From humble beginnings with two offices separated down the hall and around the corner from each other in Mussehl Hall (the former poultry building), the unit has grown into eleven offices, one large graduate student room, and two labs in Hardin Hall; and we occupy considerable space in a shared boat storage facility. The Unit is now comprised of three federal scientists, eight permanent university staff, 22 graduate students, and a multitude of student workers and temporary staff which provide essential research support. Thirty-one students advised by unit scientists have graduated with master's degrees and Ph.D.s.

### GRADUATES

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From October 2013 through August 2014, eight *graduate* students in the Nebraska Coop Unit received their degrees from the University of Nebraska–Lincoln: the most graduations in a single year since the Unit was started in 2004. This tops the list of six graduates from the previous year! During the same period, eight of our current and past *undergraduate* technicians received their bachelor's degrees from UNL and UNK.

### RESEARCH GRANTS

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Multiple grants were awarded to the Unit in the past year. Two of the largest, with a combined total of \$3.5M, were awarded to Joseph (TJ) Fontaine and Dustin Martin, and to Chris Chizinski and Kevin Pope. The Nebraska Game and Parks Commission awarded both grants with the objective of understanding the motivations behind hunting and angling participation on public lands and waters in Nebraska. More than fifteen temporary staff will be employed during the year to collect survey data from hunters and anglers across Nebraska. Results of the studies will be used by the Commission to better inform procedures and regulations for hunting and fishing in Nebraska. For more information, check out their website: [FishHunt.unl.edu](http://FishHunt.unl.edu)

### FALL 2013 INTERNATIONAL TRAINING EXPERIENCE

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In fall 2013, Hannah Birgé, Danielle Haak, Noelle Hart, and Michelle Hellman joined seven other Ph.D. students from various UNL departments in a two-month international training experience focused on resilience in stressed watersheds. Based out of Vienna, Austria, the program was funded by a grant awarded to UNL from the National Science Foundation's Integrative Graduate Education and Research Traineeship Program (IGERT). The graduate students visited several European watersheds to understand how they are managed, were involved in quantitative observational techniques related to stakeholder participation in social simulations (also termed role-playing games), and learned how to develop relevant hypotheses related to role playing simulations. International networks were developed during the experience which will benefit the students throughout their careers.

### 2014 YOUNG SCIENTISTS SUMMER PROGRAM

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Danielle Haak spent the summer in Laxenburg, Vienna participating in the 2014 Young Scientists Summer Program sponsored by the International Institute for Applied Systems Analysis (IIASA). Of 332 applicants from 23 countries, only 52 students were selected to participate in the program. Danielle first connected with IIASA during the 2013 International Training Experience offered through UNL's NSF IGERT Program. Just three weeks into the summer program, Danielle said, "I think last semester's trip to Vienna/Europe was invaluable to my education, but coming back, not knowing anyone, and intensively working on research with 50 other people in the same boat, is just an incredible opportunity in itself. Every day I'm pushed to the limits of my comfort zone and then I take a few more steps outward."

## THESES AND DISSERTATIONS

JASON DEBOER, M.S. MAY 2014

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*Recruitment of Walleye and White Bass in Southwest Nebraska Irrigation Reservoirs*  
University of Nebraska–Lincoln. Advisor, Kevin L. Pope

LUCAS K. KOWALEWSKI, M.S. MAY 2014

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*Accuracy of Precision: Implications of Sample Design and Methodology on Abundance Estimation*  
University of Nebraska–Lincoln. Advisor, Kevin L. Pope

ROBERT KILL, M.S. DECEMBER 2013

---

*A Population Model for Walleye in Nebraska Irrigation Reservoirs*  
University of Nebraska–Lincoln. Advisor, Kevin L. Pope

JESSICA LASKOWSKI, M.S. MAY 2014

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*Fear Effects on Pheasant Reproductive Ecology and a Curriculum to Teach Wildlife Habitat Selection*  
University of Nebraska–Lincoln. Advisor, Joseph J. Fontaine

DUSTIN MARTIN, PH.D. DECEMBER 2013

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*Spatial and Temporal Participation in Recreational Fishing*  
University of Nebraska–Lincoln. Advisor, Kevin L. Pope

KELLY TUREK, M.S. MAY 2014

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*Influence of Non-Native Trout on Native Non-game Fish in Nebraska Headwater Streams*  
University of Nebraska–Lincoln. Advisor, Kevin L. Pope

ASHLEY VANDERHAM, M.S. AUGUST 2014

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*Informing Flood Plain Wetland Restoration Using Amphibian Monitoring*  
University of Nebraska–Lincoln. Advisor, Craig R. Allen

JUSTIN WILLIAMS, M.S. MAY 2014

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*Forecasting the Invasion Risk of Non-native Plant Species with the Nebraska I-Rank Assessment*  
University of Nebraska–Lincoln. Advisor, Craig R. Allen

## ALUMNI: WHERE ARE THEY NOW?

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

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Nate completed his master's degree from UNL in August 2008. He worked briefly for the Nebraska Game and Parks Commission on the Missouri River before accepting the position of streams biologist with the Missouri Department of Conservation. In May 2011, Nate returned to the Missouri River and serves as a fisheries biologist with the U.S. Army Corps of Engineers in Kansas City. In this position, Nate researches the effects of habitat creation efforts on native Missouri River fishes and water quality. Improved understanding of the factors potentially affecting young pallid sturgeon during the first year of life is an important research focus. Nate spends his free time with his wife, two children, and two hunting dogs. Nate is proud to say that crappie already fear his 3-year old daughter, Ella. Younger brother Riley will be due for his first fishing rod next spring!

### RYAN LUECKENHOFF (M.S., 2011)

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Ryan completed his master's degree from UNL in May 2011 and shortly after accepted the position of fisheries biologist with the Missouri Department of Conservation. Ryan assisted in investigating changes in stream habitat below hydropower dams and helped initiate a project to monitor year-round water temperature at USGS gage stations throughout Missouri. In November 2013, Ryan joined the Missouri Cooperative Fish and Wildlife Research Unit as a senior research associate. In this position, Ryan is researching the longitudinal relationship between dissolved oxygen levels and fish communities in the Lower Osage River below Bagnell Dam. Ryan also assists with other research efforts including freshwater mussel sampling in the Meramec River basin and statewide water temperature monitoring. He spends his free time outdoors, hunting and fishing with his fiancée, Leslie, and their two dogs. Ryan and Leslie are looking forward to their wedding this October!

### AMY WILLIAMS (M.S., 2011)

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Amy completed her master's degree in wildlife ecology in January 2011. After completing her degree, she moved to Houston, Texas. In October 2011, Amy began working at Perennial Environmental Services, a local environmental consulting company, as a staff biologist. Since joining the Perennial team, Amy has participated in field surveys, environmental permitting, and documentation under the National Environmental Policy Act and frequently travels throughout the U.S. She regularly interacts with clients in the energy industry as well as members of federal and state government agencies. Amy enjoys her work and has recently taken on additional responsibility as a project manager. In July 2013, Amy and Adam, her boyfriend of six years, purchased their first home in a suburb of Houston. They are enjoying home ownership and have a lot of home improvement adventures on the horizon!

## AWARDS AND RECOGNITIONS

### OUTSTANDING FACULTY, STAFF AND STUDENTS

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Caroline Jezierski was the recipient of the *Fall 2013 School of Natural Resources Staff Recognition Award*. The award is presented to staff nominated by their peers for outstanding job performance.

Joseph J. Fontaine was elected as a member of the 2013 American Ornithological Union.

Craig Allen was invited to be member of the James S. McDonnell Foundation Advisory Panel for Studying Complex Systems. The Foundation awards about \$20M each year for work that is risky, but which might result in great discoveries.

Kent Fricke received the 2014 Professional of the Year award from the Nebraska Chapter of The Wildlife Society. The award honors an individual who demonstrated outstanding achievement in the wildlife profession in Nebraska.



Dustin Martin received the 2014 *Outstanding Fishery Student Award* from the Nebraska Chapter of the American Fisheries Society. The award is given to students of Nebraska that are making outstanding contributions to the science of fisheries and aquatic resources.

In April 2014, Kelly Turek received the UNL *School of Natural Resources Meritorious Graduate Student Award*. This award is given to a graduate student to recognize their academic achievements, research, teaching contributions, leadership accomplishments, and service and personal qualifications.

#### UNIVERSITY OF NEBRASKA PRESIDENTIAL FELLOWSHIPS

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Three students from UNL were awarded University of Nebraska Presidential Graduate Fellowships for 2014–2015. Awardees included Danielle Haak, plus two others from UNL. In fact, two of the three Fellowships awarded to UNL students were awarded to students in UNL’s NSF IGERT program—Danielle and fellow IGERT student Trisha Spanbauer (Earth and Atmospheric Sciences).

#### UNL OTHMER FELLOWSHIPS AND IGERT ASSISTANTSHIP

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Amanda Lipinski and Daniel Uden were awarded prestigious 2014 University of Nebraska–Lincoln *Othmer Fellowships*.

Dan also received a 2014–2015 National Science Foundation IGERT Assistantship, and a 2014–2016 Great Plains Graduate Fellowship, both from the University of Nebraska–Lincoln.

#### OTHER SCHOLARSHIPS AND FELLOWSHIPS

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Kent Fricke received the 2013 *Shikar-Safari Club Scholarship*. Each year, a selected group of fisheries and wildlife faculty nominate one UNL wildlife student for the scholarship.

Lindsey Messinger was awarded the 2014 *Pheasants Forever Wildlife Scholarship*. The scholarship is awarded to one graduate student per year by the Nebraska chapter of Pheasants Forever and Quail Forever.

#### ELEVATOR SPEECH CONTEST

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In April 2014, the School of Natural Resources hosted an Elevator Speech Contest and associated Poster Symposium. Undergraduate and graduate students were challenged to give a three to four minute speech about their research project without props or special effects. Enthusiasm was high and our students performed well!

- Victoria Simonsen, UCARE student, third place, undergraduate category
- Emma Brinley Buckley, first place, Master’s category
- Hannah Birgé, first place, Doctorate category
- Dan Uden, third place, Doctorate category
- Lindsey Messinger, popular vote, poster symposium



#### TRAVEL AWARDS

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Noelle Hart received travel awards from UNL’s *David H. and Anne E. Larrick Memorial Travel Fund*, and from the Resilience Alliance. Both supported her attendance and presentation at the May 2014 Resilience Conference in Montpellier, France.

The Max McGraw Wildlife Foundation awarded Victoria Simonsen a Conservation Leaders for Tomorrow Scholarships to attend a four-day conservation education, professional development workshop.

## OTHER AWARDS AND RECOGNITIONS

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Caitlyn Gillespie was the recipient of the 2014 American Ornithological Union Membership Award. The award is a one-year complimentary membership to the AOU for students interested in pursuing a career in ornithology.

2013 Nebraska Wildlife Society Conference Presentation Awards were presented to both Caitlyn Gillespie and Kent Fricke.

Dustin Martin was an invited plenary speaker at the 2014 New York Chapter of the American Fisheries Society.

Danielle Haak was accepted to attend the Teaching Individual/Agent-based Modeling Short Course by Humboldt State University, presented in Leipzig, Germany, September 15–19, 2014.

## OUTREACH ACTIVITIES

The following are a *sample* of the outreach activities that Unit staff and students participated in during the past year.

### ENVIRONMENTORS

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Kent Fricke and Dan Uden continue to participate in the UNL Chapter of Upward Bound EnvironMentors program. They are serving as mentors for a high school student and assist the student with conducting a science project. They also served as 2014 judges in the April 14 EnvironMentors Spring Showcase.

### K-12 AND YOUTH CONNECTIONS

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NEBRASKAland's magazine *Trail Tales*, Winter 2013, featured a story by Kelly Turek, "Why I love my job as a fisheries biologist." *Trail Tales* is produced and distributed four times a year to Nebraska's fourth grade classrooms. Each edition focuses on Nebraska's wildlife species, science concepts and outdoor sports.

Noelle Hart and Bethany Teeters joined six other UNL graduate students in mentoring inner-city youth through nature photography. Participating youth met community elders, professional scientists and photographers. Their photos became a museum exhibit. Funded by the Fulbright Canada-RBC Eco-Leadership Program.

### NEBRASKA INVASIVE SPECIES PROGRAM

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The Nebraska Invasive Species Program has two billboards located at Lake McConaughy informing people to Stop Aquatic Hitchhikers and to raise awareness of invasive species in Nebraska. A new program website ([neinvasives.com](http://neinvasives.com)) went live in December 2013 providing the public with information on invasive species, an outreach event calendar and the ability to report invasive species sightings. The program coordinator and technicians attended numerous outreach events providing the public with information on the prevention of invasive species in Nebraska. Technicians interviewed boaters at high risk Nebraska waterbodies to assess their level of knowledge on aquatic invasive species and gauge their support for invasive species prevention regulations in Nebraska. Clean, drain and dry materials were given to over 2,000 boaters.

### WIND AND WILDLIFE

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Caroline Jezierski had several booths in and around the Lincoln area to educate the public about Wind and Wildlife in Nebraska including: Rainwater Basin Joint Venture Informational seminar, in Grand Island, NE; Nebraska Wildlife Society meeting in Kearney, NE; Eureka, UNL Extension Educators Event, in Lincoln, NE; Weatherfest, University of Nebraska–Lincoln; and the Lincoln Earth Day celebration in Lincoln, NE.

# 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 2015

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

Project Location: 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 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 to determine the effectiveness of removal techniques to improve ecosystem health and function. Finally, the results of this study will be used to develop an adaptive plan for management of invasive woody plants in the Niobrara River Valley. Fieldwork began in spring 2012 and will continue through fall 2014.



**Niobrara Valley**  
Photo: Craig Allen

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## AMPHIBIAN OCCUPANCY, FUNCTIONAL CONNECTIVITY, AND RESILIENCE OF RAINWATER BASIN WETLANDS

Principal Investigator(s): Dan Snow, Craig R. Allen

Graduate Student(s): Michelle Hellman, Ph.D.

Project Duration: April 2013 – May 2017

Funding: National Science Foundation IGERT Program, Grant 0903469

Project Location: Rainwater Basin, Nebraska

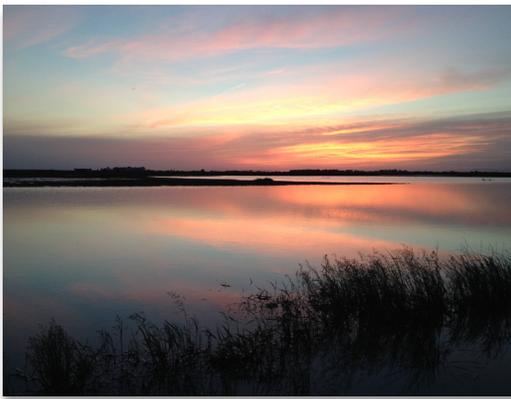
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Both the quantity and overall quality of wetlands have severely declined globally. Many remaining wetlands exist in landscapes dominated by agricultural production. The Rainwater Basin is a region of Nebraska characterized by shallow wetlands located in an agricultural matrix. Following European settlement in the mid-to-late 19th century more than 90% of historic wetlands were filled or farmed through. The remaining wetlands exist in an area of intensive agriculture that has further isolated wetlands and may affect their function, and reduce the resilience of the Rainwater Basin.

