



2019 Annual Report

July 2018 – June 2019

Cooperating Agencies:

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

Iowa Cooperative Fish & Wildlife Research Unit

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Contents

Personnel and Cooperators.....	3
New Projects.....	4
Behavioral and Physiological Responses to Anthropogenic Disturbance in Bighorn Sheep.....	5
An Index of Oxbow Restoration Quality for Topeka Shiners Based on the Fish Assemblage	6
Effects of Tile Drainage on Restored Oxbows as Habitat for Endangered Topeka Shiners and Other Biota.....	7
Evaluation of Forest and Wildlife Responses to Aerial Applications of Glyphosate.....	8
Evaluating Floral and Faunal Response to Incorporation of Early Season Forbs into Prairie Restorations	9
Evaluating Restored Mussel Population Genetics and Survivorship.....	10
Continuing Projects.....	11
Monitoring Protocol for Otter and Bobcat in Iowa	12
Ecology of Canada Geese in Urban Areas of Iowa.....	13
Inventory of Coldwater Streams and Associated Fish Communities in the Iowa Driftless Region	14
Reproductive Ecology of Asian Carp in Southeastern Iowa Rivers.....	15
Effects of Tournament Regulation Changes on Largemouth Bass Populations in Iowa	16
Evaluating Wetland Use Patterns Among Spring-Migrating Ducks in Iowa’s Prairie Pothole Region to Inform Strategic Wetland Restoration and Management	17
Survey of Psammophilic Insects in Iowa.....	18
Acoustic Monitoring for Iowa Bats	19
Southern Iowa Forest Monitoring.....	20
Restoring Royalty to the Prairie: Habitat Improvement for the Regal Fritillary and Monarch Butterfly	21
Iowa Multiple Species Inventory and Monitoring (MSIM) Program	22
Completed Projects.....	23
Habitat Improvement Projects for Stream and Oxbow Fish of Greatest Conservation Need: Database and Landscape Analyses	24
Habitat Improvement Projects for Stream and Oxbow Fish of Greatest Conservation Need: Field Monitoring and Assessment.....	25
Boone River Watershed (BRW) Stream Fish and Habitat Monitoring	26
Community Fishing Survey.....	27
Northern Long-Eared Bat Monitoring.....	28
Waterbird Responses to Iowa’s Shallow Lakes Restoration Project.....	29
Honors and Awards.....	30
Professional Activities.....	30
Presentations.....	32
Publications.....	34

Personnel and Cooperators

Unit Coordinating Committee

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

Stephen Dinsmore

Interim Department Chair
Natural Resource Ecology & Management
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Dale Garner

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Todd Bishop

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Craig Czarnecki

Assistant Regional Director
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Joe Larscheid

Fisheries Bureau Chief
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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

Kendra Lee Administrative Specialist, Department of Natural Resource Ecology & Management

Graduate Students

Aaron Matthews, MS*
Alexander Bybel, MS*
Ben Johnson, MS
Ben Luukkonen, MS
Bridget Nixon, PhD
Courtney Zambory, MS*
Dylan Osterhaus, MS
Jordan Giese, PhD
Karri Folks, PhD
Katelyn Miller, MS
Matt Stephenson, PhD
Nathan Tillotson, MS
Nick Simpson, MS*
Samuel Leberg, MS

Collaborating Professors

Adam Janke, NREM
Brian Wilsey, EEOB
Cassandra Nuñez, NREM
David Keiser, Economics
Greg Courtney, Entomology
James Adelman, NREM
Julie Blanchong, NREM
Kevin Roe, NREM/EEOB
Lisa Schulte-Moore, NREM
Mary Harris, NREM
Michael J. Weber, NREM
Miranda Curzon, NREM
Timothy Stewart, NREM
Stephen Dinsmore, NREM

*Graduated

New Projects

Behavioral and Physiological Responses to Anthropogenic Disturbance in Bighorn Sheep

Principal Investigator: Cassandra Nuñez
Robert W. Klaver

Student Investigator: Benjamin Johnson

Collaborators: National Park Service

Duration: August 2018 – August 2021

Funding Source(s): Iowa State University

Goals and Objectives:

The project goal is to understand the behavioral and physiological responses to anthropogenic disturbance in bighorn sheep (*Ovis canadensis*).

Bighorn sheep will be observed in four areas of Glacier National Park to obtain multiple behavioral measures of stress. Visitor surveys will complement the findings of the fieldwork, providing an important idea of visitor perceptions on topics regarding wildlife safety and harassment. All of these results will contribute to the growing literature on the impact of anthropogenic development on antipredator behaviors, explore mechanisms of behavioral trade-offs and energetic costs, and answer key questions about how ecologically relevant behaviors vary between and within age-sex classes of bighorn sheep. This research will provide a picture of the landscape of fear in this species—how individuals balance energetic trade-offs between foraging efficiency and predation risk across available habitats. Results from this research will help wildlife managers at Glacier National Park recognize specific spatial locations in the park where human activity is correlated with stress in resident sheep.

Progress:

Fieldwork in Glacier National Park will begin summer 2019.

Future Plans:

Data analysis will occur after Ben returns from Glacier National Park. Another field season will occur during summer 2020.

An Index of Oxbow Restoration Quality for Topeka Shiners Based on the Fish Assemblage

Principal Investigator:

Clay L. Pierce
Kevin J. Roe
Michael J. Weber

Student Investigator:

Dylan M. Osterhaus

Collaborators:

Corey McKinney, Iowa Soybean Association
Dan Campbell, Syngenta Crop Protection LLC
Karen Wilke, The Nature Conservancy
Aleshia Kenney, U.S. Fish and Wildlife Service

Duration:

January 2019 – December 2021

Funding Source(s):

Iowa Soybean Association

Goals and Objectives:

The overall goal of this study is to develop an index of oxbow restoration quality (index) for conservation of endangered Topeka shiners based on characteristics of the fish assemblage. The specific objectives are to:

1. Compile all existing data on fish assemblages in restored oxbows, including abundance of Topeka shiners and associated environmental data (water quality, habitat, restoration status)
2. Develop the index and apply to all oxbows with fish assemblage data
3. Test the index with a subset of existing test data, new data from concurrent restorations, and with environmental data
4. Synthesize results and provide public outreach, management guidance, and both oral and published dissemination of findings.

Progress:

Data from existing sources have been located and stored in a searchable database. The graduate student was recruited and has begun work.

Future Plans:

Compiling and screening existing data and development of the index will commence in summer of 2019. Testing of the index with a subset of the existing data will be done in late 2019 or 2020. Fieldwork in newly restored oxbows will commence in summer of 2019 and testing of the index with these new data will be done in 2021.

