

Nebraska Cooperative Fish and Wildlife Research Unit—USGS

REPORT OF ACTIVITIES October 2009 – October 2010

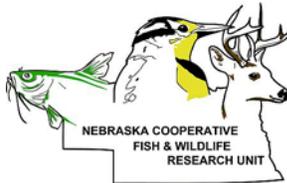
Craig R. Allee and C. S. Helling, Editors
**DISCONTINUITIES
IN ECOSYSTEMS AND OTHER
COMPLEX SYSTEMS**



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) – Biological Resources Division

Report of Activities October 2009 – October 2010



Nebraska Cooperative Fish and Wildlife Research Unit—USGS

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U.S. Fish &
Wildlife Service

UNIVERSITY OF
Nebraska
Lincoln



INTRODUCTION

The U.S. Geological Survey (USGS) Cooperative Research Units Program has been in existence for over 70 years as a partnership between USGS, state natural resource agencies, host universities, the Wildlife Management Institute and the U.S. Fish and Wildlife Service. The first unit was located at Iowa State University in Ames, Iowa. The program currently has 39 units in 37 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 between 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

UNIT PERSONNEL

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

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

UNIT STAFF – UNIVERSITY OF NEBRASKA–LINCOLN

Tony Barada, Coordinator, Creel Survey Project
Chris Chizinski, Post-Doc Research Associate and Coordinator, Creel Survey Project
Caryl Cashmere, Staff Assistant
Karie Decker, Coordinator, Nebraska Invasive Species Project
Valerie Egger, Administrative Assistant

RESEARCH TECHNICIANS

| | |
|--------------------------|--------------------|
| Daniel Dobesh | Lisa Prowant |
| Lawrence (Dan) Drimmel | Kate Rabe |
| Gordon Gover | David Rempel |
| Matt Gruntorad | Genevieve Rohzon |
| Natalie Luben | James Schalles |
| E. Ashley (Pella) Manley | Marissa Spain |
| Gabrielle Mullins | Cassandra Thompson |
| Luke O'Brien | Jessica Umberger |
| Alexander Prentice | Christopher Wood |

CREEL CLERKS

| | |
|------------------|----------------------|
| Robert Barg | Rhonda Lawing |
| Don Bohenkamp | George Maynard |
| Ryan Foley | Marlin (Doug) Miller |
| Randy Fussellman | Robert Pierson |
| Ron Grandi | Pat Rossmeier |
| Stuart Grant | Jerry Schmitt |
| Gregory Hoffman | Mike Smith |
| Steve Huber | Phil Stollberg |
| Ross Juelfs | Carrie Svoboda |

STUDENT WORKERS

| | |
|----------------------|---------------|
| Reece Allen | Brent Johnson |
| Christopher Dietrich | Jacob Walker |
| Adam Kendall | John Walrath |

UNL UCARE STUDENT

Tanner Stevens

CURRENT GRADUATE DEGREE CANDIDATES

Fisheries

- Jason DeBoer, Ph.D., School of Natural Resources,
UNL, January 2009 – present
- Carla Knight, M.S., School of Natural Resources,
UNL, March 2009 – present
- Lucas Kowalewski, M.S., School of Natural Resources,
UNL, March 2010 – present
- Ryan Lueckenhoff, M.S., School of Natural Resources,
UNL, August 2008 – present
- Alexis Maple, M.S., School of Natural Resources,
UNL, March 2009 – present
- Dustin Martin, Ph.D., School of Natural Resources,
UNL, January 2009 – present
- Lindsey Richters, M.S., School of Natural Resources,
UNL, January 2008 – present
- Peter Spirk, M.S., School of Natural Resources, UNL,
January 2009 – present

Wildlife

- Aaron Alai, M.S., School of Natural Resources, UNL,
August 2007 – August 2010
- Michelle Hellman, M.S., School of Natural
Resources, UNL, August 2009 – present
- Christopher Jorgensen, M.S., School of Natural
Resources, UNL, January 2010 – present
- Corinne Kolm, Ph.D., School of Natural Resources,
UNL, August 2010 – present
- Aaron Lotz, Ph.D., School of Natural Resources,
UNL, January 2005 – present
- Kristine Nemecek, Ph.D., School of Natural Resources,
UNL, August 2006 – present
- Sarah Rehme, M.S., School of Natural Resources,
UNL, co-advisor (advisor Larkin Powell),
January 2008 – August 2010
- Lindsey Reinartz, M.S., Biology, University of
Nebraska Omaha, co-advisor (advisor
L. Wolfenbarger), May 2006 – present
- Chad Smith, Ph.D., School of Natural Resources,
UNL, co-advisor (advisor Kyle Hoagland),
August 2007 – present
- Nick Smeenk, Ph.D., School of Natural Resources,
UNL, August 2010 – present
- Ryan Stutzman, M.S., School of Natural Resources,
UNL, January 2010 – present
- Shana Sundstrom, M.S., University of Calgary,
Canada, June 2006 – December 2009
- Daniel Uden, M.S., School of Natural Resources,
UNL, August 2010 – present
- Kody Unstad, M.S., School of Natural Resources,
UNL, May 2009 – present
- Amy Williams, M.S., School of Natural Resources,
UNL, August 2008 – present
- Justin Williams, M.S., School of Natural Resources,
UNL, August 2006 – present
- Sam Wilson, M.S., School of Natural Resources,
UNL, August 2006 – present

GRADUATES, 2009–10

- Aaron Alai, M.S., Natural Resource Sciences, UNL,
August 2010
- Sarah Rehme, M.S., Natural Resource Sciences, UNL,
August 2010

- Shana Sundstrom, M.S., Environmental Science,
University of Calgary, December 2009

COORDINATING COMMITTEE MEMBERS

U.S. GEOLOGICAL SURVEY PROGRAM

B. K. Williams, Chief
Cooperative Research Units
12201 Sunrise Valley Drive, MS 303
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(703) 648-4260

UNIVERSITY OF NEBRASKA—LINCOLN

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NEBRASKA GAME AND PARKS COMMISSION

TBA, Assistant Director
2200 N. 33rd Street
Lincoln, NE 68503-0370
(402) 471-0641

THE WILDLIFE MANAGEMENT INSTITUTE

Pat Ruble, Midwest Field Representative
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Johnstown, OH 43031-8400
(740) 966-0496

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Greg Watson, Energy and Science Coordinator
134 Union Blvd, PO Box 25486
Denver, CO 80225
(303) 236-8155

COOPERATORS

UNIVERSITY OF NEBRASKA–LINCOLN FACULTY

Sherilynn Fritz, Earth and Atmospheric Sciences (formerly Geosciences)
Paul Hanson, School of Natural Resources
Kyle Hoagland, School of Natural Resources
Scott Hygnstrom, School of Natural Resources
Stevan Knezevic, Northeast Research and Extension Center
Gary Lynne, Agricultural Economics
Jim Merchant, School of Natural Resources
Mark Pegg, School of Natural Resources
Larkin Powell, School of Natural Resources
Tom Powers, Department of Plant Pathology
John Quinn, School of Natural Resources
Ashok Samal, Computer Science and Engineering
Dan Snow, Water Center
Alan Tomkins, NU Center for Public Policy
Andrew Tyre, School of Natural Resources
Dave Wedin, School of Natural Resources
Sandra Zellmer, Law College

NEBRASKA GAME AND PARKS COMMISSION

Rex Amack, Director
Anthony Barada, Fisheries Division
Daryl Bauer, Fisheries Division
Zac Brashears, Fisheries Division
Phillip Chvala, Fisheries Division
Jim Douglas, Wildlife Division Administrator
Darrol Eichner, Fisheries Division
Don Gabelhouse, Jr., Fisheries Division Administrator
Jim Gleim, Fisheries Division
Al Hanson, Fisheries Division
Alicia Hardin, Assistant Wildlife Division Administrator
Jeff Hoffman, Assistant Wildlife Division Administrator
Richard Holland, Assistant Fisheries Division Administrator
Jake Holt, Wildlife Division
Caleb Huber, Fisheries Division
Keith Hurley, Fisheries Division
Jeff Jackson, Fisheries Division
Joel Jorgensen, Wildlife Division
Jeff Lusk, Wildlife Division
Doug Kapke, Fisheries Division
Keith Koupal, Fisheries Division
Tim McCoy, Wildlife Division
Kirk Nelson, Western Regional Parks Administrator
Brad Newcomb, Fisheries Division
Larry Pape, Fisheries Division
Mark Porath, Fisheries Division
Lindsey Richters, Fisheries Division
Dean Rosenthal, Assistant Fisheries Division Administrator

Steve Schainost, Fisheries Division
Rick Schneider, Natural Heritage Program
Jeff Schuckman, Fisheries Division
Krystal Stoner, Wildlife Division
Scott Taylor, Assistant Wildlife Division Administrator
Bruce Trindle, Wildlife Division
Dave Tunink, Assistant Fisheries Division Administrator
Thomas Walker, Wildlife Division
Sam Wilson, Wildlife Division
Gene Zuerlein, Assistant Fisheries Division Administrator

FEDERAL AGENCIES

Bureau of Indian Affairs (Jason McCauley)
Smithsonian National Zoological Park Migratory Bird Center (Bruce Robertson)
U.S. Army Corps of Engineers (Luke Wallace)
U.S. EPA–Cincinnati (Ahjond Garmestani)
U.S. Fish and Wildlife Service (Jeff Runge, Erin Williams)
U.S. Fish and Wildlife Service, DeSoto National Wildlife Refuge
U.S. Fish and Wildlife Service, Ecological Services, Nebraska Field Office
U.S. Fish and Wildlife Service, Fort Niobrara–Valentine National Wildlife Refuge (Kathy McPeak, Todd Frerichs, Mark Lindvall)
U.S. National Park Service
U.S. National Park Service / Great Plains Cooperative Ecosystems Studies Unit (Gary Willson)
USDA Animal and Plant Health Inspection Service (APHIS)
USDA Animal and Plant Health Inspection Service, PPQ (Vicki Wohlers)
USDA Forest Service, Rocky Mountain Research Station
USDA National Resource Conservation Service (NRCS) (Constance Miller)
USGS Cryospheric Studies (Gary Clow)
USGS Fort Collins Science Center (Jonathan Friedman, Susan Skagen)
USFWS Habitat and Population Evaluation Team (Diane Granfors, Neal Niemuth, Ron Reynolds)
USFWS Prairie Pothole Joint Venture (Casey Stemler)
USFWS Rainwater Basin Joint Venture (Andy Bishop)
USGS Northern Prairie Wildlife Research Center (Robert Gleason, Brian Tangen)
USGS Sonoran Desert Research Station (Charles van Riper)
USGS South Dakota Water Science Center (Mark Anderson, Parker Norton, John Stamm)
USGS Water Center, Lincoln (Robert Swanson)

STATE AGENCIES

Nebraska Department of Environmental Quality
Kansas Department of Wildlife and Parks
Nebraska Department of Agriculture, Noxious Weed Program (Mitch Coffin)
Nebraska Department of Environmental Quality (Ken Bazada)
Nebraska Forest Service (Scott Josiah)
Nebraska Weed Control association (Rob Schultz)
Oregon Department of Fish and Wildlife (Tim Hiller)

PRIVATE SECTOR COOPERATORS

Headwaters Corporation
Nebraska Partnership for All-Bird Conservation (Jill Liske)
Nebraska Public Power District (Justin King)
Pheasants Forever (Steve Riley)
The Nature Conservancy (Mace Hack, Chris Helzer)

OTHER FACULTY COOPERATORS

Melinda Harm Benson, University of New Mexico
Anna Chalfoun, Department of Zoology and Physiology, University of Wyoming
Graeme Cumming, University of Cape Town, South Africa
John Dettmers, Great Lakes Fishery Commission and University of Illinois at Urbana-Champaign
Rob Fletcher, Department of Wildlife Ecology and Conservation, University of Florida
Lenny Gannes, Department of Biology, Cornell College
Lance Gunderson, Department of Environmental Studies, Emory University
C. S. Holling, Department of Zoology, University of Florida
Wayne Hubert, USGS-Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming
Alan Kolok, Department of Biology, University of Nebraska at Omaha
Wayne Landis, Inst. of Environmental Toxicology, Huxley College of the Environment, Western Washington Univ.
Steve Lockmann, Department of Aquaculture and Fisheries, University of Arkansas at Pine Bluff
Pablo Marquet, Departamento de Ecología, Universidad Católica de Chile, Santiago, Chile
John McCarty, Department of Biology, University of Nebraska at Omaha
Reynaldo Patiño, USGS-Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University
Jan Sendzimir, International Institute for Applied Systems Analysis, Austria
Martin Simon, Benedictine College, Kansas
Richard Strauss, Department of Biology, Texas Tech University
Gene Wilde, Department of Biology, Texas Tech University
L. LaReesa Wolfenbarger, Department of Biology, University of Nebraska at Omaha

MILESTONES

GRANTS

Unit scientists secured over nine million in research funds, with more than one million in new funding this period.