Resilience of a system is the amount or magnitude of disturbance a system can absorb before it is pushed into a new stable state. Resilience can be eroded over time by small perturbations leaving the system more vulnerable to a catastrophic change.

For the Nebraska Rainwater Basin, we are interested in the resilience of the functional connectivity among wetlands for amphibian species. Amphibians are an important taxonomic group that provide services by controlling insects, serving as food for migratory birds and other species, and integrating terrestrial and aquatic systems. Amphibians are sensitive to environmental contaminants and can be used as an indicator of water quality, system health, and resilience. Occupancy of amphibians, functional connectivity of remaining wetlands, and acute and chronic effects to amphibians from commonly applied agrichemicals will be investigated. Volunteers from the Unit, from the University of Nebraska, and from the Nebraska Game and Parks Commission performed roadside amphibian call surveys this year at 125 wetlands in the Rainwater Basin. Additionally, water contaminant samples have been collected from 28 wetlands.

Moving forward, this project will seek to assess how agricultural land-use may affect resilience of a large wetland complex.



**Private wetland in an agricultural field in the Rainwater Basin in May (flooded with rainfall)**  
Photo: Michelle Hellman



**The same wetland in July. Wetland has contracted and surrounding land has been planted.**  
Photo: Michelle Hellman

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## ANGLER BEHAVIOR IN RESPONSE TO MANAGEMENT ACTIONS ON NEBRASKA RESERVOIRS – PART I

Principal Investigator(s): Kevin L. Pope

Research Assistant Professor: Christopher Chizinski

Graduate Student(s): Lucas Kowalewski, M.S. (2014)  
Dustin Martin, Ph.D. (2013)  
Peter Spirk, M. S. (2012)  
Chris Wiley, M. S. (2013)

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

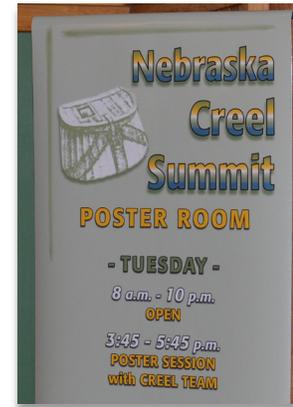
A Creel Summit was held on August 6–7, 2013 to share the past five years of creel data, program statistics, and experience with faculty and staff with the Nebraska Game and Parks Commission and the University of Nebraska–Lincoln.

The project had four study components:

1. *Statewide Angler Survey*: Anglers were interviewed at Calamus Reservoir, Harlan County Reservoir, Lake McConaughy, Lewis and Clark Lake, Merritt Reservoir, and Sherman Reservoir from April through October, 2009–2013. These interviews provided 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, anglers were interviewed 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 sampled at least one year during this study included 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.

Angler interviews were also 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) were evaluated 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 was evaluated 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 Wanhoo Reservoir in Wahoo, NE—rarely do brand new reservoirs open up. We interviewed anglers 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 was completed on 20 reservoirs in the Salt Valley region of southeast Nebraska during 2009–2012. This survey provided 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. Additional modeling will bridge the gap between social and ecological sciences by using social network analysis to look at angler participation patterns across the Salt Valley region and the influence of a new reservoir, Lake Wanhoo, on the regional fishery. 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 were 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. *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.



Collecting fish data on harvested fish

4. *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 when only six walleye were captured in a gillnet that was set overnight during standard sampling. As such, we estimated population sizes for channel catfish in 10 Salt Valley reservoirs. In addition, we investigated the applicability of techniques commonly used by wildlife biologists to estimate bird and mammal abundance, for estimating abundance of fish. This was accomplished through computer-simulated sampling of modeled populations. We observed that a trade-off exists between accuracy and precision of population estimates with regard to area of individual samples and number of samples when overall effort remains constant. Ultimately, information on fish population sizes will be linked with information on angler use and harvest.



Chris Wiley and Jean-Paul Montes pulling up a hoop net at Wildwood Lake  
Photo: Mike Dedinsky

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## ANGLER BEHAVIOR IN RESPONSE TO MANAGEMENT ACTIONS ON NEBRASKA RESERVOIRS – PART II

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

Graduate Student(s): Nicholas Cole, Ph.D.  
Alexis Fedele, M. S.

Project Duration: January 2014 – December 2019

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Website: FishHunt.unl.edu

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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 four study components:

1. *Statewide Angler Survey*: Anglers are being interviewed at Branched Oak Lake, Calamus Reservoir, Harlan County Reservoir, Lake McConaughy, Merritt Reservoir, Pawnee Reservoir, and Sherman Reservoir from April through October, 2014–2019. These interviews 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.
2. *Length-based Economic Assessment of Walleye*: Recreational fisheries are a unique industrial component to Nebraska's economy. Though they do not produce a directly-valued product, in terms of traditional economics, they do provide utility to recreational anglers through social capital or enjoyment. In seeking this social capital, anglers create demand for secondary industries (e.g., tackle, media, and travel accommodations). Thus, these secondary industries are a direct result of the quality of Nebraska's aquatic resources. As such, accounting for these economic gains within any resource assessment provides a more accurate value of the resource itself.

To quantify this valuation for walleye requires assessment of individual angler's willingness-to-pay to capture a fish and for each successive capture. Willingness-to-pay is most commonly quantified through classic cost-benefit analyses. These analyses typically focus on angler typology-specific stated-preferences, but can also use more novel methods that include license purchasing habits as a proxy to represent realized-preferences. This willingness-to-pay variable can then be used to set a monetary value for the capture of a fish.

We recognize that anglers derive social capital differently from the captures of trophy and non-trophy fish. Thus, we should expect that an angler's willingness-to-pay for a trophy fish is substantially greater than the willingness-to-pay for a small fish. To properly include this in our assessment, we will use a length-based framework. Thus, this assessment will provide a length-specific estimate of the value of captured walleye in Nebraska. Additionally, it will develop an improved census of the typologies and goals associated with Nebraska's modern walleye angler population.

3. *Spatial Distribution of Angling Pressure*: Most assessments of fisheries via angler surveys provide whole-waterbody estimates of angling pressure and catch. We know that fish communities and abundance are not uniformly distributed throughout a waterbody, particularly among very large reservoirs (> 1000 ha) where there are latitudinal zones marked by the transition of riverine habitat at the inlet to deep-water habitat by the dam. We are developing techniques to assess the spatial distribution of anglers and their catch that can be utilized in waterbodies that have distinct spatial regions. Information gained by this research should improve precision for estimates of angling effort and catch in spatially complex fisheries.
  
4. *Effect of Recreational Angling on Social Hierarchy of Fishes*: Many sport fishes establish social hierarchies, with individuals exhibiting dominant or subordinate behaviors. Recreational angling can affect individual fish directly (e.g., getting hooked) or indirectly (e.g., watching another fish get hooked), both of which have the potential to alter the social hierarchy. We are developing a series of laboratory experiments to quantify the influence that angling frequency has on the social hierarchy of common sport fishes. These experiments will provide insight into how recreational angling structures fish populations.

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## AQUATIC INVASIVE SPECIES (AIS) PREVENTION PROGRAM

Principal Investigator(s): Craig R. Allen

Project Coordinator(s): Karie Decker (7/2009 – 11/2012)  
 Rodney Verhoeff (4/2013 – 7/2013)  
 Allison Zach (9/2013 – present)

Project Duration: April 2011 – June 2015

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 Program (NISP) continues to administer a multi-institutional Aquatic Invasive Species Prevention Program funded with grant funding from the Nebraska Environmental Trust and the U.S. Fish and Wildlife Service (USFWS).

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 to help focus prevention efforts; and
4. *Increase* local and regional collaboration in the prevention of aquatic invasive species.

The NISP has conducted boater surveys and boat inspections each summer since 2012 at high-risk waterbodies throughout Nebraska to gauge public awareness of invasive species, track where boaters are coming from and going to, and to educate boaters on aquatic invasive species prevention. In 2014 surveys were collected using new survey software, and tablets were used by technicians administering the boater surveys. The new software allowed technicians to collect boater surveys when outside of Wi-Fi range. Then once back in Wi-Fi range, the technicians would sync the tablets and the survey data would be uploaded to a remote server. The program coordinator had access to the remote server and could analyze data on a daily basis to look at trends, and to make adjustments to survey schedules if necessary. In the past surveys were conducted using paper; data was later entered into an Access database during the fall. This didn't allow data analysis to be conducted until the winter following the field season. The new survey software has proven valuable for providing real time results and for looking at specific trends in boater surveys. In the fall of 2014, results of the 2012–2014 boater surveys will be presented at regional and national meetings. Result of survey findings from 2012–2014 will be submitted for publication.



**NISP technician conducting boater survey**

Below is a comparison of survey results collected between 2012 and 2013.

Topic	2012	2013
Total boater surveys completed	2,600	2,351
Had heard of zebra mussels	89%	94%
Drained boats before leaving water body	90%	92%
Visually inspect boat	77%	95%
Removed vegetation from boat	39%	42%
Flushed boat motor between uses	26%	21%
Rinsed boat off between uses	45%	46%
Dispose of bait in trash or on land	60%	58%

Zebra and quagga mussel sampling at high risk waterbodies have taken place each summer since 2010. Water samples were taken by NISP technicians and Nebraska Game and Parks (NGPC) staff. Samples were analyzed under a compound microscope using cross polarization. Any suspect samples were sent to a testing facility in Montana for verification. All water samples collected between 2011 and 2013 were negative for zebra and quagga mussel veligers (larva).

Offutt Air Force Base Lake in Bellevue, NE has been closed to motorboat usage since 2007 when a zebra mussel infestation was found and treated. The lake was again treated in 2008, but in 2013 the public reported to the NGPC that live zebra mussels were seen at the lake. In June 2014, NISP and NGPC staff again found live zebra mussels. Meetings are taking place summer and fall 2014 with the Offutt Base environmental staff and the Nebraska Invasive Species Advisory Council to determine control and management of the infestation.

A brochure is being developed to be given to bait dealers throughout Nebraska and the public to educate them on invasive fish species. The goal of this brochure is to educate the public to not dump bait in waterways and to inform them of legal bait that can be used in Nebraska. NISP and NGPC staff will disseminate the brochures across the state in 2014.



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## BAT MOVEMENTS ACROSS TRANSFORMING LANDSCAPES

Principal Investigator(s): Craig R. Allen, Caroline Jezierski

Graduate Student(s): Michael Whitby, Ph.D.

Project Duration: May 1, 2013 – April 30, 2016

Funding: Nebraska Environmental Trust  
Nebraska Game and Parks Commission

Project Location: Platte River, Nebraska

Website: <http://snr.unl.edu/renewableenergy/wind/researchbat.asp>

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Bats provide critical ecosystem services in the form of insect consumption, pollination, and seed dispersal. The economic importance of bats was estimated in 2011 to be about \$2.9 billion to the agricultural industry or on average \$74 per acre. In a state dominated by agriculture, such as Nebraska, the loss of bats could result in increased money spent for pesticides and other insect control measures. The potential synergistic impacts of wind energy development and white-nose syndrome on bats could have unanticipated, negative consequences in Nebraska and around the nation. Wind turbines are estimated to kill more than 600,000 bats every year. The seven most common bat species found dead near wind turbines are all either resident or migratory bats found in Nebraska. White-nose syndrome (WNS) is a deadly fungus that has killed over 6 million hibernating bats, threatening some species with extinction. Four of the eleven bat species affected are found in Nebraska.

Potential negative impacts of wind energy development on bats can be avoided or minimized through siting and operation that take into consideration bat presence and activity. We need more knowledge of bat migration patterns and habitat use in Nebraska to help protect bats and their habitats from the potential impacts of wind energy development, and to help utility companies, wind energy developers, and facility owners manage and mitigate the effects of new and existing wind energy facilities. Through the deployment of ultrasonic acoustic detectors, we plan to identify when and where bats are moving in eastern Nebraska during spring and fall migration.

Information gathered from this project will be shared in a variety of formats and used to further promote sound resource management practices in regards to wind energy development. Partners on this project include the Nebraska Wind Energy and Wildlife Project, the U.S. Fish and Wildlife Service, the Nebraska Game and Parks Commission, and the University of Nebraska–Lincoln.



**Michael Whitby with bat detectors**  
Photo: Emma Brinley Buckley

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## BETTER SOILS FOR BIRDS

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Hannah Birgé, Ph.D.

Project Duration: June 2013 – May 2016

Funding: National Science Foundation IGERT Program, Grant 0903469  
Nebraska Game and Parks Commission  
United States Department of Agriculture SARE Program

Project Location: North Central Nebraska

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Mid-contract management (MCM) strategies are required once per Conservation Reserve Program (CRP) enrollment period (typically ten years) to promote immediate upland bird habitat and native plant diversity. The MCM strategies commonly used in Nebraska include: (1) inter-seeding (drilling selected plant seeds into the ground), (2) disk tilling, (3) prescribed burning, or (4) herbicide application. These activities are meant to act as a surrogate for natural disturbances repressed by humans (e.g., wildfire, flooding, intermittent grazing etc.).

One primary research objective is to provide Nebraska's Niobrara Valley landowners who are enrolled in the CRP with a better understanding of how the four, major, mid-contract management activities impact key attributes of soil health. As landowners and managers are faced with the task of weighing the economic and ecological tradeoffs of different MCM strategies, soil health is often overlooked, with potentially detrimental consequences for the value and resilience of their land—especially important when landowners are faced with the option to re-enroll in the Program. We will use a combination of landowner surveys, field data collection, and laboratory analyses to understand how these four MCM activities impact soil health.

More specifically, research objectives include:

1. Tracking and establishing a set of measurable soil health attributes as identified by private landowners, and how they are differentially impacted by the four major mid-contract management strategies; and
2. Providing applicable, relevant information to private landowners, land managers and USDA NRCS personnel in an effort to promote smarter, adaptive management decisions that balance short- and long-term objectives to meet CRP contract requirements and landowner-desired outcomes alike.

A second objective is to understand how the MCM strategies drive changes in soil, plant and macroinvertebrate health that underlay upland bird habitat.

Mid-contract management activities drive high ground-dwelling macroinvertebrate abundance, forb cover, plant diversity and bare ground cover—all of which are essential to robust upland game bird habitat. However, the impact of this scheduled, human-implemented disruption on long-term upland bird habitat provisioning remains largely unknown. If MCM strategies impart concurrent benefits to bird populations, soil quality, plant communities and invertebrates, its true value to ecological restoration is underestimated. Conversely, if immediate benefits to bird production actually undermine soil quality and its ability to support essential insects and plants, the benefit of MCM to upland bird production could be fleeting. Disentangling and reporting the tradeoffs among MCM strategies will allow private landowners and federal and state personnel to better navigate the delicate task of balancing critical management goals (e.g., cost of implementation, bird production and/or soil quality).



