

Nebraska Cooperative Fish and Wildlife Research Unit—USGS

REPORT OF ACTIVITIES October 2007 – October 2008



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



UNIVERSITY OF
Nebraska
Lincoln



Report of Activities October 2007 – October 2008

Nebraska Cooperative Fish and Wildlife Research Unit—USGS

University of Nebraska—Lincoln
School of Natural Resources
422 Hardin Hall, 3310 Holdrege Street
Lincoln, Nebraska 68583-0984
<http://snr.unl.edu/necoopunit/default.asp>
Phone (402) 472-0449
Fax (402) 472-2722

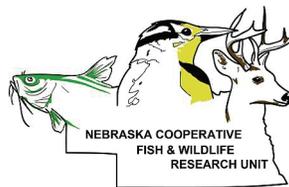


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INTRODUCTION

The U.S. Geological Survey (USGS) Cooperative Research Units Program has been in existence for over 70 years as a partnership 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 academic guidance to graduate students 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
Kevin L. Pope, Assistant Unit Leader – Fisheries
Search Underway, Assistant Unit Leader –Wildlife

UNIT STAFF – UNIVERSITY OF NEBRASKA–LINCOLN

Valerie Egger, Administrative Assistant
Annabel Major, Coordinator: Monitoring, mapping, risk and management of invasive species in Nebraska

RESEARCH TECHNICIANS

Dan Dobesh	Mary Lugg
Nick Dobesh	Ashton Mueller
Katy Dornbos	Landon Pierce
Jenna Frank	Ryan Rezac
Kent Fricke	Jeffrey Stittle
Nate Hasse	Sally Tucker

CREEL CLERKS

Greg Hoffman
M. D. Miller

FEDERAL WORK-STUDY STUDENTS

Ted Ehly
John Walrath

UNL UCARE STUDENT

Andrew Furman

STUDENT WORKER

Eric Frandsen

CURRENT GRADUATE DEGREE CANDIDATES

Ph.D., Fisheries

Chris Lewis, School of Natural Resources, UNL,
January 2007 – present

Ph.D., Wildlife

Tim Davis, Department of Entomology, Clemson University, co-advisor (advisor P. M. Horton),
January 1999 – present
Aaron Lotz, School of Natural Resources, UNL,
January 2005 – present
Annabel Major, School of Natural Resources, UNL,
January 2008 – present
Kristine Nemecek, School of Natural Resources, UNL,
August 2006 – present
Chad Smith, School of Natural Resources, UNL,
August 2007 – present
Katherine Weeks, Department of Biological Sciences, Clemson University, July 2003 – present,
Charles E. Springs, Jr. Fellowship recipient,
Battelle Fellowship recipient

M.S., Fisheries

Ryan Lueckenhoff, School of Natural Resources, UNL, August 2008 – present
Dustin Martin, School of Natural Resources, UNL, January 2007 – present
Lindsey Richters, School of Natural Resources, UNL, January 2008 – present

M.S., Wildlife

Aaron Alai, School of Natural Resources, UNL,
August 2007 – present
Thad Miller, School of Natural Resources, UNL,
January 2006 – December 2008
Sarah Rehme, School of Natural Resources, UNL, January 2008 – present
Lindsey Reinartz, Biology, University of Nebraska at Omaha, co-advisor (advisor L. Wolfenbarger), May 2006 – present
Amy Williams, School of Natural Resources, UNL, August 2008 – present
Justin Williams, School of Natural Resources, UNL, August 2006 – present
Sam Wilson, School of Natural Resources, UNL, August 2006 – present

GRADUATES: OCTOBER 2007 – OCTOBER 2008

Fisheries

Nathan Gosch, School of Natural Resources, UNL,
August 2008

Wildlife

Elizabeth Forbus, School of Natural Resources, UNL, December 2007

COORDINATING COMMITTEE MEMBERS

U.S. GEOLOGICAL SURVEY

B. K. Williams, Chief
Cooperative Research Units
12201 Sunrise Valley Drive, MS 303
Reston, VA 20192
(703) 648-4260

UNIVERSITY OF NEBRASKA—LINCOLN

John Owens, NU Vice President, IANR Harlan Vice Chancellor
Institute of Agriculture and Natural Resources
202 Agriculture Hall
Lincoln, NE 68583-0708
(402) 472-2871

NEBRASKA GAME AND PARKS COMMISSION

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

THE WILDLIFE MANAGEMENT INSTITUTE

Pat Ruble, Midwest Field Representative
12748 West Bank Dr.
Millersport OH 43046
(740) 966-0496

U.S. FISH AND WILDLIFE SERVICE, REGION 6

Greg Watson, Energy and Science Coordinator
134 Union Blvd, PO Box 25486
Denver CO 80225
(303) 236-4514

COOPERATORS

UNIVERSITY OF NEBRASKA–LINCOLN FACULTY

Sheri Fritz, Geosciences
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
Ashok Samal, Computer Science and Engineering
Dan Snow, Water Center
John Stansbury, Engineering Department
Alan Tomkins, NU Center for Public Policy
Drew Tyre, School of Natural Resources
Dave Wedin, School of Natural Resources
Sandi Zellmer, Law College

NEBRASKA GAME AND PARKS COMMISSION

Rex Amack, Director
Jim Douglas, Wildlife Division Administrator
Don Gabelhouse, Jr., Fisheries Division Administrator
Alicia Hardin, Assistant Wildlife Division Administrator
Jeff Hoffman, Wildlife Division
Richard Holland, Assistant Fisheries Division Administrator
Caleb Huber, Fisheries Division
Keith Hurley, Fisheries Division
Joel Jorgensen, Wildlife Division
Keith Koupal, Fisheries Division
Kirk Nelson, Assistant Director
Lindsey Richters, Fisheries Division
Steve Riley, Assistant Wildlife Division Administrator
Dean Rosenthal, Assistant Fisheries Division Administrator
Rick Schneider, Natural Heritage Program
Scott Taylor, Assistant Wildlife Division Administrator
Dave Tunink, Assistant Fisheries Division Administrator
Sam Wilson, Wildlife Division
Gene Zuerlein, Assistant Fisheries Division Administrator

FEDERAL AGENCIES

U.S. Army Corps of Engineers
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
U.S. National Park Service

U.S. National Park Service / Great Plains Cooperative Ecosystems Studies Unit
USDA Animal and Plant Health Inspection Service (APHIS)
USDA Forest Service, Rocky Mountain Research Station
USDA National Resource Conservation Service (NRCS)

STATE AGENCIES

Arkansas Game and Fish Commission
Iowa Department of Natural Resources
Kansas Department of Wildlife and Parks
Louisiana Department of Wildlife and Fisheries
Minnesota Division of Fish and Wildlife
Missouri Department of Conservation
Nebraska Department of Agriculture, Noxious Weed Program
Nebraska Forest Service
The Nebraska Environmental Trust
North Dakota Department of Game, Fish and Parks
Oklahoma Department of Wildlife Conservation
South Dakota Department of Game, Fish and Parks

PRIVATE SECTOR COOPERATORS

Aquatic Consultants, Inc.
In-Fisherman, Inc.
The Nature Conservancy
Turner Foundation

