2011 Annual Report

Arkansas Cooperative Fish

& Wildlife Research Unit

Arkansas Game & Fish Commission

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ARKANSAS COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

ANNUAL REPORT 2011

Arkansas Cooperative Fish and Wildlife Research Unit
Department of Biological Sciences – SCEN 523
University Of Arkansas
Fayetteville, AR 72701

Arkansas Cooperative
Fish & Wildlife Research Unit

The Unit is a Cooperative Program of the:

U.S. Geological Survey
Arkansas Game and Fish Commission
University of Arkansas
Wildlife Management Institute

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INTRODUCTION

Arkansas Cooperative Fish and Wildlife Research Unit first opened its doors in August of 1988 as one of the four units initiated that year, and one of 43 coop units across the country associated with Land Grant universities, state game and fish agencies, and the U.S. Geological Survey, Biological Resources Division. The purpose of these units is to train graduate students in scientific methods of fish and wildlife management.

Over the past 23 years, the Arkansas Coop Unit has become an active part of state and federal research efforts in Arkansas and across the Nation. By the end of our twenty-second year, Arkansas Coop Unit will have initiated many research projects with Arkansas Game and Fish Commission, U.S. Fish and Wildlife Services, U.S. Geological Survey, National Park Services, and other federal, state, and private organizations as sponsors. These projects have funded the research of 52 MS and 8 PhD students, most of which are now working as professional biologists. Presently those students are employed by federal, state, and private agencies, colleges and universities, or are continuing their graduate degrees at other schools. Arkansas Coop Unit leaders and students have published 146 scientific and technical publications listing the unit and our cooperators in byline and acknowledgements, and another six publications have been accepted or submitted for publication. Unit leaders and Assistant unit leaders have taught many classes in fisheries and wildlife. Finally, including base funds and contracts, Arkansas Coop Unit has brought more than $10,000,000 directly into the community.

During the past two decades, Arkansas Coop Unit has gone through a number of changes. We have changed our federal cooperator from the U. S. Fish and Wildlife Services to National Biological Survey to National Biological Service, and we now reside within the U.S. Geological Survey. Our University department changed from Zoology, to Biological Sciences when incorporating the departments of Botany and Microbiology. We have seen nine Departmental Chairs (Amlaner, Geren, Kaplan, Talburt, Rhoads, Roufa, Davis, Smith and Spiegel), two Unit Leaders (Johnson and Krementz), six Assistant Unit Leaders (Annette, Martin, Griffith, Kwak, Thompson, and Magoulick), four Administrative assistants (Kimbrough, Koldjeski, Parker, and Moler), three Postdoctoral Assistants (LeMar, Lehnen, and Longing), and nine Research Specialist/Technicians (Neal, Aberson, Vaughn, Thogmartin, Lichtenberg, Piercey, Bahm, Nault, and Kitterman).

MISSION STATEMENT

The mission of the Arkansas Cooperative Fish and Wildlife Research Unit is to conduct programs of research, graduate education, and technical assistance that address the needs of the State of Arkansas, the region, and the nation. Research programs will pursue both basic and applied scientific questions that are relevant to the management of fish, wildlife, and their habitats. Research topics will be pursued according to Cooperator priorities, availability of collaborative expertise from Cooperators, and funding opportunities.

The educational mission of the Unit shall focus on graduate and post-graduate students. Activities will include teaching of formal graduate-level classes, chairing and serving on advisory committees, mentoring the professional development of students, and participation by Unit scientists in academic programs of the University of Arkansas. Students should be educated to prepare for advancement in broad areas of natural resource management and to serve as future leaders of resource management in the State of Arkansas, region and country. Educational programs of the Unit will be consistent with the professional standards and hiring practices of the Cooperators, similar agencies elsewhere, and relevant professional societies involved with natural resource management.

Technical assistance will be provided to Unit Cooperators in the areas of scientific expertise of the Unit. This can include assistance with interpretation of data, preparation and review of experimental designs, identification of specific research voids or needs, and rendering professional judgment. Such activities will generally serve to link the scientists' previously established expertise to specific needs of the Cooperators or other related agencies.