**Upland sandpiper in the Lynch area**  
Photo: Hannah Birgé

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

Principal Investigator(s): Kevin L. Pope, Valery Forbes

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

Project Duration: August 2011 –

Funding: National Science Foundation IGERT Program, Grant 0903469  
University of Nebraska Presidential Fellowship  
University of Nebraska–Lincoln

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 an ecosystem after invasion. 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 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.



Photo: Danielle Haak

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## CANID DISTRIBUTION AND THE POTENTIAL IMPACTS OF ENERGY DEVELOPMENT IN NEBRASKA

Principal Investigator(s): Joseph J. Fontaine, Larkin Powell, Teresa Frink (Chadron State College)

Graduate Student(s): Lucía Corral, Ph.D.

Project Duration: January 2013 – January 2018

Funding: Nebraska Game and Parks Commission  
Nebraska Department of Roads

Project Location: Western Nebraska

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Increasing conversion of grasslands throughout the Great Plains has led to significant declines in the distribution and abundance of a variety of grassland obligate species and associated increases in habitat generalists. For example, the distribution and likely densities of generalist carnivores, including coyote (*Canis latrans*) and red fox (*Vulpes vulpes*) have increased throughout much of North America, while the closely related grassland obligate, swift fox (*V. velox*) has and continues to undergo significant declines. In Nebraska, swift fox currently occupy only 21% of their historical range, while coyotes have increased both in numbers and range throughout the state. Clearly generalists such as coyotes are capable of thriving in highly altered human landscapes, thus it is not surprising that their distribution has increased. What is less clear is why swift fox fail to occupy the 42% of Nebraska that continues to contain seemingly high quality swift fox habitat.

As the largest canid in Nebraska, coyotes are dominant to swift fox and often cited as an important source of mortality for swift fox populations. As such increases in the abundance and distribution of coyotes following the development of the Great Plains may have inadvertently restricted the range of swift fox despite the availability of suitable habitats. With increasing interest in developing infrastructure in the shortgrass prairie for gas, oil and wind energy resources, there is a clear need to identify the mechanism limiting the distribution of grassland obligate species such as swift fox, and how anthropogenic change is likely to alter important ecological relationships.

Over the next five years, we will work to identify the ecological mechanisms shaping the distribution of canid communities across Nebraska by developing and testing a series of species distribution models based on the habitat requirements and intraguild interactions between coyote and swift fox. The goal of this project is to understand how habitat structure, landscape attributes, and behavioral intraguild interactions, across multiple spatial and temporal scales, affect habitat use and geographic distribution of the canids species in Nebraska and how energy development may alter these relationships.

Starting in the spring of 2014, we began surveying for canids across 26,000 square miles of western Nebraska using baited camera traps. With the help of private landowners, we were able to deploy cameras at 107 survey sites, for over 4200 trap nights. Over the next several years, we will continue surveying for canids in the spring and fall working to develop a baseline model for canid species distribution in Nebraska.



**Lucía Corral setting a camera trap**  
Photo: Lucía Corral



**Nebraska swift fox taking a self portrait**  
Photo: Lucía Corral

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

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

Graduate Student(s): Emma Brinley Buckley, M.S. Kristine Nemecek, Ph.D. (2012)  
Kent Fricke, Ph.D. Nicholas Smeenk, Ph.D.  
Danielle Haak Ph.D. Bruce Stephen, Ph.D.  
Noelle (Chaine) Hart, Ph.D. Daniel Uden, Ph.D.  
Michelle Hellman, Ph.D. Kody Unstad, M.S. (2012)  
Robert Kill, M.S. (2013) Ashley VanderHam, M.S. (2014)

Undergraduate Student: Alec Wong (2013)

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 UNL School of Natural Resources are collaborating to expand the 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. After the drought of 2012, a mortality event occurred at Wild Plum, and approximately 20% of the adult population died. Finally, temperature thresholds and limitations were identified, and adult snails survived acute freezing events (5 hours) and had upper survival limits around 45°C.



**Collecting snails at Wild Plum Lake**  
Photo: Michelle Hellman

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## CLIMATIC CONSTRAINTS ON BOBWHITE QUAIL POPULATIONS ALONG THEIR NORTHERN EXTENT

Principal Investigator(s): Joseph J. Fontaine, Gwen Bachman

Graduate Student(s): Amanda Lipinski, Ph.D.

Project Duration: June 2014 – December 2020

Funding: Nebraska Game and Parks Commission

Project Location: South Central Nebraska

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Northern bobwhite quail (*Colinus virginianus*) are among the most popular game birds in North America; however, the loss of suitable habitat has led to precipitous population declines throughout their range. With significant grassland and farmland habitats, Nebraska has the potential to maintain viable quail populations, but due to the climatic conditions imposed by harsh winters and periodic wet springs, quail populations in Nebraska tend to be highly variable from year to year. Local habitat management may be capable of overcoming some environmental constraints, but effective management strategies necessitate a comprehensive understanding of the impacts of large scale climatic conditions on Nebraska's quail resources.

Although there are numerous studies focused on water constraints for quail populations in arid environments, the role of climatic conditions in driving quail populations in traditional temperate environments remains limited with much of the research conducted when the landscape was more conducive to facilitating population rebounds after severe weather events. Given the current agricultural paradigm, and predicted changes in climatic conditions, it remains unknown whether effective management implementation can lead to reliable quail populations and facilitate long-term stability in hunter engagement, satisfaction, and participation. In a first step to addressing this issue we propose to identify the mechanism by which climatic conditions impact quail and the means by which management may overcome climatic constraints.

The purpose of this project is to improve our understanding of how severe climatic events (i.e., snow storms, spring rains) alter quail physiology and behavioral decisions to impact population stability in Nebraska and to further develop management strategies aimed at offsetting these costs. Utilizing an individualistic approach that considers the inherent trade-offs in life history, physiological, and behavioral expression, we hope to identify key constraints in population growth and management strategies that may ameliorate population cycles.



**Bobwhite quail**  
Photo: Dave Menke, USFWS

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## DEVELOPING A NETWORK FOR INVASIVE SPECIES OUTREACH AND MONITORING IN NEBRASKA

Principal Investigator(s):	Craig R. Allen
Graduate Student(s):	none
Coordinators:	Rodney Verhoeff (4/2013 – 7/2013) Allison Zach (9/2013 – present)
Project Duration:	April 2013 – June 2016
Funding:	Nebraska Environmental Trust
Project Location:	Statewide Nebraska

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The Nebraska Invasive Species Program (NISP) administers a multi-institutional Aquatic Invasive Species Prevention Program with grant funding from the USFWS and Nebraska Environmental Trust.

Goals are to:

- Decrease the risk of invasive species introduction and spread through volunteer training workshops, and by targeted messaging across multiple user groups;
- Develop and implement a “next generation” invasive species education strategy;
- Evaluate the effectiveness of outreach in invasive species prevention through focused inventory and monitoring as well as through surveys designed to assess awareness;
- Increase local and regional collaboration in the prevention and control of invasive species.

Brochures were created and distributed to public and agency staff to promote the Nebraska Invasive Species Program and educate people on invasive species in Nebraska. Advertisements for Clean, Drain and Dry were included in Nebraska Game and Parks (NGPC) fishing and hunting guides. Advertisements will also be placed in community news journals and other NGPC publications during 2014. A new invasive species website was developed ([neinvasives.com](http://neinvasives.com)). It contains information on invasive species, an events calendar and a reporting page for invasive species sightings.

Technicians located throughout Nebraska in 2013 and 2014 conducted boater surveys and participated in outreach events. The technicians also gave presentations at outreach events and to agency staff.



**NISP technician conducting outreach in 2014**

Teaching tools for schools and outdoor education are being developed. A collection of hands-on materials and teaching materials on invasive species will be made available to Nebraska educators.

The Nebraska Invasive Species Advisory Council (NISC) meets on a monthly basis and the NISP coordinator organizes these meetings. The Council taught invasive species identification workshops in 2013 and 2014 to Master Naturalist program trainees. Identification workshops will continue to be offered to various audiences throughout 2014.



**The new invasive species cover page**

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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 for Analysis and Synthesis (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 previous 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 economics.

In a more applied exploration of these ideas, the role of species abundance, 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 resource managers to use for identifying impending regime shifts.
2. Focus on improving our understanding of the relationship between cross-scale distributions, species abundance, 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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## ECOLOGICAL APPLICATIONS OF TIME-LAPSE PHOTOGRAPHY

Principal Investigator(s): Craig Allen, Michael Farrell, Michael Forsberg

Graduate Student(s): Emma Brinley Buckley, M.S.

Project Duration: January 2013 – June 2015

Funding: Institute for Agriculture and Natural Resources, UNL

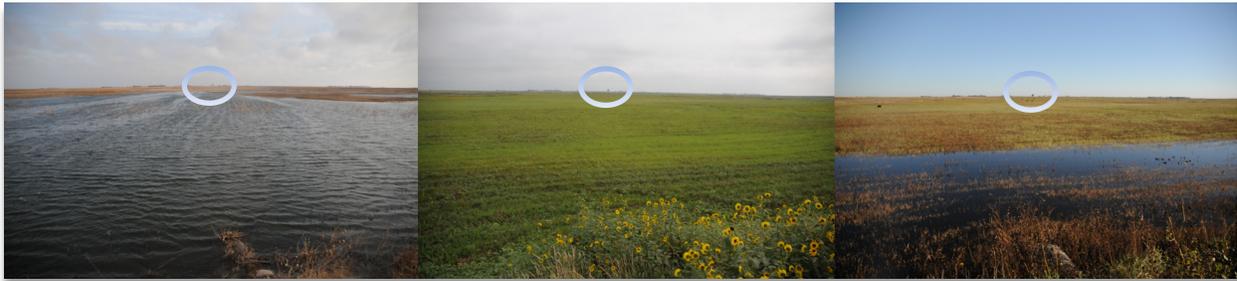
Project Location: Central Platte River Basin, Nebraska

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Stressed watersheds, where the demand for water is exceeding the natural supply, are a global issue. A leading example is happening and developing in the Great Plains of Nebraska. The central Platte River basin hosts a convergence of uses, including supplying water for agricultural irrigation, municipalities, and critical habitat for numerous species. Anthropogenic influences have impacted the flow regime, and the Platte River is a transformed system with reduced water flow, diminished sediment transport, and increased riparian vegetation.

Time-lapse camera systems are documenting the visible changes within the watershed as part of Michael Forsberg and Michael Farrell's Platte Basin Timelapse project. This study uses the time-lapse photos, and aims to explore innovative applications in the realm of science communication by integrating images with ecological and phenological data. Water quality measurements and bio-acoustic recordings of bats, frogs, and birds are being collected at camera locations.

There are two methods to this research. An educational approach uses interactive new media as a platform to visualize the watershed with images paired with interactive graphs displaying water quality measurements and the presence of wildlife. This method strives to educate the general public on system changes and patterns. The second approach employs the time-lapse cameras as in-situ remote sensors to quantify water inundation and vegetation phenophase through pixel analysis. Features will be extracted from the images to see if photographic attributes are correlated with water quality or call phenology.



Time-lapse, Platte River

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## ECOLOGICAL MODELS AND BIODIVERSITY CONSERVATION IN NEBRASKA LANDSCAPES

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Principal Investigator(s): Craig R. Allen

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

Project Duration: August 2012 – July 2015

Funding: Nebraska Game and Parks Commission  
National Science Foundation IGERT Program, Grant 0903469  
U.S. Fish and Wildlife Service

Project Location: Nebraska

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Biodiversity is increasingly threatened worldwide by an array of stressors. Therefore, sustainable means of satisfying growing human resource demands while protecting the environment and at-risk species must continue to be explored and implemented. The consideration of alternative, plausible futures for, and adaptive management of, social-ecological systems have been promoted for addressing present societal, environmental and ecological challenges; however, the application of these approaches has been met with varying degrees of success at different spatial and temporal scales. Learning from the past, adjusting current strategies according to new findings, and considering alternative plausible scenarios of the future could increase preparedness and improve management outcomes, despite uncertainties.

The Nebraska Natural Legacy Project is a state wildlife action plan that aims at accomplishing the following objectives:

1. Reverse declines of at-risk species;
2. Recover species currently listed as state or federally threatened or endangered;
3. Keep common species common, and conserve natural communities.

The plan identifies 39 Biologically Unique Landscape(s) (BUL) within Nebraska where conservation actions will be specifically targeted. A coarse filter/fine filter approach to conservation has been adopted in the plan, with the goal of benefiting the majority of species by managing at the community (coarse filter) level. Threatened species not encompassed by community-level management are then addressed specifically (fine filter).

This project will develop distribution models for species and/or communities identified as conservation targets within Nebraska BULs, with the goal of integrating modeling into an adaptive management conservation framework for BUL-scale management.

Expected products for BULs include habitat suitability ranks, assessments of functional connectivity for suitable habitat patches, baseline community area and species abundance estimates, identification of locations for focusing additional sampling and monitoring efforts, predicted community distributions and species abundances under an array of plausible management-based scenarios, evaluation of progress toward accomplishing established conservation objectives, and identification of suitable locations for the reintroduction of extirpated target species. Modeling techniques will be utilized according to data availability and their propriety for addressing specific research questions. Within an iterative framework, conservation objectives, management actions, and modeling techniques may be altered as additional information supporting adjustments is obtained.

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

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Principal Investigator(s): Craig R. Allen

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

Project Duration: April 2011 – July 2015

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

Project Location: Statewide Nebraska

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Land enrolled in the USDA Conservation Reserve Program (CRP) covers more than 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.

During the summer 2013 field season, a large portion of time was spent setting up control plots and sampling areas, installing pitfall traps, learning auditory and visual cues to identify birds, and learning local vegetation. Two technicians assisted with all activities.

The following tasks have been completed on the Smith's CRP site in Holt County, NE.

1. *Ground dwelling invertebrate sampling:* Pitfall trapping to sample ground dwelling insects palatable to upland bird chicks across the control (standard CRP seed mix plantings) and pollinator (high forb, high diversity CRP seed mix plantings) plots. Three samplings occurred thus far: one in early June, one in early July, and one in late July/early August.
2. *Pollinator sampling:* Blue Vane traps were set up to sample pollinator assemblages across the control and pollinator plots in the site. This will provide us with baseline data to compare with future years, once the pollinator plots are established. Sampling occurred during summer 2013. Additionally, sweep net sampling (to capture, record and release butterfly species) occurred in late summer 2013.
3. *Bird sampling:* Point count surveys were conducted across the pollinator and control plots to establish both baseline habitat usage and a running list of bird species that visit and inhabit the entire site. Five point counts were conducted between mid-June and mid-July. The first sampling was delayed until mid-June due to the time required to learn bird calls, and to train the technicians.
4. *Vegetation surveys:* Vegetation surveys are continuously conducted across the pollinator and control plots using a cover/frequency protocol to track changes in diversity and grass to forb ratios. A total of 15 square meters is measured within each of the 18 larger control and pollinator plots.
5. *Mapping:* Extensive GPS survey of the field is continuous and will provide us with the ability to revisit sampling areas in future field seasons and the capacity to create user-friendly ways of disseminating our data to broad audiences.



