



2017 Annual Report

July 2016 – June 2017

Celebrating 85 years!

Cooperating Agencies:

U.S. Geological Survey, Ecosystems
Iowa Department of Natural Resources
Iowa State University
U.S. Fish & Wildlife Service
Wildlife Management Institute

Iowa Cooperative Fish & Wildlife Research Unit

Iowa State University
2310 Pammel Drive
338 Science II
Ames, IA 50011-1031
Telephone: (515) 294-3056
Fax: (515) 294-5468
Email: coopunit@iastate.edu
www.cfwru.iastate.edu

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Personnel and Cooperators

Unit Coordinating Committee

Michael Tome

Units Supervisor
Cooperative Research Units
U.S. Geological Survey, Ecosystems

Todd Bishop

Wildlife Bureau Chief
Iowa Department of Natural Resources

Joe Larscheid

Fisheries Bureau Chief
Iowa Department of Natural Resources

Sue Blodgett

Department Chair
Natural Resource Ecology & Management
Iowa State University

To Be Determined!

Midwest Representative
Wildlife Management Institute

Craig Czarnecki

Assistant Regional Director
U.S. Fish & Wildlife Service

Unit Faculty & Staff

Robert W. Klaver

Unit Leader and Professor of Natural Resource Ecology & Management

Clay L. Pierce

Assistant Unit Leader, Fisheries, and Professor of Natural Resource Ecology & Management

Open Position

Assistant Unit Leader, Wildlife

Jessica Bell

Administrative Specialist II, Department of Natural Resource Ecology & Management

Graduate Students

Jalynn Almond, PhD. Student
Alexander Bybel, M.S. Student
Carlos Camacho, M.S. Graduate
Julia Dale, M.S. Graduate
Karri Folks, Ph.D. Student
Joe Lambert, M.S. Student
Nathan Mills, M.S. graduate
Bridget Nixon, PhD Student
Nick Simpson, M.S. Student
Matt Stephenson, M.S. Graduate,
Ph.D. Student
Chris Sullivan, M.S. Graduate
Jennifer Swanson, M.S. Student
Courtney Zambory, M.S. Student

Collaborating Professors

Julie Blanchong, NREM
Diane Debinski, EEOB
Stephen Dinsmore, NREM
Adam Janke, NREM
Michael Rentz, NREM
Kevin Roe, NREM/EEOB
Jennifer Vogel, EEOB
Michael J. Weber, NREM

New Projects

Restoring Royalty to the Prairie: Habitat Improvement for the Regal Fritillary and Monarch Butterfly

Principal Investigator: Stephen Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Katy Reeder, Iowa Department of Natural Resources
Stephanie Shepherd, Iowa Department of Natural Resources
Duration: January 2017 to December 2019
Funding Source(s): Iowa Department of Natural Resources Diversity Program

Goals and Objectives:

- Conduct Visual Encounter Surveys (VES) and line transect surveys for butterflies at each prairie site.
- Conduct vegetation surveys to estimate canopy cover, tree stem density, and ground cover composition, and document the presence of host plants and nectar resources for target butterfly species.

Progress:

Plans are underway for the first field season in 2017. We have completed site selection and have advertised for two seasonal field technicians to conduct the fieldwork in 2017.

Future Plans:

Monitoring (pre and post management) both the vegetative and butterfly response to prairie restoration will help assess the effectiveness of the proposed restoration activities in producing the expected results for the target species. The information will allow managers the ability to adaptively manage goat prairies to meet desired outcomes. Surveys of butterflies and vegetation structure will be conducted on a random subset of the selected restoration sites both prior to and after the restoration actions are implemented.

Butterfly and vegetation monitoring will begin in 2017 and be conducted in accordance with Iowa's Multiple Species Inventory and Monitoring (MSIM) Program protocols for field surveys. By using the MSIM protocols, we can store the data from this project in the MSIM database and make species occurrence data from this project accessible to biologists and land management staff in the Loess Hills.

Reptile, amphibian, and small mammal distribution, occupancy, and abundance in grassy agricultural conservation features in Iowa

Principal Investigator: Robert W. Klaver
Lisa Schulte Moore
Student Investigator: Matthew Stephenson (Ph.D.)
Collaborators:
Duration: April 2017 to March 2018
Funding Source(s): Iowa Department of Natural Resources, Diversity Program

Goals and Objectives:

The objectives of this project are two-fold: (1) to collect basic distributional data on reptiles, amphibians, and small mammals in agricultural landscapes in Iowa and (2) to determine what characteristics of grassy conservation features influence their abundance and occupancy rates. This study will efficiently add a reptile, amphibian, and small mammal component to an existing research project studying grassland bird nesting in grassy features on Iowa corn and soybean farms.

Progress:

Cover boards have been purchased and deployed in May 2017. Data are being gathered throughout the summer.

Future Plans:

Data will be analyzed and final report prepared by March 2018.

Developing a pocket guide book to the mammals of Iowa for biodiversity and conservation education

Principal Investigator: Adam Janke
Student Investigator: n/a
Collaborators: Mike Rentz, Department of Natural Resource Ecology and Management
Stephanie Shepherd and Vince Evelsizer, IA DNR
Duration: January 2017 to December 2017
Funding Source(s): Iowa Department of Natural Resources, REAP CEP and Diversity Program

Goals and Objectives:

Develop a comprehensive guide book to convey the basic life history and identification of native mammals of Iowa for use by conservation educators and professionals.

Progress:

Work on graphic design and individual species accounts has commenced and is proceeding on schedule for December 2017 release of the electronic version of the guidebook.

Future Plans:

Work will continue throughout the year on the development of the book and initial printings for promotion and electronic distribution to educators.

Continuing Projects

Northern long-eared bat monitoring

Principal Investigator: Julie Blanchong
Student Investigator:
Collaborators: Kelly Poole, Iowa DNR
Duration: April 2016 to May 2018
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

Conduct acoustic monitoring studies to evaluate migratory movements and habitat use of the northern long-eared bat (NLEB) in Iowa.

Progress:

This is an acoustic monitoring project to evaluate migratory movements and habitat use of the northern long-eared bat (NLEB) in Iowa. This species was recently listed as “Threatened” under the Endangered Species Act. The results of this work will be used by the Iowa Department of Natural Resources and the US Fish and Wildlife Service to support Mid-American Energy’s development of a Habitat Conservation Plan (HCP) for wind power facilities in Iowa. In summer 2016, bat echolocation activity was recorded for 2 nights at 120 sites identified as likely to contain habitat for NLEB in 60 counties in central and western Iowa during June and July. Additionally, several putative hibernacula were monitored for bat activity in both fall 2016 and spring 2017. Echolocation data were analyzed to identify presence or probable absence of NLEB as well as little brown bats at each site using USFWS approved bat call identification software.

Future Plans:

This project will be repeated in the summer of 2017 and focus on both NLEB and little brown bats. A proportion of the 120 sites will be resurveyed and some new sites will be added to overlap with projected wind energy development in Iowa in the future. Additionally, putative hibernacula will be monitored in fall and spring. Echolocation data will again be analyzed to identify presence or probable absence of NLEB and little brown bats at each site using USFWS approved bat call identification software.

