



2015 Annual Report

July 2014 - June 2015

Cooperating Agencies:

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

Iowa Cooperative Fish & Wildlife Research Unit

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Personnel and Cooperators

Unit Coordinating Committee

Michael Tome

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

Dale Garner

Wildlife Bureau Chiefs
Iowa Department of Natural Resources

Joe Larscheid

Fisheries Bureau Chiefs
Iowa Department of Natural Resources

Sue Blodgett

Department Chair
Natural Resource Ecology & Management
Iowa State University

Patrick Ruble

Midwest Representative
Wildlife Management Institute

Unit Faculty & Staff

Robert W. Klaver	Unit Leader and Professor of Natural Resource Ecology & Management
Clay L. Pierce	Assistant Unit Leader, Fisheries, and Professor of Natural Resource Ecology & Management
Open Position	Assistant Unit Leader, Wildlife
Jessica Bell	Administrative Specialist II, Department of Natural Resource Ecology & Management

Graduate Students

Jalynn Almond, Ph.D. Student
Carlos Camacho, M.S. Student
James Crain, M.S. Graduate
Julia Dale, M.S. Student
Karri Folks, Ph.D. Student
Tyler Grant, Ph.D. Graduate
Joe Lambert, M.S. Student
Nathan Mills, M.S. Student
Matt Stephenson, M.S. Student
Rebecca Reeves, M.S. Graduate
Chris Sullivan, M.S. Student
Jennifer Swanson, M.S. Student
Brenna Towery, M.S. Graduate

Collaborating Professors

Julie Blanchong, NREM
Rebecca Christoffel, NREM
Diane Debinski, EEOB
Stephen Dinsmore, NREM
John Downing, EEOB
Sue Fairbanks, NREM
Frederic Janzen, EEOB
Joseph Morris, NREM, NCRAC
Rolf Koford, Former Unit Leader
Michael Rentz, NREM
Kevin Roe, NREM/EEOB
Jennifer Vogel, EEOB
Michael J. Weber, NREM

New Projects

Bat Acoustic Monitoring

Principal Investigator: Julie Blanchong
Student Investigator:
Collaborators: Kelly Poole, IA Department of Natural Resources
Duration: June 1, 2015 to December 31, 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

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

Progress:

White Nose Syndrome (WNS), a devastating disease associated with the mortality of millions of bats was first documented in New York during the winter of 2005-2006, and is now confirmed in Iowa. The loss of large numbers of bats due to WNS is expected to have enormous economic impacts to agriculture. Knowledge of the abundance and distribution of bat species in Iowa is minimal, but is critically needed to understand the potential ramifications of WNS to Iowa. Bat acoustic monitoring has been conducted for the past two summers along transects in eastern, central and southern Iowa.

Future Plans:

We will continue to conduct drive transect and fixed location surveys along established routes during late spring-early summer 2015 to record echolocation calls while bats are on their maternity range. For summer 2015, IDNR will recruit citizen scientists, as currently occurs in some other states (e.g., Georgia), to complete the 19 drive transects established in central, eastern, and southern Iowa and the 6 fixed location transects in central Iowa. Relying on well-trained local volunteers to conduct the drive transects will be more efficient and cost effective than using ISU undergraduates who must travel long distances to reach some transects and must be paid. Transitioning the data collection to citizen volunteers will also increase public engagement with the project and public awareness of bats and the threat of WNS. ISU will hold orientation sessions to train volunteers how to conduct drive transects, teach them how to use the equipment, and show them how to keep appropriate records. ISU will continue to be responsible for analyzing the data collected by the volunteers to quantify bat activity and attempt to identify bat species.

Northeastern Iowa Goat Prairie Monitoring

Principal Investigator: Stephen J. Dinsmore
Student Investigator: One undergraduate field technician
Collaborators: Katy Reeder, Iowa Department of Natural Resources
Duration: March 25, 2015 to November 30, 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 spring 2015 a field technician was hired and reptile/butterfly surveys began in April 2015. Fieldwork will continue through mid-October 2015, after which the initial data will be summarized for an annual report.

Future Plans:

After the 2015 field season is completed we will begin some initial analyses of site occupancy and detection probability for selected reptile and butterfly species. There will be no fieldwork in 2016 to allow sufficient time for restoration efforts before a second (and final) field season in 2017.

Environmental DNA – A New Tool for Population Monitoring

Principal Investigator: Frederic J. Janzen
Student Investigator: Clare Adams
Collaborators:
Duration: April 1, 2015 to March 31, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Use environmental DNZ to detect the presence/absence of *C. picta*
- Quantify eDNA and relate it to turtle biomass, then create a statistical model based on this relationship for use in populations monitoring.

Progress:

Thus far, we have placed turtles into three different ponds (B, C, D) at the Horticulture Farm of Iowa State University on 1 April 2015. One pond (A) received no turtles and is used as a control. All of these ponds have a different turtle biomass and different numbers of turtles. Sampling is an ongoing process. We sampled before turtles were placed in the ponds, every day for a week after turtles were placed in the ponds, and every three days thereafter. The week of everyday sampling was to look at accumulation rates of eDNA; testing the hypothesis that eDNA levels will rise for a short time frame after turtles are initially added. Sampling will continue until 30 June 2015.

Samples are currently being filtered with 0.7um glass microfiber filters. Soon, sample processing will start with cellulose nitrate filters as well (1 May 2015 thru 30 June 2015, once every 15 days). Sample processing has also begun for sodium acetate and ethanol DNA extractions.

C. picta specific primers have been designed and are working on species-specific tissue of this species. Universal turtle primers have also been designed, and amplicon sequencing has revealed species-specific differences – however because of such a short amplicon sequence (200bp), the results may not stand up to traditionally accepted sequence variation. eDNA has been successfully extracted and amplified from eDNA positive controls (very dirty *C. picta* laboratory water) with the universal primer.

Future Plans:

We shall continue sampling until the 30th of June, and then sample every day for a week after turtles are removed. The latter will inform us as to how eDNA degrades in a water sample over time, once animals are no longer present.

Once the QiaShredder is ordered and arrives, filtered samples can have their DNA extracted and all samples can start the amplification process via qPCR. qPCR will then show us the amount of eDNA per sample relative to series-diluted standards, for which we can then use in statistical modeling. We plan on creating a statistical model relating the known turtle biomass per pond to eDNA quantities as amplified by qPCR. From this model, we shall sample at Ada Hayden Park in Ames, IA as well as Thomson River Causeway in Thomson, IL.

As for broader impacts, Clare has already taught undergraduate Rachel on how to filter eDNA and will be teaching undergraduate Morgan soon how to sample for eDNA and prepare samples. Once the fall semester arrives, it is possible that Clare will partner up with the herpetology class offered at Iowa State University to discuss novel methods in reptile population monitoring and conservation. It is also very likely Clare will talk to grade-school students at the Ames Catholic School about her research using a conservation perspective.

In the distant future, we hope to apply this technique to the endangered yellow mud turtle (*Kinosternon flavescens*) for continued population monitoring and informing conservation policy. On a broader note, we hope that wildlife agencies such as the Iowa DNR will be able to use eDNA to gather information about aquatic turtle populations of interest.

Midwest Mustelid Trends

Principal Investigator: Robert W. Klaver
Michael Rentz

Student Investigator:

Collaborators:

Duration: April 15, 2015 to March 31, 2016

Funding Source(s): Iowa Department of Natural Resources (IDNR), Wildlife Diversity Small Grant

Goals and Objectives:

- Determine the presence/absence of 3 weasel species in Iowa.
- Use the results of this study to select locations for more intensive research in subsequent seasons, including snow tracking, mark-recapture, and possibly radio/gps collaring.

Progress:

This initial phase will be extensive in nature, rather than intensive, and involve only non-invasive techniques. Potential habitat for the three species will be identified statewide. At each selected site I will place a number (depending upon parcel size) of baited, enclosed track plates and hair snares (Long et al. 2008). I will visit each site twice: once to place the plates/hair snares, and once more within 2 weeks to collect the stations. Research on non-invasive techniques such as these suggests that rare animals are more effectively studied with fewer stations for a longer period of time (Mackenzie and Royle 2005), hence the two week period. Longer periods would likely result in damage to the track plates (as more animals enter) or degradation of the DNA in the hair sample (Long et al. 2008).

Iowa has historically been home to 3 weasel species: the long-tailed weasel (*Mustela frenata*), short-tailed weasel or ermine (*M. erminea*) and the least weasel (*M. nivalis*) (Fagerstone 1987, Polderboer et al. 1941, Polderboer 1942). Iowa represents the southern limit for *M. nivalis* and *M. erminea*, while the range of *M. frenata* extends north to southern Canada. The species are known to overlap and demonstrate both resource partitioning and size plasticity when in competition (with the larger species moving to large end of their size range, and the small species tending to the lower end of their range) (Simms 1979).

Although none of the species are known to be of immediate conservation need in the state there is scant information on current populations in the Midwest, including Iowa. In Iowa *M. erminea* is considered to be locally common, while *M. nivalis* and *M. frenata* are listed as rare statewide (Iowa Wildlife Action Plan). Population trends for all three species are unknown (Iowa Wildlife Action Plan). Weasel populations are known to cycle, and population estimates based upon trapping records demonstrate this for Iowa (Evelsizer 2012). Weasels were rare enough by 1976 the trapping season was closed. Trapping was reinitiated in 1987, however no animals were reported until 2009. Trappers reported a total of 30 captures statewide for the 2012-2013 season (Evelsizer 2012).