**Goatsbeard on CRP**  
Photo: Hannah Birgé

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## EVALUATING THE VALUE AND EFFICACY OF AGRICULTURAL CONSERVATION PROGRAMS FOR LANDOWNERS AND CONSERVATION PRACTITIONERS

Principal Investigator(s): Joseph J. Fontaine  
Post-Doctoral Fellow: Dustin Martin  
Project Duration: July 2013 – June 2015  
Funding: Nebraska Environmental Trust  
Nebraska Game and Parks Commission  
Project Location: Nebraska

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In Nebraska, Conservation Reserve Program (CRP) enrollment peaked in 2007 at 1.3 million acres and by 2012 had declined by roughly 30% to 900,000 acres. At the current rate of loss, CRP could disappear from the Nebraska landscape by 2025. Although the complete loss of CRP is unlikely, dramatic reductions in the availability of CRP and changes in the distribution and land types covered in CRP are likely to have corresponding implications for the soil, water, and wildlife resources of Nebraska. While much of the decline in CRP enrollment is attributed to higher commodity prices—as corn acres over the same time period increased from 9.4 million to 9.9 million acres—the complexity of the CRP program and the associated changes in farm demographics and agricultural practices brings into question whether factors beyond economics may drive conservation attitudes in Nebraska’s farmers.

Moreover, while conservation efforts have largely focused on reducing impacts through habitat restoration, it is becoming increasingly apparent that protectionist efforts are insufficient to ensure long-term socio-ecological resilience. Conservation approaches which are inclusive of human demands on ecosystem services and consider the potential for human dominated landscapes to provide for and maintain biodiversity while simultaneously providing for the food and fiber needs of society may provide an opportunity to strike a balance between socio-economic needs and socio-ecological impacts. However, this shift in paradigm necessitates innovative approaches that move beyond traditional conservation strategies. In either case, whether we are attempting to ensure the future of CRP or develop novel agricultural conservation programs, it is imperative that we understand the perceptions and values of the stakeholders involved.

This project will work with conservation practitioners and landowners throughout the state of Nebraska to evaluate the perceptions and values of landowners, specifically:

1. What are the perceptions and perceived values of the CRP program?
2. What are the perceptions and perceived values of the alternative CRP practices and the associated management requirements and approaches?
3. What are the limitations to participation in CRP by landowners?
4. What are the limitations in the ability of conservation practitioners and natural resource agencies to promote CRP?
5. What are alternative conservation strategies to CRP and the perceptions and perceived values surrounding the implementation of these alternatives?

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## FREMONT STATE LAKES RENOVATION STUDY: 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): Meg Trowbridge, M.S.  
Christa Webber, M.S.

Project Duration: April 2012 – June 2018

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 1940s 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. In the fall of 2012, 16 lakes were chemically treated (with aluminum sulfate, alum) to reduce nutrients available for phytoplankton growth. In addition, four lakes were also treated with rotenone for a fishery renovation, which subsequently included removing bottom-feeding species and restocking with a more desirable assemblage.

Given the alterations to the chemical and biological structure of the lakes, the goal of this study is to understand how physical drivers (e.g., lake-basin structure) 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. *Monitoring* physical and chemical water quality;
2. *Analyzing* the internal and external phosphorous (P) budgets, and
3. *Discerning* how altered fish communities indirectly affect water-quality dynamics.

Summer 2014 represents the third consecutive year of bi-monthly sampling for water quality at the FLS. During routine sampling, which covers 12–14 weeks of the growing season (May–October), we collect samples to analyze nutrients, chlorophyll (greenness), total solids, phytoplankton, and zooplankton communities. Fish community composition is collected once per season on each lake, and will be used to discern how alteration of the fish community affects 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.



Private contractor applying alum treatment to Fremont Lakes  
Photo: Brian Hammond

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## GENERATION OF NOVELTY IN COMPLEX SYSTEMS

Principal Investigator(s): Craig R. Allen  
Graduate Student(s): none  
Project Duration: January 2013 – December 2014  
Funding: James S. McDonnell Foundation  
Project Location: Global

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Novelty and innovation are essential attributes for the continued success of ecological, social and other complex systems, both natural and anthropogenic. Without them, dynamic, adaptive change in response to disturbance is not possible. Novelty and innovation are required to keep existing complex systems resilient and adaptable, and to create new structures and interactions following catastrophic ecological or social failures. The importance of novelty is recognized in the management and business world, but is less explicitly recognized and appreciated in the scientific world.

Novelty refers to new “products,” things or ideas which are generated through innovation, the process whereby novelty is created. Novelty and innovation are characteristic of dynamic systems—systems that are “alive” and changing—and are generated at multiple levels. For example, in biological systems, novelty is generated at the genetic level through random processes of mutation, at the species level through evolution and natural selection, at the community level as a result of regrouping of species combinations, and at the ecosystem level as a result of changes in key processes and interactions. Novelty is being constantly created, and extinguished. By generating potential solutions in advance of need, solutions may be readily available when problems arise.

Novelty can be either local or global. Locally novel additions are unique to that particular system, but may exist and originate from elsewhere. For example, when a species invades an ecosystem, novelty is added to that system. The invasive species is new to that system, but the species itself is not a novel or new life-form. On the other hand, globally novel additions had no prior existence. They are new not only to the particular system within which they are generated or added, but are globally unique. Speciation in an ecological system represents the addition of global novelty.

Without innovation and novelty, systems may become stagnant. Having a constant source of innovation and novelty is clearly important for systems, both following transformations and during their normal dynamics. However, novelty may be a destructive force as well. Invasive species, for example, can alter basic process and structure in ecosystems and be a source for decline or collapse. Cellular mutations can have obviously destructive consequences upon individuals and lineages—cancer is a prime example. Thus, innovation and novelty can be a double-edged sword. In ecosystems, for example, novelty in the form of new species has been a cause of major extinctions, but is also the prime source for recovery.

To explore the causes and consequences of the generation of novelty and innovation for humans, for social systems and for ecological systems, we will convene a small diverse group of researchers from diverse disciplines, with a variety of approaches and backgrounds, where we believe a deliberate focus on the concept of novelty could be fruitful. Our overall intent is to identify commonalities across disciplines. What attributes of a system are necessary if novelty is to arise? What might be the consequences, both positive and negative, of systems structured to permit novelty and innovation?

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## IMPLICATIONS OF HUNTER HARVEST 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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Ring-necked pheasants (*Phasianus colchicus*) are a culturally and economically important game species in Nebraska. Unfortunately populations have been declining since the 1950s due to habitat loss and land use change. Managers are interested in developing programs that will continue to support and increase existing pheasant populations. While lands enrolled in the Conservation Reserve Program (CRP) are vital in supporting 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) and access to private lands through public access signup programs.

Our goal is to provide a better understanding of how pheasants use agriculturally-dominated landscapes and to identify the impacts of recreational hunting on pheasant behavior and population dynamics 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 course of the project we captured and radio collared over 300 pheasants, including equipping several birds with GPS collars programmed to take locations every four hours. We recorded over 4,000 locations and collected vegetation and microclimatic conditions at nearly 500 sites. In addition, we collected data on hunter movements and interests. Using advanced time-lapse photography, we took over 100,000 photos which we are using to estimate hunting pressure on private lands enrolled in the Nebraska Open-Fields and Waters programs. We also conducted interviews of 150 parties hunting the open access fields for pheasants. This project is expected to be completed in the next several months, with Lindsey Messinger expected to graduate in the coming semester.



**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 Turek, M.S. (2014)  
Project Duration: May 2011 – April 2014  
Funding: Nebraska Game and Parks Commission  
Project Location: Statewide Nebraska

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The Nebraska Game and Parks Commission (NGPC) continually receives political pressure to stock native and non-native fish throughout the state. In many instances, stocking fish enhances recreational opportunities for anglers. However, in some instances, stocking fish mars the integrity and stability of biotic communities.

Currently, the NGPC discourages stocking trout in streams that are home to tier I/II fishes because of concern for these 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 compete with, tier I/II individuals. Thus, introduced trout could potentially harm tier I/II fishes.

The goal of this project was to gain a better understanding of the interactions between non-native trout and species of concern in Nebraska headwater streams to better predict the outcomes of future trout stockings. Specific objectives of this project were to determine 1) if non-native rainbow trout influence survival, behavior, movement, or distribution of native longnose dace under laboratory conditions, 2) if non-native rainbow trout influence survival of native longnose dace under in-situ conditions using in-stream enclosures, and 3) if native fish populations or communities differ in the presence and absence of non-native trout under natural conditions.

Rainbow trout preyed on longnose dace at low rates in both laboratory and in-stream enclosure experiments suggesting that if rainbow trout and longnose dace overlap in microhabitat use, some predation is likely to occur. Size structures of longnose dace and white sucker were larger in the presence of brown trout, and size structure of longnose dace was smaller in the presence of rainbow trout under natural conditions suggesting that non-native trout presence may influence some native populations. However, creek chub and fathead minnow size structures did not differ in the presence and absence of non-native trout. Greater non-native trout abundances resulted in greater distinction in native fish-community composition and structure between sites with and without trout suggesting there may be increased risk to native communities in sites with high abundances of trout. Therefore, species-specific and community-wide effects of non-native trout should be considered prior to introductions.



**Jamie Kindschuh shocking for longnose dace**  
Photo: Kelly Turek



**Kelly Turek with trout for stocking in the enclosures**  
Photo: Jamie Kindschuh

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## INTEGRATING ADAPTIVE MANAGEMENT, RESILIENCE THINKING, AND OPTIMIZATION

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

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

Project Duration: August 2011 –

Funding: National Science Foundation IGERT Program, Grant 0903469  
Nebraska Natural Legacy Project

Project Location: Statewide Nebraska

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The natural resources management paradigm has been shifting from traditional command-and-control to a focus on complex social-ecological systems and explicit recognition of uncertainty. Adaptive management is an approach combining management actions and scientific investigation 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 functions and processes. 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. Adaptive management, resilience thinking, and optimization have all been suggested as appropriate ways to implement the emerging social-ecological management paradigm, but translation into practice remains a challenge.

Structured decision making is a process for making smarter decisions that involves the clear elucidation of problems, objective, alternatives, consequences, and tradeoffs. This research project seeks to explore how structured decision making can link resilience, adaptive management, and optimization in order to generate a cohesive method of implementing the emerging social-ecological paradigm. Research conducted as part of this project will involve:

1. Translating resilience theory into natural resource management practices using structured decision making;
2. Investigating how optimization can be used to address resilience objectives;
3. Exploring the potential for adaptive management under State Wildlife Grants, focusing on the Nebraska Natural Legacy Project and using forest management at Indian Cave State Park as a case study; and
4. Creating frameworks for operationalizing future natural resources management projects that engage adaptive management, resilience thinking, and optimization.

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

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

Graduate Student(s): Christopher F. Jorgensen, M.S. (2012)

Undergraduate Student: Victoria Simonsen (UCARE Student)

Project Duration: January 2010 – December 2013

Funding: Nebraska Game and Parks Commission  
University of Nebraska–Lincoln UCARE Program

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 3,000 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.

Although the bulk of this project was completed in December of 2012 when Chris Jorgensen received his master's degree, Vicky Simonsen, an undergraduate UCARE student, tested one of the mechanisms that may explain how landscapes influence pheasant populations. In the summer of 2013, we used artificial nests to test if the presence of suitable nesting habitat in the surrounding landscape reduced nest predation. Over the course of two months we put out more than 100 nests, some of which were monitored by trail cameras. In the coming year Vicky will analyze and write up her findings as part of her undergraduate thesis.



**Badger derepredating an artificial nest**  
Photo: Victoria Simonsen

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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 2007 –

Funding: No external funding

Project Location: Great Plains and Western U.S.

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Chad Smith continues his research into the application of adaptive management at large scales and the link between governance structure and the successful implementation of adaptive management.

Smith is investigating major Bureau of Reclamation river recovery programs and his research includes: 1) literature review of adaptive management and adaptive governance; 2) how the river recovery programs define and implement adaptive management; 3) a comparison of different program governance structures; and 4) the aspects of governance and program management that relate to and predict successful implementation of adaptive management. 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 was also co-lead of a small team that wrote an Adaptive Management Plan for the Middle Rio Grande Endangered Species Collaborative Program and has provided expert advice on adaptive management to programs on the Trinity River, Missouri River, and the Everglades.

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## MANAGEMENT INDUCED SHIFTS IN PHEASANT REPRODUCTIVE STRATEGIES

Principal Investigator(s): Joseph J. Fontaine

Graduate Student(s): Jessica Laskowski, M.S. (2014)

Project Duration: September 2011 – August 2017

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 employed an individualistic approach that considers behavioral and life history responses to management actions as a means of understanding pheasant population dynamics.

Radio-telemetry was used to track hen pheasants in the breeding seasons of 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 strategies (e.g., clutch size, egg size, incubation patterns) were assessed in response to variable land-cover, hunting regimes and habitat enhancement. Over three years we captured nearly 100 hen pheasants on more than ten study sites. We measured many aspects of reproductive conditions, including collecting blood from roughly 60 hens to assess baseline and elevated cortecosterone levels, an indicator of stress. We found and monitored almost 70 nests, and collected nearly 300 samples of invertebrate food resources in brood rearing habitats. In the spring of 2014, Jess Laskowski successfully defended her thesis (graduating in May), but work on this project is on-going.



Jessica Laskowski sampling nest vegetation  
Photo: Lindsey Messinger



Jessica Laskowski measuring pheasant eggs  
Photo: Lindsey Messinger

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## MERGING SOCIAL AND ECOLOGICAL NETWORK MODELS

Principal Investigator(s): Brian D. Fath (Towson University), Kevin L. Pope, Valery Forbes

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

Project Duration: June 2014 –

Funding: International Institute of Applied Systems Analysis (IIASA) Young Scientists Summer Program  
National Science Foundation IGERT Program, Grant 0903469  
University of Nebraska Presidential Fellowship

Project Location: Laxenburg, Austria and Southeast Nebraska

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The field of ecology is shifting from population and community-based research to social-ecological research at a systems scale. Humans are often excluded from analysis, nullifying the social-ecological approach proposed by the sub-fields of resilience and adaptive management. Successful natural resource management relies on understanding how the components within a system fit together, allowing actions to be more proactive than reactive.

To apply this shift in thinking to aquatic invasive species management, there are two main research objectives.

1. Identify how the social component of ecosystems can be integrated into ecological network analysis (or vice versa); and
2. Apply and adapt the current ecological network analysis approach to predict movement, likelihood of introduction, and establishment of aquatic invasive species.