OTHER FACULTY COOPERATORS

Graeme Cumming, University of Cape Town, South Africa
John Dettmers, Great Lakes Fishery Commission and University of Illinois at Urbana-Champaign
Lance Gunderson, Department of Environmental Studies, Emory University
C. S. Holling, Department of Zoology, University of Florida
Mac Horton, Department of Entomology, Clemson University
Wayne Hubert, USGS-Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming
Patrick Jodice, Clemson University, South Carolina Cooperative Fish & Wildlife Research Unit
Alan Kolok, University of Nebraska at Omaha
Wayne Landis, Institute of Environmental Toxicology, Huxley College of the Environment, Western Washington University
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
Garry Peterson, School of the Environment and the Department of Geography, McGill University, Montreal, Canada
Reynaldo Patiño, USGS-Texas Cooperative Fish and Wildlife Research Unit, Texas Tech University
Jan Sendzimir, International Institute for Applied Systems Analysis, Austria
Richard Strauss, Department of Biology, Texas Tech University
Joan Walker, USDA Forest Service, Clemson University
Gene Wilde, Department of Biology, Texas Tech University
L. LaReesa Wolfenbarger, Department of Biology, University of Nebraska at Omaha

MILESTONES

STUDENTS

We tripled the number of students graduating from the Nebraska Coop Unit! Two students earned masters degrees in natural resources from the University of Nebraska–Lincoln: Elizabeth (Beth) Forbus, wildlife; Nathan (Nate) Gosch, fisheries. Beth moved to California where she is working in a federal position at Camp Pendleton. Nate accepted a position with the Nebraska Game and Parks Commission.

The unit now has over fifteen active graduate students.

CONFERENCE

On February 6 – 8, 2008, the first ever Nebraska Invasive Species Conference was sponsored by the Nebraska Cooperative Fish and Wildlife Research Unit. About 150 people from a broad array of Nebraska agencies and organizations attended. The conference was supported by the Unit's Invasive Species Project with funding from the Nebraska Environmental Trust, and was the first conference sponsored by the Nebraska unit. Keynote speakers were Keith Duncan (New Mexico State University), Randy Westbrook (U.S. Geological Survey), and Jim Stubbendieck (Center of Great Plains Studies, University of Nebraska–Lincoln).

Presentations covered both current and perceived future threats from invasive species and provided input into future steps for managing invasive species. Breakout sessions covered important issues in partnerships and collaborations, policies and legislation, and threatened and endangered species issues. Each session made recommendations for the future of invasive species management in Nebraska with surprisingly similar perspectives.

WORKSHOP

The Nebraska Coop Unit co-sponsored a July 28 – August 1 workshop: Modeling as an Assessment Tool for Adaptive Management. Steve Light, Lance Gunderson and Drew Tyre instructed the one-week workshop, which was held on the University of Nebraska–Lincoln campus. The 21 participants included representatives from federal and state agencies, private organizations and also graduate students.

The workshop taught principles of adaptive management using examples of modeling for Adaptive Environmental Assessment and rapid prototyping, and reinforced those methods by demonstrating how these techniques can be applied to large river systems. Using adaptive management principles to link science with decision making is strategic goal of the U.S. Department of the Interior. The USGS Cooperative Research Units Program is committed to providing leadership for reaching this goal.

AWARDS AND RECOGNITIONS

CRAIG ALLEN

In May 2008, the University of Nebraska–Lincoln and USGS co-sponsored a four-day Climate Change Workshop. During the conclusion of the workshop, UNL Vice Chancellor for Research Prem Paul publicly recognized Craig for his efforts in helping to make the workshop a success. USGS also recognized Craig's role in planning the workshop by awarding him the USGS Special Thanks for Achieving Results (STAR) Award.

Craig received the USGS CRU Performance Award from the Cooperative Research Units Program (CRU) Headquarters.

VALERIE EGGER

With the departure of Brenda Van Beek from the Iowa Cooperative Fish & Wildlife Research Unit, the USGS Cooperative Research Units Program lost the editor for their internal newsletter, Coop Catch-up. Valerie accepted the challenge to become the new editor, and in January 2008 assumed the responsibilities for the newsletter.

JUSTIN WILLIAMS AND AARON ALAI

Posters by Justin Williams and Aaron Alai received second place and third place awards respectively in the student poster contest at the Nebraska Invasive Species Conference in February 2008. Justin's poster was titled Forecasting the Invasion and Distribution Potential of Non-Native Plant Species in Nebraska. Aaron's poster was titled The Predicted Distribution of the Invasive Species *Podarcis sicula* (Italian Wall Lizard).

THESES AND DISERTATIONS

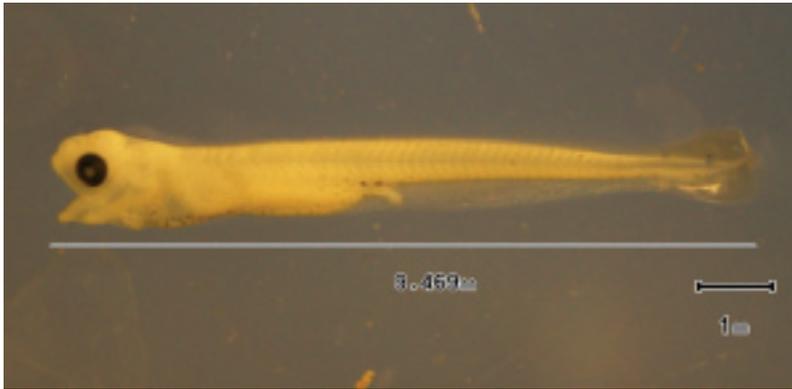
ELIZABETH FORBUS. 2007

Forbus, Elizabeth. 2007. Avian Response to Invasive Tree Removal on Remnant Prairie Pastures in Southeast Nebraska. University of Nebraska–Lincoln. 111 pps.
Major: Natural Resources. M.S. advisor: Craig R. Allen.

NATHAN GOSCH. 2008

Gosch, Nathan. 2008. Predation as a Mechanism for Control of White Perch: An Investigation of Food Habits in Two Nebraska Reservoirs. University of Nebraska–Lincoln. 131 pps.
Major: Natural Resources. M.S. advisor: Kevin L. Pope.

PROJECTS IN FISHERY SCIENCE



GEOGRAPHIC TRENDS IN CONTAMINATION OF NEBRASKA'S SURFACE WATERS AS INDEXED BY SEX STEROIDS OF COMMON CARP

Principal Investigator:	Kevin L. Pope, Alan S. Kolok (University of Nebraska at Omaha) and Dan D. Snow (UNL)
Graduate Student(s):	none
Project Duration:	March 2008 – February 2009
Funding:	U.S. Geological Survey 104b funds, administered by the UNL Water Center
Project Location:	Statewide Nebraska

During the past few years, endocrine disrupting compounds (EDCs) have been identified in the streams and rivers of Nebraska, most notably downstream from beef cattle feedlots and from local wastewater treatment plants. Furthermore, fathead minnows contained within these waters exhibit some reproductive abnormalities and alterations in the expression of reproductively important genes. Although wastewater treatment plants and beef feedlots are often located adjacent to streams, evaluating the extent to which EDCs occur throughout the lakes and reservoirs of Nebraska is also important because recruitment of fishes in Nebraska lakes and reservoirs is extremely variable, and it has been suggested that EDCs may be responsible for limited recruitment of fish in some reservoirs.