Acoustic monitoring for Iowa bats

Principal Investigator: Julie Blanchong
Student Investigator:
Collaborators: Kelly Poole, Iowa DNR
Stephanie Shepherd, Iowa DNR
Duration: June 2015 to October 2018
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

Conduct acoustic surveys along drive transects and in fixed-locations to monitor bat activity

Progress:

White Nose Syndrome (WNS), a devastating disease associated with the mortality of millions of bats, was first documented in New York during the winter of 2005-2006, and is now confirmed in Iowa. The loss of large numbers of bats due to WNS is expected to have enormous economic impacts to agriculture. Knowledge of the abundance and distribution of bat species in Iowa is minimal, but is critically needed to understand the potential ramifications of WNS to Iowa. Bat acoustic monitoring has been conducted for the past four summers along transects in eastern, central and southern Iowa. In summer 2016, we worked with the Iowa Department of Natural Resources (IDNR) to recruit and train volunteers to conduct the acoustic surveys. Relying on well-trained local volunteers to conduct the drive transects was efficient and cost effective. It also increased public engagement with the project and public awareness of bats and the threat of WNS. Citizen scientists collected bat echolocation data on 19 drive transects in central, eastern, and southern Iowa and 6 walking transects in central Iowa. Each transect was surveyed run twice during June and July. Similar to previous years, bat activity on drive transects was higher in Eastern Iowa than Central Iowa. Bat activity was higher at parks than at farms in Central Iowa. Regional differences in the percentage of “low” and “high” frequency bats were similar to findings in previous years. Specifically, in Central and Southern Iowa, bats in the low frequency group, consisting of big brown, hoary, and silver-haired bats, were most commonly recorded. In the Eastern region, bats in the high frequency group, consisting of Eastern red, evening, Indiana, little brown, northern long-eared, and tricolored bats, were most commonly recorded.

Future Plans:

We will continue to conduct drive transect surveys along established routes during summer 2017 to record echolocation calls. We will also establish three fixed location sites overlapping three drive transects for the purpose of comparing data collected by drive and fixed location surveys. As in previous years, the IDNR will recruit volunteers to conduct the surveys. ISU will hold orientation sessions to train volunteers how to conduct surveys, teach them how to use the equipment, and show them how to keep appropriate records. ISU will continue to be responsible for analyzing the data collected by the volunteers to quantify bat activity and identify bat species.

Adaptive Management in Working Landscapes to Provide Habitat for Species of Greatest Conservation Need

Principal Investigators: Diane M. Debinski
James R. Miller (University of Illinois)
Walt Schacht (University of Nebraska, Lincoln)
Lois Wright-Morton

Student Investigators: David Stein (M.S.)
Callie Griffith (M.S. University of Nebraska, Lincoln)
Jaime Coon (Ph.D. University of Illinois)

Duration: November 2013 to 2018

Funding Source(s): Iowa Department of Natural Resources,
State Wildlife Grant Comp.

Goals and Objectives:

- We will develop and implement best management practices for reducing or eliminating invasive plant species on lands owned or managed by Iowa Dept. of Natural Resources (IDNR) and Missouri Dept. of Conservation (MDC) to improve habitat conditions for Species of Greatest Conservation Need and other grassland dependent wildlife.
- We will engage private landowners in grassland management for benefit of Species of Greatest Conservation Need.

Progress:

This project builds on an experiment that began in 2006 that was designed to compare plant, insect, and bird responses to three types of grassland management in Grand River Grasslands of southern Iowa: 1) patch-burn graze, 2) graze-and-burn, and 3) burn-only. Twelve pastures, four of each treatment type, served as study sites in our efforts to assess the effectiveness of patch-burn grazing in improving habitat for grassland Species of Greatest Conservation Need (SGCN). In this new research, our goal is to test the use of adaptive management to reduce the cover of tall fescue (*Schedonorus phoenix Scop.*) within pastures. Tall fescue is a cool-season, high-moisture bunchgrass that was imported from Eurasia to the United States in the late 1800s for pasture improvement and erosion control. Although tall fescue is considered a valuable forage species, it can reduce domestic livestock performance. Alkaloids produced by endophyte-infected tall fescue are of low palatability to ungulates such as cattle, deer and elk and they may be toxic to small mammals and insects. Many ground-nesting birds are unable to use tall fescue fields as foraging or nesting habitat. The use of fire in grassland management is also complicated by the early green-up of tall fescue.

In this project the patch-burned graze pastures serve as “controls” and their responses is being compared to the graze-and-burn pastures where a Collaborative Adaptive Management (CAM) approach is employed. On the patch-burn graze sites, no herbicides are applied. On the graze-and-burn sites, each pasture is divided into three patches where different seed and herbicide treatments are applied. In both the patch-burn grazing and the burn-and-graze treatments, there are two grazing regimes: intensive early stocking (IES) and conventional stocking. Under IES, stocking density (number of cattle per unit area) is doubled and the grazing season is halved (April 1 to July 1) relative to conventional stocking. This approach will allow us to identify best management practices capable of converting fescue-dominated pastures to more diverse native grasslands. We expect that the highest probability of success will be accomplished by placing heavy grazing pressure on fescue early in the growing season and providing a late-season grazing deferment to benefit native warm-season grasses and forbs. This project involves research on state-owned and privately owned lands in Iowa and Missouri. The overall goal of CAM is to increase adaptation capacity and learning within the community of landowners and natural resource professionals.

Future Plans:

We collaborated with Iowa DNR and Missouri Dept. of Conservation, and the Nature Conservancy to select research sites and treatments in 2014 and since then have completed three field seasons of treatments and data collection. We have requested and were granted a no cost extension on the grant. The collaborators involved in this project are now in the process of analyzing data and writing up reports. One graduate student, David Stein, has defended a thesis associated with this research. We will meet with research partners in June, 2017 to present summary findings of this research and related work that has occurred over the past decade in the Grand River Grassland.

Iowa Multiple Species Inventory and Monitoring (MSIM) Program

Principal Investigator: Stephen Dinsmore
Student Investigator: Shane Patterson (M.S.)
Collaborators: Karen E. Kinkead, Iowa Department of Natural Resources
Kevin T. Murphy, Iowa State University
Duration: July 2015 to June 2018
Funding Source(s): Iowa Department of Natural Resources, State Wildlife Grant

Goals and Objectives:

- Conduct MSIM surveys for birds, mammals, amphibians, reptiles, fish, mussels, butterflies, odonates, and crayfish on 50 Wildlife Management Areas annually during 2015-2018.
- Conduct MSIM surveys on 10-20 additional properties in 2016, 2017, and 2018.
- Enter collected data into the MSIM on-line database, submit county occurrence records to the appropriate Iowa WAP taxonomic subcommittee, provide additionally requested information to the IWAP subcommittees as requested, and change database records as advised.
- Analyze data using (but not limited to): Proportion of area occupied and species density (where applicable) using habitat variables from the field and/or GIS where applicable.

Progress:

In 2016 the MSIM program employed 5 field crews of 4 technicians each (20 technicians in total) stationed in Boone, Ruthven, Mt. Ayr, Tripoli, and Iowa City. Fieldwork for this project began with training on 15 April and ended on 15 October 2016. The field season began with a training session at the Boone Wildlife Research Station on 15-17 April 2016 to prepare field technicians for the field season and familiarize them with the MSIM protocols. We completed surveys implementing MSIM protocols at 66 study sites across Iowa (Figure 1). This total includes the 50 traditionally surveyed “permanent” MSIM sites, 12 additional public lands sites, and 4 private lands sites in an effort to expand MSIM data coverage beyond only public lands sites. All species observed during surveys were recorded with special focus given the Species of Greatest Conservation Need (SGCN). All collected data were entered into the MSIM online database.