This will allow us to assess how disturbances, such as the introduction of an invasive species, alter energy flows both within an individual lake and across the regional landscape.

If successful, this method may be one option allowing us to take a true “regional fishery” approach to sport fish management. Results will provide managers with a completed, novel model specific to the Salt Valley reservoirs in southeastern Nebraska, as well as a model framework that can be applied to predict changes in energy flows due to the establishment of a variety of aquatic invasive species or even changes due to various fish stocking practices.

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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 (New Mexico Environment Department)

Graduate Student(s): Ashley VanderHam, M.S. (2014)  
Michelle Hellman, M.S. (2013)

Project Duration: July 2009 – June 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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Wetlands are among the most important and complex ecosystems in the world. They contribute to nutrient cycling, the hydrologic cycle, and provide critical habitat for many plants, fish, and wildlife. Channelization of Missouri River resulted in the loss of many floodplain wetlands. Recognition of the importance of wetlands has led to legislation that has increased wetland restoration. Despite ongoing restoration efforts, there are few ecologically-based performance guidelines, and managers need methods to quantify and assess the success of restored riverine wetland systems.

In 2008 a multi-institutional project funded by the U.S. Army Corps of Engineers was initiated in four states (Kansas, Missouri, Iowa, and Nebraska). The main goal of the project is to assess the success of previously restored wetlands and to create wetland restoration guidelines for future use. To determine restoration success, herpetofauna monitoring was established on previously restored wetlands. Frog call surveys and tadpole dip net surveys were conducted and analyzed using occupancy techniques to help determine restoration success. Amphibians were chosen for monitoring because they are globally declining, they integrate terrestrial and aquatic environments, and because they are good indicators of wetland restoration success. The focus areas for the Nebraska Coop Unit are three Missouri River bends in Nebraska, a subset of the overall project.

The amphibian monitoring data was used to conduct a comparison of frog call surveys and tadpole dip net occupancy results, a novel co-occurrence analysis for frog call surveys, and a functional connectivity analysis based on anuran dispersal distances. All analyses were performed to contribute to the overall goal of defining successful wetland restoration and creating wetland restoration guidelines for the future. The final report includes results from all four participating states: Iowa, Kansas, Missouri, and Nebraska.



**Gray Treefrogs**  
Photo: Caroline Reiland-Smith



Credit: USGS

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

Principal Investigator(s): Craig R. Allen

Coordinators: Karie Decker (7/2009 – 11/2012)  
Rodney Verhoeff (4/2013 – 7/2013)  
Allison Zach (9/2013 – present)

Project Duration: January 2010 – December 2014

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Website: <http://neinvasives.com/>

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

- Provide outreach to, and facilitate communication among, stakeholders regarding biological invasions, coordinate the Nebraska Invasive Species Council, and assist with any 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), and identification of invasive species introduction pathways.

The Nebraska Invasive Species Program (NISPP) continues to coordinate monthly meetings for the Nebraska Invasive Species Advisory Council, which was formalized as a state council through legislation in April 2012. This thirteen-member advisory council discusses topical invasive species issues, develops management plans and Early Detection-Rapid Response (EDRR) plans, builds collaborative partnerships to address priority issues, and informs the Nebraska Legislature of the status of invasive species in the state.

Project staff participated in a variety of outreach events in order to provide information regarding identification, prevention, and management of invasive species. Invasive species identification courses were given to groups of Master Naturalists during 2014 and at various agency annual meetings. The program technicians attended over 50 public outreach events giving out invasive species identification information.



**Project technician interacting with an angler as part of outreach efforts**  
Photo: Rodney Verhoeff

A new program website was built and went live in December 2013 ([neinvasives.com](http://neinvasives.com)). The website serves as a hub for invasive species information, events and links to useful resources and includes a reporting page where the public can report species sightings. Funding from this grant funded two billboards at Lake McConaughy to educate the public to Clean, Drain and Dry watercrafts to prevent aquatic invasive species. Nebraska Invasive Species identification guides were developed and distributed to the public at outreach events to assist in identifying invasive species and report them via the invasive species website.

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## OTTER DISTRIBUTION IN NEBRASKA

Principal Investigator(s): Craig R. Allen

Graduate Student(s): Nathan Bieber, M.S.

Project Duration: June 2014 – June 2016

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

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The aim of this research is to provide state furbearer managers with a more complete picture of North American river otter (*Lontra canadensis*) distribution in the state of Nebraska so that they may be better equipped to make management decisions regarding the conservation status and harvest potential of the species in the state.

After nearly a century of absence from Nebraskan waters, otter reintroduction efforts began in the state in 1986, and the otter was listed as an endangered species in the state at that time. By 1991, 159 otters had been released into Nebraska's rivers, and early indications from citizen reports, bridge surveys, and radio-telemetry of marked otters are that these iconic predators are beginning to recolonize some of their lost historic range. With the apparent success of the reintroductions, Nebraska's wildlife managers are faced with an unprecedented situation where a reintroduced and endangered species in the state may be a candidate for delisting.

Specific research objectives:

1. Determine current distribution of river otters in the state; and
2. Identify patterns of otter occupancy in order to provide managers with a framework around which to base decisions on possible controlled otter harvests and otter conservation status changes.



**Otter tracks found beneath a bridge**  
Photo: Nathan Bieber

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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 IGERT Program, Grant 0903469

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.

Previous research included such groups as ants and ground beetles. But work since 2012 has focused on pollinators, beginning with a pilot study in which the bee assemblages were compared between extremely isolated prairie fragments and large, well-connected fragments. This was a continuation of work which examined habitat factors that influence the structure of the pollinator community in the southeast prairies. 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. 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.

The work of 2012 and 2013 examined bee diversity and abundance in different types of grasslands. The dominant grassland types in the southeast are remnant prairie or haymeadow, properties enrolled in the Conservation Reserve Program and grazed pastures. These were evaluated as potential bee habitats based on floral resource availability. Bees were identified to species and sorted into functional groups that were then compared between grassland types. The goal was to identify gaps in the pollinator and plant community that could potentially influence the structure of pollination services.

Current research focuses on questions of habitat connectivity in this landscape and other habitat factors that may help explain the assemblages and distribution of species. This involves scoring the landscape of the BUL based on suitability for pollinators. Habitat suitability is determined by the potential to provide nesting and forage resources which differ with species and functional groups. The goal here is to identify gaps in the landscape where resources may be insufficient to support the current pollinator community based on forage and nesting requirements of species and functional groups or impede their dispersal based on specific foraging ranges. From this data, predictions of species distribution under different scenarios of land cover change can be made and provide insight on how and where management practices can be adjusted in order to conserve a robust pollinator community and their services..



Melissodes mallow  
Photo: Bethany Teeters

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## POPULATION ASSESSMENTS OF TEMPERATE BASSES IN NEBRASKA RESERVOIRS

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

Graduate Student(s): Lucas Kowalewski, M.S. (2014)  
Nathan Stewart, M.S.

Project Duration: July 2012 – June 2015

Funding: Nebraska Game and Parks Commission

Project Location: Southeastern Nebraska

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Branched Oak Lake and Pawnee Reservoir are flood-control reservoirs located in the Salt Creek watershed of southeastern Nebraska, and are popular sites for water-based recreation. Angler use of these reservoirs has declined in recent years and the Nebraska Game and Parks Commission is interested in restoring angler use to historic levels. The observed declines in angler use in both reservoirs have been associated with shifts in the fish communities and declines in the quality of the sport fisheries.

White perch now comprise a majority of the fish biomass in both reservoirs following their unintentional introduction. An important step towards the improvement of the sport fisheries is the reduction of white perch population sizes and their maintenance at low abundances. Previous attempts to reduce white perch population sizes by stocking predatory fish have been unsuccessful, likely because gizzard shad present in both reservoirs provide predatory fish with preferred, alternative prey. Physical reductions (removal of large portions of the populations) are needed in the white perch and gizzard shad populations for predators to have any chance of controlling and maintaining white perch abundances at low levels.

Baseline information is needed on the abundances and spatial distributions of white perch and gizzard shad to assist managers in implementing effective actions for removing large proportions of these populations. The goal of this project is to provide this baseline information with two specific objectives:

1. Quantify white perch and gizzard shad abundances;
2. Describe the seasonal and daily spatial distributions of white perch and gizzard shad.

In Branched Oak Lake, white perch and gizzard shad were concentrated during early spring in the lower portion of the reservoir where water depths were generally 6 m. Some of the fish observed in this portion of the reservoir were in tight schools near the reservoir bottom. White perch and gizzard shad during summer were distributed throughout the reservoir. White perch and gizzard shad began to concentrate again in the lower reservoir during late fall with few fish occupying the sections of the reservoir arms with water depths between 2 and 4 m, some fish in areas with water depths between 4 and 6 m, and some fish occupying water depths greater than 6 m.

In an attempt to reduce white perch and gizzard shad abundances in Pawnee Reservoir, a low-dose of rotenone (9 µg/L target concentration) was applied during November 2013. Prior to the low-dose-rotenone application, white perch and gizzard shad were the two most abundant fish species. The partial fish-kill comprised predominately white perch, gizzard shad, common carp, freshwater drum, and white crappie. It is likely that gizzard shad was extirpated from Pawnee Reservoir by the low-dose-rotenone application, and that the white perch population was reduced by less than half.



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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), Ted LaGrange (NGPC), Lisa Webb (Missouri Cooperative Fish and Wildlife Unit), Andy Bishop (Rainwater Basin Joint Venture)

Graduate Student(s): Ryan Stutzman, M.S. (2012)  
Caitlyn Gillespie, M.S.

Project Duration: January 2010 – December 2015

Funding: U.S. Geological Survey, National Climate Change and Wildlife Science Center  
(RWO 12)  
Rainwater Basin Joint Venture  
Great Plains Landscape Cooperative

Project Location: Nebraska, North Dakota, South Dakota

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The wetlands of the Great Plains are increasingly altered by anthropogenic change, but remain important stopover habitats for a variety of migratory birds, 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.

To identify the influence of anthropogenic change on avian habitat preferences, surveys were conducted for migrating shorebirds from April to June of 2010 and 2011 in north-central South Dakota. Our results show that 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 determine 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 phenology on shorebird migration to identify the potential sensitivity of migratory timing to climate change. We found that shorebird migration coincides with invertebrate food resources, indicating that migrants may be sensitive to climate-driven changes in food resource phenology.

Based on the findings from this initial study, which concluded with Ryan Stutzman receiving his M.S. in December 2012, we have now begun to assess how larger landscape attributes affect stopover decision processes and the corresponding physiological implications. In the spring of 2013, Caitlyn Gillespie began monitoring shorebird migratory patterns through the Rainwater Basin of south-central Nebraska as well as the southern Prairie Pothole Region of South Dakota, a study that is currently on-going.



**Shore birds**  
Photo: Joseph J. 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 Smeenk, Ph.D.  
Project Duration: August 2010 – May 2015  
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 to 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 post-metamorphic 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 in 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.

The primary goal of this study is to determine the current extent of chytrid in Nebraska by swabbing larval amphibian 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 and 2012, 168 swabs were collected from 5 frog species at 21 sites. Preliminary PCR results detected chytrid in 62% of the sites. Additionally, chytrid was detected in at least one swab from each species. The detection rate (*d*) was highest in bullfrogs (*n* = 9; *d* = 1.00) and lowest in plains leopard frogs (*n* = 78; *d* = 0.10). The detection rate did not appear to vary between months (May – *n* = 56, *d* = 0.125; June – *n* = 112 *d* = 0.17). An additional 10 samples were collected during 2013 and 23 samples were collected during 2014.

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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):	Kirsty Nash, Ph.D. Shana Sundstrom, 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. *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. *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. *Develop* a new conceptual model of the relationship between biodiversity, scale and resilience that accounts for abundance and functional response diversity.
4. *Develop* a resilience framework for managers from a synthesis of our discussions and basic research.

To accomplish these goals, we will convene 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.

We have successfully completed two of the three working group meetings in Fort Collins, CO, at the USGS John Wesley Powell Center for Analysis and Synthesis. Numerous publications are being developed as a result of the analytical, data-driven focus of our first two meetings. An upcoming third and final meeting will focus on translating our work into a land-use management plan framework, which incorporates key elements of resilience theory and the cross-scale resilience model.

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## USE AND SATISFACTION OF PUBLIC HUNTING OPPORTUNITIES

Principal Investigator(s): Joseph J. Fontaine, Dustin Martin, Lindsey Messinger

Graduate Student(s): Lyndsie Wszola, M.S.

Project Duration: January 2010 – December 2015

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Website: FishHunt.unl.edu

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The retention and recruitment of hunters is of increasing concern to wildlife management agencies nationwide. A lack of access to quality hunting opportunities is often deemed as the primary reason why people quit hunting. In an effort to provide hunting opportunities for their constituency, the Nebraska Game and Parks Commission invests considerable time and resources into the development and management of public Wildlife Management Areas and private lands open to public access through the Open Fields and Waters Program. Although investment in these programs is assumed to fulfill the needs of the hunting community, evaluating the use of public or private land by hunters, and their overall satisfaction with the hunting experience is challenging. Currently, the majority of hunter participation, satisfaction, and harvest data are collected at coarse spatial and temporal scales, through post season surveys. Unfortunately, this data does not provide the preferred resolution needed to appropriately manage individual Wildlife Management Areas or Open Fields and Waters sites. Moreover, it does not allow managers to assess the value of their investment in particular lands. Given the limited resources available for wildlife management, managers need a better understanding of hunter participation at the scales for which management actions occur if they are expected to manage lands appropriately. The integration of research methods from fisheries and human dimensions will allow for fine-scale spatial and temporal data to be collected using proven methodology. Incorporation of fine-scale spatial and temporal patterns in hunter participation will help managers better determine appropriate site-specific management objectives given the dynamic nature of hunter participation.

Further, fine-scale spatial and temporal patterns in hunter participation can be used to develop regional management approaches that consider the dynamic nature of hunter participation. Hunters often move among multiple sites within a region. The geographic distribution of alternative hunting locations, the respective availability of game, and the overall quality of the hunting experience plays a critical role in how people perceive and participate in outdoor recreation. Thus the effect of hunting and hunter participation on wildlife populations, hunter recruitment and retention, and local economies is likely acting at multiple scales that are currently not considered when managing wildlife resources. This regional understanding of hunter participation and satisfaction could be a considerable aid in guiding NGPC investments in public land acquisition and private land initiatives such as the Open Fields and Waters Program.



**Interviewing a party of Pheasant hunters in southwest Nebraska**  
Photo: Joseph J. Fontaine

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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 2015
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 River headwaters, and Rainwater Basins). 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 2011–2013 researchers conducted wetland condition assessments at 109 wetland sites located across Nebraska. Using data collected in 2011–2012, a Nebraska specific wetland rapid assessment method (NeWRAM) was developed and tested at 40 sites during 2013. Initial results indicate that NeWRAM is an effective method for measuring wetland condition.