The goal of this seed project is to obtain preliminary data needed to assemble a grant proposal for a large, multi-year assessment on the occurrence and biological effects of steroidogenic compounds in lakes and reservoirs throughout the Midwest. The specific objective of this project is to document the geographical variation in sex steroids concentrations in adult common carp—which is an indirect assessment of geographic trends in the occurrence of EDCs—from 20 lakes and reservoirs throughout Nebraska. We hypothesize that sex steroid profiles will vary considerably across the state, and will be associated with bioavailability of steroidogenic compounds within each reservoir. If correct, this study will provide preliminary data and direction for proposals to assess potential risks associated with contamination of surface waters, which was identified by UNL Water Center and Water Resources Research Initiative as a top ten water challenge for Nebraska.

IMPACT OF WHITE PERCH ON WALLEYE AT BRANCHED OAK AND PAWNEE RESERVOIRS

Principal Investigator:	Kevin L. Pope
Graduate Student(s):	Nathan Gosch, M.S. (2008)
Project Duration:	January 2006 – December 2008
Funding:	U.S. Geological Survey (RWO 4)
Project Location:	Branched Oak Lake (Lancaster County) and Pawnee Lake (Lancaster County), Nebraska

Habitat alterations and accidental introduction of white perch into Branched Oak Lake have shifted the fish community from one dominated by littoral (near-shore) species (e.g., largemouth bass and bluegill) to one dominated by pelagic (open-water) species (e.g., white perch and gizzard shad). Along with the change in the fish community, angler trips to Branched Oak Reservoir have declined by 85% over the last two decades. Further, the white perch population has become stunted (high density of slow growing individuals that mature at a small size). Like Branched Oak Lake, Pawnee Lake historically supported an active and diverse fishery, and has experienced similar habitat alterations and accidental introduction of white perch. However, unlike Branched Oak Lake, stunting has not yet occurred for the white perch population in Pawnee Lake. This provided an opportunity to examine white perch interactions with other fishes in two similar Nebraska water bodies at different white perch population stages (i.e., stunted and non-stunted).

This project is almost complete. The thesis was successfully defended in May 2008, and Masters student Nathan Gosch received his M.S. degree in August 2008. The project helped document potential competition bottlenecks that exist between white perch and other fish species of importance in the hopes of developing a management program to eliminate the stunted status for the white perch population in Branched Oak Lake and to prevent stunting of the white perch population in Pawnee Lake.

Primary research findings:

1. White perch consumed prey items that many young sportfishes consume, resulting in potential competition for food.
2. White perch also consumed fish eggs, possibly affecting the reproductive success of other fishes.

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

Channel catfish are an increasingly sought after sport fish species, particularly in the Midwest. Despite the popularity of channel catfish as a sport fish both nationwide and locally, little is known of its population dynamics or habitat requirements, and assessment of management strategies is lacking. The Nebraska Game and Parks Commission (NGPC) currently utilizes experimental gill nets set in autumn as the standard sampling methodology for channel catfish. This protocol typically provides small sample sizes that are inadequate for the assessment of population dynamics (recruitment, growth and mortality) and structure (abundance, size structure, and condition). The NGPC fisheries management section has proposed a shift to a new sampling gear (tandem, baited hoop-nets) that will increase the odds of collecting samples large enough to assess population dynamics and structure, thereby creating a stronger foundation for management decisions.

The focus of this project is assessment of variability in dynamics (recruitment, growth and mortality) and structure (abundance, size- and age-structure, and condition) of channel catfish populations found in standing waters of Nebraska. Specifically, we are interested in differences in dynamics and structure among water-body types and in response to various stocking strategies. This information will help managers determine the need for future harvest regulations and stockings of channel catfish. Additionally, a relatively new gear configuration for collecting catfish samples will be compared to current sampling methods. Two field technicians assisted Lindsey with the June – August, 2008 sampling season, which was conducted on 24 water bodies across Nebraska.

PREDATORS OF WHITE PERCH AT BRANCHED OAK AND PAWNEE RESERVOIRS

Principal Investigator:	Kevin L. Pope
Graduate Student(s):	Nathan Gosch, M.S.
Project Duration:	January 2006 – December 2008
Funding:	Nebraska Game and Parks Commission
Project Location:	Branched Oak Lake (Lancaster County) and Pawnee Lake (Lancaster County), Nebraska

Sedimentation and erosion have significantly altered the habitat of Branched Oak Lake, resulting in loss of usable littoral habitat and a predominance of turbid open-water areas. This loss of critical near-shore habitat, coupled with the introduction of the white perch, has changed the population dynamics within the fish community. White perch numbers have increased precipitously over the last decade resulting in a stunted white perch population in Branched Oak Lake. This unchecked white perch population is suspected of severely limiting recruitment of sportfishes such as walleye. Control of this stunted white perch population is thus desired. Chemical renovation of Branched Oak Lake has been considered; however, logistical difficulties have precluded this action. Research was initiated to assess the feasibility of biological control of white perch via predation. The purpose of this project was to quantify food habits of adult white crappie, walleye, channel catfish, flathead catfish, hybrid striped bass and white bass to determine which, if any, of these fishes prey on white perch.

Like Branched Oak Lake, Pawnee Lake historically supported an active and diverse fishery, and has experienced similar habitat alterations and accidental introduction of white perch. However, unlike Branched Oak Lake, the Pawnee Lake white perch population has not yet stunted. Thus, an opportunity existed to document predators of white perch in populations with two different size structures, allowing for predictions of likely changes in food habits of predators with purposeful changes in the targeted prey (white perch) population. This project provided information about food habits of predatory fishes that could allow for refinement of the current management program for white perch populations in Nebraska reservoirs.

Primary research finding:

The current predator populations in Branched Oak Lake are unlikely to alter (via predation) the stunted status of the white perch population. Rather, the cropping off of larger white perch via predation in Branched Oak Lake is promoting the stunted status of the white perch population.

RECRUITMENT OF WALLEYE AND WHITE BASS IN IRRIGATION RESERVOIRS

Principal Investigator:	Kevin L. Pope
Graduate Student(s):	Christopher Lewis, Ph.D. Dustin Martin, M.S. 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 water-level fluctuations within and between 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 of low natural reproduction and recruitment of young. 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 Enders, Medicine Creek, Red Willow, and Swanson 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.

Our second field season is underway. Sixty walleye and sixty white bass from Enders and Red Willow reservoirs were implanted with acoustic transmitters during autumn and tracked with telemetry during spring to identify spawning sites and assess associated habitats. Preliminary models describing walleye recruitment were developed; recruitment appears to be positively related to stocking events and negatively related to water withdrawals associated with irrigation. Larval fish surveys were completed during 2008 at Enders, Medicine Creek, Red Willow, and Swanson Reservoirs. Juvenile fish surveys were initiated in late July 2008 and will continue until early October. Creel surveys for 2008 were initiated in April and will continue through October to gather data on harvest of sportfishes by anglers.

OTHER RESEARCH IN FISHERY SCIENCE

The following research project is being lead by non-unit, University of Nebraska–Lincoln faculty. It is funded through the USGS Cooperative Research Units Research Work Order process.