This effort includes more than 3000 wildlife surveys conducted on these study sites and approximately 375 survey-related tasks such as site setup and teardown. We encountered many noteworthy sightings in several taxonomic groups including Blanding’s Turtle (6 sites), Eastern Hognose Snake (2 sites), Smallmouth Salamander (1 site), Timber Rattlesnake (1 site), King Rail (1 site), Cinnamon Teal (1 site), Blue-eyed Darner (2 sites), and Four-spotted Skimmer (3 sites); Meadow Jumping Mouse was unusually common at 16 sites. In addition to these rare/uncommon sightings we also had some species detected at all study sites including White-tailed Deer, Common Green Darner, Eastern Forktail, Widow Skimmer, American Goldfinch, American Robin, and Mourning Dove (there were no species of reptiles or amphibians found universally across all sites).

Future Plans:

Field work will continue in 2017, beginning with a 3-day workshop in mid-April to train new temporary technicians prior to the 2017 field season. We will also continue with several analyses of MISIM data with the goal of publishing it in the peer-reviewed literature. Priority topics include analyses of Monarch and herpetofauna site occupancy.

Northeastern Iowa Goat Prairie Monitoring

Principal Investigator: Stephen Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Katy Reeder, Iowa Department of Natural Resources
Duration: March 2015 to November 2017
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

- Monitor reptiles and butterflies with Multiple Species Inventory and Monitoring (MSIM) protocols to gauge responses to goat prairie restoration.
- Survey for reptiles and butterflies with Visual Encounter Surveys (VES) and reptiles with coverboards.
- Collect baseline vegetation data before and after site restoration.

Progress:

In 2015 we completed our first field season on this project (see 2015 progress report). We did not conduct any fieldwork in 2016 to allow time for management activities on each site. In 2016 we completed some initial analyses of site occupancy for a couple of priority species, but these analyses are on-going and will be finalized after the 2017 field season.

Future Plans:

We will revisit all sites in 2017 to assess the impact of management activities on reptiles and butterflies. Following the 2017 field season we will complete site occupancy analyses and prepare a final project report.

Southern Iowa Forest Monitoring

Principal Investigator: Stephen Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Paul Tauke, Iowa Department of Natural Resources
Duration: August 2015 to May 2019
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

We will conduct surveys of the birds in Stephens State Forest, Sedan Bottoms WA, and Sand Creek Bird WA. These sites are included in Bird Conservation Areas (BCAs) where conservation actions for birds are a priority. Survey plots will be in existing woodland areas of these BCAs on IA DNR land. In addition, the purpose is to compile the results of the bird community surveys and conduct statistically sound and biologically relevant analyses of the data. Ultimately, we hope that this improves our understanding of the distribution of birds, the patterns of occupancy for selected species, and the use of IA DNR's forested Wildlife Management Areas and State Forests by birds in southern Iowa.

Progress:

Bird surveys, up to 4 at each site, were completed in 2016. Data have been entered and analyzed for bird density and occupancy, along with providing GPS coordinates to DNR Forestry on plot locations and birds found. Preliminary results with maps of bird densities were presented at a Forestry Field Day at Stephens State Forest in October.

Future Plans:

Additional surveys and data analyses will continue through 2018.

Waterbird Responses to Iowa's Shallow Lakes Restoration Project

Principal Investigator: Stephen Dinsmore
Student Investigator: Rachel Vanausdall (M.S.)
Collaborators: Mark Gulick, Iowa Department of Natural Resources
Todd Bishop, Iowa Department of Natural Resources
Duration: August 2015 to December 2018
Funding Source(s): Iowa Department of Natural Resources and U.S. Fish and Wildlife Services

Goals and Objectives:

- Monitor migratory and breeding waterbird use at active shallow lakes restoration projects (pre-restoration, drawdown stage, and 1-5 years post-restoration) in Iowa during each of the two field seasons (2016 and 2017).
- Link waterbird responses to specific metrics of wetland condition and management actions to provide feedback in an adaptive resource management framework.
- Relate timing, rate, and duration of drawdowns to vegetation response that affects breeding and migratory bird use.

Progress:

A total of 30 shallow lakes were monitored in 2016, located within 12 Iowa counties. All surveys were conducted by Rachel Vanausdall and a summer technician. Migration surveys focused on waterbirds, such as shorebirds, waterfowl, wading birds, and other wetland-associated birds, using the wetlands. Passerines (Passeriformes) and raptors were not included in the surveys. Waterbirds were identified to species. Breeding bird surveys incorporated both waterbirds and other wetland associated birds, such as passerines, utilizing the wetland. Unlimited-distance point counts were used to measure the abundance of breeding birds. To better describe the vegetation community and assess potential food sources (e.g., submerged plants) for birds, line transects were used to survey vegetation at each site.

Future Plans:

We will complete a second year fieldwork in 2017. This will consist of weekly migration surveys at ~30 wetlands from mid-March through late May and then breeding bird point counts at all wetlands between late May and early July (2-3 visits per point), just as was done in 2016. We will also sample vegetation at each wetland in early summer. After fieldwork is complete we will begin data analyses and complete a M.S. thesis.

Monitoring protocol for otter and bobcat in Iowa

Principal Investigator: Robert W. Klaver
Student Investigator: Bridget Nixon (Ph.D.)
Collaborators:
Duration: January 2016 to May 2020
Funding Source(s): Iowa Department of Natural Resources
Drake University

Goals and Objectives:

- Comparing conventional population indices to integrated population modeling (IPM) to determine if IPM provides superior inferences that warrant its use as an otter and bobcat management tool.
- Performing IPM to provide estimates on otter and bobcat survival, age structure, recruitment, harvest, and population trends in Iowa.
- Using GIS to develop a river otter habitat suitability map for Iowa based on the number of otters trapped per HUC 12 watersheds as a function of land cover and landscape metrics comparable to the suitability map developed for the bobcats. Validating the habitat suitability map created in item 3.
- Evaluating the value of current data sources and simulating potential gains by including additional ancillary data for use in managing Iowan furbearers.
- Publishing a final report and outlining recommendations to the Iowa DNR for future furbearer monitoring.

Progress:

Pilot surveys of latrine sites were conducted during summer 2016. While latrines were located during these surveys, the consensus of Iowa State and DNR participants was that it was unlikely that the time investment necessary for successful surveys was feasible for inclusion as ancillary data. Related literature was reviewed and compiled, with new publications and additions being added as needed. 663 additional otter teeth were submitted to Matson's Lab to be aged, bringing samples from each year up to 20 – 25% of that year's total harvest. The teeth were recovered from previously pulled samples or pulled from jaws which had been frozen. Initial modeling has been started on otter habitat suitability with the aim of presenting a habitat suitability map at the annual Coop meeting. Compiling of bobcat teeth was started from 2007 – 2012.

Future Plans:

Bobcat teeth: Additional bobcat teeth needed to reach 20 – 25% of each year's harvest will be taken from frozen jaws or previously pulled samples and sent for aging. Previously aged teeth from 2007 – 2015 will be combined with CITES data on gender and collection date and location.