Effects of Tile Drainage on Restored Oxbows as Habitat for Endangered Topeka Shiners and Other Biota

Principal Investigator(s): Clay L. Pierce
Timothy W. Stewart

Student Investigator: Samuel S. Leberg

Collaborators: Keith E. Schilling , Iowa Geological Survey
Corey McKinney, Iowa Soybean Association
Dan Campbell, Syngenta Crop Protection LLC
Karen Wilke, The Nature Conservancy
Aleshia Kenney, U.S. Fish and Wildlife Service

Duration: January 2019 – December 2021

Funding Source(s): Iowa Soybean Association
ISU-NREM

Goals and Objectives:

The purpose of this study is to test whether a promising approach for reducing nutrient export to Iowa's waterways has consequences for an endangered species and other biota. This research will quantify the establishment of biota and habitat conditions in recently restored oxbows, with and without tile drainage, to test the effects of tile drainage on conservation benefits of oxbow restoration. The specific objectives are to:

1. Characterize habitat in two restored oxbows with tile drainage and two without tile drainage, and describe and test for differences between the two tile treatments
2. Characterize plants in two restored oxbows with tile drainage and two without tile drainage, and describe and test for differences between the two tile treatments
3. Characterize fish assemblages in two restored oxbows with tile drainage and two without tile drainage, and describe and test for differences between the two tile treatments
4. Characterize macroinvertebrate assemblages in two restored oxbows with tile drainage and two without tile drainage, and describe and test for differences between the two tile treatments

Progress:

Data from existing sources have been compiled and stored in a searchable database. The graduate student was recruited and has begun work. Preliminary site selection in coordination with stakeholders and landowner contact has begun. Fieldwork is being planned.

Future Plans:

Fieldwork in newly restored oxbows will commence in summer of 2019. Preliminary analyses will take place in late 2019. The activities will be repeated in 2020, and final analyses will be completed in 2021.

Evaluation of Forest and Wildlife Responses to Aerial Applications of Glyphosate

Principal Investigator:	Miranda Curzon
Student Investigator:	Katrina Fernald
Collaborators:	Tyler Harms, Iowa DNR
Duration:	November 2018 - June 2021
Funding Source(s):	U.S. Fish and Wildlife Service's Wildlife Restoration Program and the Iowa DNR Fish and Wildlife Trust Fund

Goals and Objectives:

Objective 1. Quantify forest vegetation response to fall aerial glyphosate application and invasive honeysuckle removal. This will include an assessment of impacts to understory herbaceous plants, shrub species, tree seedlings and saplings, and mature overstory trees.

Objective 2. Evaluate the impact of spray timing on the effectiveness of aerial glyphosate treatment of invasive honeysuckle.

Progress:

We have identified three Wildlife Management Areas to include in the study: Red Rock WMA, Mount Ayr WMA, and Rathbun WMA. We have also recruited a graduate student, Katrina Fernald, to work on the project and lead a summer field crew.

Future Plans:

The graduate student, Katrina Fernald, will work with a field crew to begin field data collection Summer, 2019. This will include the establishment of permanent plots and all pre-treatment vegetation sampling. Aerial treatment of selected plots is scheduled for late Fall, 2019.

Evaluating Floral and Faunal Response to Incorporation of Early Season Forbs into Prairie Restorations

Principal Investigator: Brian J. Wilsey

Student Investigator: Nathan Soley
Daniel Deever (Starting August 2019)

Collaborators: Katy Reeder, Iowa DNR
Stephanie Shepherd, Iowa DNR
Bill Johnson, Iowa DNR
Jessica Peterson, Minnesota DNR
Chad August, Minnesota DNR

Duration: January 2019 – January 2022

Funding Source(s): Iowa Department of Natural Resources
US Fish & Wildlife Service

Goals and Objectives:

The objective of the overall project is to restore and diversify native prairies in northwestern Iowa and southwestern Minnesota. Prairie plantings often lack early and very late flowering forbs that are important to bees, butterflies and other animal species. The goal of the project is to evaluate establishment techniques (seed vs. transplant additions), management (mowing vs. no mowing), phenological flowering state (early vs. late) and number of species (1 or 3) on forb establishment success and usage of plots by bees and butterflies. Results will be used to develop best management practices for establishing meaningful abundances of the focal plant species.

Progress:

The PI met with Iowa DNR personnel, developed an experimental design, and identified sites to be used for the study. Seeds of early (wood betony, prairie phlox, pasque flower, heart-leaved alexander and Canada anemone) and late flowering species (bottle gentian, New England aster, silky aster, and gray goldenrod) have been purchased, and transplants of each species have been grown in the greenhouse. Seeds were tested for viability, and were weighed out for planned seed additions.

Future Plans:

Experimental plots will be embedded in approximately 10 acre, first-year prairie plantings that were seeded with a seed mix that left out the target species listed above. Seed and transplant additions will be completed by the end of May 2019. Plant survival rate will be assessed in the 2019 growing season, and mowing treatments (none or establishment mowing) will commence shortly after the additions have occurred. Insect monitoring in experimental plots will begin during fall 2019 and will continue through the 2020 growing season.

Evaluating Restored Mussel Population Genetics and Survivorship

Principal Investigator:	Kevin J. Roe Clay Pierce
Student Investigator:	Katie Miller
Collaborators:	MN DNR
Duration:	Spring 2019 - Fall 2020
Funding Source(s):	SWG-C

Goals and Objectives:

1. Monitor released mussels to establish survival percentages at 3 release site in Iowa.
 - a. We expect to be able to document annual growth for any individuals captured in more than one year of follow-up monitoring.
2. Analyze genetic diversity of source population for at least one target species.

Progress:

MS student Katie Miller will be conducting a survey this summer to identify suitable reintroduction sites for propagated juvenile mussels. To date the MN DNR has not been able to produce suitable numbers of juveniles for reintroduction into the Cedar River. We anticipate they will be able to provide juveniles of at least two species by the Fall of 2019.

Future Plans:

Once re-introduction sites have been identified and juvenile mussels have been provided, we will introduce juveniles of both species and monitor their growth and survival over the next 2 years. Once source populations are identified we will sample these for genetic diversity and compare these measures to the produced juveniles to estimate the proportion of genetic diversity “captured.” This diversity could be monitored over time to evaluate changes.

Continuing Projects

Monitoring Protocol for Otter and Bobcat in Iowa

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

Goals and Objectives:

1. 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.
2. Performing IPM to provide estimates on otter and bobcat survival, age structure, recruitment, harvest and population trends in Iowa.
3. 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.
4. Validating the habitat suitability map created in item 3.
5. Evaluating the value of current data sources and simulating potential gains by including additional auxiliary data for use in managing Iowan furbearers.
6. Publishing a final report and outlining recommendations to the Iowa DNR for future furbearer monitoring.

Progress:

The continued focus of the 2018 – 2019 year was to work on improving an otter habitat model and preparing for IPM for otter and bobcat. For IPM, we selected additional bobcat teeth for aging. We also continued to work on the otter habitat model and evaluated other options besides negative binomial modeling. After comparing zero-inflated negative binomial and Poisson regressions to a negative binomial regression habitat model, the zero-inflated binomial regression was better at predicting otter presence when compared to observed data. We trapped 21 river otters at Otter Creek Wildlife Management Unit, Chariton area, and north of Clear Lake, Iowa. We are continuing to monitor 15 otters for survival. These data will be critical for our IPM work.

Future Plans:

Integrated population modeling: Once aged, additional bobcat teeth will be included in the dataset. Development of this model continues and will now ultimately include data obtained through radio-telemetry. We will also develop a more traditional reconstructive model for comparison to the IPM.

Otter habitat suitability: Harvest by location will be considered in the framework of an occupancy model and compared to the current habitat model. The map will be validated using additional years of otter capture data.

Radio-telemetry study: Continue to monitor each otter weekly.

