



2018 Annual Report

July 2017 – June 2018

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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Personnel and Cooperators

Unit Coordinating Committee

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U.S. Geological Survey, Ecosystems

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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

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

Graduate Students

Aaron Matthews, MS
Alexander Bybel, MS
Bridget Nixon, PhD
Courtney Zambory, MS
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Matt Stephenson, PhD
Nathan Tillotson, MS
Nick Simpson, MS

Collaborating Professors

Adam Janke, NREM
David Keiser, Economics
Diane Debinski, formerly EEOB
Greg Courtney, Entomology
Julie Blanchong, NREM
Lisa Schulte-Moore, NREM
Kevin Roe, NREM/EEOB
Michael J. Weber, NREM
Stephen Dinsmore, NREM

New Projects

Ecology of Canada geese in urban areas of Iowa

Principal Investigator: Robert W. Klaver
Student Investigator: Benjamin Luukkonen
Collaborators: Orrin Jones, IDNR
Duration: June 2018 – September 2021
Funding Source(s): Iowa Department of Natural Resources
Pittman-Robertson Funds

Goals and Objectives:

- Evaluate the movement of Canada geese captured in urban areas. Compare movements of the urban geese to the movements of geese captured in rural locations where the goose hunting season is closed.
- Determine the susceptibility of Canada geese captured in urban areas to hunting during the Special September Canada Goose season and the conventional Canada goose hunting season.
- Estimate annual harvest and survival rates for Canada geese captured in urban areas.
- Evaluate a three age-class model to estimate harvest and survival rates of Canada geese in Iowa.
- Where possible incorporate both live recaptures and dead recoveries to improve statistical precision and accuracy to band recovery models.

Progress:

Forty-five geese were fitted with GPS/GSM transmitters between 19 June and 9 July. The transmitters are marking locations every 15 minutes and sending the locations to the vendor's website daily. Thirty of the transmitters were on geese in the Des Moines goose urban management zone; the remaining 15 transmitters were on geese in 4 areas closed to goose hunting.

Future Plans:

The graduate student, Ben Luukkonen, will begin taking classes beginning Fall 2018 at Iowa State University. We will continue to monitor the geese both remotely and on the ground. Monthly maps of the geese's locations will be distributed to selected Iowa DNR staff. We will compile information on recapture of geese for later modeling.

Genetic Identification of Hybrid Striped Bass

Principal Investigator: Kevin J. Roe
Student Investigator: Jared Riemenschneider
Collaborators:
Duration: August 2017 - January 2018
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

ISU shall extract Genomic DNA from 497 individual hybrid striped bass to be provided by the Iowa Department of Natural Resources. DNA shall be extracted from a sample of frozen tissue. A ~1,100 base pair region of the mitochondrial cytochrome b (cytb) gene shall be amplified using polymerase chain reaction (PCR) primers. DNA sequences for each individual shall be created and the individuals shall be identified as belonging to one of two groups: Palmetto Bass or Sunshine Bass

Progress:

A report, based on the samples initially provided to the PI by the IDNR, was submitted to the IDNR. Subsequently, additional samples were provided to the PI for identification. Analysis of these samples is in progress and should be completed by the end of August 2018.

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 (IDNR)
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:

We randomly selected 11 PPJV focal areas and approximately 15 wetlands per focal area for waterfowl surveys and wetland sampling. 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 60 landowners to conduct the research. We started surveys on 7 March 2018 when ducks began to arrive in northern Iowa and ended surveys on 8 May 2018 when it appeared that migration had terminated based on numbers and species observed. During surveys, we recorded abundance of all duck species present as well as several vegetation characteristics, and measured water depth in each wetland. To date, we have entered all survey duck data and have completed all landowner correspondence for those that wanted results for their land. Initial exploratory data analyses are ongoing.

Future Plans:

We will continue data analyses from this field season. In the second and final year of this study, we will randomly select 10 new focal areas and 15 wetlands in each area and pursue permission and then repeat the field methods from 2018. At the completion of the 2019 field season, we will enter and analyze data and write the final report.

Inventory of coldwater streams and associated fish communities in the Iowa Driftless Region

Principal Investigator: Michael J. Weber
Student Investigator: Brett Kelly (M.S.)
Collaborators: Mike Siepker (IDNR)
Duration: December 2017 to July 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), and 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.

Further, native Brook Trout face many threats, including climate change, land use change, and the introduction of nonnative fishes. Consequently, Brook Trout populations are challenging to manage. Understanding relationships among a suite of biotic and abiotic factors and Brook Trout populations would facilitate management actions promoting the persistence of these important remnant populations.

Progress:

Sampling in 2018 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.

Future Plans:

Additional sampling is planned for 2019.

Factors influencing survival of stocked Walleye in Iowa

Principal Investigators: Michael J. Weber
Student Investigator: Emily Ball (PhD)
Collaborators: Iowa Department of Natural Resources
Duration: February 2018 – August 2020
Funding Source(s): Iowa Department of Natural Resources

Goals and Objectives:

1. PIT tagging 4,000 advanced fingerling Walleyes (2,000 from Spirit Lake Hatchery and 2,000 from Rathbun Hatchery)
2. Night sampling of age-0 Walleye (advanced fingerling and fry stocked) for mark-recapture analysis to assess post stocking survival
3. Fin clipping all Spirit Lake Hatchery Walleye (~ 20,000 individuals)
4. Nightly collection and processing of pre- and post-stocking predator diets in East and West Okoboji
5. Nightly collection and processing of age-0 Walleye diets stocked as advanced fingerlings and fry from East and West Okoboji.
6. Collection of stable isotope samples during each sampling month (October and November)

Introduction:

Walleye is one of the most popular recreational sport fish throughout Iowa. However, natural reproduction of Walleye in Iowa is extremely limited and populations throughout the state are maintained through annual stockings of hatchery-reared fish. Survival of stocked individuals subsequently determines the abundance of Walleye in Iowa lakes and the overall quality of the fishery. However, spatiotemporal variation in survival of stocked fishes driven by the transportation process, predation, and starvation can result in large variation in year-class strength. The argument of “bigger-is-better” has led hatcheries to raise progressively larger individuals with the goal of increasing survival and abundance of adults. Although stocking fishes at larger sizes can achieve these objectives, these fishes are stocked during fall without experience avoiding predators or foraging on live prey. In contrast, fish stocked as fry are smaller and have higher initial mortality than fish stocked as fall fingerlings, but by fall, have already survived intense mortality bottlenecks where they have experience avoiding predators and capturing live prey. The overarching objective of this project is to estimate and understand factors associated with initial (48 hours), short (60 days), and long-term (3 years) post-stocking survival of fingerling Walleyes. This research will help the Iowa Department of Natural Resources make informed decisions about Walleye stocking regimes with the goal of enhancing Walleye fisheries.