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



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

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## WIND AND WILDLIFE PROJECT

Principal Investigator(s):	Craig R. Allen, Joseph J. Fontaine
Coordinator:	Caroline Jezierski
Project Duration:	March 2011 – July 2016
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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This project helps to mitigate negative impacts of wind energy development and operation on local flora and fauna by facilitating communication among stakeholders regarding wind power development and operation, identifying and implementing priority research and monitoring efforts, and developing management tools and technical guidance materials.

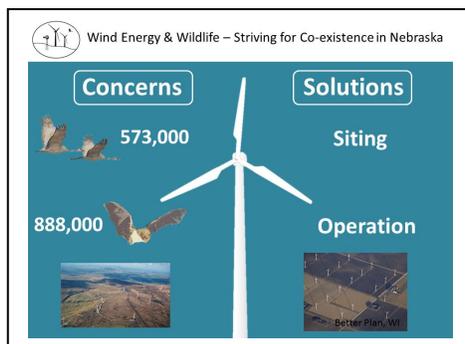
The Nebraska Wind Energy and Wildlife Project website was developed in 2011 and is frequently updated. This year, several webpages were added to assist in informing wind energy developers and environmental consultants on policies and resources for Nebraska. A *County Zoning* webpage was developed; it contains a map of counties with general zoning regulations and wind energy-specific regulations, such as setbacks for wind turbines and meteorological towers from wetlands and public conservation lands, and links to all county zoning regulations. A *Public Conservation Lands* webpage was developed to provide easy access to a map with state, federal, and other lands important to conservation. A webpage containing information on Nebraska's wetlands and the U.S. Fish and Wildlife Service (USFWS) *National Wetlands Inventory Wetlands Mapper* was developed; a table to correlate the wetlands classification system used in the county zoning ordinances and *Wetlands Mapper* was also included. The USFWS has proposed to list the northern long-eared bat as endangered; a webpage was developed that contains pertinent information on the listing process and the natural history of the bat. A *Bat Research* webpage was developed and contains an introduction to bats and wind energy, a map of the number of bats species in Nebraska counties, information on the Nebraska Bat Migration Project, and how to volunteer to help monitor bats. A Nebraska Bat Migration Project website was also developed; the website contains research highlights including a project blog.

A number of other tools have been developed to educate stakeholders about wind energy and wildlife issues. More than 80 individuals from a diverse array of stakeholders are subscribed to the listserv developed to disseminate Nebraska wind energy and wildlife information. Emails sent out via the listserv approximately every two weeks contain Nebraska-specific information and nation-wide wind and wildlife news. Several informational handouts or brochures were developed including, *Nebraska Wind Energy and Wildlife*, *Renewable Energy Development and Wildlife in Nebraska*, *Nebraska Wind Conference: Wind – Wildlife Session Presenters 2013*, *Volunteer to Monitor Bats in Nebraska*, and *2013 Wind Energy and Wildlife Survey Results* for each Public Power District.

In Nebraska, there are grassroots efforts to develop wind energy in rural communities. Wind energy developments can range greatly in size and recently there has been a push for smaller developments (10 turbines or less) by some organizations. Whether the interest is in a smaller or larger development, the Project determined it was valuable to reach out to the zoning/planning departments (or clerks) of the 93 counties and the 34 Rural Electric Associations for Nebraska. A mailing was sent out in 2013 containing information on the Project. A follow-up letter was sent in 2014 to the county zoning/planning departments asking for input on the new webpage (<http://snr.unl.edu/renewableenergy/wind/windenergydevelopment.asp#zoning>). Several county planners provided input on the webpage and a number of them indicated their interest in including setbacks for wind turbines when they update their zoning ordinances. In addition, copies of the Project brochure and information about the Project were sent to all of the University of Nebraska–Lincoln Extension Education Offices across the state and brochures were provided to the Municipal Energy Agency of Nebraska and to a number of Nebraska State Parks and other tourist locations.

A number of guidance documents have been or are currently being updated and/or developed. The *Guidelines for Wind Energy and Wildlife Resource Management in Nebraska* were updated in November 2013. *Bat Assessment Guidance for Wind Energy Facilities in Nebraska* was developed and reviewed by a number of local and national bat and wind experts. A template for Whooping Crane Contingency Plans was developed for use by wind energy companies interested in developing within the migratory corridor. A sub-group of the Nebraska Wind and Wildlife Working Group is developing mitigation recommendations for forthcoming wind energy developments. All of these documents have been developed with input from a variety of stakeholders.

A number of research projects related to wind energy and wildlife are currently being developed. The Nebraska Environmental Trust awarded a grant to study bat movements and migrations in eastern Nebraska (see the *Bat Movements across Transforming Landscapes* project page). Grant proposals for additional bat studies are being developed; other relevant research topics are being considered. Five questions related to wind energy development and wildlife resources were submitted to the 2013 Nebraska Annual Social Indicators Survey (NASIS) to learn more about Nebraskan’s knowledge and perceptions of wind energy development and its potential impacts on wildlife resources.



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## WIND AND WINGS: SUSTAINABLE WIND ENERGY DEVELOPMENT AND BAT CONSERVATION

Principal Investigator(s): Victoria Chraibi, Caroline Jezierski, Lindsay Rogers

Project Duration: January 2014 – August 2014

Funding: Fulbright Canada-RBC Eco-Leadership Program

Project Location: Statewide Nebraska

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Bats provide important ecosystem services humans rely on, yet many of our actions threaten bat survival. Nebraska has 13 species of bats, seven of which are listed as At-risk. Whether the bats are residents or migrating through Nebraska, they are all insectivores and consume thousands of insects every night. By consuming agricultural and forest insect pests, bats provide natural pest control, reducing the need for pesticide application by farmers and use of bug-spray for personal protection. Throughout the United States, bats are threatened by wind energy facilities, white-nose syndrome, habitat loss, and pesticide use. Bats are not well-understood by most people and many people harbor misconceptions that can be detrimental to bats.

The goal of this project is provide the public with information about bat conservation and wind energy through workshops and informational signs. A series of workshops targeting teachers and after-school educators will be held in Nebraska communities. Workshop participants will be provided with the skills, materials, and confidence needed to incorporate bat conservation education at their schools and in their communities. Local bat experts and educators will lead the workshops and provide continuing support through the development of web resources. An informational sign will be developed and displayed at parks and other public locations throughout Nebraska. Reaching as many members of the public with the information is the goal. Therefore, the sign will be designed in a manner that it can be adapted to fit different display cases and will freely be available for use by interested organizations.

Because both bat conservation and wind energy will continue to be prominent issues in Nebraska in the future, we aim to provide information that will empower people to conserve bats and provide a lasting impact on Nebraska communities.

## PROFESSIONAL ACTIVITIES

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### TEACHING

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#### CHRISTOPHER CHIZINSKI

##### Fall 2013: Fisheries Science

This undergraduate and graduate course covers topics important in fisheries biology (e.g., population dynamics, habitat, sampling strategies) emphasizing the determination and evaluation of vital statistics (e.g., population structure, fish body condition) for the management of fish populations, which provide the basis of specific management techniques. In addition this course provided the field (e.g., sampling techniques and gear) and laboratory skills (e.g., ageing techniques) needed for fisheries biology and management.

#### JOSEPH FONTAINE

##### Spring 2014: Fundamental Readings in Life History Theory

The focus of this course is to identify and discuss the classic and emerging papers in life history theory. Life history theory is a fundamental component of much of biological investigation, and discussions of key concepts in life history theory (e.g., clutch size evolution) continue to be debated despite often decades of consternation in the literature. Through this course students identify concepts in life history theory of interest to them, presenting 2–3 classic papers and 2–3 emerging papers on the topic.

##### Fall 2013: Trends in Ecological Applications

This course focuses on current research in applied ecology by exploring and developing the current research programs of participating students. Through this course students learn to develop and communicate their research by placing their questions within the scope of current ecological research.

#### CAROLINE JEZERSKI

##### Fall 2014: Employment Seminar

This undergraduate employment seminar intends to prepare new graduates to be successful applicants. Topics cover efficient job-hunting, resumes, cover letters, mock interviews, and dining etiquette. It is group taught. Instruction included facilitating small group discussions, serving as a resource person, and providing feedback to students on subjects that include job market research, resume preparation, and interviewing skills.

#### KEVIN POPE

##### Spring 2014: 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

- Didier Baho (Ph.D., Aquatic Sciences and Assessment, Swedish University of Agricultural Sciences, Uppsala)
- Anil Giri (Ph.D., Agricultural Economics, UNL)
- Jeff Hartman (Ph.D., School of Natural Resources, UNL)
- Wayne Ohnesorg (Ph.D., Entomology, UNL)
- Katilyn Price (M.S., School of Natural Resources, UNL)
- P. Shrestha (Ph.D., Agricultural Economics, UNL)
- Trisha Spanbauer (Ph.D., Earth and Atmospheric Sciences, UNL)
- Bruce Stephen (Ph.D., School of Natural Resources, UNL)
- Christopher Wood (M.S., Biology, University of Nebraska Omaha)

#### CHRISTOPHER CHIZINSKI

- Lindsey Messinger (M.S., School of Natural Resources, UNL)
- Christa Webber (M.S., School of Natural Resources, UNL)
- Lucas Kowalewski (M.S., School of Natural Resources, UNL) (Graduated May 2014)

#### JOSEPH FONTAINE

- Abigail Neyer (Ph.D., School of Biological Science, UNL)
- Jason DeBoer (M.S., School of Natural Resources, UNL) (Graduated May 2014)
- Robert Kill (M.S., School of Natural Resources, UNL) (Graduated December 2013)

#### KEVIN POPE

- Martin Hamel (Ph.D., School of Natural Resources, UNL) (Graduated December 2013)
- Jeremy Hammen (Ph.D., School of Natural Resources, UNL)
- Matthew Haugen (M.S., School of Natural Resources, UNL) (Graduated December 2013)
- Nicholas Hogberg (M.S., School of Natural Resources, UNL) (Graduated May 2014)
- Lindsey Messinger (M.S., School of Natural Resources, UNL)
- Mathew Rugg (M.S., School of Natural Resources, UNL) (Graduated August 2013)
- Shana Sundstrom (Ph.D., School of Natural Resources, UNL)

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### PROFESSIONAL AND FACULTY SERVICE

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#### CRAIG ALLEN

- Member, James S McDonnell Foundation Advisory Panel for Studying Complex Systems
- Core Team, National Socio-Environmental Synthesis Center, Social-Ecological System Resilience, Climate Change and Adaptive Water Governance [The Resilience and Law Project]
- Invited feature paper (Ph.D. student D. Uden, first author), *Journal of Soil and Water Conservation*
- Guest editor, *Ecological Applications*. Contribution of reserves to regional resilience
- Appointed, Core Advisory Group, Collaborative Adaptive Management Network
- August T. Larsson Guest Researcher Programme, Swedish University of Agricultural Sciences, Uppsala, Sweden
- Associate editor, *Ecology and Society*
- Board of Trustees, The Nature Conservancy Nebraska
- Nebraska Conservation Roundtable

#### KEVIN POPE

- Book Editorial Advisory Board, American Fisheries Society
- Graduate Committee, UNL School of Natural Resources

#### JOSEPH FONTAINE

- Awards Committee, American Ornithological Union
- Assistant secretary, Cooper Ornithological Society
- Book review editor, *Condor*
- 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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#### HANNAH BIRGÉ

- Organizer, special session for the 2014 Soil and Water Conservation Society annual meeting: Adaptive Management for Ecosystems

#### EMMA BRINLEY BUCKLEY

- Secretary, School of Natural Resources Graduate Student Association

#### KENT FRICKE

- At-Large board member, Nebraska Chapter of The Wildlife Society, 2013–2015
- Past-chair, Student Development Working Group, The Wildlife Society
- Chair, Participant Agenda Subcommittee, Leadership Institute Committee, The Wildlife Society

#### VALERIE EGGER

- UNL School of Natural Resources Space Survey Committee
- Editor, USGS *Coop Catch-up* newsletter

#### CAROLINE JEZIERSKI

- Planning Committee and Abstract Reviewer, National Wind Coordinating Collaborative Wind Wildlife Research Meeting X, 2014
- Planning assistance, Nebraska Wind Conference, 2013 and 2014
- Planning assistance, Nebraska Wind Siting Symposium, 2014
- EnvironMentors/Upward Bound Co-Mentor, University of Nebraska–Lincoln

#### NATHAN STEWART

- Treasurer and Secretary, 2013–2014, American Fisheries Society, Nebraska Chapter, Cornhusker Student Subunit

#### MICHAEL WHITBY

- Southeastern Bat Diversity Network Bat Blitz committee
- North American Bat Monitoring Program Technical Report reviewer

#### ALLISON ZACH

- Nebraska Representative, Mississippi River Basin Panel on Aquatic Nuisance Species
- Nebraska Representative, Western Regional Panel on Aquatic Nuisance Species
- Coordinator, Nebraska Invasive Species Council

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### TRAINING ASSISTANCE, WORKSHOPS AND OUTREACH ACTIVITIES

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#### CRAIG ALLEN

- Instructor. Over-the-water and Non-Motorized Boat training courses, July 2014. Lincoln, NE.