Ecology of Canada Geese in Urban Areas of Iowa

Principal Investigator:	Robert W. Klaver
Student Investigator:	Benjamin Luukkonen
Collaborators:	Orrin Jones, Iowa DNR
Duration:	June 2018 – September 2020
Funding Source(s):	Iowa Department of Natural Resources Pittman-Robertson Funds

Goals and Objectives:

The project goal is to evaluate movement and survival of Canada geese in urban and rural areas of Iowa to provide information to improve management and minimize conflict. The specific project objectives are:

1. Evaluate the movement of Canada geese captured in urban areas and compare to movement of geese captured in rural locations where the goose hunting season is closed.
2. Determine susceptibility of Canada geese captured in urban areas to hunting during the Special September and regular Canada goose hunting seasons.
3. Estimate annual survival and recovery rates for Canada geese captured in urban and rural areas.
4. Evaluate a three age-class model to estimate harvest and survival rates of Canada geese in Iowa.
5. Where possible incorporate both live recaptures and dead recoveries to improve statistical precision and accuracy.

Progress:

Forty-five Canada geese were fitted with GPS/GSM transmitters between June 19 and July 9, 2018; thirty transmitters were deployed in urban areas and fifteen were deployed in rural areas closed to Canada goose hunting. Location data is automatically collected at regular intervals (ex. every 15 or 30 minutes) and stored in an online database. Individuals are monitored daily to keep track of movements and detect potential issues such as mortality. Transmitters were recovered from 5 geese that were harvested by hunters and 3 transmitters were recovered from other mortalities.

Banding and dead recovery data spanning 1999-2018 were obtained from the U.S. Geological Survey Bird Banding Lab. Live recapture data for the same time period was obtained from the Iowa Department of Natural Resources. Records were checked for accuracy and were combined to create capture histories for each individual goose. These data were used to design the survival and recovery rate analysis for the final dataset, which will utilize data from 1999-2019. Additionally, specific plans for analyzing movement data were developed. These include calculating home ranges, habitat use, and proportion of locations susceptible to harvest mortality. Preliminary data analysis for both the banding and movement data are ongoing.

Future Plans:

Data analyses will continue and further refinement will occur. We will re-deploy transmitters recovered from mortalities in June and July 2019. Funding became available to purchase an additional 15 transmitters and these will be deployed to increase sample sizes in rural areas. In addition to annual statewide Canada goose banding, focused urban banding will continue in summer 2019 to provide further data for estimating survival and recovery rates for urban-banded geese.

Inventory of Coldwater Streams and Associated Fish Communities in the Iowa Driftless Region

Principal Investigator:	Michael J. Weber
Student Investigator:	Brett Kelly
Collaborators:	Mike Siepker, Iowa DNR
Duration:	December 2018 to December 2019
Funding Source(s):	Iowa Department of Natural Resources US Fish and Wildlife Service

Goals and Objectives:

The objectives of this project are to examine Brook Trout populations in the Driftless Area of northeastern Iowa to:

1. Evaluate the current spatial distribution of their populations.
2. Quantify population characteristics (e.g., abundance, body size, condition).
3. Evaluate effects of biotic and abiotic factors on their distribution and population characteristics.

Introduction:

Coldwater streams occurring throughout the Paleozoic Plateau (Driftless Region) of northeast Iowa are unique resources. However, little effort has been directed towards locating and cataloging these resources. One of the many reasons that the Driftless Region of northeastern Iowa is unique is that it represents the southwestern edge of the Brook Trout's native range. While Brook Trout were once common in the Driftless Region, they nearly disappeared throughout much of the region by the 1970s. In Iowa, the South Pine population of Brook Trout is the only relict population known to currently exist. Yet, fish surveys in other locations where remnant Brook Trout populations may persist are rare and no information exists regarding the current status of Brook Trout in Iowa. Determining if and where Brook Trout populations have persisted or increased within the Driftless Region of Iowa will allow for improved management of this unique species.

Progress:

Sampling in 2019 is currently in progress. Coldwater stream fish communities in Winneshiek, Allamakee, and Clayton counties of Northeast Iowa will be sampled using single or tandem backpack electrofishing units. Three transects will be sampled at each location. Water quality and habitat measurements will be recorded at each location to related site-specific conditions to Brook Trout presence or absence. Brook Trout occupied 16% of the sampled streams (14 of 88) and Brown Trout occupied 58% (51 of 88) of sites sampled during 2018. The most important factor influencing occupancy probability for Brook Trout was water temperature whereas mean wetted width and percent of available riffle habitat were both positively associated with Brown Trout occupancy probability. Our preliminary results suggest that Brook Trout have experienced widespread range reduction across their historic native extent in northeastern Iowa while Brown Trout have experienced range expansion, with wild populations moving upstream into headwater habitats.

Future Plans:

Additional sampling is planned for 2019.

Reproductive Ecology of Asian Carp in Southeastern Iowa Rivers

Principal Investigators:	Michael J. Weber Clay L. Pierce
Student Investigator:	Aaron Matthew (M.S.) Nathan Tillotson (M.S.)
Collaborators:	Kim Bogenschutz, Iowa DNR Jason Euchner, Iowa DNR
Duration:	July 2013 - October 2019
Funding Source(s):	Iowa Department of Natural Resources US Fish and Wildlife Service

Goals and Objectives:

Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*) are invasive species spreading throughout the Upper Mississippi River Basin (UMRB). Like many invasive species, Asian carp have negative economic and ecological impacts. The Upper Mississippi River (UMR) is divided by a series of lock and dams, creating lotic habitat below dams followed by pooled, lentic habitat before the next dam. Pooled sections of the UMR limit reproductive success and inhibit expansion. The objectives of this project are to evaluate reproduction of Bigheaded Carp in the Upper Mississippi River.

Progress:

Egg and larval fishes were sampled from 2014–2018 at the mouths of three major UMR tributaries (Des Moines, Skunk, and Iowa rivers), at Keosauqua on the Des Moines River, as well as the mouths of two additional tributaries (Rock and Wapsipinicon rivers), UMR P17, and UMR P15 from 2016 – 2018. Genetic identification of eggs captured from 2014 – 2016 and yolk-sac larvae collected from 2014 – 2017 revealed successful spawning of Bigheaded Carp in the Mississippi, Des Moines, Skunk, and Iowa rivers. Larval Bigheaded Carp were also at the mouth of the Skunk River in 2018, whereas larvae collected from the other locations during 2018 are still being identified. However, age-0 Bigheaded Carp post yolk-sac absorption were absent from our samples from 2014 – 2017. In 2018, we captured 200 juvenile Silver Carp (~120 mm) and one juvenile Bighead Carp in a backwater of the Skunk River. Juvenile hatch dates matched larval Bigheaded Carp capture dates, indicating that our ichthyoplankton sampling did a good job of detecting reproductive events and that there was no differential survival of Bigheaded Carp between the yolk-sac to juvenile stages. Additionally, adult age structure indicates that Bigheaded Carp recruitment is consistent and recently completed otolith microchemistry revealed that a large portion of adult Bigheaded Carp captured above Lock and Dam 19 were produced from this area.

Across the UMR, highest larval densities (up to 2,900 Bigheaded Carp larvae/m³) from 2014-2017 occurred at low to intermediate adult abundance when the CV of discharge and temperature was low and when the 20 d cumulative discharge was high. Cumulatively, our findings provide evidence of annual Bigheaded Carp reproduction in the UMR up to the Iowa River and now their successful recruitment to the juvenile stage above Lock and Dam 19. Successful Bigheaded Carp reproduction in the UMR will likely facilitate their spread further North in the UMR which can have serious implications for both native fish communities and the public.