STUDENTS

Currently, we have twenty-two degree candidates, seven Ph.D. and fifteen M.S., advised by Craig Allen, Joseph Fontaine and Kevin Pope. In the past year, three students earned degrees in Natural Resource Sciences and in Environmental Science.

ADAPTIVE MANAGEMENT WORKSHOP

Scientists with the Nebraska Cooperative Fish and Wildlife Unit coordinated the Adaptive Management Symposium for the 70th Midwest Fish and Wildlife Conference held in Springfield, Illinois, December 6 – 9, 2009.

SPECIAL JOURNAL ISSUE

A special issue on “Adaptive Management of Natural Resources” was developed by scientists at the Nebraska Coop Unit. This issue will be published by the *Journal of Environmental Management* during 2011 and will feature approximately twelve articles from authors at eleven institutions, including some of the most prominent scientists involved in the development of adaptive management. Funding for the special issue was provided by the national office of the USGS Cooperative Research Units.

STATEWIDE AQUATIC NUISANCE PLAN

Under guidance from the National Aquatic Nuisance Species Task Force, the Nebraska Invasive Species Project (housed within the NECFWRU) along with individuals representing various agencies and organizations has developed a draft of The Nebraska Aquatic Nuisance Species Management Plan. The plan has been signed by the Governor is awaiting federal approval. It will increase communication and collaboration among state and federal agencies, develop tools to educate and inform the public about aquatic nuisance species and in turn, help protect Nebraska’s economy and environment.

SCHOOL OF NATURAL RESOURCES FIVE-YEAR REVIEW

A Comprehensive Program Review of UNL’s School of Natural Resources was completed in November 2009 by the United States Department of Agriculture—National Institute of Food and Agriculture. The NECFWRU was celebrated in the final report as “a **big bonus to the School** with excellent collaborative efforts between the federal scientists.” The report proclaimed that the NECFWRU “has been a **strong partner** for training graduate students and conducting collaborative research. The CRU personnel have created a strong partnership with the SNR faculty and are fully engaged in the overall mission of the School.” The NECFWRU is pleased to “provide a **model of engagement** with key stakeholders for the School as a whole to follow.”

GOLDEN PILLAR AWARD

Shakespeare's Juliet asked "What's in a name?" We believe that much is in a name, and that a rose by any other name would not smell as sweet. Our Unit's name, the Nebraska Cooperative Fish and Wildlife Research Unit, conveys meaning and direction. Our Unit is located in Nebraska—we serve the citizens of Nebraska. Our Unit's focus is graduate-research education within the arena of fish and wildlife science. Most importantly, our Unit is a cooperative endeavor among a diverse array of stakeholders.

The staff and scientists of the Nebraska Cooperative Fish and Wildlife Research Unit recognize and appreciate that cooperator support is essential to our success. Unit support comes in many shapes and sizes.

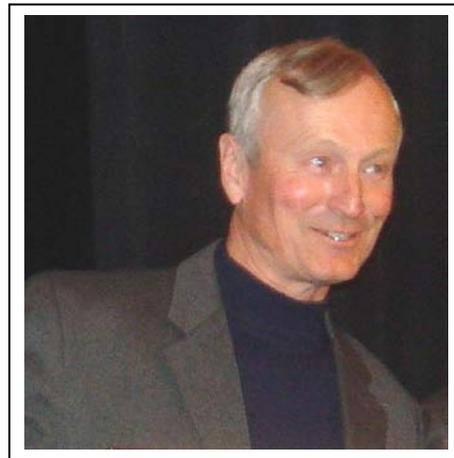
Though support of the Unit is provided by an army of individuals, there are a select few supporters that go well beyond the call of duty. The Nebraska Unit established the Golden Pillar Award to honor and recognize these outstanding individuals who are "pillars of support." Award recipients will be recognized at our annual unit meeting and presented with a token of appreciation.

Kirk Nelson, John Owens and **Steve Riley** have been, and continue to be, strong supporters of the USGS Cooperative Research Units (CRU) Program. In August, Kirk assumed a new role with the Nebraska Game and Parks Commission as Western Region Parks Administrator as part of the Commission's efforts to restructure their organization. On June 30, 2010, John retired from his joint positions as Vice President of the University of Nebraska, and the Harlan Vice Chancellor for Agriculture and Natural Resources (Lincoln campus)—positions he held since January 1, 2001. On June 20, Steve resigned as Assistant Chief of Wildlife with the Nebraska Game and Parks Commission to accept a position with Pheasants Forever.

We take this opportunity to recognize Kirk, John and Steve for their efforts, and to thank them for their tireless support of the CRU Program.

KIRK NELSON

From humble beginnings as a field assistant to his current role in the leadership of the Nebraska Game and Parks Commission (NGPC), Kirk Nelson has and continues to actively care for the people and wildlife of Nebraska. While serving as assistant director at NGPC, Kirk demonstrated his ingenuity and efficacy as a leader by playing an instrumental role in establishing the Nebraska Cooperative Fish and Wildlife Research Unit in 2003. Cooperators worked tirelessly for a decade and overcame numerous obstacles in their efforts to establish the Nebraska Coop Unit, and Kirk's guidance was instrumental during this long endeavor. Kirk's light-hearted nature and enthusiasm for the natural resources of Nebraska made him an exceptional collaborator and esteemed member of the national Coop Unit family. As an inaugural member of Coordinating Committee of the Nebraska Coop Unit, along with John Owens, Kirk helped shape the vision of the Nebraska Unit by welcoming the new scientists and facilitating their integration into natural resource management here in Nebraska with NGPC and numerous other cooperators.



In September, as part of the restructuring of the NGPC, Kirk moved into a new leadership role as the western region parks manager. In his new position Kirk will be charged with directing the new face of Nebraska's parks, and although his official relationship with the Nebraska Unit will change, we fully expect he will continue to demonstrate his commitment to the natural resources of Nebraska and the Nebraska Coop Unit.

JOHN OWENS

Without John Owens, there might not be a Cooperative Research Unit in Nebraska, or New Mexico for that matter. Prior to coming to Nebraska, John Owens served in several administrative positions at New Mexico State University. While serving as dean at New Mexico State University, and working with the New Mexico Congressional Delegation, John took the lead on establishing the New Mexico Cooperative Fish and Wildlife Research Unit in 1988. Then, at the University of Nebraska–Lincoln, working with both the New Mexico and Nebraska Congressional Delegations, he established the Nebraska Cooperative Fish and Wildlife Research Unit in 2003. The Nebraska Cooperative Fish and Wildlife Research Unit is the only such unit established by Congress since 1991. John Owens is probably the only university administrator to have established Cooperative Research Units in two different states.

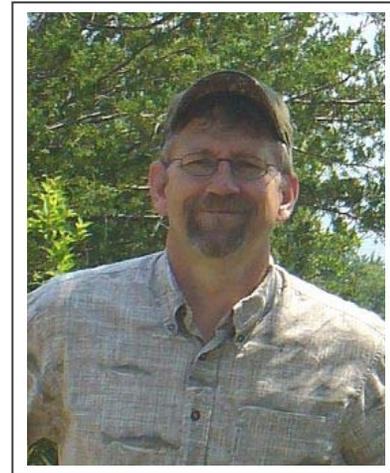
Following retirement, John returned to the faculty ranks as a UNL Extension faculty member. Initially, he is on faculty development leave as a visiting scientist with the United Nations' Food and Agriculture Organization (FAO) in Rome, Italy. Upon his return, John will assume an Extension position working out of UNL's Kimmel Education and Research Center in Nebraska City.



STEVE RILEY

While with the Nebraska Game and Parks Commission (NGPC), Steve Riley supported numerous collaborative research projects between NGPC and scientists at the Nebraska Cooperative Research Unit. Steve was also an active and vocal member of the Steering Committee for the National Cooperators' Coalition (NCC) for the Cooperative Wildlife Research Units. The NCC provides a strong voice to Congress for the funding to support the CRU Program, and in 2006, prepared the *Vision and Strategies for the Future of the Cooperative Fish and Wildlife Research Unit System* which outlines priorities and challenges for the CRU Program. Steve's active participation in the NCC contributed to the successes of the committee. His NCC service includes serving as the national chair, and traveling to Washington D.C. to meet with federal administrators. Thanks to Steve, and John Owens, the federal budget for the Nebraska Unit was permanently rolled into the overall CRU Program budget. Formally, it was added annually as a separate line item to the federal budget.

In July, Steve left the Nebraska Game and Parks Commission for a position with Pheasants Forever to help manage their growing Farm Bill Wildlife Biologist program. This program places wildlife biologists in NRCS offices throughout the country to provide much needed wildlife related technical assistance to farmers and ranchers.



THANK YOU, KIRK, JOHN AND STEVE, AND BEST WISHES IN THE NEXT PHASE OF YOUR CAREERS!

AWARDS AND RECOGNITIONS

RESILIENCE IN STRESSED WATERSHEDS IGERT TRAINEESHIPS

Corinne Kolm and Kristine Nemeč were awarded prestigious National Science Foundation IGERT Traineeships in support of their Ph.D. programs.

STAFF

In June, Tony Barada resigned as coordinator for the Unit's Creel Survey Project to accept a permanent position with the Nebraska Game and Parks Commission. In September, Chris Chizinski assumed Tony's responsibilities in a post-doctoral research associate position.

Karie Decker accepted a permanent position as coordinator of the Nebraska Invasive Species Project. We also congratulate Karie on receiving her M.S. in Wildlife Conservation from University of Arizona in October 2009.

OTHER GRANTS AND AWARDS

Jason DeBoer shared the Sander travel award (with Jordy Nelson, a M.S. student from Grand Valley State—his alma mater) from the Walleye Technical Committee at the 2009 Midwest Fish and Wildlife Conference in Springfield, IL. Jason received \$100 from the Walleye Technical Committee.

Kristine Nemeč received \$469 from the Wildwood Graduate Travel Grant. The grant is awarded by the UNL School of Natural Resources and it supported Kristine's travel to at the North American Prairie Conference August 1 – 5 in Cedar Falls, IA to present a talk entitled *Influence of Seeding Rate and Diversity on Establishment of Prairie, Weedy, and Non-Native Plant Species in Prairie Restorations*.