PERSONNEL AND COOPERATORS

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CURRENT GRADUATE STUDENTS

Jon Flinders (Ph.D., Fisheries – Magoulick)
Dustin Lynch (Ph.D., Fisheries – Magoulick)
Matt Nolen (M.S., Fisheries – Magoulick)
Tyler Pittman (Ph.D., Wildlife – Krementz)
Karen Willard (Ph.D., Wildlife – Krementz)

RECENTLY GRADUATED GRADUATE STUDENTS

J. Matt Carroll (M.S., Wildlife – Krementz)

INTERNSHIP PROGRAM WITH AGFC

Jenna Swain Innis (May 15, 2010 – August 15, 2010)

HOURLY TECHNICIANS

Mr. J. Matt Carroll – King Rails
Mr. Giles Courtney – General help (Work-study)
Mr. Bobby Douangpangna – General help (Work-study)
Mr. Brett Garrison – Crayfish
Mr. William Harris – General help (Hourly)
Mr. Kyle Morgensen – King Rail
Ms. Brianna Olsen – Yellowcheek
Mr. Jared Schluterman – Yellowcheek & Flow Assessment (Volunteer)
Mr. Toshiki Hayashi – Yellowcheek & Flow Assessment (Volunteer)
Ms. Nicole Vogt – Yellowcheek & Flow Assessment (Volunteer)

RESEARCH AND FACULTY COLLABORATORS

Dr. Sammy King – Louisiana Cooperative Fish and Wildlife Research Unit
Dr. Tom Cooper – U.S. Fish and Wildlife Service
Mr. Robert J. DiStefano – Missouri Department of Conservation
Mr. Jacob Westoff – Ph.D. Student, University of Missouri
Mr. Jeffrey W. Quinn – Arkansas Game and Fish Commission
Dr. Sarah Lehnen – Consultant
Dr. John Jackson – Department of Biological Sciences, Arkansas Tech University
Mr. Josh Duzan – Biohydrologist, The Nature Conservancy
Dr. Jim Petersen – Hydrologist Study Unit Chief, Ozark Plateaus Study Unit USGS Arkansas Water Science Center
Mr. Richard Crossett – U.S. Fish and Wildlife Service
Mr. Robert Bastarache – U.S. Forest Service
Ms. Rhea Whalen – U.S. Forest Service
Mr. David Arbor – Oklahoma Department Wildlife Conservation
Mr. Kevin Lynch – Arkansas Game and Fish Commission
Mr. Luke Naylor – Arkansas Game and Fish Commission
Mr. Dennis Daniel – National Wild Turkey Federation
Mr. Houston Havens – Mississippi Department of Wildlife, Fisheries, and Parks

COMPLETED WILDLIFE PROJECTS

Juvenile King Rail fitted with VHF transmitter, Red Slough WMA, 2011

Wildlife

Wilson's Snipe

Development of a Winter Survey for Wilson's Snipe in the Mississippi Flyway

Funding Source:	US Geological Survey
Project Duration:	January 2009 to May 2011
Principal Investigator:	DAVID G. KREMENTZ
Graduate Research Assistant:	J. MATTHEW CARROLL (M.S. Student)

Research Objectives:

1. To develop a feasible roadside survey for Wilson's snipe.
2. To determine survey–specific covariates needed in the survey design.
3. To estimate snipe abundance in the Mississippi Flyway.
4. To estimate habitat level detection probabilities and densities.
5. To examine other possible factors influencing variation of snipe density on the wintering grounds.

Project Summary:

Among North American game birds, the Wilson's snipe (*Gallinago delicata*) has received little research attention. Evidence of this lack of information is that no statistically rigorous population or regional abundance or higher-level trend estimates exist. However, there are indications of population declines across North America.