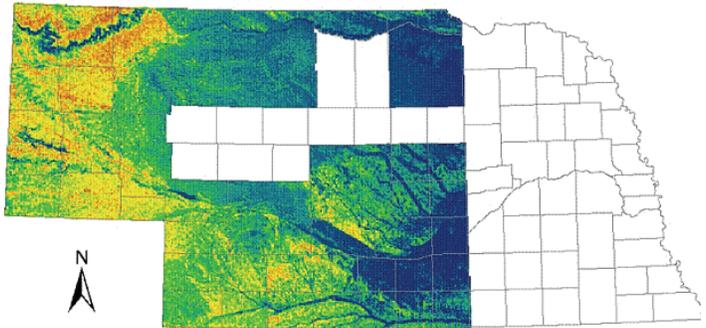
MULTI-CRITERIA ASSESSMENT OF HABITAT RESTORATION FOR THE MISSOURI RIVER

Principal Investigator: John Stansbury (PI), Istvan Bogardi
Graduate Student(s): Jennifer Gitt, M.S.
Project Duration: August 20, 2007 – August 20, 2009
Funding: U.S. Geological Survey
U.S. Army Corps of Engineers (RWO 7)
Project Location: Missouri River

This project is focused on restoration of habitat for pallid sturgeon in the Missouri River. Management and restoration of habitat in the Missouri River is a complex endeavor that affects many people with many and often conflicting priorities. For example, habitat restoration activities for one species may interfere with habitat needs for another species.

The primary objective of this project is to develop a multi-criteria assessment tool that can be used to assess the overall status and progress of the habitat restoration efforts on the Missouri River (or portions of the river) to help the U.S. Army Corps of Engineers and cooperators assess the status and the progress of the habitat restoration program. Secondary objectives are to determine the indicators (e.g., water depth, water velocity) needed to make a multi-criteria assessment of the habitat and to develop methods to collect and measure those indicators.

PROJECTS IN WILDLIFE SCIENCE



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

Principal Investigators:	Larkin Powell (UNL) and Craig R. Allen
Graduate Student(s):	Sarah Rehme, M.S.
Project Duration:	June 1, 2007 – September 30, 2010
Funding:	U.S. Geological Survey (Natural Resource Preservation Program) National Parks Service (RWO 2)
Project Location:	Three National Park Service Units in Kansas, Minnesota, Nebraska

National Park Service (NPS) units in the Great Plains provide breeding habitats for many grassland birds. But the relative value of the NPS grassland habitats to regional songbird production is unknown. To understand if management practices in NPS grasslands are effective for songbird production, or if the size of NPS units is adequate for providing the necessary habitat, nest survival needs to be documented—a prohibitively labor-intensive and expensive process when conducted on a regional scale. Park managers need lower-cost data for informed decision-making.

The project will use unique methods—stable isotope analyses of avian tissues—to evaluate variability in productivity and 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. Stable isotope analyses may allow biologists to efficiently gauge the importance of grassland habitat patches to regional productivity. In forested habitats, analyses of the variability in isotope values inferred that second-year ovenbirds (*Seiurus aurocapillus*) had lower fidelity to a study area than older individuals. This project will evaluate whether stable isotope analyses can be extended to breeding grassland birds and will target four species of grassland birds, dickcissel (*Spiza americana*), grasshopper sparrow (*Ammodramus savannarum*), eastern meadowlark (*Sturnella magna*), and western meadowlark (*Sturnella neglecta*), which are common in the study parks. Upon completion, NPS managers will receive a habitat-quality assessment for breeding grassland birds at the three study areas, as well as our assessment of stable isotope techniques.

The first field season concluded at the end of July 2008. We conducted surveys, nest searches, and mist netting on all three park sites with a crew of six technicians. Blood and feather samples were collected from mist-netted adults and from fledglings in nests. Sarah Rehme coordinated the efforts. Avian nest survival and habitat data will be analyzed during 2008 – 2009. The stable isotope samples will be analyzed at a lab in Canada with our cooperator, Keith Hobson. The second field season will begin in May 2009 at the same study sites.

CROSS SCALE STRUCTURE AND SCALE BREAKS IN COMPLEX SYSTEMS

Principal Investigator:	Craig R. Allen
Graduate Student(s):	Aaron Lotz, Ph.D. Donald Wardwell, M.S. (2006) Aaron Alai, M.S.
Project Duration:	July 1, 2004 – January 1, 2008
Funding:	James S. McDonnell Foundation
Project Location:	Lincoln, Nebraska

This research was motivated by the discovery of regular patterns of deviation from scaling laws and the continuous distributions of attributes of complex systems. This suggests that systems organize over discrete ranges of scale, and that organization abruptly shifts with changes in scale. If this is so, scaling laws serve only as the baseline from which to measure those departures, and those departures indicate “scale breaks” (transitions) between scales of structure in complex systems. Patterns of scale breaks from a scaling law baseline may provide clues to the processes that lead to the emergence of the scaling relationships themselves. At the minimum, investigating departures from scaling laws give us a clue into the nature of the structure and process of the system in question. These investigations also help us understand and perhaps predict phenomena that have puzzled ecologists and other scientists, such as the generation of biological diversity and the emergence of phenomena such as resilience.

Scale breaks 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. Recently, it has been demonstrated that the body masses of endangered and invasive species in a community occur at the edges of body mass aggregations two to four times as often as expected by chance. That correlation is consistent in all data sets examined so far. Those include four different taxa in two different ecosystems. It may seem surprising that both invasive and declining species are located at the edge of body-mass aggregations. These results suggest that something similar must be shared by the two extreme biological conditions represented by invasive species and declining species. An examination of the phenomena of nomadism in birds in an Australian Mediterranean climate ecosystem found that nomadic birds also cluster about scale breaks (occur at the edge of body mass aggregations). 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.

This project is specifically investigating cross-scale structure and its implications in ecosystems. Analysis of Mediterranean-climate data is complete and a report is in final revision. Paleo-ecological data and avian data from South Africa are currently being analyzed.

EVALUATION OF THE NEBRASKA LANDOWNER INCENTIVES PROGRAM FOR SPECIES AT RISK

Principal Investigator:	Craig R. Allen
Graduate Student(s):	Elizabeth Forbus, M.S. (2007)
Project Duration:	September 7, 2004 – December 31, 2007
Funding:	Nebraska Game and Parks Commission U. S. Geological Survey (RWO1)
Project Location:	Southeastern Nebraska

The Nebraska Landowner Incentive Program assists landowners with invasive tree removal. Landowners benefit from increased forage on pasturelands and restorations of prairie plants and wildlife, and management practices that sustain prairie and grassland communities. This project evaluated the impact of tree removal on the avian grassland community over three field seasons. Assessment focused on elements that were likely to respond rapidly, such as vegetation structure (which were directly manipulated by the LIP program), insect communities (which have short generation times), and bird communities (which quickly respond to vegetative structure).

In 2005, pretreatment, base-line data were collected and followed by the removal of invasive trees such as red cedar. Data included assessment of vegetation using the Floristic Quality Index, and estimation of bird densities. Herpetofauna data were collected using coverboards, but were sparse and discontinued for 2006. The second season of data, collected in 2006, focused on bird response to the altered prairie conditions. The third (2007) and final season of field work included analyses of how landscape context influenced avian response to tree removal. Post-treatment vegetation data were collected by Nebraska Game and Parks Commission staff.