Future Plans:

Sampling in 2019 will be occurring when river conditions permit. Laboratory analysis, data entry, and statistical analysis are ongoing.

Effects of Tournament Regulation Changes on Largemouth Bass Populations in Iowa

Principal Investigator:

Michael J. Weber

Student Investigator:

Andrea Sylvia (PhD)
Brandon Maahs (MS)

Collaborators:

Iowa Department of Natural Resources

Duration:

February 2018 – August 2020

Funding Source(s):

Iowa Department of Natural Resources

Goals and Objectives:

1. Evaluate tournament angler group's adoption of the new bass tournament regulations
2. Assess population level effects of bass tournaments pre- and post-regulation bass tournament regulation change

Introduction:

Affinity towards largemouth bass fishing both recreationally and in tournament events is prevalent in lakes throughout Iowa. In 2011, bass anglers in Iowa comprised 44% of the total anglers in the state, spending 2,440 days targeting bass in Iowa waters. Bass tournaments in Iowa are also very popular, with some lakes seeing as many as 45 bass tournaments during the open water season every year (e.g., Brushy Creek). Past tournament regulation in Iowa consisted of registering the event with the Iowa DNR, a three bass bag limit per angler, and a 15" minimum length limit. Under these conditions, approximately 30% of the bass population in Brushy Creek is weighed in during tournaments each year (A. Sylvia, unpublished data). However, in 2017, the Iowa legislature enacted a law increasing the bag limit to five bass per angler and no minimum length limit (registration of tournaments with the DNR is still required). Once these new regulations are implemented in January 2018, they have the potential to impact largemouth bass populations on Iowa lakes with heavy tournament pressure. Yet, it is unknown to what effect these regulation changes will affect bass populations. Increasing live-well densities, tournament weigh-in procedure times, and increasing fish densities at release locations can all be affected by increased bag limits, potentially resulting in increased bass mortality. Decreasing length limit regulations of bass also cause a larger portion of bass populations to be susceptible to potential tournament associated mortality. However, not all bass tournaments may abide by the newly enacted regulations. While bass tournament regulations have become more relaxed in Iowa, many tournament fishing clubs impose more stringent self-regulation than those of the state management agency. Thus, to what extent new Iowa regulations may impact bass populations remains unknown.

Progress:

2019 sampling is currently in progress. Boat electrofishing has been conducted on a monthly basis to capture and tag bass. Between 1 and 4 bass tournaments are attended each week where all bass weighed-in are measured for length and weight, tagged and released. A subset of bass have also been implanted with a radio transmitter and are tracked on a weekly basis to evaluate movement patterns, habitat use, angler catches, and survival. Thirteen of 14 tournament groups, but only 42% of the total tournaments, adopted some variation of the new regulations in 2018. More bass were weighed-in at tournaments in 2018 (n=1,808) compared to 2015-2017 (mean = 1,534/year) and there were more initial mortalities (54 bass in 2018) compared to previous years (mean = 30 bass/year from 2015-2017). However, tournaments that adopted new regulations only captured more bass per angler per tournament during May and June than the group that did not adopt new regulations whereas number of bass captured was similar between the two groups during other months. Additionally, tournaments retained 26% of the population during 2018, similar to 2015-2017. However, tournaments captured 229 bass <380-mm (15") in 2018 compared to less than 137 bass captured in this size-class from 2015 to 2017.

Future Plans:

Sampling will be completed in fall 2019. Data will then be analyzed and a final report will be completed by summer 2020.

Evaluating Wetland Use Patterns Among Spring-Migrating Ducks in Iowa's Prairie Pothole Region to Inform Strategic Wetland Restoration and Management

Principal Investigator:	Adam Janke
Student Investigator:	Derek Ballard
Collaborators:	Orrin Jones, Iowa DNR
Duration:	November 2017 – May 2020
Funding Source(s):	USFWS Region 3 Migratory Birds Joint Venture

Goals and Objectives:

The goal of this research is to address information gaps in the understanding of duck use of modern prairie wetland landscapes during spring migration to inform wetland conservation priorities in intensively farmed regions of the PPR. These landscapes are traditionally out of the scope of breeding-focused habitat conservation programs in the region and therefore may be best-served by an alternative conservation and management paradigm than typically used across the PPR landscape for breeding-habitat conservation. The specific objectives of our proposed research are to:

1. Document the relative use of key wetland types by spring-migrating ducks to understand the contribution of specific wetland classes to migrants at the landscape scale.
2. Describe the spatial distribution of ducks during spring migration in the Iowa PPR.
3. Identify wetland factors associated with use or avoidance by spring migrating ducks, including landscape context, vegetation composition, wetland size, and basin characteristics.

Progress:

During 2018-2019 we conducted preliminary analyses on the 2018 field season and gave two oral presentations on the work at statewide wildlife meetings. During the second and final field season in 2019 we randomly selected 14 PPJV focal areas and approximately 15 wetlands per focal area for waterfowl surveys and wetland sampling ($n = 210$). We also monitored duck use of approximately 100 sheetwater wetlands in crop fields with road-based surveys within focal areas. We obtained permission from approximately 45 landowners to conduct the research. We started surveys during March when ducks began to arrive in northern Iowa and at the time of submitting this report, surveys are ongoing and will be terminated in early May. During surveys, we recorded abundance of all duck species present as well as several vegetation characteristics, and measured water depth in each wetland.

Future Plans:

At the completion of the 2019 field season, we will enter and analyze data and write the final report with an expected graduation date for Derek Ballard of May 2020.

Survey of Psammophilic Insects in Iowa

Principal Investigator:	Gregory Courtney
Student Investigator:	
Collaborators:	
Duration:	April 2018 – April 2020
Funding Source(s):	Iowa Department of Natural Resources Wildlife Diversity Small Grants Program

Goals and Objectives:

Short-term goals:

1. Survey shifting-sand and marginal sand-bar habitats across the state for the presence and abundance of psammophilic (“sand-loving”) taxa.
2. Gather phenological and other life-history information on resident psammophilic taxa.
3. Correlate taxon richness with environmental/habitat variables to identify potential indicator taxa.
4. Make lists of taxa and images available as an interactive web-based e-source.

Long-term products:

Because this habitat has been largely ignored in most benthic surveys, this study will provide range extension information for many taxa and new records of insect species to Iowa. Specimens in ethyl alcohol will provide fresh specimens to be utilized for molecular and phylogenetic analyses.

Progress:

To effectively survey psammophilic aquatic insects, it is necessary to sample substrates that are inherently unstable (i.e., shifting-sand!). This can be problematic (and dangerous) when river levels are high. Mid- to late-summer 2018 was exceptionally wet in Iowa, especially in the northern half of the state. The frequency of storms through May and June led to flooding and consistently high river levels throughout the area, as well as in downstream reaches of major watersheds (e.g., Des Moines River). Except for rivers in southwest and central Iowa, sampling was not possible and even in areas where sampling was possible, marginal psammophilic habitats (vs. truly aquatic habitats) were often the only alternative.