Progress:

All objectives were completed as described above. Stomach contents were collected from predators during fall 2015-2017 prior to and after Walleye stocking. Predator diets are still being processed but suggest that consumption of recently stocked fingerling Walleye can be high but vary among predator species and through time.

Fingerling Walleye stomach samples were collected from individuals during fall 2015-2017 to assess their transition to natural prey. Walleye diets are currently being processed in the lab but preliminary results indicate that age-0 Walleye stocked from Rathbun Hatchery quickly shift to consuming natural prey. Age-0 Walleye were also collected in the fall and spring for stable isotope analysis to determine diet shifts among different stocking cohorts of Walleye.

To assess long-term survival, fingerling Walleye were PIT tagged and/or fin clipped to determine their stocking origin and survival rates. Sampling was conducted in the fall and spring to recaptured tagged individuals. Recapture data collected for this portion of the research will be used to develop survival estimates after stocking.

Future Plans:

Continue to process samples in the laboratory, analyze data, and write manuscripts. Emily Ball is anticipated to defend her dissertation spring 2019.

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:

Micropterus spp. or Black bass are a highly studied genus of freshwater fishes. Due to their recreational fishing popularity, successful management of bass fisheries is critical in many systems to meet stakeholder needs. Black bass fishing has consistently risen in popularity since the 1970s as a result of their adaptability and tolerance to a wide range of environmental conditions. In 2011, more than 10.6 million participants spent 171 million days fishing for bass, making them the most popular sportfish in North America. While many facets of bass populations have been well studied, changes in bass angler behaviors and activities have led to a need for a better understanding of their potential effects on bass populations.

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:

Sampling in 2018 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.

Future Plans:

Additional sampling is planned for 2019.

Survey of Psammophilic Insects in Iowa

Principal Investigator: Gregory Courtney
Student Investigator:
Collaborators:
Duration: April 2018 – April 2019
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. Summer 2018 has been 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). Consequently, early and mid-summer sampling has been a challenge. Except for rivers in southwest- and central Iowa, early summer 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 middle part of the 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 and persistently high river-levels, and its presumed negative impact on resident populations of psammophilic organisms, I have 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!).

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)

Future Plans:

- Finish the paper survey invitation and survey reminders by the end of September, 2018
- Prepare the project report summarizing findings by the end of December, 2018

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 focus of the 2017 – 2018 year was to work on improving an otter habitat model and preparing for IPM for otter and bobcat. For IPM, additional bobcat teeth were selected for aging. While we were able to meet the 20% of harvest goal for some years, this was not possible for all years. Teeth that could be aged were sent to Matson's Lab and will be added to the dataset. We continued to evaluate measures of auxiliary data and pursue those options with data previously collected by the DNR. We believe the best model will be produced by including radio-telemetry data and have begun that arm of the project in collaboration with veterinarians, trapping technicians, and local wildlife management units.

We worked to evaluate the current otter habitat model and discussed 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. Three additional years (2012, 2015, and 2016) were worked into this model, expanding on data from 2006 onward, and harvest location maps of these years were created using ArcMap. Harvest location for 2013 and 2014 harvests were recorded in relation to the nearest city, rather than in PLSS form as the other years, and are being changed to PLSS so that they can be included in the model. 2012, 2015, and 2016 harvest years were edited to be in a consistent format and mapped in ArcMap. Using statewide predicted absence/presence data from Iowa Aquatic Gap study, fish prey species grouped by family were added to the negative binomial model. Two families (Centrarchidae and Castomidae) were found to predict a significant increase in otter presence while other families which prefer either higher or lower quality habitats (Ictaluridae, Percidae) were not found to have a significant impact on the model. This model was presented at the Midwest Furbearer Workshop in Medora, North Dakota.

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: Implantation of transmitters will begin in August 2018 with a goal of including 40 otters from 4 separate locations in Iowa. Otters will be captured using foothold traps and a veterinarian from Iowa State University will surgically implant the internal transmitters as each otter is trapped. Monitoring by ground and boat will locate each otter weekly.

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 (IDNR) 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.

Progress:

During the 2016 and 2017 field seasons, 101 fish and habitat surveys were conducted at 95 sites throughout the BRW. This includes 66 in-stream sites and 29 oxbows. In addition to 23 sites in the White Fox Creek HUC10 and 20 sites in the Eagle Creek HUC10, 52 sites were sampled throughout other sub-basins of the watershed. A total of 145,887 fish including 55 species were sampled. The five most abundant species were Common Shiner, Fathead Minnow, Black Bullhead, Orangespotted Sunfish, and Green Sunfish. The five most commonly occurring (# sites present/total # sites) species were Common Shiner, Creek Chub, Green Sunfish, White Sucker, and Bluntnose Minnow. Habitat assessments were also performed at each site. Each habitat variable along with several variables describing the fish assemblage are considered when evaluating which characteristics are associated with the presence of Topeka Shiners to be included in thesis analysis.

Of the 95 total sites sampled in the BRW, Topeka Shiners were sampled at 32 (34%). This includes 19 in-stream reaches and 13 oxbows. Topeka Shiners were not sampled at any White Fox Creek sites but were present at 6 Eagle Creek sites. In addition to Eagle Creek, Topeka Shiners were sampled in the Boone River, Middle Branch Boone River, East Branch Boone River, Prairie Creek, Otter Creek, Drainage Ditch 4, and Drainage Ditch 94. Topeka shiner abundance at sites where they were sampled ranged from 1-453 individuals with a mean of 57 and median of 16 individuals per site. Overall, 2010 Topeka Shiners were sampled in the BRW in 2016-2017 making them the 16th most abundant and 19th most commonly occurring species in our sampling.

Topeka Shiner presence and abundance was most consistent in Prairie Creek and its associated oxbows. Fourteen of 32 (43.7%) positive Topeka Shiner sites and 1633 of 2010 total Topeka Shiners sampled were in Prairie Creek or one of its oxbows. Topeka Shiners were sampled at 14 of 17 (82.4%) sites in the Prairie Creek HUC10 compared to 18 of 78 (23.1%) sites throughout all other HUC10s of the BRW. There were only two detections of Topeka Shiners in this HUC10 in two previous Iowa State University stream fish studies since 1997.