Grassland and non-grassland bird densities were analyzed for changes over the three-year study, as well as changes in vegetation structure, content, and native quality. Densities of the seven grassland birds increased to some extent following tree removals. Grasshopper sparrow, lark sparrow and field sparrow densities increased significantly and brown thrasher density decreased significantly. Landowners were notified of the changes in bird species and populations resulting from tree removal on their property. Predictive models were built using this data as well as environmental assessments such as patch size, edge effects, and surrounding land use; models indicate the importance of tree densities and the presence of non-native species.

This project is complete with results compiled into a master's thesis. Masters student Beth Forbus received her M.S. degree in December 2007.

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

Principal Investigator:	Craig R. Allen and Jim Merchant
Program Coordinator:	Annabel Major
Graduate Student(s):	Justin Williams, M.S. Annabel Major, Ph.D.
Project Duration:	May 4, 2006 – December 31, 2009
Funding:	Nebraska Environmental Trust
Project Location:	Statewide, Nebraska
Web Site:	http://snr.unl.edu/invasives/

Biological invasions are a growing threat to both human enterprise and ecological systems. This project provides: 1) resources to the public and private sector on the potential spread and impact of non-indigenous species in Nebraska, 2) the actual and potential maps of non-indigenous species range, 3) information regarding identification and management of potential invaders, 4) a centralized information on management and impacts and potential spread of currently established non-indigenous species (a Web portal), 5) outreach within Nebraska to county-level governments and individual stakeholders regarding the management, surveillance and control of non-indigenous species, 5) and an organizational and informational Nebraska conference on non-indigenous species impacts—their spread and management—focusing on state-of-our-knowledge, and coordination of disparate management and information-provisioning efforts with a goal towards unifying disparate efforts.

A Web site has been developed: <http://snr.unl.edu/invasives/>. The site is a centralized clearinghouse on identification, management, impact and potential spread of currently and potentially established non-indigenous species. An invasive species conference was hosted February 6 – 8, 2008 in Lincoln, Nebraska and was attended by over 150 people from around Nebraska. New outreach projects are being developed with the Lincoln Folsom Zoo, Earth Day on the UNL campus, and Walnut Creek Watershed/Papio South High School Field Days in Papillion/La Vista.

Research is moving forward to determine the invasion and distribution potential of non-native plant species in Nebraska. First, existing data from scientific collections, agency reports, and solicited expert opinion will be combined to rank the risk of potentially invasive species. Using the I-Rank risk assessment framework, a qualitative species assessment will be developed to rank invasion threat or impact of non-native species. Second, a subset of species will be selected to predict their potential geographic range in Nebraska. Classification trees will be utilized to model the species' potential range using species occurrence data and environmental predictive variables. Together, these two components will yield information about which species pose the greatest invasion risk and where in Nebraska they are likely to occur.

THE RELATIONSHIP BETWEEN DIVERSITY AND ECOLOGICAL FUNCTIONS

Principal Investigator:	Craig R. Allen, Chris Helzer (Nature Conservancy), and LaReesa Wolfenbarger (University of Nebraska at Omaha)
Graduate Student(s):	Kristine Nemec, Ph.D. Lindsey Reinartz, M.S. (University of Nebraska at Omaha)
Project Duration:	July 1, 2005 – June 30, 2010
Funding:	James S. McDonnell Foundation Nebraska Game and Parks Commission
Project Location:	Central Platte River Valley, Nebraska

The relationship between restoration diversity and ecological functions (e.g., pollination, soil development, resistance to invasion and herbivore control) remains poorly understood. Ecological functions, goods and services include such factors as pollination of native and crop plants, control of herbivore populations, resistance to biological invasion, production of soils, production of biodiversity, etc. Invasion by aggressive plant species, erosion of diversity over time, and failure to withstand drought or other disturbances are all possible results of unsuccessful restoration efforts.

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. 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.

Initial results from 2006 data 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. Data collections for soil development, nematodes, and invasion resistance were started in 2006 and repeated in 2007 and 2008. Large scale sites are currently being used to investigate differences in herbivory, and 2006 data indicate that herbivory rates are lower on high diversity sites.

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, 2009
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. 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 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 plan to capture and radio-tag approximately twenty northern river otters on and near the Platte River, a core component of the species' distribution in Nebraska. We will monitor radio-tagged otters to determine daily and seasonal movements, home range, habitat use, survival, response to hydrological changes in the Platte, response to Phragmites removal and relationship to abundance data from bridge surveys. These data, in conjunction with the results of the recently completed river otter health and reproductive survey and results from annual otter bridge surveys, will help to close existing information gaps and contribute to the creation of the Nebraska River Otter Management Plan and the Statewide Comprehensive Conservation Plan.

In 2006, five river otters were captured and implanted with motion and mortality sensing transmitters, and by January 2008 a total of thirteen otters were implanted with transmitters. Monitoring of the tagged otters is ongoing. The final trapping/implanting season will begin in September of 2008.

SOUTHEAST PRAIRIES AND SANDSTONE PRAIRIES RESEARCH

Principal Investigator:	Craig R. Allen
Other Cooperators:	Chris Helzer (TNC), Jarren Kuipers (NPLT), and Gerry Steinauer (NGPC)
Graduate Student(s):	none
Project Duration:	June 30, 2008 – December 31, 2008
Funding:	Nebraska Game and Parks Commission
Project Location:	Southeast Nebraska

In 2007 the Southeast Prairies Biological Unique Landscape (BUL) and Sandstone Prairies BUL were included in a Flagship Initiative approved by the Nebraska Natural Legacy Project's Partnership Team. In the flagship proposal, The Nature Conservancy (TNC) was designated as the lead agency to conduct the research and monitoring portion of the project. The Northern Prairies Land Trust (NPLT), Nebraska Game and Parks Commission (NGPC), Nebraska Cooperative Fish & Wildlife Research Unit at the University of Nebraska-Lincoln, and the University of Nebraska at Omaha were designated as partners in the research and monitoring component of the project. Those partners and others will work together to design and implement a range of research and evaluation projects, which will help drive conservation work within the Southeast Prairies and Sandstone Prairies BULs.

The goal of the initial data collection is to sample native prairies of various size, quality, and isolation to determine the impact these factors have on tallgrass prairie biodiversity. The initial portion of the study for which data are being collected in 2008 is to determine if these factors affect insect populations. Floristic Quality Assessment data are being gathered to determine prairie quality. Results from this summer's work will guide development of future research efforts.

SPATIAL RELATIONS BETWEEN AMPHIBIAN OCCURRENCE AND DIVERSITY AND LANDSCAPES

Principal Investigator: Craig R. Allen

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

Project Duration: January 2008 – May 2009

Funding: Nebraska Game and Parks Commission

Project Location: Rainwater Basin, Nebraska

We are utilizing data collected in 2005 and 2006 across 14 clusters of wetlands from the eastern and 15 clusters from the western portions of the Rainwater Basin, consisting of 228 (eastern total: n=145 and western total: n=83) individual wetlands in total. We are analyzing patterns of amphibian species richness across the Rainwater Basin, and assessing the relationships between individual species and species richness with the presence of the non-native bullfrog and with patch and landscape metrics, such as patch size, context and connectivity. Analyses will help managers assess management practices for wetland restoration, both at the site and landscape level.

A manuscript from the first phase of this project was published in the February 2007 issue of the *Journal of Wildlife Management*, "Observer Bias in Anuran Call Surveys." GIS spatial analysis continues.