Weasels have shown some resilience to urbanization in Europe (Cervinka et al. 2014) but have been shown to be negatively affected by habitat fragmentation caused by large scale agriculture (Gehring and Swihart 2004). The least weasel in Minnesota is known from only a handful of captures, none since 1990 (Minnesota DNR 2006). The species is considered of Special Concern in the state.

For these reasons I feel a preliminary, statewide survey focused on these three species is warranted.

Future Plans:

Future research on identified populations will heavily involve undergraduate students at Iowa State University through both independent research opportunities for students and as a part of taught courses (e.g. Mammalogy).

Urban Habitat Use by Butterflies: Adapting Protocols and Monitoring and Conducting Outreach with Place-based Results

Principal Investigator: Janette Thompson
Student Investigator: Bret Lang (Environmental Science)
Collaborators: Nathan Brockman, Mark Widrlechner
Duration: April 15, 2015 – March 31, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR), Wildlife Diversity Small Grant

Goals and Objectives:

- Determine the potential of urban gardens and natural areas embedded in urban settings in central Iowa to serve as habitat for butterflies
- Compare modified survey protocols to evaluate their suitability when applied in urban settings
- Conduct outreach at Reiman Gardens and Ames High based on maps of butterfly habitat use

Progress:

Six sites have been selected in Ames and Des Moines, IA and permissions sought to conduct butterfly monitoring. Permission has been granted for four sites (by personnel with the Des Moines Parks and Recreation and Ames Parks and Recreation departments, Reiman Gardens, and Ames High School/State Preserves Board) and is under consideration for the final two sites (Iowa Association of Municipal Utilities, the Des Moines Botanical Center). Similarly-sized sites were selected in the two cities that will accommodate the three survey protocols (Pollard Walks, point-count, and visual estimation). Preliminary surveys have been conducted in one urban garden and one urban natural area to ensure that methods will be successful in both types of settings. Consistently cold and wet weather has delayed initiation of systematic surveys. Investigators met with a statistician to confirm statistical validity of the approach and protocols.

Future Plans:

Sites will be surveyed approximately once every two weeks through September. Data analysis and development of maps describing butterfly habitat use will be conducted October through December. A volunteer survey protocol will be developed in January. Outreach efforts will occur February through April (or earlier as per requests at specific sites). A final report will be delivered to the Iowa Department of Natural Resources in March, 2016.

Continuing Projects

Genetic Analysis of White-tailed Deer Population Structure in Iowa: Identifying Potential Patterns and Rates of Disease Spread

Principal Investigator: Julie Blanchong
Student Investigator: Lynne Gardner (Ph.D.)
Collaborators:
Duration: June 2011 to December 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Conduct a statewide assessment of deer population genetic structure in Iowa to determine the scale of spatial autocorrelation and dispersal rates among sampled areas across the state.
- Determine the degree of genetic connectivity between free-ranging deer populations in Iowa and free-ranging deer populations in states bordering Iowa where CWD has been detected in free-ranging and/or captive deer.

Progress:

White-tailed deer (*Odocoileus virginianus*) are a valued resource for hunters, for viewing, and for state revenue. Knowledge of deer population structure can provide insight into aspects of deer ecology (e.g., dispersal) that are important for managing populations and understanding potential for disease spread. The goal of this project is to use genetic techniques to characterize deer population genetic structure in Iowa.

Lynne Gardner, a PhD student, began work on this project in August 2011. We received several thousand deer tissue samples collected for the Iowa Department of Natural Resource's 2010-2011, 2011-2012, 2012-2013, and 2013-2014 CWD surveillance efforts. In addition, we obtained deer tissue samples from captive cervid facilities in Iowa. We received deer samples from deer harvests in two urban communities and from surrounding rural populations. Deer tissue samples have been received from Illinois, Indiana, Kansas, Minnesota, Nebraska, Ohio, North Dakota, South Dakota, and Wisconsin, and Missouri. Some of these samples may be used to characterize deer genetic structure beyond the state of Iowa.

Genotyping of deer harvested in areas of low, medium, and high density in Iowa at 10 microsatellite loci has been completed and mitochondrial DNA (mtDNA) sequencing is nearly complete. We also completed genotyping deer samples from two urban areas and samples from surrounding rural areas to document the degree of connectivity between urban and rural deer. Preliminary results of this urban-rural comparison were presented at the Iowa chapter of the Wildlife Society annual meeting and the national Wildlife Society meeting.

Future Plans:

We have requested a no-cost extension of this project through December 2015. During this time, we will complete genetic data collection to identify factors shaping deer genetic structure across the state of Iowa. Samples from surrounding states may also be included. We will also complete data analyses for all components of the project. Specifically, we will use the genetic data to a) characterize the relationship between genetic structure and deer density, b) characterize genetic connectivity between captive and free-ranging deer, c) determine genetic connectivity between urban and rural deer in Iowa, and d) identify factors shaping deer population genetic structure across the state of Iowa. A final report will be completed by December 2015.

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

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

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

Collaborators:

Duration: Nov. 15, 2013 to March 30, 2017

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

Goals and Objectives:

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

Progress:

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

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

Future Plans:

We collaborated with Iowa DNR and Missouri Dept. of Conservation, and the Nature Conservancy to select research sites and treatments in 2014 and have completed one field season of treatments and data collection. Our second field season is underway and we are planning meetings in June, 2015 with all of the collaborators involved in this project.

Iowa Multiple Species Inventory and Monitoring (MSIM) Program

Principal Investigator: Stephen Dinsmore
Student Investigator: Shane S. Patterson (M.S.)
Collaborators: Karen Kinkead, Iowa Department of Natural Resources (IDNR)
Kevin T. Murphy, Research Associate, Iowa State University
Duration: January 2012 to December 31, 2017
Funding Source(s): Iowa Department of Natural Resources (IDNR), State Wildlife Grant

Goals and Objectives:

- Conduct MSIM surveys on a minimum of 113 new properties and up to 26 previously surveyed properties.
- Ensure collected data are entered 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 and change database records as advised.
- Thoroughly review the MSIM Program in 2014, based on the information collected between 2007 and 2013.

Progress:

Objective 1: Conduct MSIM surveys on a minimum of 113 new properties. We observed a range of bird species, mammal species and odonate species in several Iowa counties detailed in the report provided for the Coop Unit website. We also observed a number of butterfly species and conducted surveys for freshwater mussels at 10 properties in 2014. Other surveys were included for fish, crayfish and acoustic monitoring for bats.

Objective 2: Ensure collected data are entered into the MSIM online database. Currently, we have all data collected in the field through the 2014 season entered into the online database. The database currently contains more than one million records that includes species data as well as terrestrial and aquatic habitat data.

Objective 3: Submit county occurrence records to the appropriate IWAP taxonomic subcommittee. See the table at the end of the proposal for the structure and chairs of the IWAP taxonomic subcommittees. Thus far, we have submitted county lists from the 2014 field season to the bird (chair – Dr. Stephen J. Dinsmore), butterfly (chair – Ms. Stephanie Shepherd), and herptile (chair – Mr. Jeff LeClere) committees to be reviewed at their annual meetings. The chairs of these committees send these lists to the entire committee for review. They flag the species that are unusual or represent new county records. We then go back to the original data sheets and determine whether there was a data entry error or whether the record was entered legitimately. We have received some responses from committees regarding the 2014 data.

Objective 4: Provide additionally requested information to the IWAP subcommittees and change database records as advised. We continue to play a role in the review process of all records done through the IWAP subcommittees. After providing species lists from MSIM data to each subcommittee, we receive feedback on questionable records, determine the veracity of those records, and then either provide confirmation back to the subcommittee or modify/delete the record from the MSIM database. Any records deemed unacceptable by the committees are changed to ‘unknown species’ in the database with a note as to what the original identification was. As we are still working on providing the extra information to other committees, we again stress that the information presented in this report should be considered preliminary for 2014.

Objective 5: Thoroughly review the MSIM Program in 2014, based on the information collected between 2007 and 2013. Evaluation of the MSIM Program is ongoing.

For more details please see the project report listed on the Iowa Cooperative Fish and Wildlife Research Unit’s website.

Future Plans:

In 2015 we will return to a full-crew field season with four crews covering all of the permanent MSIM sites plus some new permanent sites statewide. We will also continue to work on data analyses and publications including work with Monarchs, grassland birds, forest birds, butterfly sampling methods, and predictive modeling using species occupancy patterns.

Northeast Iowa Forest Monitoring

Principal Investigator: Stephen Dinsmore
Student Investigator: Two undergraduate field technicians
Collaborators: Katy Reeder, IA Department of Natural Resources
Duration: April 15, 2013 to June 30, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Monitor breeding birds with Multiple Species Inventory and Monitoring (MSIM) protocols to gauge responses to forest habitat management.
- Monitor butterflies with Visual Encounter Surveys (VES) to gauge responses to forest habitat management.

Progress:

Bird surveys in 2013 were focused on sampling the breeding bird community, and we thus limited to the primary nesting season for Iowa (late May through early August). A total of 108 point counts at 48 stands was repeated 3 times (324 total point counts) in the period 21 May to 1 August and detected a total of 3,965 individuals of 85 species. Species with the greatest number of detections included American Crow (388), American Robin (275), and Blue Jay (214). However, surveys also detected 19 SGCN birds including Yellow-billed Cuckoo, Red-headed Woodpecker, Least Flycatcher, Veery, Wood Thrush, Blue-winged, Cerulean, Worm-eating, and Kentucky warblers, Ovenbird, and Scarlet Tanager.