This work was presented at the Midwest Fish and Wildlife Conference, the Iowa Chapter of the American Fisheries Society annual meeting in both 2017 and 2018 and at the 2018 Iowa Water Conference.

Future Plans:

Fish and habitat sampling has been completed. We are currently analyzing data and selecting models to accurately describe habitat and fish community associations. We have been working with random forests to aid in selecting which variables should be included in a multivariate logistic regression. The goal of logistic regression is to determine which variables are significantly different between sites with Topeka Shiners and sites without Topeka Shiners and to what extent.

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 (IDNR)
Todd Kolander (Minnesota 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 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. She has completed her statistical analysis of landscape variable data that influences Topeka Shiner distribution in both oxbow and stream habitats and generated a species distribution model to map current distribution of Topeka Shiners. In addition, she has completed analysis of the process created to identify historical stream meanders and current oxbow lakes as potential restoration sites in the Boone, North Raccoon, and Rock River watersheds. The methodology used to create the WHAF has been applied to Iowa using comparable methods when data availability allowed. Health Index scores have been completed.

Future Plans:

Courtney has defended her thesis, graduated and is working on submitting manuscripts for publication.

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 (IDNR)
Todd Kolander (Minnesota 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.

Progress:

DNA of 798 Topeka shiners from 43 sites have been extracted and genotyped. Only 9 loci of the original 13 showed polymorphism. Analysis of the genetic data is ongoing.

Future Plans:

Genetic analysis of microsatellite data will continue in the summer for both Topeka Shiner and Plains topminnows.

Prey Selection and Dynamics of Native Larval Fish in the Upper Mississippi River Across a Gradient of Bigheaded Carp Density

Principal Investigators: Michael J. Weber
Clay L. Pierce
Student Investigator: Nathan A. Tillotson (M.S.)
Collaborators: Kim Bogenschutz (IDNR)
Jason Euchner (IDNR)
Neal Jackson (USFWS)
Duration: January 2017 – December 2019
Funding Source(s): US Fish and Wildlife Service

Goals and Objectives:

Aquatic systems are particularly susceptible to biological invasions due to their high level of connectivity and use by humans for recreational and commercial activities. In recent years, Silver Carp (*Hypophthalmichthys molitrix*) and Bighead Carp (*H. nobilis*) have established themselves throughout the Mississippi River basin, and become one of the most recognizable invasive species in North America. Collectively referred to as Bigheaded carps, these invasive fish are planktivorous and have strong potential to compete with native adult planktivores and all larval stages of fish within the Mississippi River. Bigheaded carp have reduced/alterd plankton communities in some systems, and even caused reduced condition in adult Bigmouth Buffalo and Gizzard Shad. However, there is no evidence so far linking Bigheaded carp feeding strategies to competitive relationships with larval fish. In larval fish, growth rates and prey selection are two important factors affecting mortality and year-class strength. Within the Upper Mississippi River, the invasion front of Bigheaded carp falls along the southeast border of Iowa, USA. The goals of this study are to investigate the dynamics of larval growth rates, prey selection, gut fullness, and timing of exogenous feeding of two important forage fish taxa (*Dorosoma cepedianum* and *Lepomis macrochirus*) in relation to the gradient of Bigheaded carp population density along the invasion front.

Progress:

Adult Bigheaded carp, native larval fish, and plankton community data were collected from various sites along the invasion front in the UMR from 2014 – 2018.

Future Plans:

Laboratory analysis, data entry, and preliminary statistical analysis are ongoing. Fieldwork will be complete in fall 2018. Completion is scheduled for fall 2019.

Waterbird Responses to Iowa's Shallow Lakes Restoration Project

Principal Investigator: Stephen Dinsmore
Student Investigator: Rachel Vanausdall (M.S.)
Collaborators: Mark Gulick (IDNR)
Todd Bishop (IDNR)
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 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 and 2017, 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 second year of fieldwork was completed in 2017. Rachel Vanausdall completed her M.S. thesis in spring 2018 and this will constitute the project final 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

Southern Iowa Forest Monitoring

Principal Investigator: Stephen Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Paul Tauke (IDNR)
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 2017 using the same methodology from 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. The five most abundant species in 2016 (E. Wood-pewee, Blue Jay, American Crow, White-breasted Nuthatch, Ovenbird) were similar to those for 2017 (E. Wood-pewee, Red-eyed Vireo, Blue Jay, American Crow, N. Cardinal).

Future Plans:

Additional surveys and data analyses will continue through 2018 and there are plans to add a M.S. graduate student to complete the analyses and final project report.

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 (IDNR)
Stephanie Shepherd (IDNR)
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 2017 we surveyed 34 remnant prairies on nine different properties in the Loess Hills. Butterfly surveys found a total of 55 species (11 SGCN) and species richness ranged from 16 to 31 across all sites. Estimated Shannon Diversity ranged from 1.23 to 2.68 across all sites and tended to be lower in the Southern Loess Hills. Surveys found a total of 30 Monarchs and 7 Regal Fritillaries, both target butterfly species. Vegetation surveys detected 159 plant species across all sites with richness ranging from 16 to 59 species.

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 we will take a break from fieldwork in 2018 to allow for management actions. The second (and final) field season will occur in 2019.

Acoustic monitoring for Iowa bats

Principal Investigator: Julie Blanchong
Adam Janke

Student Investigator:

Collaborators: Kelley Poole (IDNR)
Stephanie Shepard (IDNR)

Duration: June 2015 – June 2019

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 2017, 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 19 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.

We also examined relationships between habitat features and bat detection along transects. The probability of detecting a bat was positively related to amount of forest and negatively related to distance from water reinforcing the importance of forest and water as important habitat attributes for bats.

We conducted two educational programs on forest management for bats for forest landowners in northeastern Iowa and at the Tri-state Forest Stewardship Conference in southwest Wisconsin. We also developed and distributed a video on white-nose syndrome basics for social media and published an article on forest management for bat habitat to fight white- nose syndrome.

Future Plans:

We will continue to conduct drive transect surveys along a subset of established routes during summer 2018 to record echolocation calls. We will also survey the 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, focusing on written and digital materials.