SPATIAL RISK ASSESSMENT OF INVASIVE SPECIES IMPACTS ON NATIVE SPECIES IN NEBRASKA

Principal Investigators:	Craig R. Allen and Jim Merchant
Graduate Student(s):	Thad Miller, M.S.
Project Duration:	August 31, 2005 – December 31, 2008
Funding:	Nebraska Game and Parks Commission U. S. Geological Survey (RWO 5)
Project Location:	Statewide, Nebraska

This project conducts spatially-based risk analyses for species and communities identified as at-risk. The project focuses on assessing the potential risk to native Nebraska species from invasive non-native species. Modeling of both stressors and targets will be based on species-habitat associations with the use of relevant auxiliary data, as per Gap Analysis protocols. Several different GIS land covers are available for the State of Nebraska and we will likely have to make use of several of them, as all have different strengths and weaknesses. Where possible, we will utilize the methods described in Allen et al. (2001) to incorporate minimum viable population modeling based on minimum critical areas for vertebrate models. Products will include spatial models of stressors and targets, models of spatial overlap, hazard indices, and relative risk indices for each target. Stressors (invasive species on the Nebraska Watch List) and targets have been identified and modeling is currently underway.

Where possible, the project incorporated the methodologies and terminology of a regional risk assessment using the relative risks model. Nebraska invasive species were selected from the Nebraska Weed Control Association watch list. The nine species selected were evaluated by the NatureServe invasive species ranking system and given an I-rank of "High." The rare and endangered species selected are from the Nebraska Natural Legacy Project "Tier I" list and have a state rank of 1 or 2 and a global rank of 1, 2, or 3. This resulted in a list of nine rare and endangered species. A manuscript is being developed and should be complete this winter.

The project's thesis research was presented at the annual meeting of the Ecological Society of America in August. The presentation was entitled *Prioritizing invasive plant management and rare species conservation using the relative risks model*. The thesis defense will be conducted in fall 2008.

UNDERSTANDING INVASIONS AND EXTINCTIONS

Principal Investigator: Craig R. Allen

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

Project Duration: August 31, 2005 – December 31, 2008

Funding: U.S. Geological Survey (RWO 3)

Project Location: Lincoln, Nebraska

Mediterranean-climate regions support large human populations resulting in extensive and, outside the Mediterranean Basin proper, rapid, anthropogenic transformation. Compared to other continental areas, Mediterranean regions have been invaded by a large number of non-indigenous organisms, including vertebrates. Concomitant with invasions, declines and extinctions have transformed the faunas of Mediterranean ecoregions. This empirical analysis of global Mediterranean-climate ecosystems will 1) compare the vertebrate body mass structures of Mediterranean-climate ecosystems, and 2) examine the effects of invasions and extinctions in Mediterranean-climate ecosystems on body mass structure and alpha, beta and gamma diversity.

Data sets were developed from published literature and by communications with scientists in five countries. Analysis is complete and a report is in final revision.

OTHER RESEARCH IN WILDLIFE SCIENCE

The following research projects are being lead by non-unit, University of Nebraska–Lincoln 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.

AN ADAPTIVE MANAGEMENT APPROACH FOR SELECTING HABITAT IMPROVEMENT TARGETS IN THE SHORTGRASS PRAIRIE ECOSYSTEM

Principal Investigator:	Andrew Tyre (PI), Mike Fritz and Scott Taylor
Post-Doc:	Naikoa Aguilar-Amuchastegui
Project Duration:	September 1, 2006 – November 30, 2007
Funding:	Nebraska Game and Parks Commission U.S. Fish and Wildlife Service
Project Location:	Lincoln, Nebraska

This project focused on developing prototype modeling tools for identifying and prioritizing high quality shortgrass prairie habitat in western Nebraska, and outlined how this work could be used in an Adaptive Management framework for managing restoration dollars. We examined two primary datasets that identified good quality shortgrass prairie habitat (SPH)—a presence-only dataset collected over several years, and a single year, large scale stratified transect survey that recorded locations of high quality shortgrass habitat. We constructed several GIS layers describing a range of covariates that we expected would influence the probability of a site containing SPH including % clay, soil depth, elevation, slope, landcover class and a measure of ecosystem productivity based on NDVI. All layers, including the response variable “presence of SPH,” were either subsampled or downscaled to a consistent 250m pixel size. Several methods of analysis were explored, but the one best able to cope with the resolution and extent of the data was the maximum entropy based method MAXENT. This produces maps of the relative probability of occurrence of SPH from presence only data. To identify areas that should be prioritized for restoration funding, we used the predicted occurrence maps in the ZONATION algorithm, a spatial conservation planning software. ZONATION can accept multiple layers representing different species or community types and identify minimum areas that meet many conservation objectives simultaneously. Use of ZONATION was limited because there was only a single conservation objective, SPH, but it is clear that this approach has merit and is able to deal with large datasets quickly and effectively.

We made three recommendations to guide future development of Adaptive Management for making decisions about restoration funding in Nebraska:

1. The extent to which real decisions are made about habitat incentive programs should be evaluated.
2. Evaluate the objectives for each Tier I and Tier II species to ensure that they are consistent with the species biology, and develop a framework for evaluating the uncertainty in those objectives.
3. Design surveys for a sample of Tier I and II species to evaluate the fitness of existing data for this purpose and obtain estimated costs for surveys of the entire suite of Nebraska Tier I and II species.

Recommendations one and three require a substantial amount of research, including Human Dimensions research, while recommendation two will necessarily involve some research, but more likely requires workshops with scientists, managers and stakeholders to refine objectives for species.

INDIVIDUAL-BASED MODELS TO PREDICT THE SPREAD OF CHRONIC WASTING DISEASE IN NEBRASKA

Principal Investigator:	Scott Hygnstrom
Graduate Student(s):	David Baasch, Ph.D. Charles Frost, Ph.D.
Project Duration:	September 28, 2007 – September 28, 2008
Funding:	U.S. Geological Survey (RWO 8)
Project Location:	Statewide Nebraska

This is the final phase of this study and will lead to the estimation of parameters and development of individual-based models to predict the spread of chronic wasting disease (CWD) in Nebraska. The research in Nebraska is unique because it evaluates the role of sympatric mule deer and white-tailed deer and riparian habitats in the spread of CWD. Results will be used to develop strategies to control the spread of CWD in North America. The objectives for 2007/08—relative to deer in riparian areas across Nebraska—are to determine the overlap of utilization distributions by species; evaluate resource selection by species, sex, and age classes; and estimate the extent and rate of spread of CWD.

PRODUCTIVITY AND BIOLOGY OF DUCKS NESTING IN THE SANDHILLS OF NEBRASKA

Principal Investigator: Larkin Powell

Graduate Student(s): Zachary Cunningham, M.S.

Project Duration: January 1, 2007 – August 31, 2009

Funding: Nebraska Game and Parks Commission

Project Location: Nebraska Sandhills

While the grasslands in the Nebraska Sandhills do not appear to be at high risk of conversion to cropland, the potential risk does exist. In addition, the wetlands and soils of the Sandhills face other threats such as sale of groundwater to high-demand areas. Potential developers need information to help assess the inherent risks to the wildlife populations that depend on this unique landscape for survival.

This project will evaluate the importance of Sandhills wetlands to duck populations. The study intends to 1) design and develop an annual, repeatable brood survey for estimating relative production across the Sandhills; 2) conduct the brood survey for two years and refine survey and analysis methods; 3) examine female age ratios of ducks nesting in the Sandhills; 4) examine patterns of recaptured male mallards south of Bassett, Nebraska; and 5) determine the origin of females nesting in the Sandhills via feather stable isotopes (depending on additional funding).