THESES AND DISERTATIONS

AARON ALAI, M.S. AUGUST 2010

The Textural Discontinuity Hypothesis and its relation to nomadism, migration, decline, and competition
University of Nebraska–Lincoln
Advisor, Craig Allen

SARAH REHME, M.S. AUGUST 2010

Ecology, stable isotopes, and management of grassland songbirds at National Park Service properties on the Great Plains
University of Nebraska–Lincoln
Advisors, Larkin Powell and Craig Allen

SHANA SUNDSTROM, M.S. DECEMBER 2009

The Textural Discontinuity Hypothesis and its relationship to biodiversity, extinction risk and resilience
University of Calgary, Faculty of Environmental Design Environmental Science Program
Research advisor, Craig Allen. Academic advisor, M.E. Tyler

OUTREACH ACTIVITIES

Below is a sampling of some of the outreach activities that Unit staff and students participated in during the past year.

DINOSAURS AND DISASTERS

More than twenty stations staffed by UNL scientists, staff, graduate and undergraduate students provided discovery and hands-on activities to children, parents and grandparents at *Dinosaurs and Disasters*. Held at the University Of Nebraska State Museum in February 2010, this year's theme was "Extinction." Karie Decker manned a station that informed participants about the impending arrival of the emerald ash borer with its potential for decimating the ash tree population throughout the country.

UNL SUNDAY WITH A SCIENTIST—AND OTTER SCAT

As part of the July 2010, University of Nebraska State Museum's Sunday with a Scientist series, graduate student Amy Williams presented a program for children and families on how DNA analysis of otter scat can provide data about the recently introduced species, including lineage, population size, and where they live.

Otters are a reclusive species which became extinct in Nebraska in the 1900s, and were re-introduced by the Nebraska Game and Parks Commission in 1986. Because they are still considered threatened in Nebraska, scientists want to learn more about their habitat and environment in order to develop an otter management plan that would aid in their conservation. Radio telemetry was used with limited success to track otters and understand their home range. Researchers began collecting otter scat (poop) in October 2009 for DNA analysis. While it may not be glamorous work, analysis of the scat has yielded useful data that begins to close existing information gaps. If this noninvasive, genetic technique proves successful, it may be used on a larger scale statewide.

NEBRASKA BOATER EDUCATION—INVASIVE SPECIES EDUCATION

Throughout the past year, the Nebraska Invasive Species Project has worked with several groups to educate boaters across the state about aquatic invasive species. We have collaborated with the Nebraska Game and Parks Commission to provide information for participants of boater safety courses, developed aquatic invasive species signs to be displayed at boat ramps, and have given several presentations at various events associated with the Commission. In addition, we have provided educational booths at several public events including the Annual Clean Boat Event at Lewis and Clark Reservoir, the Nebraska Outdoor Expo, and Nebraska's Biennial Waterfest. Through these outreach efforts we are able to educate boaters on how they can help prevent the introduction (or spread) of aquatic invasive species, such as Quagga and Zebra Mussel.

AQUATIC INVASIVE SPECIES WORKSHOP/SYMPOSIUM

A workshop/symposium will be offered October 13, 2010 in Lincoln, Nebraska which will inform and educate participants on the status of aquatic invasive species in Nebraska, the development of a Nebraska Aquatic Invasive Species Plan, changes in policy, aquatic invasive species identification, and aquatic invasive species prevention.

RESEARCH PROJECTS



ANGLER BEHAVIOR IN RESPONSE TO MANAGEMENT ACTIONS ON NEBRASKA RESERVOIRS

Principal Investigator: Kevin L. Pope

Project Coordinators: Anthony Barada, Christopher Chizinski

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

Project Duration: January 2009 – December 2013

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Natural resource agencies invest substantial resources to recruit anglers—the Nebraska Game and Parks Commission is no different. 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 five study components:

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

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

2. *Regional Angler Survey*: An intensive year-round survey is being conducted on 19 reservoirs in the Salt Valley region of southeast Nebraska. The survey will provide baseline data necessary to develop a model predicting temporal and spatial participation of anglers. This model will be especially useful for understanding changes in fishing pressure on specific reservoirs as influenced by conditions at near-by reservoirs such as water drawdowns for repairs to in-reservoir structures, out-breaks of blue-green algae, etc. During 2009, angling effort was high in urban reservoirs; however, these anglers were less likely than rural anglers to fish elsewhere if access to their preferred waterbody was prevented.



Angler Surveyors
Photo credit: J Fontaine



Angler Interview



Interviewing anglers
Photo credit: J Fontaine

3. *Ability of Angler to Identify Fishes*: Pre-testing of a fish-identification quiz is underway. The quiz was first given in August to participants of a Family Fishing event hosted by the Nebraska Game and Parks Commission. It will also be given at the upcoming Naturepalooza event hosted by the UNL School of Natural Resources in October. Participants are asked to examine fish models and identify the species. Information gained will allow us to quantify anglers' current abilities to correctly identify fish species, and evaluate several different products designed to educate anglers about fish identification. Understanding angler ability to correctly identify fish is important for predicting the likely success of complex fishing regulations.
4. *Angling Pressure and Bluegill Parasites*: Catch-and-release angling is extremely popular on the reservoirs within Nebraska's Salt Valley watershed. Fish that are captured and released by anglers are often subjected to stressors that alter physiology, which has the potential to alter fish behavior and ultimately fish fitness. Additionally, increases in angling pressure should correlate positively with catch-and-release events. Finally, fish can become more susceptible to infestation by parasites when stress compromises the fish's immune system. Thus, we predict that a positive relationship exists between angling pressure and rate of parasite infestation. To test this prediction, we will examine angling pressure and larval trematode (i.e., *Neascus* spp. and *Clinostmum* spp.) abundance in juvenile bluegill for 16 Salt Valley reservoirs.
5. *Angler Effects on Sexually-Dimorphic Fish Species*: Detailed information (species, length, weight, age, sex, liver weight, and gonad weight) was gathered on fish harvested at Sherman and Calamus reservoirs during spring 2009 and 2010. Differences in harvest among male and female fish can alter sex-specific rates of recruitment, growth, and mortality, and hence, the overall health of a fish population. Species included in this assessment are white bass, walleye, and crappie. Currently work is being done to age all fish and analyze data; expected completion of this study component is December 2010.



Peter Spirk removing otoliths, recording data, and removing the liver and gonads from harvested fish.

ASSESSING LOCAL AND LANDSCAPE CONSTRAINTS ON HABITAT MANAGEMENT OF UPLAND BIRDS

Principal Investigator: Joseph J. Fontaine, Larkin Powell

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

Project Duration: January 2010 – January 2013

Funding: Nebraska Game and Parks Commission

Project Location: Southeast Nebraska

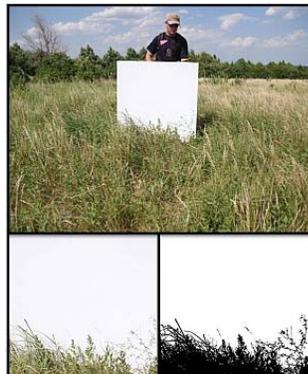
Throughout the Great Plains, grassland communities are increasingly exposed to agricultural pressure and changing land use practices, resulting in large scale loss of biodiversity. Consequently, prairie ecosystems are increasingly reliant on effective conservation and restoration efforts provided by private, state, and federal agencies. Yet, local management efforts do not always demonstrate the desired outcome and may be constrained by landscape factors beyond the borders of the managed area. Understanding why management actions fail is paramount; yet, past studies have focused on assessing habitat attributes at a single scale, and often fail to consider the importance of ecological mechanisms that act across multiple scales. By exploring how grassland bird communities respond to local vegetative composition and landscape factors, we can gain perspective on why populations and communities fail to respond to apparently suitable habitat improvements.

Using avian point count surveys and small scale vegetation analysis, we assessed habitat quality on 23 wildlife management areas across southern Nebraska. Percent vegetative cover (also known as visual obstruction) was quantified at each survey point, using a new and innovative digital photography technique. The project identifies landscape factors affecting productivity by using ArcGIS spatial analyst tools. The resulting data will be used to construct hierarchical models to determine where to focus management efforts, to provide the maximum benefit to grassland bird communities.

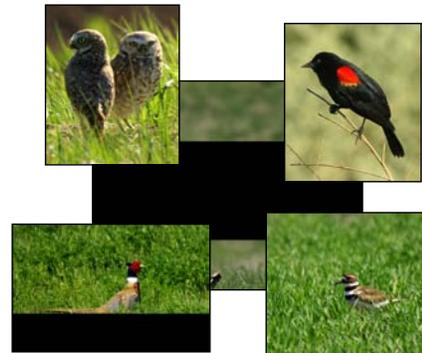
In the first field season, 23 Wildlife Management Areas were surveyed and 7,581 individual birds were detected representing 108 avian species, of which 8 are considered obligate grassland breeders. Red-winged blackbirds (*Agelaius phoeniceus*) were the most frequently detected species with 952 individuals, followed by the dickcissel (*Spiza americana*) with 679 individuals. Vegetative analysis and density estimates are currently being analyzed.



Northern Bobwhite Quail
Photo Credit: Christopher F. Jorgensen



Using digital photography to survey percent vegetative cover
Photo Credit: Jake D. Walker



Left to Right, Top to Bottom: burrowing owl (*Athene cunicularia*), red-winged blackbird (*Agelaius phoeniceus*), bobolink (*Dolichonyx oryzivorus*), ring-necked pheasant (*Phasianus colchicus*), killdeer (*Charadrius vociferus*)
Photo Credit: Joseph Fontaine

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

Principal Investigators: Larkin Powell, Craig R. Allen

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

Project Duration: June 1, 2007 – May 31, 2011

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

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

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

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

All years of field research, including 2008 and 2009, have been completed at all three sites. Grassland bird species richness was highest at Pipestone and Tallgrass. Grassland obligate nest success for both years was 39% at Homestead and 6-29% for target species at Tallgrass. No target species nests were found at Pipestone. Mean adult feather hydrogen ratios (δD) were separable among study sites ($P < 0.05$). Site fidelity tended to be higher at the large site, Tallgrass (63%), and lower at the small site, Homestead (50%). Mean blood δD values were 46% more depleted than mean δD feather values.

Analyses of nest success, site species richness, avian density, site fidelity, and stable isotopes have been completed. Results have been compiled and report in a Master's Thesis submitted to the University of Nebraska-Lincoln and available at: <http://digitalcommons.unl.edu/natresdiss/11>.



Bird banding
Photo credit: Sarah Rehme



Pulling a feather for analysis
Photo credit: Sarah Rehme



Pipestone Prairie, MN
Photo credit: Sarah Rehme

AVIAN CONSERVATION IN THE PRAIRIE POTHOLE REGION: UNDERSTANDING THE LINKS BETWEEN CLIMATE, ECOSYSTEM PROCESSES, WETLAND MANAGEMENT, AND BIRD COMMUNITIES

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

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

Project Duration: January 2010 – January 2013

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

Project Location: North Central South Dakota

In the Prairie Pothole Region (PPR) of the northern Great Plains, wetlands act as essential stopover sites and breeding habitats for a variety of migratory bird species. Unfortunately, wetlands are increasingly threatened by climate change, changing agricultural practices and invasion by non-native species. It is unknown how these impacts may affect avian community structure and function in the PPR.