Despite high river levels during the early and mid-summer, surveys were conducted at 18 locations, all in either southwest or central Iowa. Most samples were from marginal sand rather than truly aquatic habitats, again because of high water levels. Almost all marginal samples contained a predictable assemblage of psammophilic Carabidae (e.g., *Bembidion* Latreille, *Chlaenius* Bonelli, *Clivina* Latreille, *Elaphrus* Fabricius, & *Omophron* Latreille). *Omophron* samples include 4 known species, the most notable being *O. grossum* Casey, previously known from only three Iowa specimens, all collected pre-1950. Most truly aquatic samples include nymphs of the Common Sanddragon (*Progomphus obscurus* (Rambur)). Samples from two sites contained the unusual mayfly, *Pseudiron centralis* McDunnough, one of several species likely to have been significantly impacted by June flooding.

Future Plans:

Because of our atypical summer 2018 and persistently high river-levels, and its negative impact on resident populations of psammophilic organisms, I requested a 1-year extension on this grant. My hope is that 2019 will be an “average” year for precipitation and river levels, so I can effectively sample Iowa’s psammophilic taxa throughout the summer (and throughout the state!). For these reasons, a 1-year extension was granted.

Acoustic Monitoring for Iowa Bats

Principal Investigator(s):

Julie Blanchong
Adam Janke

Student Investigator:

Collaborators:

Kelly Poole, Iowa DNR
Stephanie Shepherd, Iowa DNR

Duration:

June 1, 2015 – December 31, 2020

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
- Identify habitat features associated with the probability of bat detection
- Develop outreach materials to educate Iowa citizens about white-nose syndrome

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 critically needed to understand the potential ramifications of WNS to Iowa. To gather data on bat abundance and distribution in Iowa, acoustic monitoring has been conducted for several summers along transects in eastern, central and southern Iowa.

In 2018, as in previous summers, 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 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 12 drive transects in central, eastern, and southern Iowa and at 3 fixed-location survey sites, one in each region. Each transect was surveyed once in June and again in July. Similar to previous years, bat activity on drive transects was highest in Eastern Iowa. Regional differences in detections were similar to findings in previous years. Specifically, in Central and Southern Iowa, low frequency bats (e.g., big brown, hoary, silver-haired) were most commonly recorded. In the Eastern region, high frequency and *Myotis* bats, which includes Eastern red, evening, Indiana, little brown, northern long-eared, and tricolored bats, were most commonly detected.

Interpretive informational posters about the bats of Iowa and about the conservation importance of bats were produced for use in education and outreach activities.

Future Plans:

We will continue to conduct drive transect surveys during summer 2019 to record echolocation calls. We will also survey at least three fixed location sites. As in previous years, the IDNR will recruit volunteers to conduct the surveys. ISU will hold orientation sessions to train volunteers. ISU will continue to be responsible for analyzing the data collected by the volunteers to quantify bat activity and identify bat species. Outreach efforts to educate citizens about bats, bat habitat, and white-nose syndrome will continue.

Southern Iowa Forest Monitoring

Principal Investigator:	Stephen Dinsmore
Student Investigator:	Benjamin West (M.S. student) Two undergraduate field technicians
Collaborators:	Jeff Goerndt, Iowa DNR
Duration:	August 2015 to September 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 2016-2018 using the same methodology. 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. The five most abundant species were similar across years: 2016 (Blue Jay, E. Wood-pewee, American Crow, Ovenbird, White-breasted Nuthatch), 2017 (E. Wood-pewee, American Crow, Blue Jay, N. Cardinal, Ovenbird) and 2018 (E. Wood-pewee, American Crow, Blue Jay, N. Cardinal, Eastern Towhee).

Future Plans:

Additional surveys and data analyses will continue through 2019 and a final project report will be submitted this fall along with a M.S. thesis in summer 2020.

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

Principal Investigator: Stephen J. Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Katy Reeder, Iowa DNR
Stephanie Shepherd, Iowa DNR
Rachel A. Vanausdall, Iowa State University
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:

In 2018 we conducted no surveys because this was the middle year when scheduled habitat management actions were occurring.

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.

The first year of butterfly and vegetation monitoring in 2017 is complete and site management actions occurred in 2018. The second (and final) field season will occur in 2019.

Iowa Multiple Species Inventory and Monitoring (MSIM) Program

Principal Investigator:	Stephen J. Dinsmore
Student Investigator:	~20 seasonal field technicians
Collaborators:	Karen E. Kinkead, Iowa DNR Rachel A. Vanausdall, Iowa State University
Duration:	July 2015 to December 2019
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 2018 the MSIM program employed 5 field crews of 4 technicians each (20 technicians in total) stationed in Boone, Ruthven, Chariton, Tripoli, and Iowa City. Fieldwork for this project began with training on 15 April and ended on 15 October 2017. The field season began with a training session at the Boone Wildlife Research Station in mid-April 2017 to prepare field technicians for the field season and familiarize them with the MSIM protocols. We completed surveys implementing MSIM protocols at 68 study sites across Iowa. This total includes the 50 traditionally surveyed "permanent" MSIM sites, 12 additional public lands sites, and 6 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 >1800 wildlife surveys conducted on these study sites and approximately 100 survey-related tasks such as site setup and teardown. A summary of species seen by taxa includes 43 mammals (8 SGCN), 180 birds (61 SGCN), 48 herpetofauna (25 SGCN), 79 odonates (13 SGCN), 56 lepidoptera (7 SGCN), 47 fish (8 SGCN), and 8 crayfish. We encountered many noteworthy sightings in several taxonomic groups including Bobcat (6 sites), River Otter (3 sites), Meadow Jumping Mouse (9 sites), Red Squirrel (2 site), Northern Bobwhite (14 sites), Henslow's Sparrow (12 sites), Central Newt (2 sites), Smallmouth Salamander (1 site), Woodhouse's Toad (6 sites), Blanding's Turtle (5 sites), Six-lined Racerunner (1 site), Prairie Ringneck Snake (6 sites), Sulphur-tipped Clubtail (1 site), Rusty Snaketail (1 site), Spangled Skimmer (3 sites), Regal Fritillary (4 sites), Monarch (46 sites), Zebulon Skipper (4 sites), and Grass Pickerel (3 sites).

Future Plans:

Field work will continue in 2019, beginning with a workshop in late March to train new temporary technicians prior to the 2019 field season. We will also continue with several analyses of MISIM data with the goal of publishing it in the peer-reviewed literature. Two papers using the MSIM monarch data are in press and we are working on submitting a bird SGCN paper soon.

Completed Projects

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

Principal Investigators:

Clay L. Pierce

Kevin J. Roe

Michael J. Weber

Student Investigator:

Courtney L. Zambory (M.S.)

Collaborators:

Karen Kinkead, Iowa DNR

Todd Kolander, MN DNR

Aleshia Kenney, USFWS

Duration:

January 2016 – December 2018

Funding Source(s):

US Fish and Wildlife Service

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*). 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.

Results:

Using LiDAR derived digital elevation models we characterized the morphologic and topographic characteristics of floodplain depressions and developed classification trees to distinguish relic streams and oxbows from other landscape features. Our models demonstrated strong ability to distinguish between these features. Ensemble species distribution models were created with the R package biomod2 for streams and off-channel habitats using multiscale landscape variables. Model projections and variable importance were generated for each modeled habitat and watershed combination. Off-channel habitat suitability were projected onto 3,557 potential restoration sites identified using the top results of an off-channel identification process. Percent forest cover was the most frequent variable identified as having a negative effect on Topeka Shiner presence and was influential in all oxbow models except in the Rock River watershed model. Percent water cover was negatively associated with Topeka Shiner presence and the most influential variable in most stream analyses. Ensemble models performed very strongly in identifying suitable and unsuitable habitat for all models.