Otter habitat suitability: Landscape and land cover metrics relating to otter presence will be modeled and a map created to evaluate suitability across Iowa. The map will be validated using additional years of otter capture data.

Ancillary data: Options for ancillary data to include in the IPM will be evaluated and appropriate data will be added to an age-at-harvest model.

Developing a Model to Predict Canada Goose Breeding Pair Densities in the Midwest Using National Wetlands Inventory Data

Principal Investigator: Robert W. Klaver
Student Investigator: Brenna Towery (M.S. Graduate)
Collaborators:
Duration: January 2013 to September 2017
Funding Source(s): Iowa Department of Natural Resources
U.S. Geological Survey

Abstract:

Updated measurements of Canada goose distribution and nest survival are essential to develop and evaluate management strategies. Iowa's protocols for monitoring the Canada goose breeding population use a stratified random sampling method to select square-mile sections to be surveyed by helicopter. Precise population estimates require that the universe of survey plots be accurately stratified. I provided a more statistically rigorous method of stratifying Iowa's square-mile sections by developing a model to predict Canada goose breeding pair densities by incorporating updated National Wetlands Inventory data and previous breeding population survey data. I found that breeding pairs were best predicted by the wetland types, number of wetlands, area of each wetland type, and a quadratic of the area of each wetland type in each section, as well as an interaction between the wetland types and the area of each wetland type, and random effects for observations and sections. The model indicated that goose densities are highest at large semi-permanent marshes. Reliable estimates of Canada goose nest survival allow management agencies to evaluate available nesting habitats and determine appropriate management techniques. I monitored Canada goose nests at five state-managed wetland complexes to determine how nesting habitat influenced nest survival rates at rural wetlands in north-central Iowa. I found that nest structures produced significantly higher nest survival than nests on islands and muskrat houses. I also found that shallow lake renovation activities at Rice Lake Wildlife Management Area, which involved manipulating the water level, had a negative impact on Canada goose nest survival.

Future Plans:

The project has been completed.

The following papers have been published / accepted:

Ness, B. N. and R. W. Klaver (2016). "Canada Goose Nest Survival at Rural Wetlands in North-central Iowa." *Wildlife Society Bulletin* 40(4): 705-713.

Koford, R. R., G. Dodici, G. Zenner, J. A. Vogel, B. Ness and R. W. Klaver (2016). "Influence of Patch Shape on Mallard Nest Survival in Northern Iowa." *Wildlife Society Bulletin* 40(4): 714-721.

Ness,, B.N., R.W. Klaver, and G.G. Zenner. In Press. Long-term changes in Canada goose nest success and nest densities at an Iowa wetland complex. *The Prairie Naturalist*.

Grassland bird and invertebrate response to grassland diversity in restored plantings in northwestern Iowa

Principal Investigator: Robert W. Klaver
Jennifer A. Vogel
Student Investigator: Joseph Lambert (M.S.)
Collaborators:
Duration: January 2015 to August 2017
Funding Source(s): Iowa Department of Natural Resources
U.S. Fish and Wildlife Service

Goals and Objectives:

This project builds on a study that began in 2006 that was designed to compare bird response to four recently established habitat types within the Spring Run Wetland Complex in northwestern Iowa. The four habitat types were: (1) introduced grass (smooth brome) with scattered legumes, (2) a five-grass mix of native tall-grass species, planted before 2004, (3) a five-grass mix of native tall-grass species, planted in 2005-2007, and (4) a diverse mixture of grasses and forbs, planted with over 40 species, planted in 2005-2011.

The goal of this study was to compare grassland bird response in established fields that are more indicative of the long-term conditions in an area. Therefore, the same four habitat types were used in the study. An additional habitat type consisting of a mix of short-grass species and forbs, planted with over 100 species, was also incorporated into this phase of the project. Understanding invertebrate populations within the area will be helpful in explaining bird abundance.

Progress:

Bird surveys, vegetation surveys, and invertebrate surveys have been completed. Grassland bird use among the planting types has been evaluated. Environmental variables responsible for shifts in grassland bird communities among the planting types over time have also been analyzed. Drafts presenting final results are under review.

Future Plans:

A final thesis will be constructed and defended in June. Manuscripts will be submitted to the Journal of Wildlife Management and Ecological Restoration.

Conclusions and Recommendations:

Grassland bird communities differed among planting types and over time. Both vegetation composition and structure significantly influenced grassland bird community structure. A diversity of grassland planting types of differing ages are needed to provide the necessary habitat characteristics to conserve grassland bird populations.

Amphibian Populations in Wetlands of the Des Moines Lobe in Central Iowa

Principal Investigator: Clay L. Pierce
Student Investigator: Jennifer Swanson (M.S.)
Collaborators: Erin Muths, U.S. Geological Survey
Mark Vandever, U.S. Geological Survey
Kelly Smalling, U.S. Geological Survey
Duration: January 2015 to August 2017
Funding Source(s): U.S. Geological Survey

Goals and Objectives:

- Determine amphibian occupancy rates in Iowa Prairie Pothole Region wetlands
- Correlate wetland habitat characteristics with amphibian species presence or absence
- Document post-breeding movement patterns of northern leopard frogs on Conservation Reserve Enhancement Program wetlands
- Assess the effect of surrounding land use practices as they contribute to chemical exposure and concentrations in northern leopard frogs

Progress:

Amphibian populations have been experiencing declines in both the United States as well as globally. Recent research indicates that even species previously considered to have stable populations may be experiencing background rates of decline that have gone unnoticed or underestimated. Although several factors have been identified as contributing to amphibian population losses, habitat loss and risks associated with land use change, such as environmental contamination, have been acknowledged one of the top threats to amphibians. In the state of Iowa, much of the historic land cover has been converted from a mosaic of wetlands and prairies to agricultural production. In order to preserve amphibian species in these areas it is vital to understand the relationship between amphibian presence, movement, and habitat characteristics such as landscape use. Previous work has shown that wetlands in agricultural landscapes can support amphibian populations, but understanding how individuals use these habitats at several spatial scales is important to promote the health and diversity of amphibian species.

A graduate student, Jennifer Swanson, has completed two seasons of field work between April and August in 2015 and 2016. Seventy-two northern leopard frogs were radio tracked in two Conservation Reserve Enhancement Program wetlands. After tracking was completed, 30 of the frogs were euthanized and their bodies analyzed for pesticide content. Twenty-seven wetlands in northern Iowa were surveyed for all amphibian species seven times each over the two field seasons of this study.

Future Plans:

Jennifer will defend her thesis in June, 2017.

Boone River Watershed (BRW) Stream Fish and Habitat Monitoring, IA

Principal Investigator: Clay L. Pierce
Michael J. Weber
Kevin J. Roe

Student Investigator: Nicholas Simpson (M.S.)