Changes in climate and agricultural practices are not independent, but rather interact to alter wetland habitats and wetland dependent species. Our goal is to determine how these compounding effects will impact wetlands in the PPR and the migratory species that rely on them. Specifically, we will examine how migrating populations of shorebirds select and use wetland habitats in various landuse types in north central South Dakota. Understanding how these populations use wetlands in different landuse types during the essential migration period can help managers predict how continued landuse change-such as further conversion of grasslands to agriculture-might affect these migrating populations. Additionally, differences in wetland and plant phenology between wetlands distributed across a natural elevation gradient can be used to predict how climate change may further impact migratory species.

This project will have three field seasons; the first was completed in the spring of 2010. Surveys were conducted of migrating and breeding shorebirds across two elevations and eight available landuse types. Video cameras were used to record foraging behaviors. Preliminary analysis indicates migratory shorebirds prefer flooded soybeans fields, contrary to breeding species which show a clear preference for wetlands in native grasslands.

Ultimately, the findings of this project will assist managers and conservation professionals within federal, state, and nongovernmental organizations concerned with protecting migratory bird species and their habitats.



Left to Right, Top to Bottom: American Avocet (*Recurvirostra americana*), flight of shorebirds, Dunlin (*Calidris alpina*)
Photo Credit: Joseph Fontaine



CROSS-SCALE STRUCTURE AND SCALE BREAKS IN COMPLEX SYSTEMS

Principal Investigator: Craig R. Allen

Graduate Student(s): Aaron Lotz, Ph.D.
Aaron Alai, M.S.

Project Duration: July 1, 2004 – December 2010

Funding: James S. McDonnell Foundation

Project Location: University of Nebraska–Lincoln, Clemson University

Scale breaks (discontinuities) in attributes of animal communities (such as body masses) correlate strongly with a set of poorly understood biological phenomena that seem to mix contrasting attributes. These phenomena include invasion, extinction (high species turnover), increased population variability, migration and nomadism. The clustering of these phenomena at predictable scale breaks suggests that variability in resource distribution or availability is greatest at these states. Location at scale breaks affords species great opportunity, but also potential crisis. Complex behaviors such as migration and rapid adaptation leading to speciation may evolve most efficiently and commonly at scale breaks, where there is the greatest potential reward, although with the highest potential cost.

The causes of nomadism, migration, and decline in vertebrates are poorly understood. Literature suggests nomadism may arise in species that specialize in granivory, nectivory, or the utilization of rodent outbreaks. Literature also suggests that species become migratory because they exploit certain scarce or variable food types. Species decline is hypothesized to be the result of many different factors as well; large species, island species and specialists may be more prone to decline.

Results of analyses suggest that a combination of species characteristics, including the distance to the edge of a body mass aggregation, explain the complex phenomena of nomadism, migration and decline. Generally no single predictive model was supported, and often many models were in the confidence set. However, results suggest that position in which a species exists within a body mass distribution can aid in predicting nomadic and migratory bird species. Almost all models tested show that as a species approaches the edges of a body mass aggregation, it has a greater likelihood of being nomadic or migratory. Models testing for species decline, however, yield less robust results and instead indicate that larger body masses of species indicate a declining population. However, these results may be due in part to human observation of declining species being biased towards larger species. Aaron Alai graduated in August, 2010; Aaron Lotz hopes to graduate in December, 2010.

THE EFFECT OF COMMON REED ON RIVER OTTER HABITAT USE

Principal Investigator: Craig R. Allen

Graduate Student(s): Amy Williams, M.S.

Project Duration: May 2009 – December 2010

Funding: Nebraska Game and Parks Commission
The Nebraska Environmental Trust

Project Location: Big Bend Region of the Platte River, Nebraska

The recent invasion of *Phragmites australis* (common reed) in the Big Bend region of the Platte River has made the need to examine its potential effects on river otters more critical. The ability of *P. australis* to rapidly alter both landscapes and habitats could have large effects on a population that may still be vulnerable, such as river otters.

Using locations from radio tagged river otters (*Lontra canadensis*) along the central Platte River in conjunction with GIS, this study is determining if otters use river ways with *P. australis*, or if otter den use in areas with *P. australis* is more or less than expected relative to availability, and will identify any differences in otter use of areas before and after *P. australis* treatments. This study will increase our understanding of the effects of this invasive plant on river otters—a flagship species for non-game conservation.

Data collection ended in December of 2009 with eighteen otters successfully implanted with transmitters and over one thousand locations being recorded. The data is currently being analyzed and will be completed in December of 2010.



Study Otter (implanted with transmitter)
Photo credit: Sam Wilson



Phragmites australis

Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA SCS. 1989. *Midwest wetland flora: Field office illustrated guide to plant species.* Midwest National Technical Center, Lincoln.

ESTIMATING NORTH AMERICAN RIVER OTTER (*LONTRA CANADENSIS*) POPULATION SIZE USING DNA FROM SCAT

Principal Investigator: Craig R. Allen

Graduate Student(s): Amy Williams, M.S.

Project Duration: Fall 2009 – Fall 2010

Funding: Nebraska Game and Parks Commission

Project Location: Big Bend Reach of the Platte River between Gibbon and Alda, Nebraska

River otters (*Lontra canadensis*) are a state threatened species in Nebraska. Their rare and elusive nature makes them particularly difficult to study. Non-invasive genetic sampling is a new technique in which the DNA of the target species is collected from scat or hair samples and used to answer questions regarding the population.

In September 2009, a study began with the goal of using DNA from river otter scat to estimate otter population size at the Big Bend Reach of the central Platte River. Scat samples were collected once in September 2009 on a 13 mile stretch of river and then again in October 2009 DNA extraction was completed in June of 2010 and further analysis of the DNA is expected to be completed this fall.

A population estimate for otters on the Big Bend Reach of the Platte River will be important in an overall state management plan. The information gained from this study will also be useful in performing a larger, statewide study to determine otter populations in other areas throughout Nebraska.



Both Photos:
Amy Williams learning DNA analysis techniques
Photo credits: Craig Allen

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

Principal Investigator: Craig R. Allen, Kyle Hoagland

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

Project Duration: July, 2008 –

Funding: No external funding

Project Location: Platte River in Nebraska, Colorado, Wyoming

Adaptive management has been and continues to be implemented around the country and world, yet few examples exist of programs successfully implementing all six steps (Assess, Design, Implement, Monitor, Evaluate, and Adjust) of adaptive management. A key break point in this process seems to be synthesizing collected data and using that synthesis to tell a story about what data say in regard to key questions and hypotheses in a way that is useful to decision-makers and results in positive changes in management or policy.

The intent of this research is to explore the science/policy interface in a comparative study of several adaptive management programs; provide specific background on this issue as it relates to the Platte River Recovery Implementation Program; complete a “mock report” and other decision support tools for the Program that can be utilized as decision support tools in other adaptive management programs; and discuss opportunities for and challenges to bridging the science/policy gap.

MISSOURI RIVER MITIGATION: IMPLEMENTATION AND ADAPTIVE MANAGEMENT FOR WETLAND RESTORATION EVALUATION

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

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

Project Duration: July 1, 2009 – March 2014

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

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

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

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



The first season of the Wetland Herpetofaunal Survey has been completed. We performed breeding anuran call surveys and tadpole dip-netting over three seasons in April, May and June. In July we implemented turtle trapping to obtain species richness and abundance estimates. Field season concluded at the end of July, and we are now analyzing data. The results will be used to create spatial models of the herpetofauna's distribution during the survey period. The second field season will begin April 2011.



Snapping turtle
Photo credit: Jessica Umbraer



Releasing fish caught in net
Photo credit: Reece Allen



Retrieving nets
Photo credit: Reece Allen

MONITORING, MAPPING AND RISK ASSESSMENT FOR NON-INDIGENOUS INVASIVE SPECIES IN NEBRASKA

Principal Investigator: Craig R. Allen, Jim Merchant

Program Coordinators: Karie Decker, Chris Kelly, Annabel Major

Graduate Student(s): Amy Williams, M.S.
Justin Williams, M.S.

Project Duration: May 4, 2006 – December 31, 2009

Funding: Nebraska Environmental Trust

Project Location: Statewide, Nebraska

Website: <http://snr5.unl.edu/invasives/index.htm>

Biological invasions are a growing threat to both human enterprise and ecological systems. This project developed, collected and provided resources to the public and private sector.

- Education and outreach to Nebraska to county-level governments and stakeholders regarding the potential spread and impact, and the management, surveillance and control of non-indigenous species in Nebraska
- Actual and potential maps of non-indigenous species range (habitat specific maps at high resolution)
- Information regarding identification and management of potential invaders
- A website with centralized information on management, impacts and spread of currently non-indigenous species
- Nebraska conference on the impacts of non-indigenous species impacts with a goal towards unifying efforts

The project created momentum towards building a cohesive, non-indigenous species information system in Nebraska that is fully integrated and relatively seamless across institutional boundaries. The project now serves as the primary hub for invasive species information in Nebraska, and across the U.S. Through the grant, graduate student research provided a comprehensive spatial-risk analysis by modeling habitat suitability for several non-indigenous species in Nebraska, which in turn, was used by the noxious weed board to help identify species for the watch list. In addition, we were able to model actual and potential locations of non-indigenous species in Nebraska, and estimate their potential spread. A large portion of the project was dedicated to increasing public awareness about invasive species issues.

Perhaps one of the most successful outreach tools created is the Nebraska Invasive Species Project website; on average, the website receives nearly 250 unique visitors each week. An invasive species newsletter was developed and is widely distributed. Finally, in 2008, the Nebraska Invasive Species Council was formed to bring together individuals from multiple organizations in order to coordinate invasive species research and management. Through imperative research and dissemination of information, the Nebraska Invasive Species Project is now grounded in Nebraska's invasive species management.

In January 2010, the Nebraska Invasive Species Project received funding from the Nebraska Game and Parks Commission to continue the project for another five years—*Monitoring, Mapping, Risk Assessment and Management of Invasive Species in Nebraska*. With five more years of funding, the future of the project lies in many more collaborative efforts in invasive species research and management in Nebraska.

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

Principal Investigator: Craig R. Allen

Program Coordinator: Karie Decker

Project Duration: January 1, 2010 – December 31, 2014

Funding: Nebraska Game and Parks Commission

Project Location: Statewide, Nebraska

Website: <http://snr5.unl.edu/invasives/index.htm>

This five-year project continues the work begun with funding from the Nebraska Environmental Trust. However, while many of the same goals exist, the project now takes on many new tasks in collaborating with the Commission. For example, the project recently released a draft of the Nebraska Aquatic Nuisance Species Management Plan. Similar plans are in effect in most other states but is lacking in Nebraska. Other invasive species management plans are scheduled for development, encouraging cross-agency collaboration even further. The now fully-equipped education and outreach program is reaching out to broad audiences across the state, and has recently focused on state policy makers in hopes of solidifying upcoming invasive species legislation. The invasive species newsletter, *Nebraska Invasive News Network*, is now distributed electronically to around 400 people. With five more years of funding, the future of the project lies in many more collaborative efforts in invasive species research and management in Nebraska.