Butterfly surveys in 2013 were focused during the primary summer flight season for most species. Cool, wet weather in May and June delayed or reduced the 2013 flight season for many species, so numbers and diversity were lower than expected. Nonetheless, a single visual encounter survey was repeated at 48 stands 3 times (144 total VES) in the period 21 May through 30 July and documented 753 individuals of 28 species across all sites. Species with the greatest number of detections included Great Spangled Fritillary (233), Hackberry Emperor (118), and Little Wood-Satyr (73). The only target species found were Silvery Blue and Striped Hairstreak, each at one site.

Future Plans:

The original plan was to conduct a second round of surveys in 2014, but this has been delayed one year (to 2015) to allow extra time for management actions to occur on each site. In 2015 we will repeat the surveys to better assess the impacts of management activities on target species of birds and butterflies.

Missouri River Multiple Species Inventory Monitoring

Principal Investigator:
Student Investigator:
Collaborators:

Stephen Dinsmore
5 Undergraduate field technicians
Karen Kinkead, Iowa Department of Natural Resources (IDNR)
April 1, 2014 to June 15, 2016
Iowa Department of Natural Resources

Duration:

Funding Source(s):

Goals and Objectives:

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

Progress:

Fieldwork for this project began in mid-April 2014 with the hiring of a field crew and site selection. A 5-person crew surveyed from 15 April to 15 October in 2014 collecting wildlife and habitat data for 19 study sites on 8 properties in southwest Iowa (Monona, Harrison, Mills, and Fremont Counties). All species observed during surveys were recorded with special focus given the Species of Greatest Conservation Need (SGCN). All collected data were entered into the MSIM online database. Field study sites were selected based on specific habitat types and management practices of interest to state agency wildlife management staff that conduct habitat management on selected properties.

Objective 1: Collect baseline information on vertebrates and invertebrates in accordance with the Multiple Species Inventory and Monitoring (MSIM) protocols at 15-20 sites along the Missouri River. - We conducted surveys using MSIM protocols at 19 study sites on 8 properties: Copeland Bend WMA, Deer Island WMA, Frazer Bend WMA, Louisville Bend WMA, Nottleman Island WMA, St. Marys WMA, Three Rivers WMA, and Tyson Bend WMA (Figure 1). We documented 146 species of birds (39 SGCN, 1 federally listed), 37 species of butterflies (2 SGCN, 1 rare vagrant), 25 species of mammals (2 SGCN), 17 species of fish (2 SGCN), 45 species of odonates (3 SGCN), and 26 species of herpetofauna (2 SGCN). In addition to the diversity of wildlife observed during the 2014 field season there were several noteworthy sightings. Federally endangered Least Terns were documented nesting at two sites and successfully fledged young at one of the study sites. This event is the first documented successful nesting of this species at a natural habitat type south of Gavins Point in modern times. Another noteworthy avian record from this season was a vagrant Roseate Spoonbill associating with flocks of egrets. Two butterfly records of note include a vagrant Gulf Fritillary and an Olympia Marble (an SGCN). A mammalian record of particular interest was the capture of a Plains Pocket Mouse; this was the first time that MSIM protocols have detected this SGCN in the state of Iowa.

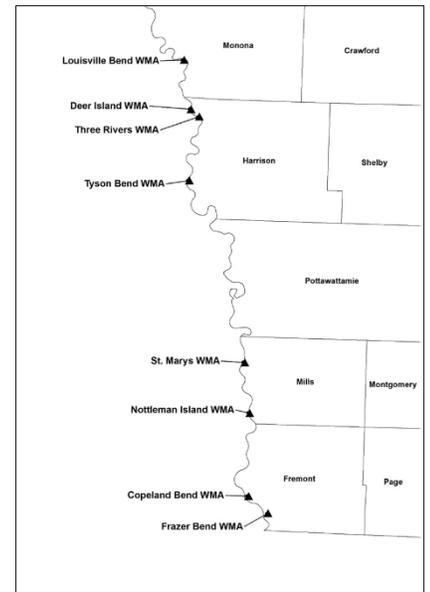


Figure 1. Map of properties surveyed during the Missouri River MSIM monitoring efforts, 2014.

Objective 2: Estimate probability of occupancy and abundance for select species of interest, as appropriate. - Analyses of these data are ongoing with further field efforts planned for 2015.

Objective 3: Link findings to the Missouri River Recovery Program (MRRP) objectives for these sites. - Further field efforts in 2015 will provide increased spatiotemporal coverage and better insight into wildlife occupancy and abundance patterns in the study area. Analyses of these data will be ongoing to help guide efforts to meet MRPP objectives on these sites.

Future Plans:

Fieldwork will resume on 15 April 2015 and continue through 15 October 2015. 15 study sites on 7 properties will be surveyed during this field season. At the end of the field season we will ensure all data are entered into the MSIM database, produce an annual report, and work with partners to provide analyses for select species of interest to meet management objectives.

Twin Lakes Restoration Diagnostic and Feasibility Study

Principal Investigator: John Downing
Student Investigator:
Collaborators: Christopher Filstrup and Clayton Williams
Duration: October 1, 2014 to October 31, 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- To provide the Iowa Department of Natural Resources with a diagnostic and feasibility study of North and South Twin Lakes, Calhoun County, Iowa for planning and implementing lake and watershed improvement efforts.

Progress:

North and South Twin Lakes monitoring activities for lake, tributary, and outfall locations continue until July 31, 2015. To date, we have completed physical, chemical, and biological analyses of water samples collected during 2014, and continue to analyze water samples collected during 2015. An interim project report, including final results from soft sediment mapping, was submitted in January 2015. We have coordinated one public meeting and two local steering committee meetings to share initial project findings and to gain feedback on study design and analyses from the community.

Future Plans:

We will submit the final diagnostic study report and recommendations for the feasibility study to Iowa DNR on September 30, 2015. With the help of Iowa DNR, we will coordinate a public meeting and two local steering committee meetings during Autumn 2015 to present findings from this study to the public and to develop effective restoration strategies with community leaders, respectively.

Silver Lake (Palo Alto County) Restoration Diagnostic and Feasibility Study

Principal Investigator: John Downing
Student Investigator:
Collaborators: Christopher Filstrup and Clayton Williams
Duration: April 1, 2014 to April 30, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- To provide the Iowa Department of Natural Resources with a diagnostic and feasibility study of Silver Lake, Palo Alto County, Iowa for planning and implementing lake and watershed improvement efforts.

Progress:

Silver Lake monitoring activities for lake, tributary, and outfall locations continue until January 31, 2016. To date, we have complete physical, chemical, and biological analyses of water samples collected during 2014, and continue to analyze water samples collected during 2015. An interim project report, including final results from soft sediment mapping and dredge analysis, was submitted in April 2015. We have coordinated one public meeting to discuss project goals and objectives and will host a local steering committee meeting soon to gain feedback on study design and analyses.

Future Plans:

We will submit the final diagnostic study report and recommendations for the feasibility study to Iowa DNR on March 31, 2016. With the help of Iowa DNR, we will coordinate a public meeting and four local steering committee meetings during Summer 2015 through Spring 2016 to present findings from this study to the public and to develop effective restoration strategies with community leaders, respectively.

Estimating Breeding Populations of Canada Geese in the Midwest

Principal Investigator: Robert W. Klaver
Student Investigator: Brenna Towery, M.S.
Collaborators:
Duration: January 1, 2013 to September 30, 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

In order to develop a model to predict giant Canada goose breeding pair densities in Iowa, we will first reclassify the NWI data by modifying the current Cowardin classification system to a simplified classification system based on wetland vegetation and permanence. We will also identify all sections in the state with potential Canada goose nesting habitat and assign each section to a class based on their predicted numbers of breeding pairs. In addition, we will determine giant Canada goose nest success at Rice Lake Wildlife Management Area, and other areas where nest densities have historically been very high.

Progress:

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. Future plans are to submit three manuscripts to the Journal of Fish and Wildlife Management, Prairie Naturalist, and Wildlife Society Bulletin.

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

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

Goals and Objectives:

- Compare breeding bird use of five habitat types that have been established on managed land in the Spring Run Wetland Complex (Spring Run).
- Compare vegetation composition and structure in each of the five established habitat types at Spring Run.
- Compare invertebrate populations in each habitat type at Spring Run.

Progress:

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) monotypic, 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.

The goal of this study is 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 will be used in the study. An additional habitat type consisting of a mix of short-grass species and forbs, planted with over 100 species, will also be incorporated into this project. Understanding invertebrate populations within the area will be helpful in explaining bird abundance.



Future Plans:

Bird surveys: Surveys will take place weekly for six weeks during the summers of 2015 and 2016 along line-transects.

Vegetation surveys: Surveys will take place in June and July during the summers of 2015 and 2016 along randomly located transects in each habitat type.

Invertebrate surveys: Sweep-net sampling will take place on randomly located transects during May, June, and July during the summers of 2015 and 2016.

Amphibian Occupancy and Effects of Habitat Use on Chemical Exposure in Northern Leopard Frogs (*Lithobates pipiens*) in Iowa Prairie Pothole Wetlands

Principal Investigator: Clay L. Pierce
Student Investigator: Jennifer Swanson
Collaborators: Erin Muths, Mark Vandever, Kelly Smalling (U.S. Geological Survey)
Duration: January 1, 2015 to December 31, 2016
Funding Source(s): U.S. Geological Survey

Goals and Objectives:

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



Progress:

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

A graduate student, Jennifer Swanson, has been selected and began classes in Spring 2015.

Future Plans:

Jennifer will begin field work in May 2015.



Jenny Swanson practicing suturing techniques with Dr. Taylor Yaw, DVM Surgical Intern at Iowa State University Hixon-Lied Small Animal Hospital.