#### EMMA BRINLEY BUCKLEY

- EnvironMentors/Upward Bound (Mentor)
- Waterfest (Photographer)
- Beyond Plain Sight, QUESTNebraska, Nebraska Educational Television (TV Show Segment Interviewee)
- Produced video shown on Nebraska Nature Conservancy website

#### CARYL CASHMERE

- Presenter. UNL Forms and Processes. Statewide Creel Clerk Workshop, March 2014. Lincoln, NE
- Presenter. UNL Forms and Processes. Hunter Survey Clerk Workshop, August 2014. Lincoln, NE

#### CHRISTOPHER CHIZINSKI

- Co-Instructor. Motorboat Operators Certification Course (MOCC), May 2014. Brookings, SD
- Planning coordinator. Statewide Creel Clerk Workshop, March 2014. Lincoln, NE
- Co-Instructor. Over-the-water training. August 2014

#### JOSEPH FONTAINE

- Co-Instructor. Over-the-water training. August 2014

#### CAROLINE JEZIERSKI

- UCARE Project Advisor
- Invited Presenter. Wind Energy Development & Wildlife—Striving for Co-existence. Sandhills Taskforce Quarterly Meeting. October 2013. Thedford, NE
- Guest Lecturer. Wind Energy Development & Wildlife—Striving for Co-existence. University of Nebraska–Lincoln Environmental Planning and Policy class (CRPL 470/870). October 2013. Lincoln, NE

- Renewable Energy and Wildlife in Nebraska—Striving for Co-existence. Rural Futures Conference. November 2013. Lincoln, NE
- Invited Presenter. University of Nebraska–Lincoln, Natural Resources Course. November 2013. Lincoln, NE
- Moderator, Session Planner. Outreach/Education Booth. The Nebraska Wind Conference, November 2013. Lincoln, NE
- Invited Presenter. Wind Energy Development & Wildlife—Striving for Co-existence. Wachiska Audubon Monthly Meeting. January 2014. Lincoln, NE
- Nebraskans views of wind energy development and wildlife: Results of the 2012 and 2013 Nebraska Annual Social Indicators Survey. Midwest Fish & Wildlife Conference. January 2014. Kansas City, MO
- Outreach/Education Booth. Rainwater Basin Joint Venture Informational Seminar. February 2014. Grand Island, NE
- Invited Presenter. Conference Planner, & Outreach/Education Booth. Wind Energy & Wildlife—Striving for Co-existence in Nebraska. Nebraska Wind Siting Symposium. February 2014. North Platte, NE
- Presentation & Booth. Nebraskans views of wind energy development and wildlife: Results of the 2012 and 2013 Nebraska Annual Social Indicators Survey. Nebraska Chapter, The Wildlife Society Annual Meeting. February 2014. Kearney, NE
- Invited Presenter. Wind Energy & Wildlife—Striving for Co-existence in Nebraska. USFS Regional Coordinating Meeting. March 2014. Wood River, NE
- Outreach/Education Booth. University of Nebraska–Lincoln Extension Educators *Eureka* Event. March 2014. Lincoln, NE
- Invited Presenter. Wind Energy & Wildlife—Striving for Co-existence in Nebraska. University of Nebraska–Lincoln, School of Natural Resources Elevator Speech Contest. April 2014. Lincoln, NE
- Outreach/Education Booth. Weatherfest. April 2014. Lincoln, NE
- Outreach/Education Booth. Lincoln Earth Day. April 2014. Lincoln, NE
- Mentor. Upward Bound EnvironMentors Program. Student research topic—Impact of Light Pollution on Insects. Fall–Spring 2013–2014. Lincoln, NE

#### KEVIN POPE

- Co-Instructor. Motorboat Operators Certification Course (MOCC), May 2014. Brookings, SD

#### NATHAN STEWART

- EnvironMentors/Upward Bound Co-Mentor. University of Nebraska Lincoln, 2013–2014

#### DAN UDEN

- EnvironMentors/Upward Bound Co-Mentor. University of Nebraska–Lincoln

#### MICHAEL WHITBY

- Bats of Nebraska: An Introduction to the Natural History of Bats with a Focus on Nebraska Presentation and detector demonstration at Mahoney State Park

#### ALLISON ZACH

- Workshop on Invasive species identification, Master Naturalists, April and June 2014
- Booth at Carp-O-Rama, various locations throughout Nebraska during summer 2014
- Booth Nebraska Game and Parks Kearney, May 2014
- Booth Nebraska science teachers association meeting, May 2014
- Booth at Waterfest. May 2014. Lincoln, NE,
- Booth at family fishing events, throughout Nebraska, summer 2014
- Workshop on aquatic invasive species identification, Creel clerk training, Lincoln, NE, April 2014

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## PEER-REVIEWED PUBLICATIONS

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Allen, C.R., and A. Garmestani. (In Press.) *Adaptive Management of Social-ecological Systems*. Springer, New York, NY.

Allen, C.R., D.G. Angeler, A.S. Garmestani, L.H. Gunderson, and C.S. Holling. 2014. Panarchy: Theory and application. *Ecosystems* 17:578–589.

Allen, C.R., D.R. Uden, A.R. Johnson, and D.G. Angeler. (In press). Spatial modeling approaches for understanding and predicting the impacts of invasive alien species on native species and ecosystems. In C. Vennette (Ed.), *Pest risk modelling and mapping for invasive alien species*. CAB International, Wallingford, U.K.

- Angeler, D.G., C.R. Allen, M. Alvarez-Cobelas, C. Rojo, M.A. Rodrigo, and S. Sánchez-Carrillo. 2013. Inferring the relative resilience of alternative states. *PLoS ONE* 8(10): e77338. doi:10.1371/journal.pone.0077338.
- Angeler, D.G., C.R. Allen, H.E. Birge, B.G. McKie, and R.K. Johnson. (In press). Assessing and managing freshwater ecosystems vulnerable to global change. *Ambio*.
- Angeler, D.G., C.R. Allen, A. Vila-Gispert, and D. Almeida. (In press). Fitness in animals correlates with proximity to discontinuities in body mass distributions. *Ecological Complexity*.
- Baho, D.L., S. Drakare, R.K. Johnson, C.R. Allen, and D.G. Angeler. 2014. Similar resilience attributes in lakes with different management practices. *PLoS ONE* 9(3):e91881. doi: 10.1371/journal.pone.0091881.
- Britzke, E.R., N.R. Beane, A.V. Davis, M.W. Whitby, and S.M. Brasfield. 2014. *A robust scalable framework for conducting climate change susceptibility analyses*. ERDC TN-14-1. Vicksburg, MS: US Army Engineer Research and Development Center.
- Chizinski, C.J., D.R. Martin, C.G. Huber, and K.L. Pope. (In Press). Emergency drawdown of reservoir affects angler visitation and catch. *Great Plains Research*.
- Chizinski, C.J., D.R. Martin, K.L. Hurley, and K.L. Pope. 2014. Self-imposed length limits in recreational fisheries. *Fisheries Research* 155:83–89.
- Chizinski, C.J., D.R. Martin, K.L. Pope, T.J. Barada, and J.J. Shuckman. 2014. Angler effort and catch within a spatially complex system of small lakes. *Fisheries Research* 154:172–178.
- Cosens, B., L. Gunderson, C.R. Allen, and M. Harm Benson. 2014. Identifying legal, ecological and governance obstacles and opportunities for adapting to climate change. *Sustainability* 6:2338–2356; doi: 10.3390/su6042338.
- Cumming, G., D. Cumming, K. Maciejewski, M. Nenadovic, K. Kotschy, G. Epstein, H. Biggs, C. Moore, N. Ban, A. de Vos, M. Etienne, R. Mathevet, C. Allen, D. Biggs, and M. Schoon. (In press). Understanding protected area resilience: A multi-scale, social-ecological framework. *Ecological Applications*.
- Fontaine, J.J., R.J. Stutzman, and L.Z. Gannes. (In Press). Leaps, chains and climate change for Western migratory birds. *Studies in Avian Biology*.
- Garmestani, A., and C.R. Allen. 2014. *Social–Ecological Resilience and Law*. University of Columbia Press, New York, NY.
- Garmestani, A., C.R. Allen, A.C. Arnold, and L.H. Gunderson. 2014. Social-ecological resilience and law. Pages 1–14 in A.S. Garmestani and C.R. Allen (Eds.), *Social–Ecological Resilience and Law*. Columbia University Press, New York, NY.
- Garmestani, A., C.R. Allen, J.B. Ruhl, and C.S. Holling. 2014. The integration of resilience and law. Pages 365–384 in A.S. Garmestani and C.R. Allen (Eds.), *Social–Ecological Resilience and Law*. Columbia University Press, New York, NY.
- Gordon, N.M., and M.L. Hellman. (Accepted). Dispersal distance, gonadal steroid levels and body condition in Gray Treefrogs (*Hyla versicolor*): Seasonal and breeding night variation in females. *Journal of Herpetology*.
- Gothe, E., L. Sandin, C.R. Allen, and D.G. Angeler. (In press). Quantifying spatial scaling patterns and their local and regional correlates in headwater streams: Implications for resilience. *Ecology and Society*.
- Huber, C.G., T.B. Grabowski, R. Patiño, and K.L. Pope. (In press). Distribution and habitat associations of juvenile common snook in the lower Rio Grande, Texas. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*.
- Jorgensen, C.F., L.A. Powell, J.J. Lusk, A.A. Bishop, and J.J. Fontaine. 2014. Assessing landscape constraints on species abundance: Does the neighborhood limit species response to local habitat conservation programs? *PLoS ONE* 9(6): e99339. doi: 10.1371/journal.pone.0099339.
- Jorgensen, C.F., R.J. Stutzman, L. Anderson, S. Decker, L.A. Powell, and J.J. Fontaine. 2013. Choosing a DIVA: A comparison of emerging digital imagery vegetation analysis techniques. *Applied Vegetation Science* 16:552–560.
- Lotz, A., and C.R. Allen. 2013. Social-ecological predictors of invasions and extinctions. *Ecology and Society* 18(3):15. <http://dx.doi.org/10.5751/ES-05550-180315>.
- Martin, D.R., C.J. Chizinski, K.M. Eskridge, and K.L. Pope. 2014. Using posts to an online social network to assess fishing effort. *Fisheries Research* 157:24–27.
- Myers, P.E., C.R. Allen, and H.E. Birgé. (In press). Consuming fire ants reduces northern bobwhite survival and weight gain. *Journal of Agricultural and Urban Entomology*.
- Nash, K.L., C.R. Allen, D.G. Angeler, C. Barichievy, T. Eason, A.S. Garmestani, N.A.J. Graham, D. Granholm, M. Knutson, J. Nelson, M. Nyström, S. Riley, C.A. Stow, and S.M. Sundstrom. 2014. Discontinuities, cross-scale patterns and the organization of ecosystems. *Ecology* 95:654–667.

- Nash, K.L., C.R. Allen, D. Angeler, C. Barichiev, A.S. Garmestani, N. A. J. Graham, D. Granholm, M. Knutson, J. Nelson, M. Nystrom, S. Riley, C.A. Stow, and S.M. Sundstrom. 2014. Discontinuities, cross-scale patterns and the organization of ecosystems. *Ecology* 95: 654-667.
- Nash, K.L., C.R. Allen, C. Barichiev, M. Nystrom, S. Sundstrom, and N. Graham. 2014. Habitat structure and body size distributions: Cross-ecosystem comparison for taxa with determinate and indeterminate growth. *Oikos* 123:971-983. doi: 10.1111/oik.01314.
- Nemec, K.T., C.R. Allen, S.D. Danielson, and C.J. Helzer. 2014. Responses of predatory invertebrates to seeding density and richness in experimental tallgrass prairie restorations. *Agriculture, Ecosystems & Environment* 183:11-20.
- Nemec, K.T., J. Chan, C. Hoffman, T.L. Spanbauer, J.A. Hamm, C.R. Allen, T. Hefley, D. Pan, and P. Shrestha. 2014. Assessing resilience in stressed watersheds. *Ecology and Society* 19(1):34. <http://dx.doi.org/10.5751/ES-06156-190134>.
- Pope, K.L., C.R. Allen, and D.G. Angeler. 2014. Fishing for resilience. *Transactions of the American Fisheries Society* 143:467-478.
- Spanbauer, T.L., C.R. Allen, D.G. Angeler, T. Eason, K.L. Nash, S.C. Fritz, and J.R. Stone. (In press). Long-term instability prior to a rapid regime shift. *PLoS One*.
- Spurgeon, J.J., R.H. Stasiak, G.R. Cunningham, K.L. Pope, and M.A. Pegg. 2014. Status of native stream fishes within selected protected areas of Niobrara River in western Nebraska. *Great Plains Research* 24:71-78.
- Stutzman, R.J. and J.J. Fontaine. (In Press). Shorebird migration in the face of climate change: Phenology, resource availability and scenario planning. *Studies in Avian Biology*.
- Sundstrom, S.M., C.R. Allen. 2014. Complexity versus certainty in understanding species' declines. *Diversity and Distributions* 20:344-355.
- Sundstrom, S., C.R. Allen, A.S. Garmestani, J. Garcia, and D.G. Angeler. (In press). Transdisciplinary application of the cross-scale resilience model. *Sustainability*.
- Turek, K.C., M.A. Pegg, and K.L. Pope. 2014. Short-term evaluation of visible implant alpha tags in juveniles of three fish species under laboratory conditions. *Journal of Fish Biology* 84:971-981.
- Uden, D.R. (In press). Book note on: This far-off wild land: The Upper Missouri letters of Andrew Dawson. *Great Plains Quarterly*.
- Uden, D.R., C.R. Allen, T.D. McCoy, R.B. Mitchell, and Q. Guan. 2014. Predicted avian responses to bioenergy development scenarios in an intensive agricultural landscape. *Global Change Biology Bioenergy* doi: 10.1111/gcbb.12157.
- Uden, D.R., M.L. Hellman, D.G. Angeler and C.R. Allen. (In press). The role of reserves and anthropogenic habitats for functional connectivity and resilience of ephemeral wetlands. *Ecological Applications*. 10.1890/13-1755.1
- Uphoff, C.S., C.W. Schoenebeck, W.W. Hoback, K.D. Koupal, and K.L. Pope. 2013. Degree-day accumulation influences annual variability in growth of age-0 walleye. *Fisheries Research* 147:394-398.
- van Riper, C., J.W. van Wagtenonk and J.J. Fontaine. 2013. Great gray owls (*Strix nebulosa*) in Yosemite National Park: On the importance of food, nesting snags, and human disturbance. *Natural Areas Journal* 33:286-295.
- Whitby, M.D., T.C. Carter, E.R. Britzke, S.M. Bergeson. 2014. (In Press). Evaluating the effectiveness of three acoustic monitoring techniques for landscape level bat population monitoring. *Acta Chiropterologica*.
- Wilde, G.R., and K.L. Pope. 2013. Worldwide trends in fishing interest indicated by internet search volume. *Fisheries Management and Ecology* 20:211-222.
- Wong, A., C.R. Allen, N.M. Chaîne, D.M. Haak, K.L. Pope, N.A. Smeenk, B.J. Stephen, and D.R. Uden. 2013. Enamel-based mark performance for marking Chinese mystery snail *Bellamya chinensis*. *Management of Biological Invasions* 4:231-234.

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## PRESENTATIONS

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- Allen, C.R., D.G. Angeler, and K. Nash. May 2014. Discontinuity, variability and resilience. Resilience 2014 Conference, Montpellier, France.