Emerald Ash Borer (*Agrilus planipennis* Fairmaire)
Photo credit: David Cappaert, Invasive.org



Boater education pocket card
Photo credit: Karie Decker

PLATTE RIVER WATERSHED ECOSYSTEMS SERVICES ON NATIVE AND RESTORED GRASSLANDS

Principal Investigator: Craig R. Allen

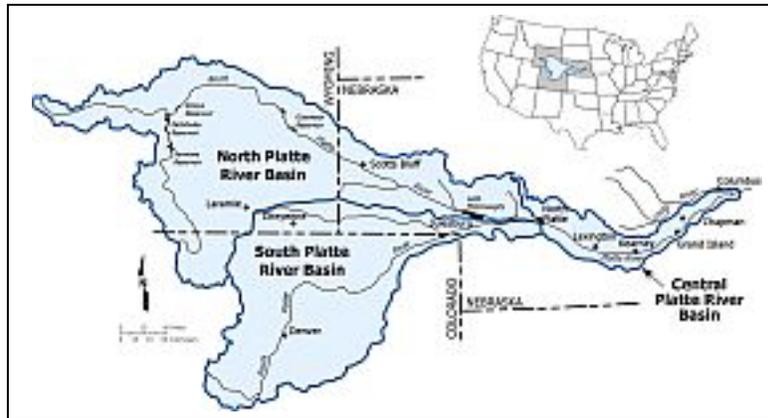
Graduate Student(s): Corinne Kolm, Ph.D.

Project Duration: August 2010 –

Funding: National Science Foundation IGERT Program

Project Location: Platte River Watershed, Nebraska

This new research project will focus on ecosystem services provided by native and restored grasslands in the Platte River watershed, including land enrolled in the USDA Conservation Reserve Program (CRP). Although empirical data has indicated that grasslands provide a variety of services important for humankind, including habitat for crop pollinators, carbon sequestration, and erosion control, little research has been undertaken that compares the functioning of high quality virgin prairie with either high or low-diversity restorations. This research will include comparisons of specific ecosystem attributes in each grassland type while also exploring how pockets of prairie (surrounded by intensive agriculture) add to the resilience of the system.



POPULATION ASSESSMENT OF CHANNEL CATFISH IN NEBRASKA

Principal Investigator: Kevin L. Pope

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

Project Duration: January 2008 – December 2010

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Despite the popularity of channel catfish as a sport fish, little is known of its population dynamics or habitat requirements, and assessment of management strategies is lacking. This project is assessing the present variability in the dynamics (recruitment, growth and mortality) and structure (abundance, size- and age-structure, and condition) of channel catfish populations found in standing water bodies throughout Nebraska. Catfish populations from across Nebraska are being compared among water-body types and among stocking strategies. The results will help managers determine the need for future stockings and harvest regulations of channel catfish. Further, catches of catfish in tandem, baited hoop-nets (a new approach in sampling gear) will be compared with catches of catfish in experimental gill nets; this comparison will help NGPC evaluate a potential change in sampling standards for channel catfish in standing water bodies.

Approximately 5,200 catfish were collected from 22 Nebraska water bodies during the first sampling season (summer 2008); ages were estimated for about 2,400 of those catfish. An additional 20 water bodies were sampled during the second and final 2009 sampling season. The 2009 sampling season also included return visits to three water bodies sampled during the first season to document temporal variability in catch rates. Aging of collected spines has been completed, and assessment of recruitment, growth and mortality is in progress.

Preliminary assessments indicate that condition was not influenced by stocking rate or ecosystem type. Relative weight varied among water bodies, but did not differ among treatments. Preliminary assessments also indicate that stocking rate influenced abundance in two of three ecosystem types. In sand pits and flood control reservoirs, catch per unit effort (CPUE) was greatest in frequently stocked water bodies, and least in those that were not stocked; however, there was no apparent relationship between abundance and stocking rate in irrigation/power generation reservoirs. Ecosystem type also influenced abundance; CPUE was greatest in flood control reservoirs. Preliminary assessments indicate that stocking rate influences size structure in sand pits and flood control reservoirs, but not in irrigation reservoirs. In sand pits and flood control reservoirs, increased stocking rates result in a shift towards greater proportions of small fish. Preliminary assessment of temporal variability in catch indicates that catch of channel catfish in hoop nets varies within season and among years.

In gear comparisons, length frequency distributions and proportional stock density values of captured fish were similar between hoop nets and gill nets in flood control reservoirs and irrigation/power generation reservoirs. In sand pits, low total catch of gill net surveys prevented size structure comparison between gears. Catch per unit effort was greater with hoop nets than gill nets in flood control reservoirs, but similar between gears in irrigation/power generation reservoirs and sand pits. For gill nets, ecosystem type did not influence CPUE, whereas for hoop nets, CPUE was greatest in flood control reservoirs and least in irrigation/ power generation reservoirs.

Measuring catfish
Photo credit: Lindsey Richters



Removing catfish spine
Photo credit: Lindsey Richters



RECRUITMENT OF WALLEYE AND WHITE BASS IN IRRIGATION RESERVOIRS

Principal Investigator: Kevin L. Pope

Graduate Student(s): Jason DeBoer, Ph.D.
Christopher Lewis, Ph.D.
Dustin Martin, M.S. (2008)
Ryan Lueckenhoff, M.S.

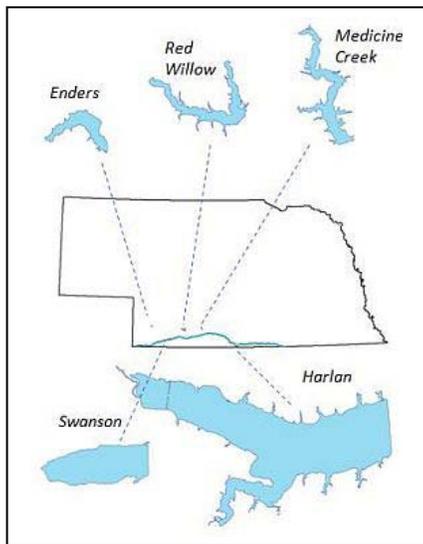
Project Duration: September 2006 – August 2011

Funding: Nebraska Game and Parks Commission

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

The five reservoirs within Nebraska's Republican River watershed (Swanson, Enders, Red Willow [also referred to as Hugh Butler], Medicine Creek [Harry D. Strunk], and Harlan County) were built primarily for flood control and irrigation, resulting in large in-reservoir water-level fluctuations within and among years. These reservoirs also provide important fisheries for anglers in southwest Nebraska; walleye and white bass are of particular importance in these reservoirs. However, continued annual stockings of walleye are necessary because natural production is limited. In contrast, white bass populations are self-sustaining within these reservoirs, although recruitment is extremely erratic (i.e., weak or missing year-classes are common) in all but Harlan County Reservoir. A "recruitment bottleneck" likely exists for walleye and perhaps white bass in these irrigation reservoirs. The purpose of this project is to gain an understanding of the factors affecting recruitment of walleye and white bass in irrigation reservoirs. The primary foci are documenting the relative importance of spawning habitats and determining when the suspected recruitment bottleneck for walleye and white bass occurs in southwest Nebraska irrigation reservoirs. This information is vital for understanding reservoir fish ecology in semiarid regions.

Sampling walleye and white bass populations continues in these reservoirs. Several more years of data are needed to begin initial explorations for potential recruitment bottlenecks of walleye and white bass in southwest Nebraska irrigation reservoirs. Difficulty distinguishing juvenile hybrid striped bass from juvenile white bass added an unexpected dimension to this project. Thus, genetic assessments were initiated on age-0 and age-1 temperate basses this past year.



Catching walleye with an electro-fisher

THE RELATIONSHIP BETWEEN DIVERSITY AND ECOLOGICAL FUNCTIONS

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

Graduate Student(s): Kristine Nemec, Ph.D.
Lindsey Reinarz, M.S. (University of Nebraska Omaha)

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

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

Project Location: Central Platte River Valley, Nebraska

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

We have identified existing high diversity restorations and low diversity remnant grasslands (pastures) as large scale study sites (~100 acre). We also established twenty-four 0.75-acre plots which are planted to six replicates each of four treatments: high diversity sites of ~100 species, high diversity sites at twice the normal seeding rates (to be similar with NRCS practices), and CP25 sites (15 species) at normal and half-normal seeding rates. These sites are currently being used to assess invasion resistance among the treatments, and to assess soil development and nematode populations.



Soil sample for assessing soil development
Photo Credit: Kristine Nemec



**Upright prairie coneflower leaves
eaten by insect herbivores**
Photo Credit: Kristine Nemec

Large scale sites are being used to investigate differences in herbivory, and 2006 data indicate that herbivory rates are lower on high diversity sites. Initial results from 2006 data from smaller plots show lower abundances of bull thistle and sweet clover in high diversity plots compared to low diversity plots. Populations of economically-significant grasshoppers and predatory invertebrates were sampled from June through August 2007–2009. Data collections for soil development, nematodes, and invasion resistance were started in 2006 and repeated in 2007–2009. All spider specimens, and ground beetle and ant specimens from 2007 and 2008 have been identified. Ground beetle and ant specimens from the 2009 sampling season will be identified in the coming year. Plant species observed along transects were also recorded in 2007–2009. Data analysis is ongoing.

RIVER OTTER HOME RANGE AND HABITAT USE

Principal Investigator: Craig R. Allen

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

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

Funding: Nebraska Game and Parks Commission

Project Location: Platte River, Nebraska

River otters became reestablished in Nebraska following their reintroduction in the mid 1980s and early 1990s. The species is currently listed as threatened in Nebraska (S2). Despite the high profile of the reintroduction and the otters' role as a flagship species, relatively little is known about river otter ecology in Nebraska. The Nebraska Cooperative Fish and Wildlife Research Unit with the Nebraska Game and Parks Commission (NGPC) initiated this project in October 2006 with the objective of collecting home range and habitat use information on river otters along the big bend area of the Platte River using remote sensing (radio telemetry). We captured and radio-tagged eighteen northern river otters on and near the Platte River, a core component of the specie's distribution in Nebraska.

This project has recently completed the collection of home range and habitat use information on river otters along the big bend area of the Platte River. Data collected, in conjunction with the results of an ongoing river otter health and reproductive survey and results from the Nebraska Game and Parks Commission's annual otter bridge survey, will help close existing information gaps and contribute to the creation of the Nebraska River Otter Management Plan and the Statewide Comprehensive Conservation Plan. This is one of the largest otter tracking projects in the United States and the only current project in the Midwest.



**Sam Wilson and Amy Williams
examining otter trap**
Photo Credit: Adam Butler



Sam and Amy setting otter trap
Photo Credit: Adam Butler



Sam with otter transport tube
Photo Credit: Amy Williams

SCENARIOS OF CLIMATE CHANGE AND LAND USE CHANGE AND BIOLOGICAL INVASIONS IN THE HIGH PLAINS

Principal Investigator: Craig R. Allen

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

Project Duration: August 2010 –

Funding: U.S. Geological Survey (RWO 14) and USGS Water Center

Project Location: Greater Platte River Basin

Biological invasions are a growing threat to both human enterprise and ecological systems. Estimates of costs associated with non-indigenous species in the United States exceed \$120 billion per year. Ecological costs are more difficult to quantify, but include the extinction of indigenous biota and changes in ecological processes, with concomitant losses of ecosystem services and capital. Climate change will almost certainly exacerbate problems with invasive species. A number of investigations have indicated that regional change in climate will affect plant invasions in the Great Plains. Observed or predicted alterations of climate include earlier onset of spring, warmer winters, spatial and temporal changes in precipitation patterns, and reduced snowpack in the Rocky Mountains—resulting in lower runoff to Great Plains' streams. However, much remains unknown concerning the relationship between climate change and biological invasions.