Reproductive ecology of Asian Carp in Southeastern Iowa rivers

Principal Investigator: Clay L. Pierce
Michael Weber
Student Investigator: Carlos Camacho (M.S.)
Collaborators: Kim Bogenschutz, IDNR
Jason Euchner, IDNR
Duration: July 1, 2013 to June 30, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Evaluate Asian Carp reproduction (Fecundity, Larval and juvenile densities) and recruitment in select Iowa rivers including the Mississippi, Des Moines, Skunk, Iowa and Cedar rivers

Progress:

Bighead (*Hypophthalmichthys nobilis*) and silver (*H. molitrix*) carps (collectively, Asian carp) are an invasive species that have been expanding their range throughout the Mississippi River basin. Further range expansion and establishment is dependent upon the ability of adults to find suitable spawning habitat and reproduce. A lock and dam system has transformed the upper Mississippi River into a series of lentic habitats that may not support successful Asian Carp reproduction. However, free flowing tributaries to the upper Mississippi River may provide necessary suite of conditions for reproduction. In Iowa, Asian carp adults are known to inhabit the lower portions of the Des Moines, Iowa, Cedar, and Skunk rivers but it is not known whether these populations are successfully reproducing and recruiting in Iowa rivers. Our objective was to evaluate Asian Carp reproduction in four southeastern Iowa tributaries and the Mississippi River using adult gonad development and ichthyoplankton densities.

In 2014, Silver Carp gonadosomatic index (GSI) and gonad development were compared between the Des Moines and Mississippi rivers. Silver Carp were collected monthly in the Mississippi River in pool 20 and the Des Moines River from April to October, 2014. Gonads were categorized by developmental stage, removed, and weighed. Peak GSIs were observed in May for the Mississippi River and June for the Des Moines River while lowest GSIs were observed in July for both rivers. Female gonad stages progressed from full to spent ovaries from June to July for both rivers. Based on seasonal changes in gonad staging and GSI, spawning may have occurred in the Mississippi River and Des Moines River during the month of June. Ichthyoplankton samples are being processed for eggs and larvae to verify reproduction and identify potential limitations to early life stages. If Silver Carp are able to successfully reproduce in upper Mississippi River tributaries, population abundance may increase rapidly despite inadequate reproductive habitat in impounded sections of the Mississippi River.

Future Plans:

Additional adult, egg, and larval sampling will occur in 2015 to evaluate annual variation in reproductive patterns.



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

Principal Investigator: Kevin Roe
Student Investigator: Jermaine Mahguib
Collaborators:
Duration: September 15, 2012 to September 15, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

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

Progress:

Initial attempts to collect DNA samples from mucous trails of the Federally Endangered Iowa Pleistocene Snail (*Discus macclintocki*), were successful. Although the amount of DNA recovered using this technique is low compared to more traditional methods, it is deemed to be sufficient to conduct the proposed project.

The PI with the cooperation of the USFWS was able to non-lethally collect samples from 85 individual *D. macclintocki* from nine different glacial slopes this past field season. Additional field collections are ongoing (Spring 2015).

The PI was successful in identifying a graduate student to assist with the project. Jermaine Mahguib is a PhD student in the EEB program at Iowa State University and will be conducting additional field collections and laboratory based research on *D. macclintocki* as part of his dissertation.

Graduate student Jermaine Mahguib successfully extracted genomic DNA from the 85 samples obtained.

Experiments to validate the utility of the genomic DNA for the proposed research were conducted. Jermaine Mahguib has amplified and sequencing a portion of the 16S rDNA that was used in a previous genetic study of *D. macclintocki*. This work has confirmed the usefulness and quality of the extracted DNA and also provide a means of comparing the results of this project with the earlier research.

The lab that was used by the PI to generate the proposed microsatellite markers is no longer available. We are currently exploring options for generating the necessary genetic data to complete the project.

Future Plans:

Collect samples from as many sites as feasible. Finalize plans to generate genotypic data, collect and analyze data.

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

Principal Investigator: Jennifer Vogel
Diane Debinski

Student Investigator:

Collaborators: Stephanie Shepherd, IDNR

Duration: January 2013 to December 2016

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

Goals and Objectives:

- Evaluate the genetic diversity of the existing small population of greater prairie-chickens in Iowa and examine the effects on genetic diversity of supplementing the current population with translocated birds.
- Develop a habitat suitability model and examine habitat use for greater prairie-chickens in Iowa. We will use current satellite landcover data along with local scale habitat data to develop a habitat suitability model for greater prairie-chickens in Iowa.

Progress:

Genetics: We collected 74 blood samples from translocated birds in 2013 and 109 blood samples from translocated birds in 2014. In addition, we collected 86 feather samples from the 2 active lek sites in Iowa in 2014. Blood and feather samples are being processed at the University of North Texas.

Lek Surveys: We conducted prairie-chicken lek surveys weekly from March 20, 2014 to May 8, 2014. During the surveys, the maximum number of birds observed was 17 on Kellerton lek, 6 on Woods lek, and 12 on Dunn Ranch lek.

Habitat Surveys: For grasslands within 3km of active lek sites, we conducted vegetation surveys that include measuring visual obstruction and determining vegetation composition. We will use this vegetation data to assess habitat use of prairie-chickens within 3km of the active lek sites. We obtained and reclassified 2009 High Resolution Landcover data for the state of Iowa as the basis for our landscape level habitat suitability model.

Telemetry: We attached 12 ARGOS satellite/GPS transmitters to 10 female and 2 male translocated prairie-chickens. We are continuing to track locations with weekly downloads. Based on the location data for the birds wearing transmitters, we were able to determine female nesting behavior. Two of the birds wearing transmitters had successful nests in 2014.

Future Plans:

We will collect blood samples from translocated birds prior to release in April 2015. In addition, we will collect feather samples from lek sites in April 2015. We will monitor the locations of the birds with transmitters via weekly downloads from the ARGOS Web System. We will continue work on both the local and landscape level habitat use models

Factors affecting mercury concentrations in Iowa fishes

Principal Investigator: Michael Weber
Clay L. Pierce
Student Investigator: Nathan T. Mills
Collaborators: Iowa DNR Staff
Duration: June 1, 2014 to December 31, 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Develop regression models to predict the concentration of mercury in a range of fishes as a function of fish total length across natural lakes, impoundments, reservoirs, and rivers to guide consumption advisories.
- Evaluate regional (e.g., north vs south, east vs west) differences in mercury concentrations to help guide consumption advisories. Include additional biotic (e.g., age, food web dynamics) and abiotic (e.g. land use, water quality) factors in models to explain additional variation in mercury concentration not explained by fish length.
- Evaluate temporal changes in mercury concentrations in largemouth bass to guide mercury sampling protocols.

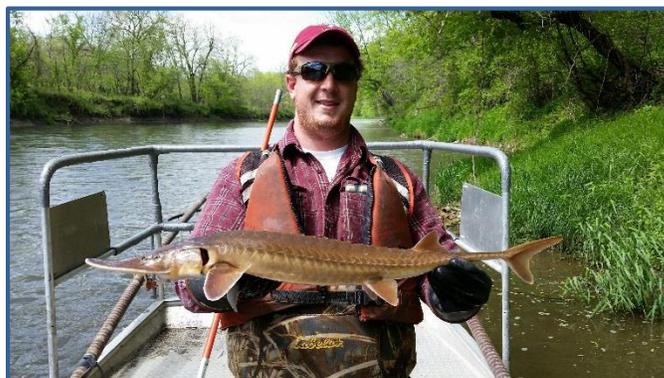
Progress:

Mercury is naturally present in the environment but levels have increased dramatically since the 19th century due to anthropogenic emissions. Mercury concentrations in fishes can be highly variable among species and populations driven by a range of biotic and abiotic factors. Larger and older fish typically have higher mercury concentrations compared to smaller and younger individuals. Understanding fish length-mercury concentration relationships is an important component of issuing fish consumption advisories because fish length is easy for anglers to measure and understand. However, large variation in mercury concentrations within a species and individuals of similar size is common. The majority of mercury in fish muscle is derived from dietary sources. Understanding trophic ecology and population dynamics (e.g., age, growth, mortality) are important aspects of understanding mercury concentrations in fishes.

DNR biologists and Iowa State University personnel have been collecting fish from several lakes, reservoirs, and rivers across Iowa. As of March 2015, 277 bluegill, 207 black crappie, 112 white crappie, 63 yellow perch, 150 channel catfish, 101 flathead catfish, 70 smallmouth bass, 525 largemouth bass, 32 muskellunge, 21 sauger, 335 walleye, and 92 northern pike have been collected for mercury analysis. The highest total mercury concentration detected was 2.52 mg/kg and was found in a 1204mm (47.4") female muskellunge from West Okoboji Lake, in northern Iowa, during April 2014. Of the 1700 tissue samples that have been analyzed for mercury, only 165 (~10%) have had mercury concentrations exceeding the EPA criterion of 0.30 mg/kg. While 703 (41%) of these samples have had undetectable mercury concentrations (<0.05 mg/kg).

Future Plans:

Once all samples have been analyzed for mercury, multiple regression models will be created to identify biotic and abiotic influences on mercury accumulation in Iowa fishes. Spatial relationships and lake-by-lake or species-specific contamination concerns will be identified from these models to guide further development of Iowa consumption advisories.