Conclusions and Recommendations:

This process identifies potential restoration sites and provides information to managers to select appropriate restoration locations, but final site selection should be accompanied by local knowledge, proximity to known Topeka Shiner populations, potential risks to infrastructure, and of course landowner permission, if on private land. There is natural risk to fishes that inhabit ephemeral off-channel habitats as extended periods of dry weather can lead to complete desiccation and complete fish mortality within the off-channel habitat, so features with lower relative elevations to the stream channel may be priority sites for restoration as they are more likely to be closely connected to the groundwater at the hyporheic zone. Groundwater percolation into the restored off-channel habitat may be critical for fish survival during extending periods of little or no precipitation. Habitat modeling of potential restoration sites may allow managers to prioritize areas where restorations may be most effective for the target species.

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

Principal Investigators:	Clay L. Pierce Kevin J. Roe Michael J. Weber
Student Investigator:	Alexander P. Bybel (M.S.)
Collaborators:	Karen Kinkead, Iowa DNR Todd Kolander, MN DNR Aleshia Kenney, USFWS
Duration:	January 2016 – December 2018
Funding Source(s):	US Fish and Wildlife Service

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.

Results:

Analysis of population structure across the range of Topeka shiners revealed seven populations were present. Sites clustered into larger basins of the Des Moines River and the Missouri River basins, with a third grouping in Kansas that encompassed the Kansas River and Cottonwood River basins as well as Sugar Creek in Missouri. Analysis of the Kansas and Sugar Creek group indicated it consisted of two populations, one group consisting of three sites in the Kansas River and a second consisting of the Cottonwood River Basin and Sugar Creek Basin. The Kansas River group split again with Willow Creek Basin forming one population and the two sites from Deep Creek in the Kansas River Basin forming the other. The Cottonwood River Drainage and the Sugar Creek Drainage were also identified as separate groups. Four distinct demes were identified in both the Rock River and Boone River basins. No comparison of genetic diversity between oxbows and streams was significantly different.

Conclusions and Recommendations:

Once widely distributed and well interconnected throughout the Midwest, landscape, floodplain, and stream alteration has reduced the distribution of Topeka shiners to multiple fragmented and genetically isolated populations with moderate genetic diversity. Although full reestablishment of historical connectivity may not be feasible due to large geographic distances and anthropogenic barriers between populations, increasing the amount and distribution of suitable habitat to maintain current populations and allow natural reestablishment of Topeka shiners is a worthy goal. The maintenance of genetic diversity and therefore adaptive potential is crucial to the survival of Topeka shiners in a changing environment.

Boone River Watershed (BRW) Stream Fish and Habitat Monitoring

Principal Investigators:

Clay L. Pierce
Michael J. Weber
Kevin J. Roe

Student Investigator:

Nicholas Simpson (M.S.)

Collaborators:

Scott Grummer, Iowa DNR
Karen Wilke, The Nature Conservancy, TNC
Aleshia Kenney, USFWS

Duration:

January 2016 – 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.

Results:

In 2016-2017, fish, water quality, and habitat surveys were conducted at 111 stream sites within the Boone, Beaver Creek, North Raccoon, and Rock River watersheds. A total of 72,971 individual fish of 58 different species were collected. A total of 13 SGCN were collected in states where they were listed. At least one SGCN was sampled at 94 of 111 sites, with a maximum of six SGCN collected at four sites. A total of 790 Topeka Shiners were sampled at 40 of 111 (36%) sites throughout all watersheds in this study. Fish assemblages and abiotic characteristics differed between sites where Topeka Shiners were present and absent. Topeka Shiners tended to be present at sites with lower relative abundances of Golden Redhorse and Channel Catfish. Sites where Topeka Shiners were present often had lower amounts of canopy cover, tree and root wads, woody riparian vegetation, instream woody debris, and instream small brush compared to sites where they were absent. The top model set for the all variables model included 15 candidate models with $\Delta AIC_c \leq 2$. Canopy cover, Fantail Darter CPUE, and Orangespotted Sunfish CPUE were common to all candidate models in the top model set. Canopy cover and Fantail Darter CPUE were negatively associated with Topeka Shiner presence whereas Orangespotted Sunfish CPUE had a positive association with Topeka Shiner presence. The top model set for the abiotic variables model included five candidate models with $\Delta AIC_c \leq 2$. Canopy cover and temperature were included in all candidate models in the top model set. Canopy cover was negatively associated with Topeka Shiner presence whereas temperature had a positive association with Topeka Shiner presence. The top model set for the fish abundance variables model included 14 candidate models. Fantail Darter CPUE and Orangespotted Sunfish CPUE were included in all candidate models in the top model set. Fantail Darter CPUE was negatively associated with Topeka Shiner presence whereas Orangespotted Sunfish CPUE was positively associated with Topeka Shiner presence.

In 2016-2017, fish, water quality, and habitat surveys were conducted at 98 total oxbows within the Boone, Beaver Creek, North Raccoon, and Rock River watersheds, including 64 restored oxbows and 34 unrestored oxbows. A total of 166,497 individual fish of 49 different species were collected. Forty species and 123,995 individuals were sampled in restored oxbows compared to 46 species and 42,502 individuals in unrestored oxbows. Topeka Shiners were collected at 40 oxbows, including 29 of 64 (45.3%) restored oxbows and 11 of 34 (32.4%) unrestored oxbows and represented the 9th most abundant and the 12th most commonly occurring species overall. An average of 0.75 (± 0.31 ; mean $\pm 95\%$ CI) Topeka Shiners were sampled per 100m² in unrestored oxbows compared to 6.73 (± 5.10 ; mean $\pm 95\%$ CI) Topeka Shiners per 100m² in restored oxbows (two sample t-test: $P = 0.03$). Oxbows with Topeka Shiners also had a higher average species richness, 13.0 (± 1.22 ; mean $\pm 95\%$ CI) than oxbows without Topeka Shiners (7.89 ± 1.19 ; two sample t-test: $P \leq 0.001$).

Conclusions and Recommendations:

Thought to be on the decline and possibly near extinction in much of the Boone River watershed, Topeka Shiners were surprisingly abundant, being present at 34% of 95 total sites in the watershed. This could signal a recovery, which would coincide with the increased effort to restore oxbows throughout the watershed in recent years. Topeka Shiners were present at 80 of 209 (38%) total sites across all watersheds in 2016-2017, including 41% of oxbows and 36% of stream sites. This demonstrates the importance of both habitat types in the life cycle of Topeka Shiners and therefore, why it is important for biologists to further understand associations of the species in streams and oxbows to improve conservation practices. Topeka Shiners were generally more abundant in oxbows than streams, potentially indicating that oxbows are a more important habitat for some life processes, such as spawning. Thus, continuing oxbow restorations could be key for a recovery. Modeling results show a positive association of Topeka Shiners with Orangespotted Sunfish CPUE in streams and in oxbows.

Community Fishing Survey

Principal Investigator: David Keiser
Student Investigator:
Collaborators: Yongjie Ji (ISU)
Duration: May 2018 – December 2018
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

Conduct household survey on a sample of around 2,500-targeted households living in several urban communities in Iowa to learn about household fishing experiences and other factors that affect their fishing participation decisions.