The purpose this study is to develop a gap analysis of research and monitoring needs for biological invasions as mediated or affected by climate change in the Northern Great Plains of the USA. This analysis is in support of the development of a Climate Effects Center in the Great Plains, and will include a gap analysis of: 1) current research; 2) research needs and 3) monitoring needs. Additionally, we will begin work on developing scenarios of climate/landuse change effects on species invasions and range contractions, and the effects of policy interventions on the impacts of invasions driven by climate change.

SOUTHEAST PRAIRIES BUL AND SANDSTONE PRAIRIES BUL RESEARCH

| | |
|-------------------------|---|
| Principal Investigator: | Craig R. Allen, Chris Helzer (TNC), Jarren Kuipers (NPLT), Gerry Steinauer (NGPC) |
| Graduate Student(s): | Kody Unstad, M.S. Christopher Wood M.S. (UNO) |
| Project Duration: | June 2008 – June 2013 |
| Funding: | Nebraska Game and Parks Commission |
| Project Location: | Southeast Nebraska |

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

Our aspect of the project has two major objectives aimed at conservation of at-risk species and biological diversity. (1) Evaluate on-going, private-lands habitat work to improve the location, conservation goals, and methods of those projects. (2) Evaluate the current and potential viability of ecological systems within priority landscapes. The second objective will inform the first. Understanding population viability for various taxa and how that status differs between more and less fragmented areas, as well as other variables, will help to more wisely select locations and strategies for management and conservation projects.

We are focused on three key insect groups that provide important ecosystem services: pollinators, ants and ground beetles. Pollinators are important in that 65% of flowering plants depend upon them for reproduction, including many prairie plant species. Ants make up a huge portion of the insect biomass in prairies, and are important for soil aeration and drainage, seed dispersal and nitrogen cycling. Ants and most ground beetles are important predators, keeping many herbivorous insect populations in check. This research intends to determine the factors having the greatest impact on the abundance and species richness of these key insect groups in tallgrass prairie fragments. Factors may include vegetation structure, floral composition, litter depth, fragment size, fragment shape, fragment isolation or the composition of the surrounding landscape. Understanding the impact of these factors may improve use of conservation resources through targeted decision-making about what fragments to preserve, or where grasslands should be planted to best supplement prairie fragments, and will also be useful when approaching landowners about techniques benefiting both agriculture and prairie conservation.

Following pilot studies, Chris Wood completed the second of two years of pollinator collection in 2010 with white, yellow and blue pan-traps used for sampling; Kody Unstad initiated his first year of ant and ground beetle data collection with test tube pitfall traps used for sampling. Both studies were conducted on the same 23 privately-owned hay meadows scattered throughout the SEBUL region. A floral quality assessment of the 23 sites was conducted in 2009 and 2010. Vegetation structural data were also collected on all sites in 2010. Pollinators, ants and ground beetles continue to be sorted and identified.



Photo credits: Kody Unstad and Chris Wood

WETLAND CONDITION ASSESSMENT

Principal Investigator: Craig R. Allen, Ted LeGrange

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

Project Duration: August 2010 –

Funding: Nebraska Game and Parks Commission and the U.S. EPA

Project Location: Statewide Nebraska

This project will add approximately 110 additional sample locations in support of the U.S. Environmental Protection Agency's 2011 National Wetland Condition Assessment. A network of assessment sample locations will be established in 11 different Nebraska wetland complexes and these will be used to track changes to the health and condition of Nebraska's wetlands. Cooperators of this project represent 17 different agencies and organizations.

In the years 2011 to 2013, a field team will visit each sample location and collect wetland assessment data. The data collection methods will conform to the protocol established by the U.S. Environmental Protection Agency. The indicators that we are considering for assessment include vegetation, algae, macroinvertebrates, amphibians, water quality, soils, and hydrology. Data will enable the evaluation of seasonal and annual changes in wetland condition.

Outcomes of this project will be an improved understanding of the condition of Nebraska's wetlands that can be used to target wetland conservation efforts, track changes in invasive species distribution, evaluate potential climate change effects on wetlands, and describe the range of reference conditions for key and vulnerable wetland complexes in the state that are also representative of many wetlands throughout the Great Plains.

OTHER AFFILIATED RESEARCH PROJECTS

The following research projects are being lead by non-unit faculty. They are funded through the USGS Cooperative Research Units Research Work Order process, or by modifications to the Nebraska Game and Parks Commission Cooperative Agreement.

QUANTIFYING UNCERTAINTY IN MISSOURI RIVER ADAPTIVE MANAGEMENT PROCESSES

Principal Investigator: Andrew Tyre (PI)
Graduate Student(s): Adam Schapaugh
Project Duration: April 2009 – April 2011
Funding: U.S. Geological Survey (RWO 9) and U.S. Army Corps of Engineers
Project Location: Missouri River Basin from Montana to Missouri

The Missouri River Recovery Project (MRRP) is arguably one of the largest ecosystem recovery projects ever attempted. Choosing actions and resolving conflicts among stakeholders is difficult because predicting the consequences of actions is fraught with uncertainty. This is particularly true of endangered species responses to recovery actions. In response to this uncertainty, the U.S. Army Corps of Engineers (USACE) has committed to taking an adaptive management approach to the recovery of the Missouri River. Initial efforts at developing adaptive management plans for endangered species are presently underway. However, building a predictive capacity that integrates hydrology, climate, sociology, and ecology is technically challenging. The critical need is for a linked set of decision tools that provides a simple and transparent linkage between management actions and responses. These linked tools can only be built by a dedicated team of scientists with expertise in all of the disciplines as well as a strong central linkage. Without this dedicated team, the development of the necessary integrated science takes place only slowly, if at all.

The long term goal of this project is to develop an integrated system of predictive tools used iteratively to guide the recovery project. Ultimately, the capacity to both develop and use these tools needs to be transferred to the management agency, the USACE. Thus, training is needed in addition to scientific development.

The specific goals of this project are:

- 1) Quantify uncertainty in ecological responses to management in a manner that is useful for decision makers.
- 2) Develop decision support tools that link hydrological inputs with ecological outputs and use existing monitoring data both as validation and to improve parameter estimation.
- 3) Train USACE and other federal agency personnel in the use of these tools to ensure the continued development of the tools and successful use beyond the life of the project.

The primary outcome of this project will be a decision support system that is trusted and highly regarded by the diverse stakeholders in the Missouri River Basin. This will lead to improved medium to long term decision making in the Recovery Project, and these decisions will be robust and unlikely to be challenged by stakeholders. The system will be flexible enough to adapt as new challenges emerge. The adaptive management expertise and technical modeling capacity built within the USACE during the project will be transferable to other river management issues at many scales.

TOTAL VEGETATION CONTROL ON SANDBARS ALONG THE MISSOURI RIVER UTILIZING LIME AND HERBICIDES

Principal Investigator: Stevan Knezevic (PI), Charlie Shapiro, Tom Hunt, Mark Bernards
Post-Doc: Avishek Datta
Project Duration: June 1, 2007 – December 31, 2010
Funding: U.S. Geological Survey (RWO 6) and U.S. Army Corps of Engineers
Project Location: Missouri River

Lack of bare sand areas due to vegetative overgrowth is the main reason for the reduction of nesting habitats for two endangered bird species, piping plover (*Charadrius melodus*) and interior least tern (*Sterna antillarum*), in the backwaters of Lewis and Clark Lake along the Missouri River. To create suitable nesting habitats (e.g., large open bare sand), a series of vegetation management practices are being tested on the existing sandbars. It is important to identify practices that will maintain sandbars free of vegetation; thus, protect proper nesting habitats for the above bird species. We are in the second year of studying the effects of lime, ash, and imazapyr either applied alone or in combination as tools for long-term vegetation control in maintaining suitable habitat for piping plover and interior least tern on the existing sandbars.

USGS SUBSURFACE INVESTIGATION FOR EOLIN AND INTERDUNE DEPOSITS NEAR CRESCENT LAKE NATIONAL WILDLIFE REFUGE

Principal Investigator: Paul Hanson
Graduate Student(s): TBA
Project Duration: August 2010 – December 31, 2011
Funding: U.S. Geological Survey (RWO 13) and USGS Water Center
Project Location: Crescent Lake National Wildlife Refuge, Nebraska Sandhills

Recent and long-term dune activation records, and the nature and persistence of interdune deposits will be studied near Crescent Lake National Wildlife Refuge in the Nebraska Sandhills. Previous studies from the region did not produce detailed investigations on the nature of the interdune areas, or produce age estimates for interdune longevity. Many of these regions currently hold lakes, which would make them sinks for dust. However, during drought periods they may have acted as dust sources for locations to the south and east.

- This project will study the response of this region to drought events of the past and address the nature of these interdune areas as potential dust sources or dust sinks throughout the past approximate 16,000 years.
- Cores will be collected, described, and sub-sampled for optical dating and particle size analysis.
- Optical dating and particle size analysis will be completed. The single-grain optical dating technique is relevant for use in sediments deposited in hillslope, alluvial or lacustrine environments. The interdune deposits we will be dating in this study will likely have sediments from one or more of these environments.
- A database containing both previous and active paleoclimate and geologic data available from the region will be generated and will become available online as data is collected.

PROFESSIONAL ACTIVITIES

TEACHING

CRAIG ALLEN

Spring 2010: *Ecology of Biological Invasions*

Biological invasions are an accelerating global phenomenon with significant economic and ecological impacts. This course was designed to increase understanding of invasions and their impacts, and draws from plant, invertebrate and vertebrate examples. The focus is primarily on animal invasions and understanding the effects on structure, process and function of native ecological systems. The analytical component of this course in 2010 focused on established non-native plants in Nebraska. We conducted a spatial and statistical analysis of the approximately 500 non-native plants established in Nebraska, and contrasted the flora of today— which is 20% non-native— with the historic flora. The results of this analysis are being submitted to a special feature (focused on biological invasions and ecosystem services) in the *Journal Invasive Plant Science and Management*.

JOSEPH FONTAINE

Fall 2010: Adaptive Natural Resource Management

From cultural taboos to the current socio-ecological framework, the art and science of natural resource management has and continues to evolve. The primary focus of this course is to introduce students to the concepts of structured decision making and adaptive management, but in doing so the course will explore the history of natural resource management and the various management paradigms that have and continue to dominate resource management. At the completion of this course students will have an understanding of the theory and practice of adaptive management as well as an understanding of why we continue to move toward a more transparent and scientific methodology of natural resource management.

KEVIN POPE

Spring 2010: Quantitative Fishery Assessment

This course provided an overview of common statistical methods used in ecological field studies. It was designed to increase 1) understanding of current fishery assessment practices, and 2) proficiency with SAS statistical software. Emphasis is placed on quantitative assessments of fish populations (e.g., recruitment, growth, and mortality), communities (predator-prey interactions) and ecosystems (biostressors). At the completion of this course, students were expected to have the skills necessary to utilize current quantitative methods in fishery data analysis, effectively communicate statistical ideas, and critique scientific studies (e.g., identify strengths and weaknesses of statistical assessments).

TRAINING, WORKSHOPS AND OUTREACH ACTIVITIES

CRAIG ALLEN

- Resilience and Sustainability in Australia, December 2009 – January 2010. Canberra, Sydney and Townsville, Australia.