Northern long-eared bat monitoring

Principal Investigator: Julie Blanchong
Student Investigator:
Collaborators: Kelly Poole (IDNR)
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 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. Echolocation data were analyzed to identify presence or probable absence of NLEB as well as Indiana bats, little brown bats, tri-colored bat at each site using USFWS approved bat call identification software.

Future Plans:

This project will continue at a smaller spatial scale in summer 2018. Sites in central Iowa that overlap with projected wind energy development sites in Iowa will be surveyed for multiple nights using acoustic monitoring methods. Echolocation data will again be analyzed to identify presence or probable absence of northern long-eared, Indiana, little brown, and tri- colored bats at each site using USFWS approved bat call identification software.

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 (IDNR)
Jason Euchner (IDNR)

Duration: July 2013 - June 2018

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*), collectively Asian carp, 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. Despite the lack of optimal reproductive habitat within the UMR, tributaries of the UMRB contain stretches of free-flowing, unimpounded sections where reproduction has been documented in the Des Moines, Iowa and Skunk rivers. Adult densities within the UMR bordering Iowa are highest below Lock and Dam 19 (LD 19) near Keokuk. Although presence above LD 19 is not uncommon, abundance decreases progressively upstream. The objectives of this project are to (1) evaluate stock-recruitment trends present within the UMR where both adult stock and recruits have been sampled (Des Moines, Skunk, and Iowa Rivers) and (2) to assess accuracy of random forest models previously constructed to identify fish species based on egg morphometrics within the UMRB.

Progress:

Sampling was conducted from April to September in 2016 and 2017 every ten days. Larvae and eggs were collected with ichthyoplankton nets in backwater, channel border and thalweg habitats. Biotic and abiotic samples taken include chlorophyll *a*, zooplankton, and discharge from United States Geological Survey and Army Corps of Engineers river gauges.

Future Plans:

Laboratory analysis, data entry, and preliminary statistical analysis are ongoing. Completion is scheduled for fall 2018.

Completed Projects

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:

A final thesis has been constructed and defended. 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.

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

Principal Investigator: Robert Klaver
Student Investigator: Brenna Towery (M.S.)
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*.

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

Principal Investigator: Robert Klaver
Lisa Schulte Moore
Student Investigator: Matt Stephenson
Collaborators:
Duration: April 2017 – March 2018
Funding Source(s): Iowa Department of Natural Resources
Diversity Program

Goals and Objectives:

The objectives of this project were 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:

As a part of a larger study of wildlife use of on-farm habitat, we are investigating the distributions, species diversity, and encounter rates of reptiles, amphibians, and small mammals in grassy agricultural conservation features in Iowa from 2015 until present. We placed 719 (0.6 by 1.2 m) plywood cover boards in 178 grassy features on 13 farms around Iowa. Boards were checked monthly-to-weekly and the presence of reptiles, amphibians, and small mammals was recorded. Reptiles were captured and given unique marks and examined for symptoms of Snake Fungal Disease (SFD) (*Ophidiomyces ophiodiicola*).

We have thus far encountered eight reptile, four amphibian, and at least seven small mammal species, including seven Species of Greatest Conservation Need (SGCN). Initial results indicate that wildlife diversity and encounter rates were higher in contour strips planted with diverse prairie compared to other available on-farm habitat, but further analysis is needed. Thirty-five individuals of eight snake species were given unique marks for a capture-mark-recapture study, but sample sizes and recapture rates were too low to estimate population sizes.

Future Plans:

Data continue to be collected during the summer 2018 field season as a part of the larger wildlife study. In 2018, we have captured approximately 90 individuals and swabbed them for SFD, including several skinks (one that appeared symptomatic).

Amphibian Occupancy and Effects of Habitat Use on Pesticide Exposure in Northern Leopard Frogs in Iowa Prairie Pothole Wetlands

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

Goals and Objectives:

Amphibians living in agricultural areas encounter many challenges. Two factors affecting individuals in these landscapes are habitat loss and pesticides. This project focused on amphibians using agricultural wetlands in Iowa, where row crops such as corn and soybeans dominate the landscape. The goal of the first study was to determine the influences of site characteristics on amphibian presence and success. Occupancy analysis was used to estimate proportion of area occupied by four species as a function of eight covariates hypothesized to affect occupancy: fish abundance, salamander abundance, invertebrate density, vegetative cover, wetland area, water atrazine concentration, surrounding crop land use, and overall wetland health score. The goal of the second study was to understand where and when frogs are most susceptible to pesticide exposure and how that exposure relates to accumulation. We hypothesized habitat use would influence a frog's exposure to pesticides. 72 Northern Leopard Frogs (*Lithobates pipiens*) were radio tracked in agricultural wetlands and their survival was assessed. Passive Sampling Devices (PSDs) were used to test for differences in pesticide exposure among grassland, wetland, and agricultural habitats.

Progress:

27 wetlands were surveyed in 2015 and 2016. Occupancy analysis results indicated almost all covariates were supported in our model sets although their estimated effects were weak. Direction of predicted effects of covariates on amphibians varied by species and life stage. Results showed that wetland site occupancy for species in our study ranged from 0.23 to 0.95. We found that pesticide concentration analyzed from PSDs varied among habitat types ($P < 0.01$) with concentration greatest in agricultural habitats. Amphibians frequently used wetland habitats early in our study, and transitioned into grassland habitats later in the summer, using agricultural fields rarely. Number and concentration of pesticides were greatest in tissues collected in May, but few pesticides were detected in individuals captured in August ($P < 0.01$ and $P < 0.01$, respectively).

Conclusions and Recommendations:

Although we did not find strong evidence that the environmental factors we measured influenced amphibian occupancy, the first study provided insight on amphibian use of a modified agricultural landscape. Our second study indicated risk of pesticide accumulation is highest in aquatic habitats earlier in the year.

Northeastern Iowa Goat Prairie Monitoring

Principal Investigator: Stephen Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Katy Reeder (IDNR)
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 2017 we completed our second 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.

Conclusions and Recommendations:

Fieldwork for this project was completed in 2017 with a final report due at the end of 2017. For the final project report I completed some occupancy and density analyses that aggregated data from surveys in 2015 and 2017.