Progress:

- Finished the household survey questionnaires both in paper and online (June, 2018 – July, 2018)
- Sent out the first round of survey invitation letters to around 2,500 households (July, 2018)
- The survey was closed at the end of October, 2018

Conclusions and Recommendations:

The survey results show that most urban residents are interested in fishing to various degrees. The willingness to participate in future fishing activities is related to childhood experience, gender and age demographics. Respondents reported constraining factors include poor water quality, lack of opportunities, lack of mentorship, safety of eating fish, and accessibility to fishing sites. The degree to which respondents feel constrained differ among active anglers and non-active anglers.

In general, the results identify an ideal fishing trip consists of catch-related and experiential factors with more weights put on catch-related factors by active anglers. For the favorability of amenities on fishing sites, respondents show preferences for on-site amenities like bathrooms, parking areas, and access facilities. The most favored type of facilities differ across gender and age.

Northern Long-Eared Bat Monitoring

Principal Investigator: Julie Blanchong
Student Investigator:
Collaborators: Kelly Poole, Iowa DNR
Duration: April 22, 2016 – December 31, 2018
Funding Source(s): Iowa DNR

Goals and Objectives:

This was 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.

Progress:

In summer 2016 and again in 2017, 120 sites identified as likely to contain habitat for NLEB in 60 counties in central and western Iowa were monitored for bat activity using acoustic methods. Additionally, several putative hibernacula were monitored for bat activity in both fall and spring as well as from February through late April in 2018. In summer 2018, 30 sites located in 20 counties in central Iowa were monitored to bat activity using acoustic methods. Echolocation data were analyzed to identify presence or probable absence of NLEB as well as Indiana bats, little brown bats, tricolored bat at each site using USFWS approved bat call identification software.

Conclusions and Recommendations:

For this study, stationary acoustic surveys were used to collect data on the presence or probable absence of the federally threatened northern long-eared bat, the federally endangered Indiana bat (within the USFWS published range), the little brown bat, and the tricolored bat at sites on public land identified by the Iowa DNR as containing suitable summer habitat or possible hibernacula. MidAmerican Energy Company will use these data to create a habitat conservation plan associated with their wind energy development in Iowa.

Waterbird Responses to Iowa's Shallow Lakes Restoration Project

Principal Investigator:	Stephen Dinsmore
Student Investigator:	Rachel Vanausdall (M.S.)
Collaborators:	Mark Gulick, Iowa DNR Todd Bishop, Iowa DNR
Duration:	August 2015 to December 2018
Funding Source(s):	Iowa Department of Natural Resources 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 three field seasons (2016, 2017, and 2018). Breeding waterbirds were not surveyed in 2018.
- 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, 2017, and 2018, located within 12 Iowa counties. All surveys were conducted by Rachel Vanausdall and seasonal field technicians. 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.

Conclusions and Recommendations:

The third year of fieldwork was completed in 2018. Rachel Vanausdall completed her M.S. thesis in spring 2018 and the 2018 data were added to the final project report.

With respect to spring migration surveys, the important findings included:

- Non-restored sites hosted the fewest species and number of individuals and were dominated by piscivorous birds
- Young restorations hosted greater species diversity and more individuals, especially diving ducks and secretive marshbirds
- Old restorations were similar to young restorations and had the greatest use by dabbling ducks and other waterbirds (e.g., rails)

With respect to breeding bird use of shallow lakes, the important findings included:

- Environmental variables (day of season, wind speed, time of day) were important considerations for the detection probability of marsh passerines
- There were strong observer effects in detection probability
- Vegetation height and density affected the detection probability of some species

Honors and Awards

Nathan Tillotson

- Izaak Walton League of America Dr. Keith McNurlen Award. 2019

Ben Johnson

- EEB First-Year Fellowship, ISU Ecology and Evolutionary Biology Program, 2018
- ISU Graduate College Scholar Award, 2018
- 2019 Glacier National Park Conservancy – Jerry O'Neal Research Fellowship

Ben Luukkonen

- Washington Brant Foundation Scholarship, 2019

Professional Activities

Teaching/Learning Opportunities

Robert Klaver

- Analysis of Animal Populations (A_ECL 611) Fall 2018

Clay Pierce

- Fisheries Science (A_ECL 520), Spring 2019

Ben Johnson

- Mammalogy Laboratory (AECL 459L), Teaching Assistant, Spring 2019

Ben Luukkonen

- Database Design Short Course, Department of Fisheries and Wildlife, Michigan State University, August 2018
- Accepted to participate in the Waterfowl Breeding Ecology in the Prairie Pothole Region Field Course, Delta Waterfowl, May 2019

Nathan Tillotson

- Fisheries Techniques (A_ECL 333) Backpack Electrofishing/Gill Netting Lab Assistant, Fall 2018
- Undergraduate Research (HON 290), Adviser/Mentor for an undergraduate research project, Spring 2019

Graduate Committee Service

Robert W. Klaver

Advisor/Co-Advisor

- Ben Johnson (M.S. Department of Natural Resources Ecology & Management, Iowa State University)
- Ben Luukkonen (M.S. Department of Natural Resources Ecology & Management, Iowa State University)
- Bridget Nixon (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Karri Folks (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

- Jordan Giese (Ph.D., Department of Natural Resource Ecology & Management, Iowa State University)
- David Loney (Ph.D., Ecology and Evolutionary Biology, Iowa State University)
- Emily Ball (Ph.D. Department of Natural Resource Ecology & Management, Iowa State University)
- Jeremy Andersen (M.S., Ecology and Evolutionary Biology, Iowa State University)
- Morgan Mackert (M.S., Ecology and Evolutionary Biology, Iowa State University)
- Robert Valek (Ph.D., Sustainable Agriculture, Iowa State University)

Clay Pierce

Advisor/Co-Advisor

- Alex Bybel (M.S., Department of Natural Resources Ecology & Management, Iowa State University) Graduated 2018
- Aaron Matthews (M.S., Department of Natural Resources Ecology & Management, Iowa State University) Graduated 2019
- Nathan Tillotson (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Courtney Zambory (M.S., Department of Natural Resources Ecology & Management, Iowa State University) Graduated 2018
- Sam Leberg (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Dylan Osterhaus (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Katelyn Miller (M.S., Department of Natural Resources Ecology & Management, Iowa State University)

Committee Member

- Bridget Nixon (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- 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) g Graduated 2018
- 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)
- Brett Kelly (M.S., Department of Natural Resources Ecology and Management, Iowa State University)

Professional Service & Outreach

Robert Klaver

- Participated in the Iowa DNR Wildlife Bureau Statewide meeting
- Evaluated abstracts for The Wildlife Society 2019 meeting
- Peer review articles for multiple scientific journals
- 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 Polk County Conservation Board to lead the fish sampling portion of a Bioblitz, Fourmile Creek Greenbelt, June 7-8, 2019
- Invited by Syngenta Crop Protection LLC to review a population modeling project for the purpose of improving habitat restorations for the federally endangered Topeka shiner, March 2019
- Invited by Iowa Water Center to serve as a water professional interviewee for their high school student essay
- Iowa Department of Natural Resources, Iowa Wildlife Action Plan – Fish Subcommittee Chair (2008 to present)
- American Fisheries Society
 - Member 1987 to present
 - Iowa Chapter member 1994 to present
 - Continuing Education Committee Chair (1997 to present)
 - Organized 15 continuing education courses
 - Taught one continuing education course