KARIE DECKER

- Education/Outreach Booth at the Platte River Symposium, October 2009. Kearney, NE
- Education/Outreach Booth at the Rainwater Basin Joint Venture Conference, February 2010. Hastings, NE
- Education/Outreach Activity Booth at the Morrill Hall's Dinosaurs and Disasters Event, February 2010. Lincoln, NE
- Outreach—discussed the invasive species project to a group of high school students during an SNR recruitment event, March 2010. Lincoln, NE

- Education/Outreach Booth at the Annual Rivers and Wildlife Conference, March 2010. Kearney, NE
- Education/Outreach Booth and Activity at the Morrill Hall Sunday with a Scientist Event, April 2010. Lincoln, NE. <http://www.museum.unl.edu/sundaywithascientist/apr2010.html>
- Radio show: NGPC Outdoor Nebraska, discussed zebra mussels and other invasive species, April 2010. Lincoln, NE. <http://outdoornebraska.ne.gov/news/radio/audio/2010/april/oneb041910-1.mp3>
- Education/Outreach Booth at the annual NGPC Outdoor Expo, May 2010. Fort Kearney, NE
- Education/Outreach Booth—Annual Clean Boat Event, May 2010. Yankton, SD
- Article in *Prairie Fire* Newspaper about invasive species in Nebraska, May 2010. <http://www.prairiefirenewspaper.com/2010/05/invasive-species>
- Radio show: The Outdoor Connection with Rick Windham out of North Platte. Discussed zebra mussels and the aquatic nuisance species plan, June 2010. <http://outdoornebraska.ne.gov/news/radio/audio/2010/april/oneb041910-1.mp3>
- Radio interview with Clay Masters on Nebraska Public Radio about the aquatic nuisance species plan, June 2010.
- Education/Outreach Booth—Waterfest at Holmes Lake, June 2010. Lincoln, NE
- Mini-article in *Prairie Fire* Newspaper about zebra mussels, June 2010.
- Presentation about the NE ANS Plan: NGPC Fisheries Management Section Meeting, August 2010. Ogallala, NE
- Presentation about the NE Aquatic Nuisance Species Plan: NGPC Commissioners Meeting, August 2010. Ogallala, NE
- Education/outreach Booth—Morrill Hall Natural Resources Event, October 2010. Lincoln, NE
- Poster and education/outreach Booth—invasive species: Platte River Symposium, October 2010. Lincoln, NE
- Organize workshop/symposium on Aquatic Invasive Species in Nebraska, October 2010

KEVIN POPE

- Resilience and Sustainability in Australia, December 2009 – January 2010. Canberra, Sydney and Townsville, Australia
- Motorboat Operators Certification Course (MOCC), May 2010. Lincoln, NE

PEER-REVIEWED PUBLICATIONS

- Allen, C. R. 2009. [Review of the book *Wildlife science: Linking ecological theory and management applications*]. *Great Plains Research*, 19:258–259.
- Allen, C. R., E. A. Forsys, and C. S. Holling. 2010. Body mass patterns predict invasions and extinctions in transforming landscapes. Pages 281–297 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.). *Foundations of Ecological Resilience*. New York, NY: Island Press. (Reprinted from *Ecosystems* 2:114–121.)
- Allen, C. R., L. Gunderson, and C. S. Holling. 2010. Commentary on part one articles. Pages 3–18 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press.
- Allen, C. R., L. Gunderson, and C. S. Holling. 2010. Commentary on part two articles. Pages 197–204 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press.
- Allen, C. R., L. Gunderson, and C. S. Holling. 2010. Commentary on part three articles. Pages 301–307 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press.
- Allen, C. R. and L. H. Gunderson. *In press*. Pathology and failure in the design and implementation of adaptive management in Allen, C. R., J. J. Fontaine, and K. L. Pope (Eds.), *Adaptive Management of Natural Resources* [Special Issue]. *Journal of Environmental Management*.
- Allen, C. R. and C. S. Holling. 2010. Novelty, adaptive capacity and resilience. *Ecology and Society*. 15(3): 24. [online] URL: <http://www.ecologyandsociety.org/vol15/iss3/art24/>
- Allen, C. R., K. Pope, and T. J. Fontaine. *In press*. Adaptive Management for a turbulent future in Allen, C. R., J. J. Fontaine, and K. L. Pope (Eds.), *Adaptive Management of Natural Resources* [Special Issue]. *Journal of Environmental Management*.

- Chizinski, C. J., K. L. Pope, and G. R. Wilde. 2010. A modelling approach to evaluate potential management actions designed to increase growth of white perch in a high-density population. *Fisheries Ecology and Management*. 17:262–271.
- Chizinski, C. J., K. L. Pope, G. R. Wilde, and R. L. Strauss. 2010. Implications of stunting on morphology of freshwater fish. *Journal of Fish Biology*. 76:564–579.
- Epperson, D. and C. R. Allen. 2010. Red imported fire ant impacts on upland arthropods in southern Mississippi. *American Midland Naturalist*. 163:54–63.
- Fontaine, J. J., K. L. Decker, S. K. Skagen, and C. van Riper III. 2009. Spatial and temporal variation in climate change: A bird's eye view. *Climatic Change*, 97:305–311.
- Fontaine, J. J. *Accepted*. Changing climates and the incorporation of adaptive management into our state wildlife action plans. *Trans. North American Wildlife and Natural Resource Conference*.
- Fontaine, J. J. *In Press*. Improving our Legacy: Incorporation of adaptive management into state wildlife action plans. *J. Environmental Management*.
- Garmestani, A. S., C. R. Allen, and H. Cabezas. 2009. Panarchy, adaptive management and governance: sustainable options for building resilience. *Nebraska Law Review*, 87:1036–1054.
- Garmestani, A. S., C. R. Allen, and L. Gunderson. 2009. Panarchy discontinuities reveal similarities in the dynamic system structure of ecological and social systems. *Ecology and Society*, 14 (1) 15. [online] URL: <http://www.ecologyandsociety.org/vol14/iss1/art15/>
- Gosch, N. J. C., L. L. Pierce, and K. L. Pope. 2010. The effect of predation on stunted and nonstunted white perch. *Ecology of Freshwater Fish*, 19:401–407.
- Gosch, N. J. C., J. R. Stittle, and K. L. Pope. 2010. Food habits of stunted and non-stunted white perch (*Morone americana*). *Journal of Freshwater Ecology*, 25:31–39.
- Gosch, N. J. C., K. L. Pope, and P. H. Michaletz. 2009. Stomach capacities of six freshwater fishes. *Journal of Freshwater Ecology*, 24:645–649.
- Gunderson, L., C. S. Holling, and C. R. Allen. 2010. The evolution of an idea—the past, present, and future of ecological resilience. Pages 423–444 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press.
- Gunderson, L., C. R. Allen, and C. S. Holling. 2010. *Foundations of Ecological Resilience*. New York, NY: Island Press. 466pp.
- Gunderson, L., C. R. Allen, and C. S. Holling. 2010. Why resilience? Why now? Pages xii–xxv in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press.
- Hubert, W. A., K. L. Pope, and J. M. Dettmers. *In press*. Passive capture techniques. Pages 000–000 in A. V. Zale, D. L. Parrish, and T. M. Sutton (Eds.). *Fisheries Techniques*, 3rd edition. Bethesda, MD: American Fisheries Society.
- Martin, D. R. and K. L. Pope. *In print*. Luring Anglers to Enhance Fisheries in Allen, C. R., J. J. Fontaine, and K. L. Pope (Eds.), Adaptive Management of Natural Resources [Special Issue]. *Journal of Environmental Management*.
- Martin, D. R., L. A. Powell, and K. L. Pope. 2009. Spring home ranges of white bass in irrigation reservoirs of the Republican River Basin, Nebraska. *Ecology of Freshwater Fish*, 18:514–519.
- Miller, T. K., C. R. Allen, W. Landis, and J. Merchant. 2010. Risk assessment: Simultaneously prioritizing the control of invasive plant species and the conservation of rare plant species. *Biological Conservation*, 143:2070–2079.
- Peterson, G., C. R. Allen, and C. S. Holling. 2010. Ecological resilience, biodiversity and scale. Pages 167–193 in Gunderson, L., C. R. Allen and C. S. Holling (Eds.), *Foundations of Ecological Resilience*. New York, NY: Island Press. (Reprinted from *Ecosystems*, 1:6–18.)

- Pope, K. L., S. E. Lochmann, and M. K. Young. *In press*. Methods for assessing fish populations. Pages 000-000 in M. C. Quist and W. A. Hubert (Eds.), *Inland Fisheries Management in North America*, 3rd edition. Bethesda, MD: American Fisheries Society.
- Pope, K. L. and G. R. Wilde. 2010. Survival of foul-hooked largemouth bass (*Micropterus salmoides*). *Journal of Freshwater Ecology*, 25:135–139.
- Pope, K. L., R. M. Neumann, and S. D. Bryan. 2009. Warmwater fish in small standing waters. Pages 13–27 in S. A. Bonar, W. A. Hubert, and D. W. Willis (Eds.), *Standard Methods for Sampling North American Freshwater Fishes*. Bethesda, MD: American Fisheries Society.
- Rehme, S. E., C. R. Allen, and L. A. Powell. *In press*. Weak inference and management decisions: What's a manager to do? in Allen, C. R., J. J. Fontaine, and K. L. Pope (Eds.), *Adaptive Management of Natural Resources* [Special Issue]. *Journal of Environmental Management*.
- Robertson, B. A., R. L. Hutto, and J. J. Fontaine. *Accepted*. Evaluating food availability and nest predation as sources of bias in aural bird surveys. *Journal of Field Ornithology*.
- Robertson, B. A., J. J. Fontaine, and E. Loomis. 2009. Seasonal patterns of song structure variation in a suboscine passerine. *Wilson Journal of Ornithology*, 121: 815–818.
- Wardwell, D. and C. R. Allen. 2009. Variability in population abundance is associated with thresholds between scaling regimes. *Ecology and Society* 14 (2):42. [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art42/>
- Wilde, G. R. and K. L. Pope. 2008. A simple model for predicting survival of angle-caught and released largemouth bass. *Transactions of the American Fisheries Society*, 137:834–840.

PRESENTATIONS AT SCIENTIFIC MEETINGS

- Allen, C. R. 2010. Invasions and resilience. In *Invasive Plant Species Impacts on Ecological Services*. Symposium on Ecosystem Services: The Unwarranted, Undeniable Contribution by Invasive Plant Species, conducted at the Soil and Water Conservation Society Annual Conference, St. Louis, MO. July 2010. Invited presentation and panel member.
- Allen, C. R. 2009. *Resilience, climate change, and tipping points*. Sportsmen's Forum: Climate change and Nebraska Wildlife. Lincoln, NE. December 2009. Invited presentation.
- Barada, T. J., and K. L. Pope. 2010. Do special walleye regulations influence angler behavior? Annual Meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010.
- Barada, T. J., K. L. Pope, and D. L. Eichner. 2009. Temporal trends in angling at Lake McConaughy, Nebraska: Assessing a complex fishery. 70th Annual Meeting, Midwest Fish and Wildlife Conference, Springfield, IL. December 2009. Poster presentation.
- Barada, T. J., K. L. Pope, and D. L. Eichner. 2010. Temporal trends in angling at Lake McConaughy, Nebraska: Assessing a complex fishery. Annual Meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010. Poster presentation.
- DeBoer, J. A., C. R. Lewis, C. G. Huber, and K. L. Pope. 2010. Irrigation and year-class strength of fishes—the importance of a species' spawning period. Dakota Chapter of the American Fisheries Society Annual Meeting, Spearfish, SD. February 2010.
- DeBoer, J. A., K. L. Pope, and K. D. Koupal. 2010. Irrigation and Year-Class Strength of Fishes—the Importance of a Species' Spawning Period. Greater Platte River Basins Symposium, Lincoln, NE. October 2010.
- DeBoer, J. A., C. R. Lewis, C. G. Huber, and K. L. Pope. 2009. Irrigation and year-class strength of fishes—the importance of a species' spawning period. 70th Annual Meeting, Midwest Fish and Wildlife Conference, Springfield, IL. December 2009. Poster presentation.