Asian Carp population dynamics and distribution in southeast Iowa rivers

Principal Investigator: Michael Weber
Clay L. Pierce
Student Investigator: Chris Sullivan (M.S.)
Collaborators: Kim Bogenschutz, IDNR
Jason Euchner, IDNR
Duration: May 1, 2014 to June 2016
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Estimate the influence of environmental covariates on occupancy and detection probabilities of Asian Carp
- Evaluate and compare temporal (e.g., seasonal and annual) trends in Asian Carp population characteristics (abundance, distribution, size structure, condition) and dynamics (growth, mortality, recruitment) among southeast Iowa tributaries and upper Mississippi River populations
- Evaluate patterns of large-scale spatial synchrony of dynamic rates (recruitment and growth) for Asian Carp populations among Midwestern Mississippi River watersheds

Progress:

Since their introductions in the 1970s, Bighead *Hypophthalmichthys nobilis* and Silver Carp *H. molitrix* (collectively Asian Carp) have spread throughout the Mississippi River basin and become two of the most recognizable invasive species in North America. Their migration and possible establishment into higher reaches of the Upper Mississippi River (UMR) and its major tributaries is not well understood and currently southeast Iowa river systems are at the main stem Mississippi River invasion front. Presently, there is a paucity of knowledge associated with established and migrating populations at the invasion front and understanding population characteristics and dynamics and factors influencing population regulation is needed to facilitate assessment and management on a local and regional scale. To effectively monitor large-scale range expansion, knowledge of site occupancy as well as critical environmental variables influencing detection is needed. Additionally, evaluation of spatiotemporal trends in Asian Carp local population characteristics and dynamic rates among a major tributary on the invasion front will aid in understanding dispersal characteristics, and possible establishment, into higher reaches of the UMR. Lastly, the degree of synchrony among Midwestern Mississippi River systems and the influence of climate and dispersal on Asian Carp recruitment and growth may further our understanding and aid managements understanding on local and regional mechanistic processes influencing dynamic rates, manipulating management scales for Asian Carp.

In summer 2014, Asian Carp were collected in the Des Moines and Skunk rivers. A total of 1,148 Asian Carp were collected from April 18 to October 25. In the Des Moines River, Silver Carp made up majority of the catch (98%) while Bighead Carp only comprised approximately 2% of captured individuals. Additionally, three individuals captured were identified as Hybrid Carp. Silver Carp ranged from 450 to 880 mm (mean = 644 mm) in length and 1.2 to 7.4 kg (mean = 2.8 kg) in weight. Bighead Carp ranged from 624 to 1003 mm (mean = 840 mm) in length and 2.6 to 10.3 kg (mean = 6.4 kg) in weight. In the Skunk River, only 12 Silver Carp were captured throughout the year ranging from 631 to 899 mm (mean = 817 mm) in length and 2.6 to 9.6 kg (mean = 6.3 kg) in weight. Proportional size distribution (PSD) indices suggest Silver Carp populations are of larger size structure in downstream sites compared to upstream sites while populations above Lock and Dam 19 are larger than populations immediately downstream. Additionally, age structures of Silver Carp populations were smaller than downstream sites while Bighead Carps exhibited a reverse age structure.

Future Plans:

Additional adult sampling for Asian Carp will occur spring through fall 2015 in southeast Iowa rivers as well as among Midwestern Mississippi River tributaries.



Completed Projects

Lead in Species in Conservation Need: Free-flying Bald Eagles as Indicators

Principal Investigator: Julie A. Blanchong
Stephen Dinsmore
Student Investigator: William Reiter-Marolf (M.S.)
Collaborators:
Duration: January 2012 to June 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR), State Wildlife Grant

Goals and Objectives:

- Characterize lead levels in nesting and winterizing Bald Eagles in Iowa State University
- Compare lead exposure in free-flying eagles with eagles admitted to rehabilitation centers

Progress:

The high proportion of Bald Eagles (*Haliaeetus leucocephalus*) with lead poisoning reported by wildlife rehabilitation centers and wildlife health monitoring programs has raised concern about the magnitude and consequences of lead exposure in this species and other bird Species of Greatest Conservation Need (SGCN). This study is examining the degree to which avian SGCN are being exposed to lead in their diets by examining lead levels in Bald Eagles admitted to rehabilitation centers and in nesting and wintering Bald Eagles in Iowa.

In 2012 and again in 2013, M.S. student William (Billy) Reiter-Marolf and his technician non-invasively collected excrement samples from wintering Bald Eagle roosts and from up to 110 randomly Bald Eagle nest sites in winter (during egg incubation) and again in spring (when eaglets were 3-9 weeks of age). Half of the nests were in close proximity to the Mississippi River and half were distributed throughout the rest of Iowa. Blood and excrement samples were also collected from Bald Eagles admitted to 3 rehabilitation centers in Iowa. All samples were sent to the Iowa State Hygienic Lab for lead testing. Testing is complete and we are completing data analysis. In 2014, Billy defended his M.S. thesis and results of this research were presented at the Iowa chapter of the Wildlife Society annual meeting and the national Wildlife Society meeting.

We received approval to use the remaining funds from this project to examine levels of several additional heavy metals in the eagle excrement samples. We will complete statistical analyses of other heavy metal data and prepare manuscripts for publication.

A final report will be submitted in June 2015.

Conclusions and Recommendations:

We did not identify any significant spatial or temporal trends in lead exposure in samples from free-flying Bald Eagles. Lead levels in excrement from free-flying birds ranged from <1.0 mg/kg (our detection limit) to 170 mg/kg while values in rehabilitation birds ranged from <1.0 mg/kg to 520 mg/kg. High lead levels (>5 mg/kg) were documented less frequently in excrement samples from free-flying eagles (2.8%) compared to samples from rehabilitation eagles (29.8%). Our results suggest that free-flying eagles are not experiencing high levels of lead exposure at the same rates as observed in rehabilitation Bald Eagles. However, most samples collected from free-flying and rehabilitation Bald Eagles contained some lead.

Our comparison of lead levels in blood and excrement from Bald Eagles submitted to rehabilitation centers found that excrement lead levels were a significant predictor of blood lead levels. A linear regression model indicated that when excrement lead levels are low, it is likely that blood lead levels will also be low. When excrement lead levels are high, it is likely that blood lead levels will also be high. We concluded that excrement has the potential to be a valuable tool for investigating lead exposure in Bald Eagles. However, additional work is needed in order to be able to predict clinical outcomes based on excrement lead levels.

Acoustic monitoring for Iowa bats: preparing for White Nose Syndrome

Principal Investigator: Julie A. Blanchong
Rebecca Christoffel

Student Investigator:

Collaborators: Daryl Howell

Duration: December 2013 to December 2014

Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

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

Progress:

White Nose Syndrome (WNS), a devastating disease associated with the mortality of millions of bats was first documented in New York during the winter of 2005-2006, and is now confirmed in numerous US states and Canadian provinces. The fungus that causes WNS was detected on a big brown bat hibernating in an Iowa cave in March 2012. The loss of large numbers of bats due to WNS is expected to have enormous economic impacts to agriculture. Knowledge of the abundance and distribution of bat species in Iowa is minimal, but is critically needed to understand the potential ramifications of WNS to Iowa.

We conducted acoustic surveys along 19 30-mile drive transects in eastern, central, and southern Iowa to document bat echolocation activity in order to gain a better assessment of bat abundance and distribution in Iowa. Each transect was surveyed twice between May 28 - July 30, 2014. To complement these mobile surveys, we will establish three fixed-location sites in urban parks that are difficult to survey by vehicle as well as three fixed-location sites in agricultural areas in central Iowa were monitored twice during summer 2014.

A final report was submitted to the Iowa Department of Natural Resources in November 2014.

Conclusions and Recommendations:

For drive transects, bat activity was higher in the Eastern region of Iowa than in the Central or Southern regions. This difference may be tied to differences in bat habitat in the three surveyed regions of Iowa. Qualitatively, the eastern counties appear to be more densely forested and less agricultural than the central or southern counties. Bat activity varied across farms while bat activity in the 3 parks was similar.

In the Central and Southern regions of Iowa, bats in the low frequency group, consisting of Big Brown, Hoary, and Silver-haired bats, were most commonly recorded. In the Eastern region, bats in the high frequency group, consisting of Eastern Red, Evening, Indiana, Little Brown, Northern Long-eared, and Tricolored bats, were most commonly recorded. The reason for this difference in the percentage of bats in these two frequency groups between eastern and central-southern regions of Iowa may be tied to habitat differences between the regions and warrants further exploration.

We had limited ability to identify bat calls to a single species. The Hoary bat was the bat most commonly identified to species and outnumbered call sequences identified to each of the other species that were able to be narrowed down to a single species. This greater identification of Hoary bats is likely attributable to the distinct nature of call sequences produced by this species, making it by far the easiest species to identify. Bats will vary their calls due to flight pattern, foraging phase, the presence of conspecifics, and the density of acoustic clutter in the environment. This variation increases the overlap in call characteristics among species making it difficult to identify individual species. In addition, Doppler shifts associated with drive transects can affect the characteristics of the call recording which can further complicate identifying a call.

Assessment of Iowa Habitat and Access Program

Principal Investigator: Rebecca Christoffel
Student Investigator: James Crain
Collaborators: Peter Fritzell, IDNR and Chris Jennelle, IDNR
Duration: September 30, 2012 to May 31, 2015
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Assess the Iowa Habitat and Access Program (IHAP) that was established in 2010 and determine the potential value of the program to hunters in terms of willingness to pay for program continuation beyond the initial period in which Federal funding was provided.

Progress:

Task 1 determined the sampling time frame was developed in 2012 and 2013, and completed during fall 2013. The contractor developed the sampling frame (database) of hunters who utilize IHAP properties in fall of 2012 and spring 2013.