Herptile surveys were intended to sample the entire herptile community through the use of Visual Encounter Surveys (VESs). We met our goal of conducting 3-4 surveys per site, with a total of 224 surveys conducted between 7 May and 14 October 2015 and a total of 208 surveys conducted between 15 May and 22 September 2017. We detected a total of 201 individuals of 13 species in 2015 and 306 individuals of 17 species in 2017. Species with the greatest number of individuals detected included Timber Rattlesnake (94), Five-lined Skink (21), and American Toad (14) in 2015 and Timber Rattlesnake (120), Six-lined Racerunner (94), and Eastern Garter Snake (33) in 2017. The number of detections of Timber Rattlesnakes was especially impressive as this species is generally considered uncommon in this region. The totals for the skink in 2015 and the racerunner in 2017 were also noteworthy. The lone 2017 sightings of Eastern Hognose Snake and Pickerel Frog were the best herp finds overall. Snake numbers and diversity were generally low with the exception of rattlesnakes.

Butterfly surveys were focused during the primary summer flight season for most species. As expected, we encountered numerous weather delays because survey conditions for this taxon are quite specific. We completed 123 butterfly single visual encounter survey at 43 goat prairies (1 site was missed) in the period 17 May through 14 October 2015 and documented 805 individuals of 50 species across all sites. Species with the greatest number of detections included Great Spangled Fritillary (30 detections of 97 individuals), Little Wood-Satyr (27 detections of 122 individuals), Monarch (21 detections of 64 individuals), Clouded Sulphur (19 detections of 69 individuals) and Hackberry Emperor (12 detections of 30 individuals). The only target species found were Silvery Blue and Striped Hairstreak, each at one site. Butterfly surveys were repeated at 41 goat prairies from 25 May to 22 September 2017 and documented 641 individuals of 37 species across all sites. Species with the greatest number of detections included Little Wood-Satyr (58 detections of 146 individuals), Great Spangled Fritillary (detections of 69 individuals), Summer Azure (24 detections of 31 individuals), and Eastern Tiger Swallowtail (20 detections of 21 individuals). The only target species found were Silvery Blue and Striped Hairstreak (each at one site in 2015) and Columbine Duskywing (9 detections of 19 total individuals in 2017).

Iowa Multiple Species Inventory and Monitoring (MSIM) Program

Principal Investigator: Stephen Dinsmore
Student Investigator: Shane Patterson (M.S.)
Collaborators: Karen E. Kinkead (IDNR)
Kevin T. Murphy (ISU)
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 2017 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 more than 3000 wildlife surveys conducted on these study sites and approximately 400 survey-related tasks such as site setup and teardown. A summary of species seen by taxa includes 39 mammals (5 SGCN), 242 birds (84 SGCN), 47 herpetofauna (24 SGCN), 78 odonates (14 SGCN), 69 lepidoptera (8 SGCN), 78 fish (20 SGCN), and 8 crayfish. We encountered many noteworthy sightings in several taxonomic groups including Bobcat (7 sites), River Otter (10 sites), Meadow Jumping Mouse (11 sites), Red Squirrel (1 site), Northern Bobwhite (23 sites), King Rail (1 site), Barn Owl (2 sites), Henslow's Sparrow (20 sites), Central Newt (1 site), Smallmouth Salamander (1 site), Woodhouse's Toad (2 sites), Blanding's Turtle (6 sites), Stinkpot (1 site), Six-lined Racerunner (1 site), Prairie Ringneck Snake (6 sites), Boreal Bluet (2 sites), Sulphur-tipped Clubtail (2 sites), Rusty Snaketail (1 site), Spangled Skimmer (11 sites), Slaty Skimmer (8 sites), Regal Fritillary (8 sites), Monarch (66 sites), Zebulon Skipper (6 sites), American Brook Lamprey (4 sites), Ozark Minnow (1 site), Pirate Perch (1 site), Trout Perch (1 site), Grass Pickerel (3 sites), and Banded Darter (4 sites).

Future Plans:

Field work will continue in 2018, beginning with a workshop in mid-April to train new temporary technicians prior to the 2018 field season. We will also continue with several analyses of MSIM data with the goal of publishing it in the peer-reviewed literature. Priority topics include analyses of Monarch and herpetofauna site occupancy.

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

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

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

Duration: November 2013 to May 2018

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

Goals and Objectives:

- 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.
- Engage private landowners in grassland management for benefit of Species of Greatest Conservation Need.

Progress:

This project built 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: 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). Our goal was 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 U.S. 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 served as “controls” and their responses were compared to the graze-and- burn pastures where a Collaborative Adaptive Management (CAM) approach was employed. On the patch-burn graze sites, no herbicides were applied. On the graze-and-burn sites, each pasture was divided into three patches where different seed and herbicide treatments were applied. In both the patch-burn grazing and the burn-and-graze treatments, there were two grazing regimes: intensive early stocking (IES) and conventional stocking. Under IES, stocking density (number of cattle/area) was doubled and the grazing season was halved (April 1 to July 1) relative to conventional stocking. By placing heavy grazing pressure on fescue early in the growing season and providing a late-season grazing deferment we hoped to benefit native warm-season grasses and forbs. The goal was to increase adaptation capacity and learning within the community of landowners and natural resource professionals. We collaborated with Iowa DNR, Missouri Dept. of Conservation, and The Nature Conservancy to select research sites and treatments in 2014 and conducted three field seasons of research. We met with research partners annually, and in June 2017 we held a larger meeting to summarize findings of this research and the related work that had occurred over the past decade in the Grand River Grassland.

Conclusions and Recommendations:

Tall fescue decreased, whereas warm season grasses and forbs increased after herbicide application. Spatial heterogeneity of visual obstruction readings in patch-burn graze pastures increased in both Intensive Early stocked and Season-Long Stocked grazed pastures. The combination of spring fire and intensive early stocking followed by grazing removal in early July favored warm-season grasses. The bird community showed species-specific and predictable responses to treatments based on their affinity for vegetation height and litter depth. The take home message is that heterogeneity is key to providing habitat for the diversity of grassland birds. The butterfly community

was much less responsive to the spray & seed treatments at the patch level, but showed more notable responses to adaptive management at the larger-landscape level when we compared herbicide treatments to PBG, graze only or burn only. We suspect that the butterfly response was driven by the abundance of some forbs that may not serve as valuable nectar resources. In summary, the adaptive management approaches we tested were effective approaches for modifying the vegetation composition and structure. The songbird community did respond at the patch and the pasture level in predictable ways based on vegetation structure and composition. The butterfly community was much less responsive to the herbicide and seeding treatments, but did show larger landscape scale responses.