Ben Johnson

- ISU NREM Graduate Student Organization, 2019 – present
- Errington Lecture Committee Member, Graduate Student Representative, 2019 - present

Ben Luukkonen

- The Wildlife Society, student member 2016—present
- ISU NREM Graduate Student Organization Treasurer April 2019—present

Matthew D. Stephenson

- Iowa Ornithological Union, Member, 2015-present
- The Wildlife Society, student member 2014-present
- ISU Department of Natural Resource Ecology and Management Graduate Student Organization volunteer committee chair 2019-present
- ISU Transportation Advisory Council representative, 2018-present

Nathan Tillotson

- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - Graduate and Professional Student Senate, 2019 - Present

Presentations

Davis, E. D., T. C. Swearingen, **R. W. Klaver**, and C. N. Jacques. 2019. Evaluating survival and cause-specific mortality of bobcats in west-central Illinois. 79th Midwest Fish and Wildlife Conference, Cleveland, Ohio. 27 – 30 January 2019.

Davis, E. D., T. C. Swearingen, **R. W. Klaver**, C. R. Anderson, J. A. Jenks, C. S. DePerno, R. D. Bluett, and C. N. Jacques. 2019. Influence of spatial alignment on photographic detection rates at remotely triggered camera stations. 79th Midwest Fish and Wildlife Conference, Cleveland, Ohio. 27 – 30 January 2019.

Davis, E. D., T. C. Swearingen, **R. W. Klaver**, and C. N. Jacques. 2019. Evaluating survival and cause-specific mortality of bobcats in west-central Illinois. Western Illinois University Graduate Research Conference, Macomb, Illinois. 25 March 2019.

Davis, E. D., T. C. Swearingen, **R. W. Klaver**, C. R. Anderson, J. A. Jenks, C. S. DePerno, R. D. Bluett, and C. N. Jacques. 2019. Estimating density of bobcats in midwestern landscapes using spatial capture-recapture models. 55th Annual Meeting of the Illinois Chapter of The Wildlife Society, Springfield, Illinois. 14 April 2019.

Davis, E. D., **R. W. Klaver**, and C. N. Jacques. 2019. An evaluation of immobilizing drugs during bobcat (*Lynx rufus*) field processing events. 55th Annual Meeting of the Illinois Chapter of The Wildlife Society, Springfield, Illinois. 14 April 2019.

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- Matthews, A. J.**, M. J. Weber, and **C. L. Pierce**. 2019. Asian Carp population evaluation along the invasion edge in the Upper Mississippi River (contributed paper). Iowa Chapter American Fisheries Society, Moravia, IA. February 2019.
- Tillotson, N. A.**, M. J. Weber, and **C. L. Pierce**. 2019. Reproduction of Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*Hypophthalmichthys nobilis*) Along the Upper Mississippi River Invasion Front. Iowa Chapter of the American Fisheries Society, Moravia IA. February 2019.
- Tillotson, N. A.**, M. J. Weber, and **C. L. Pierce**. 2019. Reproduction of Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*Hypophthalmichthys nobilis*) Along the Upper Mississippi River Invasion Front. Rivers and Streams Technical Committee Meeting, Moline IL. April 2019.
- Giese, J.C.**, and M. E. O'Neal. Birds, pollinators, and other wildlife: new findings from prairie STRIPS biodiversity research. Iowa Water Conference, Ames, IA, 2019
- Johnson, Benjamin**. Antipredator behavior in a human-impacted landscape. Ignite Talks, Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA. 2019
- Johnson, Benjamin**. Group identity as a driver of behavioral variation in the red-bellied lemur. Graduate Student Poster Symposium, Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA. 2018
- Jones, O. E., **B. Z. Luukkonen**, and **R. W. Klaver**. 2018. Investigating the ecology of Canada geese in urban Iowa. Iowa Department of Natural Resources Central Wildlife District Fall Meeting. 27 September 2018.
- Luukkonen, B. Z.**, and S. R. Winterstein. 2018. Aerial survey and Lincoln estimates of Canada goose abundance in Michigan. Iowa State University Department of Natural Resource Ecology and Management Graduate Student Research Symposium. 7 December 2018.
- Stephenson, Matt** Are prairie strips suitable wildlife habitat? Stephenson, M. ISU fish and wildlife biology club meeting. March 2019. Ames, Iowa. 15 attendees.
- Stephenson, Matt** Fragments of a once-great plains or islands in an agricultural sea: Relative importance of edge configuration versus isolation for nest survival and density in prairie strips. Stephenson, M. ISU NREM Department lighting talk. March 2019. Ames, Iowa. 60 attendees.
- Stephenson, Matt** On-farm experiences with prairie and crops: Farmers talk about prairie strips program and prairie on farms. De Kok-Mercado, O., M. Stephenson, A. Kittle, T. Smith, R. Stout, J. Kramer. Iowa Water Conference. March 2019. Ames, Iowa. 50 attendees
- Stephenson, Matt**...Reptile and small mammal occupancy in prairie strips integrated in an agricultural landscape. Stephenson, M. Midwest Fish and Wildlife Conference. January 2019. Cleveland, Ohio. 55 attendees.

Publications

Blanchong, Julie A., Christopher A. Anderson, Nicholas J. Clark, **Robert W. Klaver**, Paul J. Plummer, Mike Cox, Caleb Mcadoo, and Peregrine L. Wolff. 2018. Respiratory disease, behavior, and survival of mountain goat kids. *Journal of Wildlife Management* 82:1243-4251.

Schuler, K.L., J.A. Jenks, **R. W. Klaver**, C.S. Jennelle, and R.T. Boyer. 2018. Chronic wasting disease detection and mortality sources in semi-protected deer population. *Wildlife Biology* 2018:wlb.00437.

Stephenson, M.D., L.A. Schulte, **R.W. Klaver**. 2019. Quantifying thermal-imager effectiveness for detecting bird nests on farms. *Wildlife Society Bulletin*. (in press).

Sullivan, C. J., M. J. Weber, **C. L. Pierce**, and C. A. Camacho. 2018. Influence of river discharge on grass carp occupancy dynamics in southeastern Iowa rivers. *River Research and Applications* 2018:1-8. DOI: 10.1002/rra.3385.

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Pierce, C. L., **N. T. Simpson**, **A. P. Bybel**, **C. L. Zambory**, M. J. Weber, and K. J. Roe. *In Press*. Status of the Topeka shiner in Iowa. *American Midland Naturalist*.

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Swanson, J. E., **C. L. Pierce**, S. J. Dinsmore, K. L. Smalling, T. W. Stewart, M. W. Vandever, and E. Muths. 2019. Factors influencing anuran wetland occupancy in an agricultural landscape. *Herpetologica* 75(1):47-56. <https://doi.org/10.1655/HERPETOLOGICA-D-18-00013.1>.

Zambory, C. L., H. Ellis, **C. L. Pierce**, K. J. Roe, M. J. Weber, K. E. Schilling, and N. C. Young. 2018. The development of a GIS methodology to identify oxbows and former stream meanders from LiDAR-derived digital elevation models. *Remote Sensing* 2019, 11(1), 12, <https://doi.org/10.3390/rs11010012>.