Task 2 state the contractor shall develop a survey instrument to assess hunters' willingness to pay for IHAP. This was developed in conjunction with Peter Fritzell and Chris Jennelle of Iowa DNR and Catherine Kling of Iowa State University. The instrument was finalized in Spring 2014.

Task 3 developed a report on landowner interviews to be conducted during the spring/summer of 2013 that addresses landowner satisfaction. These interviews were conducted as planned and the report completed in Fall 2013.

Task 4 provides the DNR with a final report that included survey analysis and recommendations for IHAP based on landowner interviews and willingness to pay survey. The survey was implemented in Fall 2014.

Conclusions and Recommendations:

The survey data have been analyzed and the final report completed by May 31, 2015.



The Use of Fire and Grazing to Improve Grassland Habitat for Species of Greatest Conservation Need

Principal Investigator: Diane Debinski
James R. Miller (University of Illinois)
David M Engle (Oklahoma State University)
Lois Wright-Morton

Student Investigator: John Delaney (Ph.D.)
Courtney Duchardt (Ph.D., UI)
Tim Lyons (Ph.D., UI)
Derek Scasta (Ph.D., OSU)

Collaborators:

Duration: August 2010 to July 2014

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

Goals and Objectives:

- We will develop specific guidelines for natural resource managers regarding the use of fire and grazing to enhance habitat conditions for Species of Greatest Conservation Need (SGCN) and other grassland-dependent wildlife in the Grand River Grasslands on approximately 2500 acres.
- We will extend what is learned on experimental pastures to nearby private lands by increasing landowner knowledge and skills in the application of restoration practices to enhance habitat conditions for SGCN and other grassland-dependent wildlife while maintaining grazing and recreational uses on 1800-3000 acres.

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 of southern Iowa: 1) patch-burn graze, 2) graze-and-burn, and 3) burn-only. We examined bird, butterfly, and vegetation responses to each of the three treatments during the second three-year burn cycle and this project incorporated a social science component focused on working with local farmers to extend what is learned on experimental pastures. All treatment variables remained the same as in the first three-year burn cycle with the exception of stocking rate, which was reduced in 2010 compared to previous years, and it was maintained at this reduced rate since 2010. 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). Pastures ranged in size from 38 to 84 acres and are located at the IA DNR's Ringgold and Kellerton Wildlife Management Areas, on properties owned by The Nature Conservancy, on private properties in Ringgold County, Iowa, and at the Missouri Department of Conservation's Pawnee Prairie Preserve in Harrison County, Missouri. The three treatments were defined as follows: 1) *patch-burn graze*: burning of spatially distinct patches within the pasture and free access by cattle, 2) *graze-and-burn*: free access by cattle and burning of the entire pasture, and 3) *burn-only*: burning of the entire pasture but no grazing (typical management for protected lands in the region). Each of the three treatments was burned on a three year fire-return-interval. Patch-burn graze and graze-and-burn pastures were stocked annually from May 1 until October 1 at an average rate of 0.7 animal-unit months per acre (this stocking rate began in 2010). Burn-only pastures were not fenced. No fertilizers or herbicides were applied in the pastures prior to the study, and no chemicals were applied during the course of the current study. We held annual field days for landowners and we organized workshops to explain the use of fire and grazing for grassland management. We also conducted in-person interviews to document landowner knowledge, attitudes, and willingness to learn about and implement conservation and restoration management practices such as prescribed fire and grazing on their lands. Three graduate students completed degrees associated with this project and the manuscripts from this work are being submitted for publication.

Conclusions and Recommendations:

Our team produced a large number of peer-reviewed papers from this research and we are now initiating a new project focusing on adaptive management in these same pastures. We hope to continue to study these sites and to continue our collaborative interactions with local and state land managers and private land owners.

Estimating Breeding Populations of Canada Geese in the Midwest

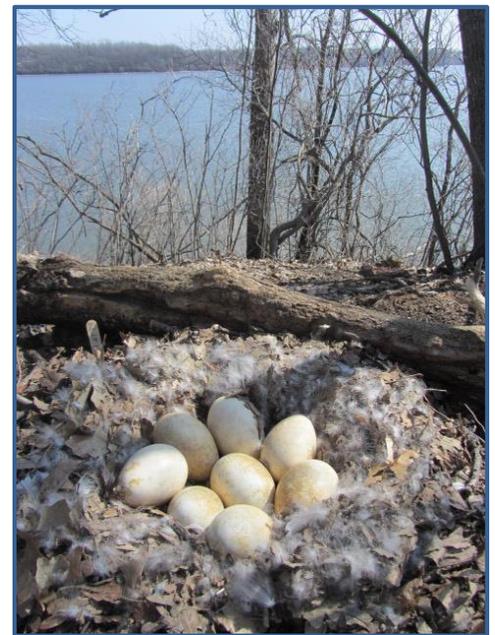
Principal Investigator: Robert W. Klaver
Student Investigator: Brenna Towery (M.S.)
Collaborators:
Duration: January 1, 2013 to May 31, 2015
Funding Source(s): U.S. Geological Survey

Goals and Objectives:

In order to develop a model to predict giant Canada goose breeding pair densities in Iowa, we will first reclassify the NWI data by modifying the current Cowardin classification system to a simplified classification system based on wetland vegetation and permanence. We will also identify all sections in the state with potential Canada goose nesting habitat and assign each section to a class based on their predicted numbers of breeding pairs. In addition, we will determine giant Canada goose nest success at Rice Lake Wildlife Management Area, and other areas where nest densities have historically been very high.

Conclusions and Recommendations:

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.



Functional Assessment of Missouri River Mitigation Wetlands in Iowa

Principal Investigator: Rolf R. Koford
David L. Otis

Student Investigator: Tyler Grant (Ph.D.)

Collaborators: Karen Kinkead, Angi Bruce, Iowa Department of Natural Resources
NE, KS, MO State Agencies and Universities

Duration: June 2009 to May 2015

Funding Source(s): U.S. Army Corp of Engineers

Goals and Objectives:

- Evaluate herpetofauna habitat function of restored wetlands in the Missouri River floodplain
- Relate species response to management practices and physical attributes of wetlands
- Integrate results from comparable studies in collaborating states to produce models to inform adaptive management of existing and future mitigation programs

Conclusions and Recommendations:

Amphibians and their associated wetlands in the Missouri River floodplain in Iowa were studied from 2010-2013. I had the opportunity to study the effect of a catastrophic flood on an anuran community in the Missouri River floodplain. Three species (plains leopard frog, Woodhouse's toad, and Blanchard's cricket frog) had only minor changes in adult male occupancy rate in the two years after the flood. Colonization rates for these species were positively associated with wetlands that were shallower near the shore and they did not appear to be affected by reduced vegetation. Three other species or species complexes (northern leopard frog, the gray treefrog complex, and boreal chorus frog) had greatly reduced occupancy rates in the two years after the flood. Colonization rates for these species were relatively low, and they had high extinction rates. Colonization rates for these species were not associated with any measured habitat characteristic. Future flood events will likely continue to make northern leopard frogs, gray treefrogs, and boreal chorus frogs a less important part of the ecological community. Although some species may fare well under extreme climate events forecast under climate change scenarios, I hypothesize that many species will be challenged.

Amphibian conservation has often relied on auditory call surveys to determine habitat associations of anuran species. These surveys are restricted to only a single important life stage, however, and management recommendations from call surveys alone risk creating ecological traps or population sinks. Calling adult male surveys had established that slope at the inner edge of the wetland, wetland area, and percentage of bare ground within 1 m of the wetland were important habitat associations of calling adults of various species. I surveyed tadpoles and metamorphs of 5 anuran species and compared habitat associations for extinction rates of tadpoles and metamorphs with habitat associations for calling adults and found little overlap. I also estimated occupancy rates for calling adults, tadpoles, and metamorphs. Occupancy estimates indicate that reproductive success is variable, but the reasons are unknown. Occupancy rates of tadpoles and metamorphs were often lower than occupancy rates of adult calling males. Too often amphibian conservation and management proceeds with little information on critical aquatic life stages and I recommend greater emphasis on the entire life cycle to avoid potential misinformed conservation actions.

The importance of isolated wetlands disconnected from the river in large river floodplains has largely been ignored and consequently there is little management supporting this important component of productivity and biodiversity. Isolated and fishless wetlands in the upper elevations of floodplains may support a community largely absent from the rest of the floodplain. Flow regulation has rendered the upper elevations of many floodplains nearly devoid of wetlands but restoration of large river floodplains places no emphasis on isolated wetlands, despite concern over their status elsewhere. Primary drivers of community composition in isolated wetlands are predatory fish and hydrology. Wetlands are likely colonized by fish, and I used a GIS model of the floodplain topography to estimate the connection stage (the river stage when a wetland floods), and fill stage (river stage corresponding to the minimum elevation of the wetland, which is an indication of hydroperiod) of isolated wetlands in my study site. I compared the characteristics of current isolated wetlands to historical hydrology to determine how often fishless isolated wetlands are present. Productivity and biodiversity of the floodplain could be increased greatly by increasing the number of wetlands with a connection stage corresponding to river stage of 8-9 m and a fill stage of 5-7 m. I recommend restoration of large river floodplains give due consideration to the entire gradient of wetland types that were present before flow regulation so that the full complement of biodiversity and productivity can be restored.