- DeBoer, J. A., K. L. Pope, and K. D. Koupal. How does reservoir retention time affect larval fish ontogeny? Joint Annual Meeting, Centrarchid, Esocid and Walleye Technical Committees, North Central Division of the American Fisheries Society, LaCrosse, WI. July 2010 .
- DeBoer, J. A., K. L. Pope, and K.D. Koupal. 2010. Morphology of larval fishes: What does it tell us about early life–history? Walleye Technical Committee Joint Summer Meeting, LaCrosse, WI. July 2010 .
- Decker, K. L. 2009. Updates from the Nebraska Invasive Species Council. Nebraska Game and Parks Annual Wildlife Division Meeting, Fort Robinson NE. October 2009. Invited presentation.
- Decker, K. L. 2009. Invasive species in Nebraska grassland ecosystems: current and potential threats. University of Nebraska Center for Grassland Studies Seminar Series, Lincoln, NE. November 2009. Invited presentation.
- Decker, K. L. 2009. The role of the Nebraska Invasive Species Project in research and management of invasive species across the Midwest. 70th Annual Midwest Fish and Wildlife Conference, Springfield, IL. December 2009. Poster presentation.
- Decker, K. L. 2009. Managing for invasive species in Nebraska. Nebraska Weed Control Association NACO Conference, Lincoln, NE. December 2009. Invited presentation.
- Decker, K. L. 2010. Invasive species in Nebraska: current and potential threats. Izaak Walton League annual meeting, Lincoln, NE. January 2010. Invited presentation.
- Decker, K. L., C. J. Conway, and J. J. Fontaine. 2010. Seasonal decline in avian clutch size: a test of six alternative hypotheses. Joint meeting of the American Ornithologist's Union and Cooper Ornithological Society, San Diego, CA. February 2010.
- Decker, K. L. 2010. Development of the Nebraska Aquatic Nuisance Species Management Plan. Nebraska Game and Parks Commission Annual Fisheries Division Meeting, Ponca, NE. February 2010. Invited presentation.
- Decker, K. L. 2010. The role of the Nebraska Invasive Species Project in research and management of invasive species across the Midwest. Missouri River Natural Resources Committee Conference and BiOP Forum, Nebraska City, NE. Poster presentation, March 2010.
- Decker, K. L. 2010. Zebra mussel threats and management options in Nebraska. Nebraska Game and Parks Commission and the Army Corps of Engineers Aquatic Nuisance Species Management Meeting, Alma, NE. May 2010. Invited presentation.
- Decker, K. L. 2010. Identifying current and potential invasive species threats along the lower Platte River. Lower Platte River Corridor Alliance Conference, Lincoln, NE. July 2010. Invited presentation.
- Fontaine, J. J. and S. K. Skagen. 2010. Avian migration and climate change throughout the Prairie Pothole Region. North American Wildlife and Natural Resource Conference, Milwaukee, WI. December 2009. Invited presentation.
- Fontaine, J. J. 2009. Implementing adaptive management in state wildlife plans as an adaptation to climate change. North American Wildlife and Natural Resource Conference, Milwaukee, WI. December 2009. Invited presentation.
- Fontaine, J. J., L. Z. Gannes, K. L. Decker, S. K. Skagen and C. van Riper. 2010. Understanding habitat settlement cues for migratory birds in light of changing climates. Cooper Ornithological Society, American Ornithologists' Union and Society of Canadian Ornithologists Joint Meeting, San Diego, CA. February 2010. Invited presentation.
- Fontaine, J. J. 2009. Improving our legacy: implementation of adaptive management in state wildlife plans. 70th Annual Midwest Fish and Wildlife Conference, Springfield, IL. December 2009. Invited presentation.
- Fontaine, J. J. 2009. Spatial and temporal variation in climate change: A migrant bird's dilemma. Sportsmen's Forum on Climate Change, Lincoln, NE. October 2009. Invited presentation.
- Fontaine, J. J. 2009. Thinking and Rethinking Wildlife Management. Nebraska Game and Parks Commission Wildlife Division Meeting, Crawford, NE. July 2010. Invited presentation.
- Fontaine, J. J. 2009. Physiological, life–history, and behavioral responses of a breeding bird community to experimentally reduced nest predation risk. USGS Northern Prairie Science Center, Jamestown, ND. Invited presentation.

- Fontaine, J. J. 2009. Spatial and temporal variation in climate change: A migrant bird's dilemma. Biological Sciences Seminar Series. North Dakota State University, Fargo, ND. Invited presentation.
- Huber, C. G., and K. L. Pope. 2009. Angler use on four southwest Nebraska reservoirs. Annual Meeting, Nebraska Chapter, American Fisheries Society, Gretna, NE. October 2009.
- Hurley, K. L., Richters, L. K. and K. L. Pope. 2010. Effect of stockings on Nebraska catfish population densities. *Conservation, Ecology, and Management of Catfish: The Second International Symposium*, St Louis, MO. June 2010. Poster Presentation.
- Lueckenhoff, R. W., and K. L. Pope. 2009. Morphological variation in age-0 white bass and striped bass in the Republican River Basin, Nebraska. Annual Meeting, Nebraska Chapter, American Fisheries Society, Gretna, NE. October 2009.
- Maple, A., L. Kowalewski, M. A. Pegg, and K. L. Pope. 2010. Latitudinal influences on aging bluegill with otoliths and scales. Annual Meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010. Poster presentation.
- Martin, D. R., K. L. Pope, and L. A. Powell. 2009. Habitat selection of spawning walleye and white bass in irrigation reservoirs of the Republican River basin. Annual Meeting, Nebraska Chapter, American Fisheries Society, Gretna, NE. October 2009. Poster presentation.
- Martin, D. R., and K. L. Pope. 2010. Substitute sites and angler use of Salt Valley reservoirs. Annual meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010.
- Nemec, K. T., and C. R. Allen. 2010. The relationship between diversity and resistance to invasions prairie restorations. Association for Environmental Studies and Sciences Annual Meeting, Portland, OR. June 2010.
- Pope, K. L. 2009. Catching managers, anglers, and fish. 70th Annual Meeting, Midwest Fish and Wildlife Conference, Springfield, Illinois. December 2009.
- Porath, M. T., Pape, L. D., Richters, L. K., Pope, K. L. and M. A. Pegg. 2010. Influence of throat configuration and fish density on escapement of channel catfish from hoop nets. *Conservation, Ecology, and Management of Catfish: The Second International Symposium*, St Louis, MO. June 2010.
- Rehme, S. E. and C. R. Allen. 2009. Weak inference and management decisions: What's a manager to do? *Adaptive Management Symposium* at 70th Annual Midwest Fish and Wildlife Conference, Springfield, IL. December 2009. Invited presentation.
- Richters, L. K., D. R. Martin, and K. L. Pope. 2009. Channel catfish catches in tandem hoop nets: the influence of sampling date. Annual Meeting, Nebraska Chapter, American Fisheries Society, Gretna, NE. October 2009. Poster presentation.
- Richters, L. K. and K. L. Pope, 2010. Baited, tandem-set hoop nets: A sensitive gear. *Conservation, Ecology, and Management of Catfish: The Second International Symposium*, St Louis, MO. June 2010. Poster Presentation.
- Richters, L. K., and K. L. Pope. 2010. Catch comparison of channel catfish sampled in Nebraska reservoirs with two gears. Annual Meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010. Poster presentation.
- Richters, L. K., K. L. Pope, 2010. Comparison of channel catfish catches from tandem-set hoop nets and gill nets in lentic systems. American Fisheries Society Nebraska Chapter Annual Meeting, Ponca, NE. February 2010. Poster Presentation.
- Richters, L. K. and K. L. Pope, 2010. Comparison of channel catfish catches from tandem-set hoop nets and gill nets in lentic systems. *Conservation, Ecology, and Management of Catfish: The Second International Symposium*, St Louis, MO. June 2010.
- Spirk, P., and K. L. Pope. 2010. Effects of length limits on sexually-size dimorphic fish. Annual Meeting, Nebraska Chapter, American Fisheries Society, Ponca, NE. February 2010.

Sundstrom, S., A. Garmestani and C. R. Allen. 2010. The multi-disciplinary application of the cross-scale resilience model. Association for Environmental Studies and Sciences Annual Meeting. Portland, OR. June 2010.

Swanson, R. B., R. Zelt, J. Cannia, L. Tieszen, K. Epsy, and C. R. Allen. 2010. Designing a framework for integrated climate-change-effects assessment in the greater Platte River Basins. USGS Climate Change Science, Denver, CO. March 2010.

GRADUATE COMMITTEE SERVICE

CRAIG ALLEN

- Andrew Kessler (M.S. School of Natural Resources, UNL) (Graduated 2009)
- Jamie McFadden (M.S., School of Natural Resources, UNL)
- Dori Porter (M.S., Entomology, UNL) (Graduated 2010)
- Wayne Ohnesorg (Ph.D., Entomology, UNL)
- Christopher Wood, (M.S., Biology, UNO)

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- Jason DeBoer (Ph.D., School of Natural Resources, UNL)
- Mary Brown (Ph.D., School of Natural Resources, UNL)
- Irina Skinner (M.S., Department of Wildlife Ecology and Conservation, University of Florida)

KEVIN POPE

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- Aaron Blank, (M.S., School of Natural Resources, UNL)
- Cameron Goble (M.S., School of Natural Resources, UNL)
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PROFESSIONAL AND FACULTY SERVICE

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- Associate Editor (Macro and Landscape Ecology), *Ecology and Society*
- Board of Directors, The Resilience Alliance (<http://www.resalliance.org>)
- Steering Committee, Nebraska Partnership for All-Bird Conservation
- Fellow, Center for Great Plains Studies and Member: Scholarship Committee
- Core Team, Invasive Plants State Technical Committee, Natural Resources Conservation Service (NRCS)
- Associate, Center for Grassland Studies, University of Nebraska
- Alternate committee member, Institutional Animal Care and Use Committee, UNL
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- Working group member, USGS Adaptive Management Working Group
- Missouri River Mitigation, Herpetofauna Monitoring and Evaluation Subcommittee
- Southeast Nebraska Flagship Initiative, Research and Evaluation Steering Committee
- Guest Associate Editor, *Journal of Environmental Management*
- Scientific Committee, Nebraska Natural Legacy Plan

KEVIN POPE

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- Guest Associate Editor, *Journal of Environmental Management*
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- Research Committee, UNL School of Natural Resources
- Graduate Committee, UNL School of Natural Resources

JOSEPH FONTAINE

- Assistant Secretary, Cooper Ornithological Society
- Local Committee, 2011 AFO/COS/WOS Joint Annual Meeting, Kearney, NE
- Guest Associate Editor, *Journal of Environmental Management*
- Scientific Committee, Nebraska Partnership for All-Bird Conservation
- Scientific Committee, Nebraska Natural Legacy Plan
- Adaptive Management Plan Creative Team, Nebraska Natural Legacy Plan
- Avian Priority Species Expert Panel, Nebraska Natural Legacy Plan
- Technical Committee, Rainwater Basin Joint Venture
- Graduate Student Awards Committee, Cooper Ornithological Society

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