We have completed two field seasons, as of 2008. We continue to find a high number of 1st-year females nesting in the Sandhills, and we also have documented higher-than-anticipated return rates for males (recaptures). We will be analyzing the double-observer surveys of broods and breeding ducks during 2008 – 2009. Zach Cunningham's anticipated graduation date is May 2008.

STABLE ISOTOPE DETERMINATION IN DEER AND MOUNTAIN LION TISSUE

Principal Investigator: Larkin Powell

Post-Doc: Viviane Henaux (Wisconsin Cooperative Wildlife Research Unit)

Graduate Student(s): none

Project Duration: May 1, 2008 – October 31, 2008

Funding: Nebraska Game and Parks Commission

Project Location: Statewide Nebraska

Lymph node tissue from deer will be used to develop a base map for stable isotope variation in the State of Nebraska for carbon and hydrogen. The stable isotope base map will be used in current and future studies of wildlife dispersal in Nebraska. Samples will be prepared and sent to an off-site lab for analyses. This project will complete the base map that was partially completed in March 2008. In addition, the base map will be compared to isotopic values from one mountain lion claw to determine path of origin for the mountain lion. The claw was obtained from a specimen that was radio-marked in South Dakota and found dead near Valentine, Nebraska.

We have prepared claw tissue for analysis and are awaiting lab results. This project continues to be a high-profile project, with recent newspaper articles in the *Lincoln Journal-Star*, which was carried by other newspapers throughout Nebraska. Viviane Henaux (former UNL post-doc) reported research results at the ESA conference in Milwaukee, Wisconsin, and a reporter from the on-line news service for *Nature* interviewed her for a story that ran the following week. We were also contacted by officials in Chicago, Illinois, and are preparing a claw from a cougar shot in Chicago in April, 2008 for a similar analysis.

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

Principal Investigator: Stevan Knezevic (PI), Charlie Shapiro, Tom Hunt

Post-Doc: Avishek Datta

Project Duration: June 1, 2007 – December 31, 2009

Funding: U.S. Geological Survey
U.S. Army Corps of Engineers (RWO 6)

Project Location: Missouri River

In an effort to increase suitable nesting habitat for piping plovers (*Charadrius melodus*) and Interior least terns (*Sterna antillarum*), sandbars are being constructed in the backwaters of Lewis and Clark Lake along the Missouri River. However, vegetative encroachment usually renders these sandbars unsuitable for nesting habitat within three to five years. Consequently, it is important to identify practices that will maintain the sandbars free of vegetation in the absence of scouring flows. This project will study the effects of liming and the use of the herbicide imazapyr as tools for long-term vegetation control on both existing and newly-created sandbars in an effort to maintain suitable habitat for piping plovers and least terns in the back waters of Lewis and Clark Lake.

Objectives one and two of the project are focused on evaluating newly-created sandbars: 1) evaluate various liming materials and sodium carbonate to increase soil pH above 9 on newly-created sandbars; 2) evaluate total vegetation control on newly-created sandbars as influenced by lime and imazapyr rates and their interaction. No experiments were initiated for objectives one and two in the spring and summer of 2008 because new regulations restricted access to the newly-created sandbars during the birds' nesting period. At this point (August 2008), it is not known if permission will be given to access new sandbars.

Objective five is to evaluate the effect of liming and herbicide application to obtain total vegetation control on existing sandbars. One sandbar was selected and the first experiment was initiated in April of 2008, in the backwaters of the Lewis and Clark Lake, along the Missouri River about 30 miles west of Yankton, SD. Soil samples were taken in April, prior to the application of treatments. Soil amendments (lime or sodium carbonate) were applied in June with a drop spreader and/or by hand. Herbicides were applied soon after with a backpack sprayer—they were sprayed across and randomized over each of the soil amendments. Pit-fall and sticky traps for insect monitoring were also placed on several locations inside and outside the study area in early July. Insects are collected in two week intervals. First rating of vegetation control was conducted in early August 2008.

PROFESSIONAL ACTIVITIES

TEACHING

CRAIG ALLEN

Spring 2008:
Natural Resources (NRES) 896, Ecology of Biological Invasions

Biological invasions are an accelerating global phenomenon with potential far-reaching 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. Activities included collecting, and identifying, samples of invasive plants along potential invasion corridors in Lincoln, and submitting a group evaluation of a recently published book on invasions.

KEVIN POPE

Spring 2008:
Natural Resources (NRES) 896, 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 AND WORKSHOPS

CRAIG ALLEN

- Workshop on Law and Resilience, Lincoln, Nebraska, September 25, 2008
- Panel Discussion Chair, UNL and USGS Climate Change Workshop: *Sustainability in a Time of Climate Change: Developing an Intensive Research Framework for the Platte River Watershed and the High Plains*, North Platte, Nebraska, May 19 – 20 2008

KEVIN POPE

- Instructor, Motorboat Operator Certification Course, Lincoln, Nebraska, May 2008
- Instructor, Conservation Leaders for Tomorrow Program (Max McGraw Wildlife Foundation), Dundee, Illinois, October 2007

PEER-REVIEWED PUBLICATIONS

- Allen, C. R., A. Alai, A. Kessler, T. Kinsell, A. Major, K. Nemeč and B. Stevens. 2008. Invasive Plants: A Guide to Identification, Impacts, and Control of Common North American Species (book review). *Great Plains Research*: in press.
- Allen, C. R. and C. S. Holling. 2008. Thresholds and the generation of novelty. *Ecology and Society*: in press.
- Allen, C. R. and C. S. Holling. 2008. Cross-scale structure and the generation of innovation and novelty in discontinuous complex systems. Pages 219-233 in Allen, C. R. and C. S. Holling, editors. *Discontinuities in Ecosystems and other Complex Systems*. University of Columbia Press, New York, NY.
- Allen, C. R., and C. S. Holling, Editors. 2008. *Discontinuities in Ecosystems and other Complex Systems*. University of Columbia Press, New York, NY. 272 pp.
- Chizinski, C. J., C. G. Huber, M. Langoria, and K. L. Pope. 2007. Intraspecific resource partitioning by an opportunistic strategist, inland silverside *Menidia beryllina*. *Journal of Applied Ichthyology* 23:147-151. Online: doi:10.1111/j.1439-0426.2006.00811.x
- Chizinski, C. J., C. G. Huber, and K. L. Pope. 2008. Development and validation of a bioenergetics model for inland silverside in freshwater systems. *Transactions of the American Fisheries Society* 137:254-261.
- Chizinski, C. J., B. Sharma, K. L. Pope, and R. Patiño. 2008. A bioenergetics model for zebrafish. *Journal of Fish Biology* 73:35-43.
- Garmestani, A. S., C. R. Allen, and K. M. Bessey. 2008. Discontinuities in urban systems: comparison of regional city-size structure in the United States. Pages 136-164 in Allen, C. R. and C. S. Holling, editors. *Discontinuities in Ecosystems and other Complex Systems*. University of Columbia Press, New York, NY.
- Garmestani, A. S., C. R. Allen and C. M. Gallagher. 2008. Power laws, discontinuities and regional city size distributions. *Journal of Economic Behavior and Organization*: in press.
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- Gunderson, L., C. R. Allen, and D. Wardwell. 2007. Temporal scaling in complex systems: resonant frequencies and biotic variability. Pages 78-89 in Bissonette, J. A., and I. Storch, editors. *Temporal dimensions in landscape ecology: wildlife responses to variable resources*. Springer.
- Holling, C. S., C. R. Allen, and G. D. Peterson. 2008. Panarchies and discontinuities. Pages 3-19 in Allen, C. R. and C. S. Holling, editors. *Discontinuities in Ecosystems and other Complex Systems*. University of Columbia Press, New York, NY.
- LaBram, J. A., A. E. Peck and C. R. Allen. 2007. Monitoring-based assessment of Gap Analysis models. *Southeastern Naturalist* 6:633-656.
- Lotz, A., and C. R. Allen. 2007. Observer bias in anuran call surveys. *Journal of Wildlife Management* 71:675-679.
- Pope, K. L., and C. G. Kruse. 2007. Condition. Pages 423-471 in C. S. Guy and M. L. Brown, editors. *Analysis and interpretation of freshwater fisheries data*. American Fisheries Society, Bethesda, Maryland.
- Pope, K. L., G. R. Wilde, and D. W. Knabe. 2007. Effect of catch-and-release angling on growth and survival of rainbow trout, *Oncorhynchus mykiss* (Walbaum). *Fisheries Management and Ecology* 14:115-121.
- Stow, C. A., C. R. Allen, and A. S. Garmestani. 2007. Evaluating discontinuities in complex systems: toward quantitative measures of resilience. *Ecology and Society* 12(1): 26. Online: <http://www.ecologyandsociety.org/vol12/iss1/art26/>
- Wardwell, D. and C. R. Allen. 2008. Variability in population abundance is associated with thresholds between scaling regimes. *Ecology and Society*: in press.