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

Principal Investigator: Adam Janke
Student Investigator:
Collaborators: Mike Rentz (ISU)
Stephanie Shepherd (IDNR)
Vince Evelsizer (IDNR)
Duration: January 2017 to May 2018
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:

Production of the guidebook was completed in spring of 2018 and is available for free download or purchase from the Iowa State University Extension and Outreach Online Store.

Conclusions and recommendations:

Visit <https://store.extension.iastate.edu/product/15391> to download the guide.

Honors and Awards

Courtney Zambory (M.S. Student)

- Best Student Poster for the Iowa Chapter of the American Fisheries Society, February 2018 annual meeting

Nathan Tillotson (M.S. Student)

- Kenneth Carlander Memorial Graduate Scholarship. 2018.
Department of Natural Resource Ecology and Management, Iowa State University.

Publications

Ball, E. E., D. M. Adams, J. N. Dupuie, M. M. Jones, P. G. McGovern, R. M. Ruden, S. R. Schmidt, G. J. Vaziri, J. S. Eeling, B. D. Kirk, A. L. McCombs, A. B. Rabinowitz, K. M. Thompson, Z. J. Hudson and **Robert W. Klaver**. 2017. "Serendipity: An Ecologist's Quest to Understand Nature." *Journal of Mammalogy* 98:1509-1510.

Bartelt, P.E. and **R.W. Klaver**. 2017. Response of anurans to wetland restoration on a Midwestern agricultural landscape. *Journal of Herpetology* 54:504-514.

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* In Press.

Fischer, J. R., B. D. Bakevich, C. P. Shea, **C. L. Pierce**, and M. D. Quist. 2018. Floods, drying, habitat connectivity, and fish occupancy dynamics in restored and unrestored oxbows of west-central Iowa. *Aquatic Conservation: Marine and Freshwater Ecosystems* 28:630-640. <https://doi.org/10.1002/aqc.2896>.

Jacques, Christopher N., James S. Zweep, Mary E. Scheihing, Will T. Rechkemmer, Sean E. Jenkins, **Robert W. Klaver**, and Shelli A. Dubay. 2017. Influence of trap modifications and environmental predictors on capture success of southern flying squirrels. *Wildlife Society Bulletin* 41:313-321.

Jacques, Christopher N., James S. Zweep, Sean E. Jenkins, and **R. W. Klaver** (2017). "Home range use and survival of southern flying squirrels in fragmented forest landscapes." *Journal of Mammalogy* 98:1479-1488.

Michel, Eric S., Jonathan A. Jenks, Kyle D. Kaskie, **Robert W. Klaver**, and William F. Jensen. 2018. Weather and landscape factors affect white-tailed deer neonates at ecologically important life stages in the Northern Great Plains. *PLoS ONE* 13:e0195247.

Mills, N., D. Cashatt, M. J. Weber, and **C. L. Pierce**. 2018. A case study and a meta-analysis of seasonal variation in fish mercury concentrations. *Ecotoxicology* (2018). <https://rdcu.be/NZ2c>.

Simpson, N.T. 2018. Occurrence, abundance, and associations of Topeka Shiners and species of greatest conservation need in streams and oxbows of Iowa and Minnesota. M.S. Thesis. Iowa State University.

Sullivan, C. J., M. J. Weber, **C. L. Pierce**, D. H. Wahl, Q. E. Phelps, C. A. Camacho, and R. E. Colombo. 2018. Factors regulating year-class strength of silver carp throughout the Mississippi River Basin. *Transaction of the American Fisheries Society* 147:541-533.

Swanson, J. E., E. Muths, **C. L. Pierce**, S. J. Dinsmore, M. W. Vandever, M. L. Hladik, and K. L. Smalling. 2018. Exploring the amphibian exposome in an agricultural landscape using telemetry and passive sampling. *Scientific Reports* 8:10045.

Szcodronski, Kimberly E., Diane M. Debinski, and **Robert W. Klaver**. 2018. Occupancy modeling of *Paranassius clodius* butterfly populations in Grand Teton National Park, Wyoming. *Journal of Insect Conservation* 22:267-276.

Zambory, C.L. 2018. Geospatial methods for aquatic conservation: Topeka Shiner restoration site selection and the development of an Iowa watershed health assessment. *M.S. Thesis*.

Zambory, C.L., Bybel, A.P, Pierce, C.L., Roe, K.J., and Weber, M.J. 2017. Habitat Improvement Projects for Stream and Oxbow Fish of Greatest Conservation Need. *Annual Progress Report*.

Zeep, James. S., Christopher. N. Jacques, Sean. E. Jenkins, **Robert W. Klaver**, and Shelli A. Dubay. 2018. Nest Tree Use by Southern Flying Squirrels in Fragmented Midwestern Landscapes. *Wildlife Society Bulletin* In Press.

Presentations

Bybel, A. P., N. T. Simpson, C. L. Pierce, M. J. Weber, and K. J. Roe. 2018. Genetic analysis of Topeka shiner utilization of oxbows in Iowa and Minnesota (invited). Midwest Fish and Wildlife Conference, Milwaukee, WI, January 2018.

Bybel, A. P., N. T. Simpson, C. L. Pierce, M. J. Weber, and K. J. Roe. 2018. Genetic analysis of Topeka shiner utilization of oxbows in Iowa and Minnesota (contributed paper). Iowa Chapter American Fisheries Society, Moravia, IA. February 2018.

Bybel, A. P., N. T. Simpson, C. L. Pierce, M. J. Weber, and K. J. Roe. 2018. Genetic analysis of Topeka shiner utilization of oxbows in Iowa and Minnesota. Iowa Water Conference, Ames, IA, March 2018.

Bybel A.P., Roe K. J., Weber M. J., **Pierce C.L.** (2018) "Genetic Analysis of the Endangered Topeka Shiner." Oral Presentation. Iowa Chapter of the American Fisheries Society. Honey Creek, IA.

Davis, E.D., T.C. Swearingen, C.N. Jacques, J.L. Fusaro, **R.W. Klaver**, C.R. Anderson, J.A. Jenks, C.S. DePerno, and R.D. Bluett. 2018. Influence of spatial alignment on photographic detection rates at remotely triggered camera stations. Midwest Fish and Wildlife Conference. Hilton Milwaukee City Center, Milwaukee, Wisconsin. 28 - 31 January 2018.