I used a the multi-season occupancy model to estimate occupancy rates of successive life stages in Chapter 3, herein referred to as multiple life stage design. The constraints in a multi-stage analysis, namely, colonization rates of 0 and the successively decreasing occupancy rates for each life stage, require special considerations during the study design phase. I

used simulations to explore the robustness of the parameter estimates when incorrectly assuming that colonization rate is 0. I explored the effect of design considerations such as the number of sites, detection probability, and number of surveys on confidence intervals of occupancy rates. Unacceptable bias in nearly all parameters is induced by true values of the colonization rate as low as 0.05 when the colonization rate is fixed to 0. Confidence intervals for occupancy rates are most improved by increasing the number of sites, but also by increasing detection probability and increasing the number of surveys. Under a simulated scenario with 50 sites, confidence intervals overlapped if the difference between occupancy rates was approximately 0.3 or less. Under excellent simulated study conditions with 200 sites, confidence intervals overlapped when the difference between occupancy rates was approximately 0.15 or less. These results will aid researchers in making appropriate study design decisions to avoid bias and meet their objectives in researching life stages.



Comparison of Amphibian Habitat Suitability in USDA CREP and Reference Wetlands in the Des Moines Lobe of Iowa

Principal Investigator: Clay L. Pierce
Student Investigator: Rebecca Reeves (M.S.)
Collaborators: Erin Muths, USGS Fort Collins Science Center
Mark Vandever, USGS Fort Collins Science Center
Duration: September 2011 to December 2014
Funding Source(s): Iowa Department of Natural Resources (IDNR)

Goals and Objectives:

- Compare amphibian species richness in restored CREP and reference wetlands in central Iowa
- Estimate lethal and sub-lethal impacts to adult leopard frogs (*Lithobates pipiens*) in CREP and reference wetlands in central Iowa by estimating survival rates and population sizes and characterizing developmental stress exhibited by frogs (via fluctuating asymmetry and body condition)
- Estimate and compare chorus frog (*Pseudacris maculata*) population sizes in reference and restored wetlands in central Iowa
- Characterize abiotic factors (e.g., depth, hydroperiod, water pH, turbidity, nutrient concentrations, and conductivity) and environmental stressors (e.g., predators, emergent diseases, as well as parasite and pesticide exposure) experienced by amphibians in restored and reference wetlands in central Iowa

Progress:

All project objectives were completed, a final report will be submitted in July, and three manuscripts are being prepared for publication.

Conclusions and Recommendations:

We sampled environmental characteristics and amphibian populations in six wetlands (3 CREP and 3 reference) between 2011 and 2013. As anticipated, given their purpose, water samples from CREP wetlands had higher concentrations of nitrogen. Additionally, we tested water, frog tissue, and sediment samples for nearly 100 agricultural contaminants, including fungicides, insecticides, herbicides and degradation products. While we found contaminants in all samples, there were no differences in concentrations between CREP and reference wetlands. Compounds detected in amphibian tissue were similar to those detected in water and sediment samples, so it is likely that frogs are picking up contaminants from their habitat. We found no differences in amphibian species richness or adult leopard frog survival rates between wetland types. Reductions in leopard and chorus frog population size correlated with extended hydroperiods and the presence of fish and non-native bullfrogs (*Lithobates catesbeiana*) in wetlands. The amphibian chytrid fungus was detected in all wetlands, but was found in higher concentrations in water samples from reference wetlands. Exposure to the amphibian chytrid fungus is known to increase hind limb asymmetry in frogs. In line with this, leopard frogs from reference wetlands exhibited higher levels of developmental stress (i.e., reduced body condition and increased size differences between paired limbs) than frogs from CREP wetlands. Overall, our findings suggest that CREP and reference wetlands are valuable components of the amphibian habitat available in central Iowa. Maintaining a complex of fish-free wetlands with variable hydroperiods may reduce the impacts of drought and variable rainfall on amphibians in central Iowa.



Honors and Awards

Carlos Camacho (M.S. Student) received the Dr. Keith McNurlen Scholarship, 2015, by the Izaak Walton League of America and Iowa State University, Natural Resource Ecology & Management.

Carlos Camacho (M.S. Student) was a Janice Lee Fenske Memorial Award Finalist, 2015, at the 75th Midwest Fish & Wildlife Conference.

Joseph Lambert (M.S. Student) received the C.E., Farnsworth Memorial Fund Scholarship, 2015, Iowa State University, Natural Resource Ecology & Management.

Brenna Towery (M.S. 2015 Graduate) received the Caine-Bogle Family Graduate Fellowship, 2014, Iowa State University College of Agriculture and Life Sciences.

Publications

Camacho, C.A. 2015. It's a bird, it's a plane...it's a carp? Field Notes, Iowa State University, Ames, Iowa. Available: www.nrem.iastate.edu/fieldnotes.

Camacho, C. A., C.J. Sullivan, M. J. Weber, **C. L. Pierce.** 2015. Distribution and Population Dynamics of Asian Carp in Iowa Rivers. Annual Progress Report to: Iowa Department of Natural Resources Fisheries Bureau. Boone, Iowa.

Grant, T.J., Peter G. Eyheralde, Melissa S. C. Telemeco, Amy L. Moorhouse, **Rebecca A. Reeves,** Karin Grimlund, Amy Podaril, Sarah E. Emeterio, and **Robert W. Klaver.** 2014. Book Review: Conservation by Proxy: Indicator, Umbrella, Keystone, Flagship, and Other Surrogate Species. *Prairie Naturalist* 46:109-110.

Grant, T.J. Accepted. Short Term Anuran Community Dynamics in the Missouri River Floodplain Following an Historic Flood. *Ecosphere*.

Jacques, C.N., J.A. Jenks, T.W. Grovenburg, **R.W. Klaver,** and S.A. Dubay. 2015. Influence of ecological factors on prevalence of meningeal worm (*Parelaphostrongylus tenuis*) infection in South Dakota, USA. *Journal of Wildlife Diseases* 51: 332-340

Monteith, K.L., **R.W. Klaver,** K.R. Hersey, A.A. Holland, T.P. Thomas, and M.J. Kauffman. Effects of climate and

plant phenology on recruitment of moose at the southern extent of their range. *Oecologia*

Colvin, M. E., **C. L. Pierce,** and T. W. Stewart. *In Press.* A food web modeling analysis of a Midwestern, USA eutrophic lake dominated by non-native Common Carp and Zebra Mussels. *Ecological Modeling*.

Bakevich, B. D., **C. L. Pierce,** and M. C. Quist. *Accepted.* Status of the Topeka shiner in west-central Iowa. *American Midland Naturalist*.

Smalling, K. L., R. A. Reeves, E. Muths, M. W. Vandever, W. A. Battaglin, M. L. Hladik, and **C. L. Pierce.** 2015. Pesticide concentrations in frog tissue and wetland habitats in a landscape dominated by agriculture. *Science of the Total Environment* 502 (2015):80-90.

Parks, T. P, M. C. Quist, and **C. L. Pierce.** 2014. Anthropogenic disturbance and environmental associations with fish assemblage structure in two nonwadeable rivers. *River Research and Applications* DOI: 10.1002/rra.2844.

Parks, T. P, M. C. Quist, and **C. L. Pierce.** 2014. Historical changes in fish assemblage structure in Midwestern nonwadeable rivers. *American Midland Naturalist* 171:27-53.

Presentations

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2015. Reproductive Ecology of Silver Carp Along the Upper Mississippi River Invasion Front (oral). 145th Annual Meeting of the American Fisheries Society. Portland, Oregon. (submitted)

*Todey, M., **C. A. Camacho,** C. J. Sullivan, M. J. Weber. 2015. Zooplankton Dynamics in the Des Moines River in Response to an Invader (poster). Iowa State University Honors Program Symposium. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2015. Distribution and Population Dynamics of Asian Carp in Iowa Rivers: Asian Carp Reproduction in Southeastern Iowa Rivers (oral). Iowa Department of Natural Resources Annual Research Meeting. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, C. L. Pierce. 2015. Using GSI and Gonad Staging as an Indication of Silver Carp Spawning in the Des Moines and Mississippi Rivers (oral). Iowa Chapter of the American Fisheries Society Conference. Ames, Iowa.

Sullivan, C.J., **C.A. Camacho, C.L. Pierce,** and M.J. Weber. 2015. Seasonal variation in catch rates and size structure of Silver Carp in southeast Iowa Rivers (oral). Iowa Chapter of the American Fisheries Society Conference. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, C. L. Pierce. 2015. Seasonal Variation of Silver Carp Egg Development in the Upper Mississippi and Des Moines Rivers (oral). 75th Midwest Fish and Wildlife Conference. Indianapolis, Indiana.

Sullivan, C.J., **C.A. Camacho, C.L. Pierce,** and M.J. Weber. 2015. Seasonal sampling dynamics of Silver Carp in southeast Iowa rivers (oral). 75th Midwest Fish and Wildlife Conference. Indianapolis, Indiana

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2014. Evaluating Asian Carp Reproduction in Southeastern Iowa Rivers (poster). Iowa State University Natural Resource Ecology and Management Seminar Series. Ames, Iowa.

Sullivan, C. J., **C. A. Camacho, C. L. Pierce,** and M. J. Weber. 2014. Seasonal Variation of Silver Carp Catch Rates and Size Structure (poster). Iowa State University Natural Resource Ecology and Management Seminar Series. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2014. Distribution and Population Dynamics of Asian

Carp in Iowa Rivers: Asian Carp Reproduction in Southeastern Iowa Rivers (oral). Ames Anglers. Ames, Iowa.

Sullivan, C. J., **C. A. Camacho, C. L. Pierce,** and M. J. Weber. 2014. Distribution and Population Dynamics of Asian Carp in Iowa Rivers (oral). Ames Anglers. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2014. Distribution and Population Dynamics of Asian Carp in Iowa Rivers: Asian Carp Reproduction in Southeastern Iowa Rivers (oral). American Fisheries Society Iowa State Student Subunit. Ames, Iowa.