I conducted road transects (1.8 km long) for snipe in the Lower Mississippi Alluvial Valley in Arkansas, Mississippi and Louisiana, the west Gulf Coastal Plain of Louisiana, and the Red River Region of Louisiana. I conducted transects in random selected townships and those based on previous Christmas Bird Count (CBC) data. Thus in 2009 I surveyed in 49 townships and in 2010 I surveyed in 84 townships. In 2009 I detected 1,492 snipe in 757 km of survey effort, while in 2010 I detected 2,487 snipe in 1,262 km of survey effort making for a total of 3,979 snipe along 2,019 km of roads during both years. Of the 2,487 snipe detected in 2010, I detected 1,087 in routes repeated from the 2009 season and I detected 1,400 snipe in new routes. I surveyed 1,462 km of roads in random townships and 557 km of roads in CBC townships. In 2009, the highest individual township count was 338 snipe near Turrell, Arkansas. In 2010, the highest individual township count was 343 snipe near De Witt, Arkansas.

For 2009, 2010, and for both years pooled I found that density estimate confidence intervals between random and CBC townships overlapped. For 2009, estimated snipe densities were 9.18 inds/km^2 (95% CI: 5.21 - 16.17) in random townships, and 12.95 inds/km^2 (95% CI: 6.90 - 24.31) in CBC townships. For 2010, estimated snipe densities were 4.01 inds/km^2 (95% CI: 2.76 - 5.84) for random townships and 2.30 inds/km^2 (95% CI: 1.15 - 4.58) in CBC townships. For both years pooled, estimated snipe densities were 4.15 inds/km^2 (95% CI: 3.02-5.70) in random townships, and 2.82 inds/km^2 (95% CI: 1.53-5.19) in CBC townships. Thus, my abundance estimate is 1,167,964 (95%CI: 664,312-2,061,788) snipe wintering within the study area in 2009 and 511,303 (95%CI: 351,919- 744,641) snipe wintering within the study area in 2010. My abundance estimate from both years pooled is 529,155 (95%CI: 385,072-726,791) snipe wintering within the study area.

For modeling detection and estimating density within the study area, the half normal key function and cosine series expansion with observer as a factor covariate, and vegetation cover and water cover included as non-factor covariates was the most plausible model for the 2009 data. For modeling detection and estimating density within the study area, the hazard rate key function and cosine series expansion with observer as a factor covariate, and vegetation height and water cover included as non-factor covariates, was the most plausible model for the 2010 data. For modeling detection and estimating density within the study area, the half normal key function and hermite polynomial series expansion with observer as a factor covariate, and vegetation cover and water cover included as non-factor covariates was the most plausible model for the pooled 2009 and 2010 data.

The overlapping confidence intervals of random and CBC township densities indicates no difference between density produced by random or CBC townships. The subsequent densities derived for the CBC townships were based on the same systematic sampling technique used for the random townships and is not comparable to protocol or resulting individual per party hour data used by the CBC. However, I found that the snipe counts for CBC sites and snipe counts from road surveys in townships selected based on their association with specific CBC sites were different ($p < .05$ in 2009 and $p < .005$ in 2010). Overall, I found that CBC sites had higher snipe counts than my systematic road survey method. My results indicate that CBC's detected more snipe than my systematic road survey method and therefore could contribute to different population trend information and may not reflect true snipe abundance or population trends. However, my study only provides two years of data and long-term research would be required to examine the comparison of CBC's and road surveys thoroughly.

I estimated snipe detection probabilities of 0.70 (95%CI: 0.67-0.73) for row crop, 0.72 (95% CI: 67-.77) for rice, and 0.13 (95% CI: 0.10-0.16) for pasture. I estimated snipe densities of 7.9

(95% CI: 5.6-11.1; %CV: 17.28) inds/km^2 for row crop, 12.25 (95% CI: 6.7-22.36; %CV: 31.38) inds/km^2 for rice, and 12.62 (95% CI: 3.7-43.03; %CV: 69.05) inds/km^2 for pasture.

My results indicate that the road transect survey method is effective for estimating wintering snipe density in the lower Mississippi Flyway. I provide a baseline abundance estimate of snipe within the study area which was previously unknown through a systematic survey method. A continued effort would yield more precise estimates and comparative data useful to snipe population monitoring. For monitoring purposes further research is needed to put the density estimates into context over the long term. Also, more research is required to continue to assess observer effects, as well as, how long and short-term habitat changes influence snipe movement. I outlined habitat specific detection probabilities and density estimates for row crops, rice and pasture habitats that should be taken into consideration for winter snipe management.