Davis, E.D., T.C. Swearingen, C.N. Jacques, **R.W. Klaver**, C.R. Anderson, J.A. Jenks, C.S. DePerno, and R.D. Bluett. 2018. Estimating density of bobcats in Midwestern landscapes using spatial capture-recapture models. Midwest Fish and Wildlife Conference. Hilton Milwaukee City Center, Milwaukee, Wisconsin. 28 - 31 January 2018.

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. 2018. Estimating density of bobcats in midwestern landscapes using spatial capture-recapture models. 98th Annual Meeting of the American Society of Mammalogists, Manhattan, Kansas. 25 – 28 June 2018.

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. 2018. Influence of spatial alignment on photographic detection rates at remotely triggered camera stations. 98th Annual Meeting of the American Society of Mammalogists, Manhattan, Kansas. 25 – 28 June 2018.

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. 2018. Influence of spatial alignment on photographic detection rates of bobcats at remotely triggered camera stations. 2018 Natural Sciences Research Symposium, Macomb, Illinois. 6 April 2018.

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. 2018. Evaluating potential effects of camera density on capture and recapture rates of bobcats. 2018 Natural Sciences Research Symposium, Macomb, Illinois. 6 April 2018.

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. 2018. Estimating density of bobcats in midwestern landscapes using spatial capture-recapture models. Illinois State Academy of Science Annual Meeting, Decatur, Illinois. 13 – 14 April 2018.

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. 2018. Influence of spatial alignment on photographic detection rates of bobcats at remotely triggered camera stations. 54th Annual Meeting of the Illinois Chapter of The Wildlife Society, Champaign, Illinois. 23 April 2018

- 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. 2018. Evaluating potential effects of camera density on capture and recapture rates of bobcats. 54th Annual Meeting of the Illinois Chapter of The Wildlife Society, Champaign, Illinois. 23 April 2018.
- Giese, J.C.**, L.A. Schulte, and **R.W. Klaver**. Prairie Strips for Birds: Increasing Biodiversity Alongside Agriculture. American Ornithological Society. Hilton Tucson El Conquistador, Tucson, Arizona. 9 –14 April 2018.
- Jacques, C.N., **R.W. Klaver**, J.S. Zweep, and S.A. Dubay. 2018. Nest tree use by southern flying squirrels in fragmented Midwestern landscapes. Midwest Fish and Wildlife Conference. Hilton Milwaukee City Center, Milwaukee, Wisconsin. 28 - 31 January 2018.
- Jacques, C.N., S.A. Dubay, B.M. Walker, and **R.W. Klaver**. 2018. Sex biased effects on prevalence of parasites in southern flying squirrels. Midwest Fish and Wildlife Conference. Hilton Milwaukee City Center, Milwaukee, Wisconsin. 28 - 31 January 2018.
- Jacques, C.N., T.C. Swearingen, E.D. Davis, **R.W. Klaver**, C.R. Anderson, J.A. Jenks, C.S. DePerno, and R.D. Bluett. 2018. Evaluating potential effects of camera density on capture and recapture rates of bobcats. Midwest Fish and Wildlife Conference. Hilton Milwaukee City Center, Milwaukee, Wisconsin. 28 - 31 January 2018.
- Jacques, C. N., S. A. Dubay, B. M. Walker, and **R. W. Klaver**. 2018. Sex-biased effects on prevalence of ectoparasites in southern flying squirrels. 54th Annual Meeting of the Illinois Chapter of The Wildlife Society, Champaign, Illinois. 23 April 2018.
- Jacques, C. N., J. S. Zweep, S. E. Jenkins, **R. W. Klaver**, and S. A. Dubay. 2018. Nest tree use by southern flying squirrels in fragmented Midwestern landscapes. 98th Annual Meeting of the American Society of Mammalogists, Manhattan, Kansas. 25 – 28 June 2018.
- Jacques, C. N., T. C. Swearingen, **R. W. Klaver**, E. D. Davis, C. R. Anderson, C. S. DePerno, J. A. Jenks, and R. D. Bluett. 2018. Evaluating potential effects of camera density on capture and recapture rates of bobcats. 98th Annual Meeting of the American Society of Mammalogists, Manhattan, Kansas. 25 – 28 June 2018.
- Jacques, C. N., **R. W. Klaver**, J. Z. Zweep, and S. A. Dubay. 2018. Nest tree use by southern flying squirrels in fragmented Midwestern landscapes. 54th Annual Meeting of the Illinois Chapter of The Wildlife Society, Champaign, Illinois. 23 April 2018.
- Jones, O., A. Janke, **R. Klaver**, H. Jones, and T. Harms. 2018. Migratory game bird banding, more than just maps. Iowa TWS Annual Meeting. Quality Inn & Starlite Village, Ames, Iowa. 7 – 8 January 2018.
- Klaver, Robert W.** and Orin E. Jones. 2018. Three age-class survival and recovery models for temperate breeding Canada geese in Iowa. Mississippi Flyway Council 2018 Winter Meeting. 27 February 2018. **INVITED**
- Nixon, B.** and **R. W. Klaver**. 2017. Habitat variables and river otters in Iowa. Midwest Furbearer Workshop. Baker Village, Luther College, Decorah, Iowa. 5 – 8 June 2017.
- Pierce, C. L.**, and K. E. Schilling. 2018. Origins, current status, and potential roles of oxbows for conservation and nutrient reduction in agricultural landscapes: introduction to the oxbow track (contributed paper). Iowa Water Conference, Ames, IA, March 2018.
- Pierce, C. L.**, and K. E. Schilling. 2018. Origins, current status, and potential roles of oxbows for conservation and nutrient reduction in agricultural landscapes: introduction to the oxbow session (contributed paper). Midwest Fish and Wildlife Conference, Milwaukee, WI, January 2018.
- Silker, B.J., **M.D. Stephenson**, L.A. Schulte, and **R.W. Klaver**. Effect of vegetation composition and structure on daily nest survival in red-winged blackbird (*Agelaius phoeniceus*) and dickcissel (*Spiza americana*). Midwest Fish and Wildlife Conference, Milwaukee, Wisconsin. 29 January, 2018. – Poster
- Simpson, N. T.**, **A. P. Bybel**, M. J. Weber, **C. L. Pierce**, and K. J. Roe. 2018. Occurrence, abundance, and habitat use of Topeka shiners in restored and unrestored oxbows in Iowa and Minnesota (contributed paper). Iowa Chapter American Fisheries Society, Moravia, IA. February 2018.