Collaborators: Scott Grummer, US Fish and Wildlife Service
Karen Wilke, US Fish and Wildlife Service
Aleshia Kenney, US Fish and Wildlife Service

Duration: December 2015 to December 2018

Funding Source(s): US Fish and Wildlife Service

Goals and Objectives:

Fish assemblages and habitat conditions in two streams in the Boone River Watershed (BRW), White Fox Creek and Eagle Creek, will be monitored to evaluate their potential as Topeka shiner population sources and conduits for associated oxbow habitats. Eagle Creek and associated natural oxbows support the only known remnants of the Topeka shiner distribution in the BRW. Topeka shiners are presumed extirpated from the White Fox Creek sub-watershed, but five oxbows have been restored there for Topeka shiners and three of them have subsurface tile inflow for maintenance of water supply and nitrate sequestration. The success of restored oxbows for Topeka shiners is dependent on existence of populations in associated streams with suitable habitat. Our monitoring and assessment results will help guide present and future oxbow restorations and inform potential future Topeka shiner reintroduction to the BRW.

Progress:

In the 2016 field season, 44 sites, including 27 in-stream reaches and 17 oxbows, were sampled in the BRW. In addition to 17 sites on White Fox Creek and 13 sites on Eagle Creek, we also sampled 10 sites on Prairie Creek, 2 sites on Lyons Creek, and 1 site each on Buck Creek and Brewers Creek. A total of 66,140 fish including 46 species were sampled. The five most abundant species were fathead minnow, common shiner, black bullhead, green sunfish, and orangespotted sunfish. The five most commonly occurring (# sites present/total # sites) species were green sunfish, creek chub, common shiner, white sucker, and bluntnose minnow. Habitat assessments were also performed at each of these sites. Dozens of habitat variables were measured or visually estimated in each habitat assessment.

Of the 44 total sites in the BRW, Topeka shiners were sampled at 14 (32%). This includes 8 in-stream reaches and 6 oxbows. Topeka shiners were sampled at 6 Eagle Creek sites and 8 Prairie Creek sites. Topeka shiner abundance at sites where they were sampled ranged from 1-238 with a mean of 44 and median of 18 per site. Overall, 618 Topeka shiners were sampled in the BRW in 2016, making them the 15th most abundant and 22nd most commonly occurring species in our sampling. Topeka shiner presence in Prairie Creek was surprisingly consistent considering there were only two detections of Topeka shiners in this HUC 10 in two previous Iowa State University stream fish studies since 1997. Despite being our most sampled stream, we did not sample any Topeka shiners in White Fox Creek or any of its associated oxbows.

Preliminary results were presented at the 2017 Midwest Fish and Wildlife Conference in Lincoln, Nebraska as well as the Iowa Chapter of the American Fisheries Society annual meeting in Ames, Iowa.

Future Plans:

We will continue our stream and oxbow sampling through the summer of 2017. We intend to revisit a subset of sites from the 2016 field season as well as add many new sampling sites to our study. We will be expanding our sampling to areas not sampled in 2016. Expanding our sampling distribution will provide the best opportunity to detect remaining Topeka shiner populations in the watershed.

We will continue to gather habitat data in 2017 and add new sites and combinations of variables to our models to see if the trends noted above continue and if others appear. We will also begin to incorporate biotic variables such as presence of species, biotic integrity, non-native and species of greatest conservation need in our models to evaluate relationships with Topeka shiners and restoration activities.

Habitat Improvement Projects for Stream and Oxbow Fish of Greatest Conservation Need: Database and Landscape Analyses

Principal Investigator: Clay L. Pierce
Kevin J. Roe
Michael J. Weber

Student Investigator: Courtney Zambory (M.S.)

Collaborators: Karen Kinkead, Iowa Department of Natural Resources
Todd Kolander, Minnesota Department of Natural Resources
Aleshia Kenney

Duration: January 2016 to June 2018

Funding Source(s): Iowa Department of Natural Resources, SWG-C

Goals and Objectives:

This project will focus on habitat restorations and responses of stream fish of greatest conservation need (SGCN), specifically Topeka shiners (*Notropis topeka*) and plains topminnows (*Fundulus sciadicus*). Extensive GIS analysis using a new, state-of-the-art framework will be undertaken to assist in guiding current and future restoration efforts. Monitoring of the fish populations in an adaptive management approach will be necessary to ensure fish are responding as expected to efforts to increase and improve their habitat. Additional SGCN potentially benefitting from the work include banded darters (*Etheostoma zonale*), blacknose shiners (*Notropis heterolepis*), Iowa darters (*Etheostoma exile*), blackside darters (*Percina maculate*), longnose dace (*Rhinichthys cataractae*), slenderhead darters (*Percina phoxocephala*), slender madtoms (*Noturus exilis*), southern redbelly dace (*Phoxinus erythrogaster*), tadpole madtoms (*Noturus gyrinus*), and trout perch (*Percopsis omiscomaycus*). Species occurrence databases from both states will be compiled and combined to reveal locations where the two species have been documented as occurring. Minnesota's Watershed Health Assessment Framework (WHAF) will be used in MN portions of the project area, and WHAF will be implemented in Iowa portions utilizing existing geospatial resources.

Progress:

The graduate student, Courtney Zambory, has completed entry of all Topeka Shiner presence records (historical and present) in a master database and developed a database for comprehensive entry of this project's data. Using the ACPF (Agricultural Conservation Planning Framework) tool delivered by the USDA she has generated 2m resolution LiDAR derived, hydrocorrected stream networks for both the Boone and North Raccoon River Watersheds as well as new and accurate stream reach slope, order, link, and sinuosity calculations for each reach. A GIS script has been created to identify historical stream meanders and current oxbow lakes as potential restoration sites in both the Boone and North Raccoon River watersheds. Statistical analysis has begun to identify correlations between Topeka Shiner presence/absence in oxbows and the surrounding landscape variables.

Future Plans:

Future work to be completed this spring and summer include: continuation of statistical analysis of landscape variable data, complete the Watershed Health Assessment Framework for Iowa, acquire LiDAR data for the Minnesota portion of the Rock River Watershed, and begin processing of historical color-infrared imagery to investigate off-channel habitat levels of connectivity. Additionally, there is a tentative plan to collect some off-channel habitat connectivity measurements this summer of oxbows to include as a landscape variable.

Habitat Improvement Projects for Stream and Oxbow Fish of Greatest Conservation Need: Field Monitoring and Assessment

Principal Investigator: Clay L. Pierce
Kevin J. Roe
Michael J. Weber

Student Investigator: Alexander Bybel (M.S.)

Collaborators: Karen Kinkead, Iowa Department of Natural Resources
Todd Kolander, Minnesota Department of Natural Resources
Aleshia Kenney

Duration: January 2016 to June 2018

Funding Source(s): Iowa Department of Natural Resources, SWG-C

Goals and Objectives:

This project will focus on habitat restorations and responses of stream fish of greatest conservation need (SGCN), specifically Topeka shiners (*Notropis topeka*) and plains topminnows (*Fundulus sciadicus*). Extensive GIS analysis using a new, state-of-the-art framework will be undertaken to assist in guiding current and future restoration efforts. Monitoring of the fish populations in an adaptive management approach will be necessary to ensure fish are responding as expected to efforts to increase and improve their habitat. Additional SGCN potentially benefitting from the work include banded darters (*Etheostoma zonale*), blacknose shiners (*Notropis heterolepsis*), Iowa darters (*Etheostoma exile*), blackside darters (*Percina maculate*), longnose dace (*Rhinichthys cataractae*), slenderhead darters (*Percina phoxocephala*), slender madtoms (*Noturus exilis*), southern redbelly dace (*Phoxinus erythrogaster*), tadpole madtoms (*Noturus gyrinus*), and trout perch (*Percopsis omiscomaycus*). We will survey at least 20 sites in Iowa and Minnesota for Topeka shiners, plains topminnows, and habitat. Data will be collected on all fish species encountered. Genetic analysis of Topeka shiners and plains topminnows will be conducted through the use of microsatellite markers.