- Allen, C.R., and C. Fabricius. July 2014. Adaptive management for reconciling resilience and ecosystems with increasing crop productivity and reducing yield gaps in agroecosystems. 69th Annual Soil Water Conservation Society International Conference, Lombard, IL.
- Allen, C.R., and K. Stoner. July 2014. Adaptive management and the implementation of state wildlife action plans. Conference of Ecological and Ecosystem Restoration, New Orleans, LA.
- Birge, H.E. July 2014. Adaptive management of grasslands for soil ecosystem services. 69th Annual Soil Water Conservation Society International Conference, Lombard, IL.
- Brinley Buckley, E., C. Allen, M. Farrell, and M. Forsberg. October 2013. Applications of time-lapse photography. Crane Trust Research Symposium, Kearney, NE.
- Brinley Buckley, E., 2014. Pulse of the Platte: Time-lapse photography, water-quality, and bioacoustic recordings. Audubon's Rowe Sanctuary, Gibbon, NE.
- Brinley Buckley, E., C. Allen, M. Farrell, and M. Forsberg. January 2014. Communicating complex system changes through time-lapse photography. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Brinley Buckley, E., K. Turek, and N. Smeenck. October 2013. Use of time-lapse photography in documenting watershed changes. Water Symposium: Changes: Climate, Water, and Life on the Great Plains, Lincoln, NE.
- Brinley Buckley, E.B., C.R. Allen, M. Forsberg, and M. Farrell. January 2014. Applications of time-lapse photography in complex systems: The pulse of the Platte. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Chizinski, C. J., P.G. Bajer, M. Hedrick, and P.W. Sorensen. 2014. Differences in the spring time upstream migrations of invasive common carp (*Cyprinus carpio*) and native northern pike (*Esox lucius*) in Midwestern streams allows for selective mechanical blocking and removal of carp. 2014 International Conference on Engineering and Ecohydrology for Fish Passage, Madison, WI.
- Corral, L., J.J. Fontaine, and L.A. Powell. October 2013. Canid community composition and distribution across Nebraska. The Wildlife Society Annual Meeting, Milwaukee, WI.
- Corral, L., J.J. Fontaine, and L.A. Powell. September 2013. Canid community composition and distribution across Nebraska. Nebraska Natural Legacy Conference, Nebraska City, NE.
- Fontaine, J.J. February 2014. Changing climates and changing landscapes: A migrant bird's dilemma. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE. Keynote address.
- Fontaine, J.J. 2014. Changing climates and changing landscapes: A migrant bird's dilemma. Biology Department Seminar, Kansas State University, Manhattan, KS.
- Fontaine, J.J. 2014. Changing climates and changing landscapes: A migrant bird's dilemma. Biology Department Seminar, University of Nebraska Omaha.
- Fricke, K., C. Allen, and J.J. Fontaine. February 2014. Implementing adaptive management: Demonstrating the difficulties. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Fricke, K., C. Allen, J.J. Fontaine, S. Wessel, T. Smydra, R. Jessen, and S. Rasmussen. September 2013. Challenges of integrating adaptive management into eastern red cedar rem oval projects. Nebraska Natural Legacy Conference, Nebraska City, NE.
- Fricke, K.A., C. Helzer, and L.A. Powell. April 2014. Effects of drought on biodiversity in the Great Plains. Session: *How do droughts make place?* Great Plains Symposium, Lincoln, NE.
- Fricke, K.A., C.R. Allen, and J.J. Fontaine. July 2014. Applying adaptive management to invasive species: Woody plant management in the Niobrara River Valley. Nebraska. Soil and Water Conservation Society, Lombard, IL.
- Fricke, K.A., C.R. Allen, J.J. Fontaine, S. Wessel, T. Smydra, R. Jessen, S.D. Rasmussen, and K. Stoner. February 2014. Adaptive management of invasive woody plants in the Niobrara River Valley, Nebraska. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Fricke, K.A., C.R. Allen, J.J. Fontaine, S. Wessel, T. Smydra, R. Jessen, S.D. Rasmussen, and K. Stoner. October 2013. Adaptive management of invasive woody plants in the Niobrara River Valley, Nebraska. Wildlife Society Annual Meeting, Milwaukee, WI.
- Gillespie, C. and J.J. Fontaine. September 2013. Habitat decisions in altered landscapes: Behavioral and physiological consequences for long-distance migrants. Nebraska Natural Legacy Conference, Nebraska City, NE.
- Gillespie, C. and J.J. Fontaine. 2013. Shorebird migration in Nebraska: Stopover habitat decisions in a vanishing landscape. Crane Trust Research Symposium, Wood River, NE.

- Gillespie, C. and J.J. Fontaine. 2014. Shorebird migration in Nebraska: Stopover habitat decisions in a vanishing landscape. Rainwater Basin Joint Venture Informational Seminar, Hastings, NE.
- Gillespie, C. and J.J. Fontaine. February 2014. Shorebird migration in Nebraska: Stopover habitat decisions in a vanishing landscape. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Haak, D.M., M.L. Hellman, C.R. Allen, K.A. Fricke, N.M. Hart, R.A. Kill, K.T. Nemecek, K.L. Pope, N.A. Smeenk, B.J. Stephen, D.R. Uden, K.M. Unstad, A.E. VanderHam, and A. Wong. January 2014. Solving mysteries of the snail. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Haak, D.M., B.J. Stephen, N.M. Chaine, K.L. Decker, D.R. Uden, C.R. Allen, V.E. Forbes, and K.L. Pope. January 2014. Moving faster than a snail's pace: Trends and consequences of invasive freshwater snails. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Hart, N., C. Allen, M. Benson, and A. Tyre. May 2014. Linking resilience thinking and structured decision making for natural resource planning and management. Resilience 2014 Conference, Montpellier, France.
- Hart, N., C. Allen, M. Benson, and A. Tyre. 2014. Linking resilience thinking and structured decision making for natural resource planning and management. Adaptive Management Conference Series 2014, Fort Collins, CO.
- Hart, N.M., D.R. Uden, C.R. Allen, K. Fricke, J. Jorgensen, K. Lang, M. Panella, K. Pfeiffer, R. Schneider, K. Stoner, G. Steinauer, and S. Taylor. February 2014. Management, monitoring, and modeling of Indian Cave State Park: Reaching conservation goals through adaptive management. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Jeziarski, C., E. Zach, D. Uden, C. Allen, M. Koch, J. Fontaine, R. Schneider, T. McCoy, and B. Larson. November 2013. Renewable energy and wildlife in Nebraska—Striving for co-existence. Rural Futures Conference, Lincoln, NE.
- Jeziarski, C., C. Allen, M. Koch, J.J. Fontaine, R. Schneider, and T. McCoy. 2013. Nebraskans' views of wind energy development and wildlife: Results of the 2012 and 2013 *Nebraska Annual Social Indicators Survey*. The Nebraska Wind Conference, Lincoln, NE.
- Jeziarski, C., C. Allen, M. Koch, J.J. Fontaine, R. Schneider, and T. McCoy. January 2014. Nebraskans' views of wind energy development and wildlife: Results of the 2012 and 2013 *Nebraska Annual Social Indicators Survey*. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Jeziarski, C. 2014. Wind energy & wildlife—Striving for co-existence in Nebraska. Nebraska Wind Siting Symposium, North Platte, NE.
- Jeziarski, C., C. Allen, M. Koch, J.J. Fontaine, R. Schneider, and T. McCoy. February 2014. Nebraskans' views of wind energy development and wildlife: Results of the 2012 and 2013 *Nebraska Annual Social Indicators Survey*. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Hellman, M.L., D.M. Haak, C.R. Allen, K.A. Fricke, N.M. Hart, R.A. Kill, K.T. Nemecek, K.L. Pope, N.A. Smeenk, B.J. Stephen, D.R. Uden, K.M. Unstad, A.E. VanderHam, and A. Wong. January 2014. Solving mysteries of the snails. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Laskowski, J., and J.J. Fontaine. 2013. Temporal carry-over effects of perceived predation risk on reproductive strategy. Animal Behavior Society Annual Meeting, Boulder, CO.
- Laskowski, J. G. Bachman, and J.J. Fontaine. 2014. The phantoms of predators past. University of Florida, Gainesville, FL.
- Laskowski, J., G. Bachman, and J.J. Fontaine. 2013. Temporal carry-over effects of fear on pheasant reproductive strategies. Colorado State University, Fort Collins, CO.
- Laskowski, J., G. Bachman, and J.J. Fontaine. 2014. The phantoms of predators past: fear effects on pheasant reproductive ecology. North Dakota State University, Fargo, ND.
- Laskowski, J., G. Bachman, and J.J. Fontaine. 2014. The shadows of predators past. Colorado State University, Fort Collins, CO.
- Laskowski, J.L., L.N. Messinger, G.C. Bachman, and J.J. Fontaine. 2014. Fear and the phantoms of predators past. Gordon Research Conference: Predator-Prey Interactions, Ventura, CA.
- Martin, D.R., C.J. Chizinski, and K.L. Pope. 2014. Using the internet and traditional creel surveys for regional fishery management. New York Chapter of the American Fisheries Society Annual Meeting, Geneva, NY. Plenary Speech.
- Martin, D.R., C.J. Chizinski, D. Shizuka, and K.L. Pope. 2014. Potential fish-community effects of recreational fishing in freshwater and marine systems. 2nd Fishery Depending Information Symposium, Rome, Italy.

- Martin, D.R., L.N. Messinger, K.L. Pope, and J.J. Fontaine. 2014. Temporal trends in hunting and angling participation in the United States. Research Seminar, Nebraska Game and Parks Commission, Lincoln, NE.
- Messinger, L.N. and J.J. Fontaine. 2014. Behavioral responses to variation in perceived predation risk. Gordon Research Conference: Predator-Prey Interactions, Ventura, CA.
- Messinger, L.N. and J.J. Fontaine. October 2013. Pheasant behavioral responses to hunting pressure and management actions. Wildlife Society Annual Meeting, Milwaukee, WI.
- Messinger, L.N. and J.J. Fontaine. 2013. Pheasant behavioral responses to hunting pressure and management actions. Animal Behavior Society Annual Meeting, Boulder, CO.
- Nash, K., C.R. Allen, D. Angeler, C. Barichiev, T. Eason, A. Garmestani, N. Graham, D. Granholm, M. Knutson, J. Nelson, M. Nystrom, C. Stow, S. Sundstrom, D. Bellwood, and S. Wilson. May 2014. Discontinuities, cross-scale patterns and the organization of ecosystems. Resilience Conference 2014, Montpellier, France.
- Pope, K.L., C.J. Chizinski, and D.R. Martin. 2014. Resilience of regional fisheries. Joint annual meeting between Nebraska and Iowa Chapters of the American Fisheries Society, Council Bluffs, IA. Invited presentation.
- Simonson, V. and J.J. Fontaine. October 2013. Examining the benefits of wheat as an alternative nesting habitat. The Wildlife Society Annual Meeting, Milwaukee, WI.
- Simonsen, V., J. Laskowski, and J.J. Fontaine. 2014. Examining the influence of landscape context on nest survival. University of Nebraska Research Fair, Lincoln, NE.
- Simonsen, V., J. Laskowski, and J.J. Fontaine. 2014. Examining the influence of landscape context on nest survival. Society for Range Management, Orlando, FL.
- Smeenck, N.A. 2014. Conservation, ecology, and assessment of wildlife populations and habitats. The Wilds, Cumberland, OH. Invited visiting researcher seminar.
- Smeenck, N.A., C.R. Allen, and T. LaGrange. 2014. The ecological condition of Nebraska's wetlands: An intensification of the Environmental Protection Agency's 2011 National Wetland Condition Assessment. The Wilds, Cumberland, OH. Invited visiting researcher seminar.
- Smeenck, N.A., C.R. Allen, and T. LaGrange. 2014. The ecological condition of Nebraska's wetlands: An intensification of the Environmental Protection Agency's 2011 National Wetland Condition Assessment. Joint Aquatic Sciences Meeting, Portland, OR.
- Smeenck, N.A., and M.L. Hellman. February 2014. It's not easy being green: An assessment of anurans in the Rainwater Basin. The Rainwater Basin Joint Venture 19th Annual Informational Seminar Meeting, Grand Island, NE.
- Smeenck, N.A., and M.L. Hellman. February 2014. It's not easy being green: The distribution of chytrid in Nebraska and amphibian monitoring in the Rainwater Basin. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- Smeenck, N.A., C.R. Allen, J.L. Kerby. January 2014. Distribution of the fungal pathogen chytrid in Nebraska. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Smeenck, N.A., C.R. Allen, and J.L. Kerby. 2014. Distribution of the fungal pathogen chytrid in Nebraska. The Crane Trust 2nd Annual Research Symposium, Wood River, NE.
- Spanbauer, T.L., C.R. Allen, D.G. Angeler, T. Eason, S.C. Fritz, A.S. Garmestani, K.L. Nash, and J.R. Stone. May 2014. Paleo-thresholds: What the past can tell us about abrupt changes in ecosystems. Resilience 2014 Conference, Montpellier, France.
- Spier, S., and J.J. Fontaine. 2014. The effects of urbanization on fear. University of Nebraska Research Fair, Lincoln, NE.
- Stewart, N.T., L.K. Kowalewski, C.J. Chizinski, and K.L. Pope. January 2014. Spatial distribution of invasive white perch estimated using N-mixture models. 74th Annual Meeting, Midwest Fish and Wildlife Conference, Kansas City, MO.
- Stewart, N.T., L.K. Kowalewski, C.J. Chizinski, and K.L. Pope. 2014. Estimating population size of superabundant fish. Joint annual meeting of Nebraska and Iowa Chapters of the American Fisheries Society Meeting, Council Bluffs, IA.
- Teeters, B.S., C.R. Allen, and C. Helzer. November 2013. Bee diversity and functional composition in grassland habitats of the tallgrass prairie. Annual meeting of the Entomological Society of America, Austin, TX.
- Turek, K.C., M.A. Pegg, and K.L. Pope. 2014. Influence of non-native trout on native longnose dace. Joint annual meeting of Nebraska and Iowa Chapters of the American Fisheries Society Meeting, Council Bluffs, IA.
- Turek, K.C., M.A. Pegg, and K.L. Pope. 2014. Influence of non-native trout on native longnose dace. Annual meeting, Michigan Chapter of the American Fisheries Society, Holland, MI.

- Turek, K.C., M.A. Pegg, and K.L. Pope. January 2014. Influence of non-native rainbow trout on native longnose dace. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- Turek, K.C., M.A. Pegg, K.L. Pope, and S. Schainost. September 2013. Influence of non-native trout on longnose dace size structure in Nebraska Sandhill streams. Nebraska Natural Legacy Conference, Nebraska City, NE.
- Uden, D.R. April 2014. Functional connectivity of wetlands for amphibians in Nebraska's Rainwater Basin. School of Natural Resources Elevator Speech Contest, University of Nebraska-Lincoln, Lincoln, NE.
- Uden, D.R., M.L. Hellman, C.R. Allen and D.G. Angeler. February 2014. The role of reserves and anthropogenic habitats for functional connectivity and resilience of ephemeral wetlands. Nebraska Chapter of The Wildlife Society Annual Meeting, Kearney, NE.
- VanderHam, A., M. Hellman, and C. Allen. January 2014. Using amphibian monitoring to create wetland restoration guidelines. 74th Annual Midwest Fish and Wildlife Conference, Kansas City, MO.
- VanderHam, A., M. Hellman, and C. Allen. May 2014. Functional connectivity of restored wetlands in the Missouri River flood plains. US-IALE Annual Symposium, Anchorage, AK.
- Zach, A.M. November 2013. Nebraska invasive species identification. Outdoor Educators Nebraska Game and Parks Training, Mahoney State Park, NE.
- Zach, A.M. December 2013. Nebraska Invasive Species Program. Nebraska Weed Control Association Annual meeting, Kearney, NE.
- Zach, A.M. January 2014. Nebraska Invasive Species Program. Nebraska Game and Parks Commission Fisheries Division Meeting, Kearney, NE.
- Zach, A.M. March 2014. Nebraska Invasive Species Program. Lancaster County Weed Control Association, Lincoln, NE.