Wardwell, D., C. R. Allen, G. D. Peterson and A. D. Tyre. 2008. A test of the cross-scale resilience model: functional richness in Mediterranean-climate ecosystems. *Ecological Complexity*: 5:165-182.

Wilde, G. R., and K. L. Pope. 2008. A simple model for predicting survival of angler-caught and released largemouth bass. *Transactions of the American Fisheries Society* 137:834-840.

PRESENTATIONS AT SCIENTIFIC MEETINGS

University of Nebraska-Lincoln School of Natural Resources Water Colloquium in Lincoln, Nebraska, October, 2008

- Chad Smith, presentation: *From Design to Experiment—Simple Modeling Techniques for Platte River Adaptive Management*

138th Annual Meeting of the American Fisheries Society in Ottawa, Canada, August 17 – 21, 2008

- Dustin Martin, presentation: *Models to Assess Importance of Habitat for Walleye Reproduction*
- Kevin Pope: poster with speed presentation: *Standardized Sampling of Warmwater Fish in Small Standing Waters*

Annual meeting of the Ecological Society of America in Milwaukee in Wisconsin, August 1 – 8, 2008

- Thad Miller, presentation: *Prioritizing Invasive Plant Management and Rare Species Conservation Using the Relative Risks Model*
- Annabel Major, poster: *Nebraska Invasive Species Project: Monitoring, Mapping, Risk & Management*

Nebraska Soil and Water Conservation Society annual meeting in Holdrege, Nebraska, June 5, 2008

- Thad Miller, presentation: *Nebraska Invasive Species Project: Past, Present and Future*

UNL and USGS Climate Change Workshop, *Sustainability in a Time of Climate Change: Developing an Intensive Research Framework for the Platte River Watershed and the High Plains* in North Platte, Nebraska, May 19 – 20, 2008

- Craig Allen, presentation: *Evaluating the Role and Importance of Ecological Diversity in Creating Ecological Resilience*

Resilience 2008 Conference: Resilience, Adaptation, and Transformation in Stockholm, Sweden, April 2008

- Craig Allen, presentation: *Discontinuities Reveal Panarchy in Socio-ecological Systems*
- Chad Smith, poster: *Adaptive Management Approach to Rebuilding Resilience in the Platte River Basin*

Kansas Natural Resources Conference in Wichita, Kansas, February 23, 2008

- Thad Miller, presentation: *Using the Relative Risks Model to Prioritize Invasive Plant Management and Rare Species Conservation*

Annual Nebraska Chapter Meeting, American Fisheries Society in Gretna, Nebraska, February 2008

- Nate Gosch, presentation: *Predation as a Potential Biological Control*
- Chris Lewis, presentation: *Descriptive Models of Recruitment for White Bass and Walleye in Irrigation Reservoirs*
- Dustin Martin, presentation: *Spawning Sites of Walleye in Irrigation Reservoirs*
- Kevin Pope, invited plenary presentation: *How to Catch an Angler*

61st Canadian Conference for Fisheries Research in Halifax, Nova Scotia, Canada, January 3-5, 2008

- Chris Lewis, presentation: *Descriptive Models of Recruitment for White Bass and Walleye in Irrigation Reservoirs*

68th Midwestern Fish and Wildlife Conference in Madison, Wisconsin, December, 2007

- Nate Gosch, presentation: *Predation as a Potential Biological Control for White Perch*
- Thad Miller, presentation: *Setting Priorities for Invasive Plant Management and Rare Species Conservation Using the Relative Risks Model in Nebraska*
- Dustin Martin, poster: *Spawning Sites of Walleye in Irrigation Reservoirs of the Republican River Basin in Southwest Nebraska*
- Justin Williams, poster: *Species Assessment and Predictive Models for Invasive Plants in Nebraska*

USGS/UNL workshop on partnerships in climate change science in Lincoln, Nebraska, November 2007

- Craig Allen, invited presentation: *Understanding Resilience in Working Agricultural Landscapes*

GRADUATE COMMITTEE SERVICE

CRAIG ALLEN

- James Eckberg (Ph.D., School of Biological Sciences, UNL)
- Robert George (Ph.D., University of Queensland, Australia—external dissertation examiner)
- Andrew Kessler (M.S., School of Biological Sciences, UNL)
- Shana Sundstrom (M.S., University of Calgary, Canada)

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- Michael Archer (M.S., School of Natural Resources, UNL)
- Tony Barada (M.S., School of Natural Resources, UNL)
- Bart Durham (Ph.D., Dept. of Natural Resources Management, Texas Tech University)
- Joy Ferenbaugh (Ph.D., Department of Biology, Texas Tech University)
- Jennifer Hogue (M.S., School of Natural Resources, UNL)
- Brenda Pracheil (Ph.D., School of Natural Resources, UNL)

PROFESSIONAL AND FACULTY SERVICE

CRAIG ALLEN

- Associate Editor, 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
- Invasive Plants State Technical Committee, Natural Resources Conservation Service (NRCS), January 2006 –
- Associate, Center for Grassland Studies, University of Nebraska
- Alternate committee member, Institutional Animal Care and Use Committee, UNL
- Working group member, USGS Aquatic Gap Analysis Program
- Working group member, USGS Adaptive Management Working Group

KEVIN POPE

- Associate Editor, Transactions of the American Fisheries Society
- Book Editorial Advisory Board, American Fisheries Society
- Research Committee, UNL School of Natural Resources
- President-Elect, Nebraska Chapter, American Fisheries Society
- Chair, External Affairs Committee, American Fisheries Society

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