Progress:

Topeka shiners were found in 36 of the 79 Sites sampled in Iowa and Minnesota in 2017. Genetic samples from 604 Topeka shiners have been extracted and Polymerase Chain Reaction (PCR) is currently be run at 13 polymorphic loci. The 2017 field season is currently in progress.

Future Plans:

Field work will continue through the summer of 2017. DNA extraction of new samples and PCR will continue into the fall. Analysis of genetic data will begin following the field season.

Reproductive ecology of Asian Carp in Southeastern Iowa rivers

Principal Investigator: Michael J. Weber
Clay L. Pierce
Student Investigator: Aaron Matthews (M.S.)
Carlos Camacho (M.S. Graduate)
Collaborators: Kim Bogenschutz, Iowa DNR
Jason Euchner, Iowa DNR
Duration: July 2013 to June 2018
Funding Source(s): Iowa Department of Natural Resources
US Fish and Wildlife Service

Goals and Objectives:

Evaluate Asian carp reproduction (fecundity, larval and juvenile densities) and recruitment in select Iowa rivers, including the Mississippi, Des Moines, Skunk, Iowa, and Cedar rivers

Progress:

Adult gonadosomatic index and gonad development indicated the majority of Asian carp spawning occurred in late May through June. Back calculated spawn dates from eggs and larvae suggest that peak spawning occurs during late May and June, coinciding with a substantial decrease in adult GSI and increase in post spawn females; however, spawning occurred as late as August in tributaries. Back-calculated egg and larval spawn dates were within the spawning optimum when water temperatures were 18 to 30 °C and channel velocities were 0.7 m/s or higher. Spawning occurred on rising and falling limbs of the hydrograph at 24 and 48 h intervals, indicating a rising hydrograph was not necessary for spawning. Densities of eggs and larvae were higher in downriver section compared to the upriver section within each tributary during both years. Densities among tributaries were similar in 2014 and but were significantly higher in the Des Moines River than the Iowa and Skunk rivers during 2015. Densities among the three confluence sites were similar for the Iowa and Skunk during each year. However, densities among sites associated with the Des Moines River confluence were higher in the mainstem Upper Mississippi River in 2014 and higher in the tributary site near the mouth in 2015. Collectively, this study documents the first observations of Asian Carp spawning in Upper Mississippi River tributaries in Iowa. Asian Carp reproduction in the Upper Mississippi River tributaries and subsequent establishment could provide sources of recruitment for the impounded sections of the Upper Mississippi River and other areas of poor reproduction to further expand their distribution.

Future Plans:

Egg, larval, and adult Asian Carp sampling was expanded north to pool 14 during 2016 to try to detect the leading edge of reproduction in the Upper Mississippi River. These samples are still being processed in the laboratory. Additional sampling will occur in 2017.

Completed Projects

Missouri River Multiple Species Inventory Monitoring of Wildlife Management Areas Managed by the IDNR

Principal Investigator: Stephen Dinsmore
Student Investigator: Five undergraduate field technicians
Collaborators: Karen E. Kinkead, Iowa Department of Natural Resources
Duration: March 2015 to June 2017
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

- Collect baseline information on vertebrates and invertebrates in accordance with the Multiple Species Inventory and Monitoring (MSIM) protocols at 15-20 sites along the Missouri River.
- Estimate probability of occupancy and abundance for select species of interest, as appropriate.
- Link findings to the Missouri River Recovery Program (MRRP) objectives for these sites.

Progress:

Fieldwork for this project began in mid-April 2016 with the hiring of a field crew and site selection. A 5-person crew surveyed from 15 April to 15 October in 2016 collecting wildlife and habitat data for 15 study sites on 11 properties in southwestern Iowa (Monona, Mills, and Fremont counties). All species observed during surveys were recorded with special focus given the Species of Greatest Conservation Need (SGCN). All collected data were entered into the MSIM online database. Field study sites were selected based on specific habitat types and management practices of interest to state agency wildlife management staff that conduct habitat management on selected properties.

Future Plans:

This project has been completed and a final report will be submitted in May 2017. Study findings will be used to aid local site management actions as well as those conducted under the Missouri River Recovery Plan (MRRP).

Genetic structure of the Iowa Pleistocene Snail (*Discus macclintocki*)

Principal Investigator: Kevin Roe
Student Investigator: Jermaine Mahguib
Collaborators:
Duration: September 2012 to September 2016
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

The objective of the project is to document genetic diversity, population structure, the extent of gene flow, and historical connections between populations of the Iowa Pleistocene Snail (*Discus macclintocki*).

Progress:

Due to issues with the quality of the DNA obtainable from the FTA cards we were not able to use the microsatellites that were developed to survey the populations of *D. macclintocki*. We instead used three different genes (one mitochondrial, and two nuclear) to assess genetic variation across populations.

Conclusions and Recommendations:

Phylogenetic analysis of each of the three gene portions (not shown) all indicate that *D. macclintocki* is a monophyletic group and distinct from other species of *Discus*. Results of the analysis of haplotypes revealed 44 different haplotypes distributed across the 17 IPS sites sampled. Only one of these haplotypes was widespread and was sampled from 12 different sites. Three other haplotypes were shared between two different sites, and the remaining 41 haplotypes were unique and were recovered from a single site only. The relative few shared haplotypes and the large number of unshared haplotypes is consistent with an absence of gene flow between many of the sites. The few shared haplotypes are possibly indicative of past connections between sites, when the environment was cooler and *D. macclintocki* was more widespread. This interpretation is supported by the large number of inferred nucleotide substitutions between clusters of haplotypes which indicates the divergence between these clusters is most likely quite ancient. Taken together, these results indicate that IPS sites do appear to represent distinct populations of snails. The conservation implications of these results are that sites occupied by snails should be managed as distinct entities even if these sites reside with the same algific slope. The genetic divergence between the southern and northern sites implies that additional efforts should be made to preserve these more southern sites as they represent genetically distinctive lineages of *D. macclintocki*. Similarly, IPS 30 appears to represent a phylogenetically distinct lineage of *D. macclintocki* despite its proximity to other sites and should be protected as an evolutionarily distinct entity.

Factors Affecting Mercury Concentrations in Iowa Fishes

Principle Investigator: Michael J. Weber
Clay L. Pierce
Student Investigator: Nathan T. Mills (M.S. graduate)
Collaborators: Darcy Cashatt, and other Iowa DNR staff
Duration: June 1, 2014 to July 31, 2016
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

- Evaluate temporal changes in mercury concentrations in largemouth bass to guide mercury sampling protocols.
- Develop models to predict the concentration of mercury in a range of fishes as a function of fish total length across natural lakes, impoundments, reservoirs, and rivers to guide consumption advisories.

Conclusions and Recommendations:

Largemouth bass mercury concentrations varied across months in Red Haw Lake, with the highest concentrations observed during July, and the lowest concentrations observed during October. In contrast, largemouth bass mercury concentrations were similar across months in Twelve Mile Lake. Fish mercury concentrations in Iowa lakes are generally low, with mercury concentrations <0.30 mg/kg for ~90% of fishes collected and mercury concentrations below detectable levels (<0.05 mg/kg) for ~40% of fishes.