- Simpson, N.T., A.P. Bybel, M.J. Weber, C.L. Pierce, and K.J. Roe.** 2018. Occurrence, abundance, and habitat use of Topeka shiners in restored and unrestored oxbows in Iowa and Minnesota. Oral presentation given at Iowa Water Conference, Ames, IA.
- Simpson, N.T., A.P. Bybel, M.J. Weber, C.L. Pierce, and K.J. Roe.** 2018. Occurrence, abundance, and habitat use of Topeka shiners in restored and unrestored oxbows in Iowa and Minnesota. Oral presentation given at Midwest Fish and Wildlife Conference, Milwaukee, WI.
- Simpson, N.T.** 2018. Occurrence, abundance, and associations of Topeka Shiners and species of greatest conservation need in streams and oxbows of Iowa and Minnesota. M.S. Thesis defense. Ames, IA.
- Stephenson, M.D., L.A. Schulte, and R.W. Klaver.** Prairie contour buffer strips serve as improved bird nesting habitat in Midwestern agricultural landscapes. Midwest Fish and Wildlife Conference, Milwaukee, Wisconsin. 29 January, 2018.
- Swearingen, T., C. N. Jacques, B. Bluett, **R. W. Klaver**, and C. R. Anderson. 2017. Evaluating home range size of bobcats in an agriculturally-dominated landscape of west central Illinois. Midwest Furbearer Workshop. Baker Village, Luther College, Decorah, Iowa. 5 – 8 June 2017.
- Swearingen, T., C. N. Jacques, **R. W. Klaver**, C. R. Anderson, C. S. DePerno, and J. A. Jenks. 2017. Influence of spatial alignment on photographic detection rates at remotely triggered camera stations. Midwest Furbearer Workshop. Baker Village, Luther College, Decorah, Iowa. 5 – 8 June 2017.
- Tillotson, N., M. J. Weber, and C. L. Pierce.** 2018. Spatiotemporal population characteristics of Silver Carp along the invasion front of the Upper Mississippi River (contributed paper). Iowa Chapter American Fisheries Society, Moravia, IA. February 2018.
- Zambory, C. L., H. Ellis, C. L. Pierce, K. J. Roe, M. J. Weber, N. Young, and K. E. Schilling.** 2018. Integrating LiDAR landscape analysis and species distribution models to prioritize areas for oxbow restoration (invited). Iowa Water Conference, Ames, IA, March 2018.
- Zambory, C. L., H. Ellis, C. L. Pierce, K. J. Roe, M. J. Weber, N. Young, and K. E. Schilling.** 2018. Integrating LiDAR landscape analysis and species distribution models to prioritize areas for oxbow restoration (contributed paper). Iowa Chapter American Fisheries Society, Moravia, IA. February 2018.
- Zambory, C. L., H. Ellis, C. L. Pierce, K. J. Roe, M. J. Weber, N. Young, and K. E. Schilling.** 2018. Integrating LiDAR landscape analysis and species distribution models to prioritize areas for oxbow restoration (invited). Midwest Fish and Wildlife Conference, Milwaukee, WI, January 2018.
- Zambory, C.L., Pierce, C.L., Roe, K.J., Weber, M.J.** 2017. Off-Channel Mapping for Identifying and Prioritizing Topeka Shiner Restoration Sites (contributed paper). Society for Conservation GIS Meeting, Monterey, CA, July 2017.
- Zambory, C.L. et al.** (2018) "Geospatial methods for aquatic conservation: Topeka shiner restoration site selection and the development of an Iowa watershed health assessment." *Oral Presentation*. Thesis Defense, Ames, IA

Professional Activities

Teaching/Learning Opportunities

Robert Klaver

- Restoration Ecology (A_ECL 535) Fall 2017
- Analysis of Animal Populations (A_ECL 611) Fall 2018

Clay Pierce

- Stream Ecology (A_ECL 518), Fall 2017

Courtney Zambory

- Fisheries Management Lab Teaching Assistant, Fall 2017
- Attended the “An Introduction to Species Distribution Modelling in the Marine Environment” workshop, Annual Society for Conservation GIS Conference, July 2017
- Attended the “An Introduction to Mobile Field Data Collection in ArcGIS” workshop, Annual Society for Conservation GIS Conference, July 2017

Matthew D. Stephenson

- Ecology (A_ECL 312), Teaching Assistant, Fall 2017

Nathan Tillotson

- Fisheries Techniques (A_ECL 333), Seining/Trawling Lab Assistant, Fall 2017

Graduate Committee Service

Robert W. Klaver

Advisor/Co-Advisor

- 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

- 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)
- Aaron Matthews (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Nathan Tillotson (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Jennifer Swanson (M.S., Department of Natural Resources Ecology & Management, Iowa State University) graduated August 2017
- Courtney Zambory (M.S., Department of Natural Resources Ecology & Management, Iowa State University) graduated May 2018

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) graduated May 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

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 the USFWS to provide expert review of their Biological Status Review of the federally endangered Topeka shiner, Summer 2017
- Invited by the Iowa Water Science Center to write a newsletter article featuring the topic of a session I co-organized for the annual meeting. Article title “Oxbows for Conservation and Nutrient Reduction in Iowa Floodplains”, December 2017
- Organized a session of the 2018 Midwest Fish and Wildlife Conference on the topic of conservation and nutrient reduction benefits of oxbows, January 2018
- Organized a session of the 2018 Iowa Water Conference on the topic of conservation and nutrient reduction benefits of oxbows, March 2018
- Invited by Polk County Conservation Board to the lead the fish sampling portion of a Polk County Conservation Bioblitz at Chichaqua Bottoms Greenbelt, June 8-9, 2018
- Asked by USFWS to host a regional 2-day meeting to discuss and establish criteria for the species recover plan for the endangered Topeka shiner, Jun 12-13, 2018

Matthew D. Stephenson

- Iowa Ornithological Union, Membership Committee Member, 2015-2018
- The Wildlife Society, student member 2014-present

Nathan Tillotson

- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - Vice President, 2018 - Present
 - Fisheries Representative on the Seminar Series Committee, 2018 - Present

Nicholas Simpson

- Oxbow fish sampling demonstration for Boone River Watershed landowners and research collaborators, Webster City, IA. June 27, 2018
- Polk County Conservation Bioblitz at Chichaqua Bottoms Park, Maxwell, IA. June 8-9, 2018.
- Attended Principles and Techniques of Electrofishing course at Lakeside Laboratory, Milford, IA. August 1-3, 2017