Sullivan, C. J., **C. A. Camacho, C. L. Pierce,** and M. J. Weber. 2014. Distribution and Population Dynamics of Asian Carp in Iowa Rivers: Asian Carp Population Characteristics and Distribution in Southeastern Iowa. Iowa State Student Subunit of the Iowa Chapter of the American Fisheries Society (oral). American Fisheries Society Iowa State Student Subunit Seminar. Ames, Iowa.

Camacho, C. A., C. J. Sullivan, M. J. Weber, **C. L. Pierce.** 2014. Distribution and Population Dynamics of Asian Carp in Iowa Rivers: Asian Carp Reproduction in Southeastern Iowa Rivers (oral). Annual Coordinating Committee Meeting of the Iowa Cooperative Fish and Wildlife Research Unit. Ames, Iowa.

Sullivan, C. J., **C. A. Camacho, C. L. Pierce** and M. J. Weber. 2014. Distribution and Population Dynamics of Asian Carp in Iowa Rivers: Adult Asian Carp Population Dynamics and Distribution in Southeastern Iowa (oral). Annual Coordinating Committee Meeting of the Iowa Cooperative Fish and Wildlife Research Unit. Ames, Iowa.

Grant T. 2014. Resilience of an Amphibian Community after a Catastrophic Flood using Information from Multiple Life Stages. The Wildlife Society National Meeting. 27 October 2014.

Jacques, C.N., J.A. Jenks, T.W. Grovenburg, **R.W. Klaver,** and S.A. Dubay. 2014. Influence of ecological factors on prevalence of meningeal worm in South Dakota. 63rd International Conference of the Wildlife Disease Association. Tamaya Hyatt, Albuquerque, New Mexico. 27 July – 1 August 2014.

Bartlet, P.E., and **R.W. Klaver.** 2014. Response of anurans to restored wetlands. Midwest Partners in Amphibian and Reptile Conservation Annual Meeting. Camp Iduhapi, Loretto, Minnesota. 22 – 24 August 2014.

- Adkins, K., C. Thompson, J. Foster, P. Eyheralde, **R. W. Klaver**. 2014. Small mammal community response to grazing by bison (*Bison bison*) and fire in a tallgrass prairie reconstruction. Central Plains Society of Mammalogists Annual Meeting, Missouri State University, Bull Shoals Field Station, Missouri. 10 – 11 October 2014.
- Sasmal, I., T. W. Grovenburg, S. Kempema, J. A. Jenks, **R.W. Klaver**, C. Swanson, T. Runia, and T. Kirschenmann. 2015. Evaluating landscape models for prairie grouse distributions in South Dakota. Midwest Fish and Wildlife Conference. Hyatt Regency, Indianapolis, Indiana. 8 – 11 February 2015.
- Datta, S., W.M. Inselman, J.A. Jenks, **R.W. Klaver**, and T.W. Grovenburg. 2015. Reproductive ecology of Ferruginous hawks in the Northern Great Plains. Midwest Fish and Wildlife Conference. Hyatt Regency, Indianapolis, Indiana. 8 – 11 February 2015.
- Inselman, W. M., S. Datta, J.A. Jenks, **R.W. Klaver**, and T.W. Grovenburg. 2015. Buteo ecology: an intensive study of Swainson's hawks (*Buteo swainsoni*) in the Northern Great Plains. Midwest Fish and Wildlife Conference. Hyatt Regency, Indianapolis, Indiana. 8 – 11 February 2015.
- Inselman, W. M., S. Datta, J.A. Jenks, **R.W. Klaver**, and T.W. Grovenburg. 2015. Time-lapse video as a method for assessing Swainson's hawk (*Buteo swainsoni*) diets during the breeding season. South Dakota Chapter, The Wildlife Society. Cedar Shore Resort and Convention Center, Oacoma, South Dakota. 23 – 25 February 2015.
- Datta, S., W.M. Inselman, J.A. Jenks, **R.W. Klaver**, and T.W. Grovenburg. 2015. Reproductive ecology of Ferruginous hawks in the Northern Great Plains. South Dakota Chapter, The Wildlife Society. Cedar Shore Resort and Convention Center, Oacoma, South Dakota. 23 – 25 February 2015.
- Mills, N.**, Cashatt, D., Weber, M.J., and **Pierce, C.** 2015. Seasonal variation in largemouth bass mercury levels. Midwest Fish and Wildlife Conference, Indianapolis, IN.
- Mills, N.**, Cashatt, D., Weber, M.J., and **Pierce, C.** 2015. Temporal variation in largemouth bass mercury concentrations. Iowa Chapter AFS Annual Meeting, Ames, IA.
- Mills, N.**, 2014. Mercury in Iowa fishes. Ames Anglers Meeting, Ames, IA.
- Towery, B.N.** 2015. The Distribution and Nest Survival of Giant Canada Geese Breeding in Iowa (oral). 75th Midwest Fish and Wildlife Conference. Indianapolis, Indiana.
- Towery, B. N.**, **R. W. Klaver**, and G. G. Zenner. 2015. A methodology to predict Canada goose breeding pair densities. Mississippi Flyway Council Gamebird Technical Section Winter Meeting. Little Rock, Arkansas. 23 – 27 February 2015.
- Towery, B.N.** 2015. The Distribution and Nest Survival of Giant Canada Geese Breeding in Iowa (oral). Iowa Department of Natural Resources, Research Staff Meeting. Ankeny, Iowa.
- Towery, B.**, **R.W. Klaver**, and G. Zenner. 2015. Developing a model to predict giant Canada goose breeding pair densities Using National Wetlands Inventory and breeding ground survey data. Midwest Fish and Wildlife Conference. Hyatt Regency, Indianapolis, Indiana. 8 – 11 February 2015.

Professional Activities

Teaching/Learning Opportunities

Jessica Bell (Unit Staff)

- First Aid/CPR/AED training – 28 March 2015 – Attendees included Coop Unit Student Technicians and Natural Resource Ecology and Management faculty and staff.

Tyler Grant (Ph.D. Graduate)

- (EEOB 311)

Robert W. Klaver

- Fall 2014: Analysis of Animal Populations, (NREM 611)

Clay L. Pierce

- Spring 2015: Fisheries Science (AECl 520)

Brenna Towery (M.S. Graduate)

- Fall 2014: Human Anatomy Lab (Bio 255)



Graduate Committee Service

Robert W. Klaver

- Jalynn Almond (Ph.D., Sociology – AGLS, Iowa State University)
- Chris Anderson (M.S., Department of Natural Resource Ecology & Management, Iowa State University)
- Kelly Boyer (Ph.D. Ecology and Evolutionary Biology, Anthropology, Iowa State University)
- James Crain (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Julia Dale (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Shubham Datta (Ph.D., Natural Resource Department, South Dakota State University)
- Karri Folks (Ph.D., Department of Natural Resources Ecology & Management, Iowa State University)
- Tyler Grant (Ph.D., IA Cooperative Unit, Department of Natural Resources Ecology & Management, Iowa State University) graduated May 2015
- Will Inselman (M.S., Natural Resource Department, South Dakota State University) graduated May 2015
- Amy Moorhouse (M.S., Department of Natural Resource Ecology & Management, Iowa State University)
- Rebecca Reeves (M.S., Department of Natural Resource Ecology & Management, Iowa State University) graduated August 2014
- Kim Szcodronski (M.S., Natural Resource Department, South Dakota State University) graduated August 2014
- Matt Stephenson (M.S., Department of Natural Resources Ecology & Management, Iowa State University)
- Brenna Towery (M.S., Department of Natural Resource Ecology & Management, Iowa State University)

Clay Pierce

- Christopher Sullivan (M.S., Department of Natural Resources Ecology & Management, Iowa State University)

Professional Service

Jessica Bell (Unit Staff)

- Iowa State University Professional & Scientific Council
 - Councilor, College of Agriculture & Life Sciences Representative, 2013 - present
 - Peer Advocacy Committee Chair, July 2014 – June 2015

Carlos Camacho (M.S. Student)

- Iowa State University Student Subunit of the Iowa Chapter of the American Fisheries Society, Graduate Adviser, 2013- present
- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - President, 2015 - present
 - Seminar Series Fisheries Chair, 2014 - present
 - Field notes (Graduate Student Magazine) Editor, 2014 - present
 - Brown Bag Workshop/Seminar Series Chair, 2014 - 2015
- Iowa State University, Natural Resource Ecology and Management, Wildlife Extension Hiring Committee
 - Graduate Student Representative, 2014 – 2015

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

- American Fisheries Society
 - Continuing Education Committee, Iowa Chapter, Chair, 1997 – present
 - Iowa Chapter, Member, 1994 - present
- Iowa Wildlife Action Plan, Fish Subcommittee, Iowa DNR, Chair, 2008 - present
- Stream Nutrient Technical Advisory Committee, Iowa Department of Natural Resources, Member (invited), 2010 - present
- Wildlife Working Group, Iowa DNR, Member (invited), 2009 – present
- Invited by Director of the Minnesota Aquatic Invasive Species Research Center to review a grant proposal titled, "Detailed analysis of common carp recruitment and assessing the potential for developing species-specific carp toxins to develop realistic solutions for hypoxia-prone lakes". April 2015.
- Invited by the American Fisheries Society Fisheries Information & Technology Section to review the new version of their Fishery Analysis and Modeling Simulator (FAMS) software. August 2014.

Brenna Towery (M.S. Graduate)

- Iowa State University, Natural Resource Ecology and Management, Graduate Student Organization
 - Seminar Committee Chair, 2014-2015
 - Vice President, 2014-2015