Detected mercury concentrations in lakes were highest in muskellunge, northern pike, walleye and largemouth bass, lowest in black and white crappie and bluegill, and positively related to fish length and age. Lake mean depth, pH, watershed:lake area ratio, and percent of watershed as forested land, grasslands and open water were positively related to fish mercury concentrations, whereas lake area and percent of watershed as agriculture and developed land were negatively related to mercury concentrations. Finally, detected mercury concentrations were on average 28% higher in shallow natural lakes compared to other lake types. Combined, these factors explained 74% of the variation in detectable fish mercury concentrations in Iowa lakes.

Fish mercury concentrations in rivers were also generally low and similar among species. Fish mercury concentrations were positively related to length, age, trophic position and $\delta^{13}\text{C}$ signatures. Human Threat Index and percent of watershed as open water were negatively related to fish mercury concentrations, whereas percent of watershed as forested land was positively related to fish mercury concentrations. Additionally, phosphorous, nitrogen-ammonia, and sulfate were weakly negatively related to mercury concentrations, whereas water hardness was weakly positively related to fish mercury concentrations. Fishes collected from the Paleozoic Plateau ecoregion had the highest mercury concentrations compared to those collected from other ecoregions across Iowa. Together, these factors explained 70% of the variation in fish mercury concentrations in Iowa rivers.

Conservation, Habitat Requirements, Genetic Diversity and Survival of a Translocated Population of Greater Prairie-chickens in Iowa

Principal Investigator: Jennifer Vogel
Diane Debinski

Student Investigator:

Collaborators: Stephanie Shepherd, Iowa Department of Natural Resources

Duration: January 2013 to December 2016

Funding Source(s): Iowa Department of Natural Resources, State Wildlife Grant

Goals and Objectives:

- Evaluate the genetic diversity of the small population of greater prairie-chickens in Iowa and examine the effects on genetic diversity of supplementing the current population with translocated birds.
- Develop a habitat suitability model and examine habitat use for greater prairie-chickens in Iowa.

Progress:

Genetics: We collected blood samples from all birds prior to translocation. We also collected feather samples from the 2 active lek sites in Iowa and egg shells from nests of translocated birds. Genetic samples were analyzed at the University of North Texas.

Habitat Model: We used 2009 HRLC data for Iowa to extract the percent cover of 8 land cover categories at each GPS location collected via telemetry on translocated birds and at a set of random points. To determine the probability of habitat use for prairie-chickens in Iowa, we analyzed the land cover data at the GPS locations and random points using a logistic regression model. We used the raster calculator tool in ArcGIS to apply our logistic regression model equation and create a habitat map illustrating the probability of habitat use by greater prairie-chickens in Iowa. As an extension of our prairie-chicken habitat model, we explored the effects of climate change on predicted habitat use by applying our GIS-based habitat model to projected land cover change scenarios in Iowa using the USGS Forecasting Scenarios of Land Cover Change. As another extension of our prairie-chicken habitat model, we used historic land cover data to see how prairie-chicken habitat availability changed over time in Iowa from 1985 to 2009.

Conclusions and Recommendations:

Results from the genetic analysis indicated that the translocation efforts increased genetic diversity within the population while not eliminating the local (Iowa) population. Our habitat models showing probability of habitat use by greater prairie-chickens in Iowa will be used by land managers as a tool in land acquisition and in habitat management plans.

Honors and Awards

Alexander Bybel (M.S. Student)

- Elaine Boge Scholarship. 2017. Department of Natural Resource Ecology and Management, Iowa State University

Chris Sullivan (M.S. Graduate)

- John E. Skinner Memorial Award, Honorable Mention. 2016. Education Section, American Fisheries Society.
- Diamond Hitch Award. 2016 Department of Natural Resource Ecology and Management, Iowa State University.
- LaVon Tostenson Scholarship. 2016. Department of Natural Resource Ecology and Management, Iowa State University.
- NREM Graduate Student Professional Development Travel Grant. 2016. Department of Natural Resource Ecology and Management, Iowa State University.
- Janice Lee Fenske Memorial Award, Finalist. 2016. Midwest Fish & Wildlife Conference.

Nicholas Simpson (M.S. Student)

- Elaine Boge Scholarship. 2017. Department of Natural Resource Ecology and Management, Iowa State University

Courtney Zambory (M.S. Student)

- Iowa Natural Heritage Foundation J.N. "Ding" Darling Scholarship
- Dr. Keith McNurlen Award
- Elaine Boge Scholarship
- NREM Travel Grant

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Simpson, N.T., M.J. Weber, C.L. Pierce, and K.J. Roe. 2017. Status and habitat use of the Topeka shiner in the Boone River Watershed, Iowa. Oral presentation given at Iowa Chapter of the American Fisheries Society meeting, Ames, Iowa.

Simpson, N.T., M.J. Weber, C.L. Pierce, and K.J. Roe. 2017. Status and habitat use of the Topeka shiner in the Boone River Watershed, Iowa. Oral presentation given at Midwest Fish and Wildlife Conference, Lincoln, Nebraska.

Stephenson, M.D. 2017. Quantifying the effectiveness of a thermal imaging device for locating grassland bird nests. Poster presentation given at Midwest Fish and Wildlife Conference, Lincoln, Nebraska.

Stephenson, M. D., L. Schulte-Moore, R. W. Klaver. 2017. Quantifying the impact of thermal data loggers on nest survival and estimation of daily survival rate. Midwest Fish and Wildlife Conference. Lincoln Marriott Cornhusker Hotel, Lincoln, Nebraska. 5 – 8 February 2107.

Sullivan, C.J., C.A. Camacho, M.J. Weber, C.L. Pierce, D. H. Wahl, Q. E. Phelps, and R. E. Colombo. 2017. Factors regulating year-class strength of Silver Carp throughout North America (poster). Iowa Chapter American Fisheries Society, Ames, IA.

Swanson, J. E., C. L. Pierce, E. Muths, K. Smalling, M. V. Vandever. 2016. Habitat Use and Pesticide Exposure in Northern Leopard Frogs in Conservation Reserve Enhancement Program Wetlands (contributed paper). Joint Meeting of Ichthyologists and Herpetologists. New Orleans, LA.

Swanson, J. E., C. L. Pierce, E. Muths, K. Smalling, M. V. Vandever. 2017. Habitat use and pesticide exposure in northern leopard frogs in conservation reserve enhancement program wetlands (contributed paper). Midwest Fish and Wildlife Conference, Lincoln, NE.

Swanson, J. E., Yaw, T. J., C. L. Pierce, E. Muths, K. L. Smalling, M. W. Vandever, and B. A. Zaffarano. Use of silicone passive sampling devices (PSDs) for assaying potential exposure of Northern Leopard Frogs to pesticides in agricultural wetlands (poster). Midwest Fish and Wildlife Conference, Lincoln, NE.

Swearingen, T., C. N. Jacques, B. Bluett, **R. W. Klaver**, and C. Anderson. 2017. Home range use and survival of Poster Presentation, Annual Meeting Illinois Chapter of The Wildlife Society, Macomb, Illinois.

Swearingen, T., C.N. Jacques, B. Bluett, **R.W. Klaver**, C. DePerno, J.A. Jenks, C. Anderson. 2017. Evaluating home range size of bobcats in an agriculturally dominated landscape of west central Illinois. Midwest Fish and Wildlife Conference. Lincoln Marriott Cornhusker Hotel, Lincoln, Nebraska. 5 – 8 February 2107.

Trone, E. K., C. N. Jacques, P. A. Shelton, and **R. W. Klaver.** 2017. Post-mortem RNA degradation in white-tailed deer (*Odocoileus virginianus*) in west-central Illinois. Annual Meeting Illinois Chapter of The Wildlife Society, Macomb, Illinois.

Zambory, C.L. (2017) "Utilizing Geospatial Data to Guide Topeka Shiner Conservation." Oral Presentation. Iowa State Natural Resources and Ecology Management Graduate Student Organization IGNITE Talk, Ames, IA.

Zambory, C.L. et al. (2017) "Landscape Approaches for Identifying and Evaluating Potential Restoration Sites for the Conservation of Topeka Shiners." Oral Presentation. North Central Division of the American Fisheries Society Rivers and Streams Technical Committee Meeting, Milan, IL.

Zambory, C. L., C. L. Pierce, M. J. Weber, and K. J. Roe. 2017. Application of Off-channel mapping methodology for identifying and rating oxbow habitats for federally endangered Topeka shiners (contributed paper). Midwest Fish and Wildlife Conference, Lincoln, NE.

Zambory, C. L., C. L. Pierce, M. J. Weber, and K. J. Roe. 2017. The use of landscape variable associations with Topeka shiner occupancy of off-channel habitats to prioritize potential restoration sites (contributed paper). Iowa Chapter American Fisheries Society, Ames, IA.

Zambory, C.L. et al. (2017) "The Use of Landscape Variable Associations with Topeka Shiner Occupation of Off-Channel Habitats to Prioritize Potential Restoration Sites." Oral Presentation. Iowa AFS Chapter Meeting, Ames, IA.

Zambory, C.L. et al. (2017) "The Creation of Iowa's own Watershed Health Assessment Framework to Guide Oxbow Restoration in Iowa for the Conservation of the Topeka Shiner." Poster Presentation. Iowa AFS Chapter Meeting, Ames, IA.

Zambory, C.L. et al. (2017) "Off-channel Mapping Methodology for Identifying and Rating Oxbow Habitats for Federally Endangered Topeka Shiners (*Notropis topeka*)." Oral Presentation. Midwest Fish and Wildlife Conference, Lincoln, NE.

Zambory, CL. (2016) "Prioritization of Restoration Sites for the Conservation of the Topeka Shiner (*Notropis topeka*)." Oral Presentation. IA Coop Unit Annual Meeting, Ames, IA.

Professional Activities

Teaching/Learning Opportunities

Robert W. Klaver

- Analysis of Animal Populations (NREM 611), Fall 2016
- Serendipity (NREM 505/EEB 698), Spring 2017

Clay L. Pierce

- Fisheries Science (AEcl 520), Spring 2017
- "Database Concepts, Design and Application in Fisheries Management", August 2016, (2 day continuing education course for Iowa Chapter of American Fisheries Society)

Nicholas Simpson (M.S.)

- Fish Biology (AEcl 321), Teaching Assistant, Spring 2017, Iowa State University
- Natural History of Iowa Vertebrates (AEcl 366), Teaching Assistant, Spring 2017, Iowa State University
- Fisheries Techniques (AEcl 333), unofficial Teaching Assistant, Fall 2016, Iowa State University

Courtney Zambory (M.S.)

- Basic Map Making in ArcGIS (2016) Iowa State Graduate Student Organization Brown Bag Seminar, Iowa State University, IA

Graduate Committee Service

Robert W. Klaver

Advisor/Co-Advisor

- Jalynn Almond (Ph.D., Department of Natural Resource Ecology & Management, Iowa State University)
- Julia Dale (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Karri Folks (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Joe Lambert (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- David Loney (Ph.D., Ecology and Evolutionary Biology, Iowa State University)
- Audrey McCombs (Ph.D., Ecology and Evolutionary Biology, Iowa State University)
- Bridget Nixon (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Matt Stephenson (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)

Committee Member

- Emily Ball (Ph.D. Department of Natural Resource Ecology & Management, Iowa State University)
- Kelly Boyer (Ph.D. Ecology and Evolutionary Biology, Anthropology, Iowa State University)
- Morgan Mackert (M.S., Ecology and Evolutionary Biology, Iowa State University)
- Amy Moorhouse (M.S., Department of Natural Resource Ecology & Management, Iowa State University), graduated August 2016
- Zach Ruff (M.S., Department of Natural Resources Ecology & Management, Iowa State University), graduated December 2016

Clay Pierce

Advisor/Co-Advisor

- Alex Bybel (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Carlos Camacho (M.S., Department of Natural Resources Ecology & Management, Iowa State University) graduate August 2016
- Nathan Mills (M.S., Department of Natural Resources Ecology & Management, Iowa State University) graduated December 2016
- Christopher Sullivan (M.S., Department of Natural Resources Ecology & Management, Iowa State University), graduated December 2016
- Jennifer Swanson (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Courtney Zambory (M.S., Department of Natural Resources Ecology & Management, Iowa State University)

Committee Member

- Emily Ball (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Nick Simpson (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Andrea Sylvia (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Robert Weber (M.S., Department of Natural Resources Ecology and Management, Iowa State University)

Professional Service

Jessica Bell (Unit Staff)

- Iowa State University Professional & Scientific Council
 - President – Elect: May 2016 - May 2017
 - President: June 2017 – June 2018
- Presidential Search Committee, Iowa State University/Iowa Board of Regents, 2017

Robert Klaver

- American Society of Mammalogists, Member, 1996 – present
- Great Plains Natural History Society, Member, 2010 – present
- Iowa Action Plan Implementation Committee, Member, 2012 – present
- The Wildlife Society
 - Member, 1974 - Present
 - Iowa Chapter, Member, 2012 – present
 - North Central Section, Member, 2012 – present

Clay Pierce

- Invited by US Army Corp of Engineers and The Nature Conservancy to participate in Environmental Flow workshop for the Des Moines River Sustainable Rivers Project, October 25-26, 2016, Pella, IA
- Oxbow fish sampling demonstration for Boone River Watershed landowners and research collaborators, Iowa TNC, April 2017
- American Fisheries Society
 - Continuing Education Committee, Iowa Chapter, Chair, 1997 – present
 - Iowa Chapter, Member, 1994 – present
- Iowa Wildlife Action Plan, Fish Subcommittee, Iowa DNR, Chair, 2008 - present
- Stream Nutrient Technical Advisory Committee, Iowa Department of Natural Resources, Member (invited), 2010 - present
- Wildlife Working Group, Iowa DNR, Member (invited), 2009 – present

Nicholas Simpson (M.S. Student)

- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - Officer, Errington Lecture, 2016-Present
- Oxbow fish sampling demonstration for Boone River Watershed landowners and research collaborators, Iowa TNC, April 2017

Courtney Zambory (M.S. Student)

- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - Seminar Series Fisheries Chair, 2016-2017
 - Field Notes (Graduate Student Magazine) Editor, 2016-2017