Wildlife

Mr. Havens Surveying Waterfowl

Monitoring the Effects of Climate Change on Waterfowl Abundance in the Lower Mississippi Valley: Tools for Increasing Monitoring Efficiency

Funding Source:	Arkansas Cooperative Fish & Wildlife Research Unit
Project Duration:	July 2010 to January 2011
Principal Investigator:	DAVID G. KREMENTZ
Postdoctoral Research Associate:	SARAH E. LEHNEN

Research Objectives:

1. Reduce staff time associated with the generation and processing of aerial surveys of winter waterfowl abundance.
2. Generate comparable estimates of waterfowl abundance for multiple regions.

Management Implications:

1. Increases the speed of dissemination by reducing processing time, thus allowing for faster management responses in the event of rapid declines or shifts in abundance.

Project Summary:

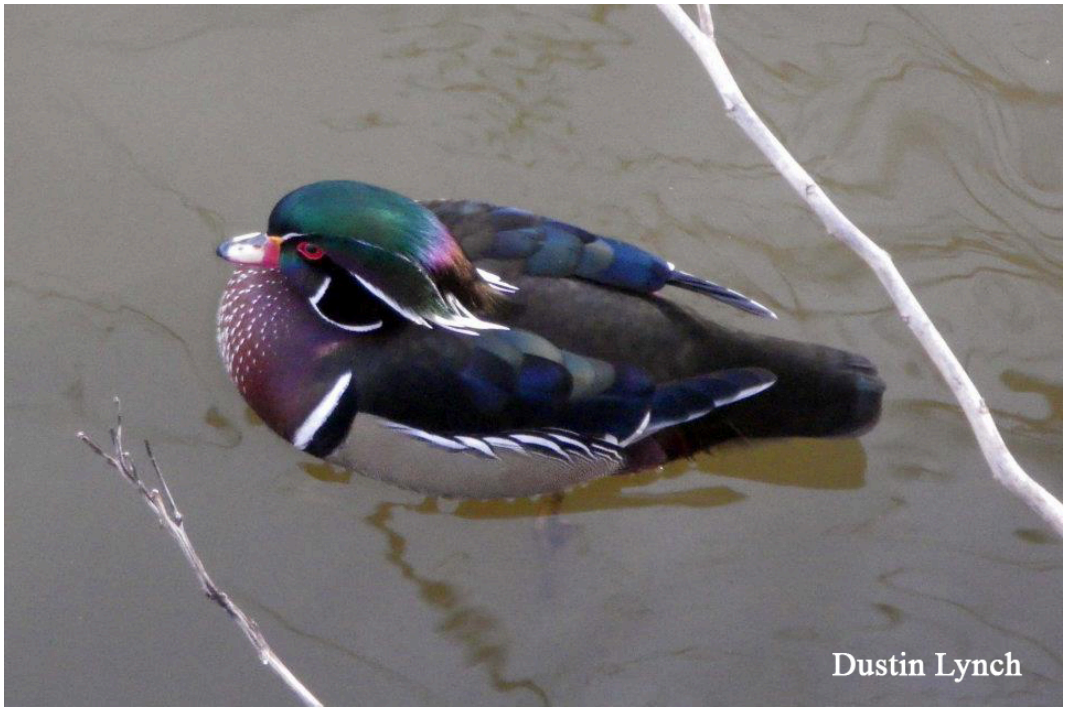
Given the potential for dramatic changes to wildlife distribution and abundance under various climate change scenarios, there is a great need to quickly collect and process reliable information on wildlife populations. Wintering waterfowl, in particular, provide an excellent bellwether for the effects of climate change as changes in their abundance and distribution reflect both a direct response to climatic variables (e.g., temperature and precipitation) and an indirect response to climate change mediated through habitat alterations. Among waterfowl the mallard is the most abundant duck in North America, and their numbers are often used as a surrogate to gauge the health of other waterfowl populations. In turn, the Mississippi Alluvial Valley (MAV) is a

continentally important region for migrating and wintering waterfowl in North America, and the single most important region for wintering mallards.

Winter waterfowl surveys have been conducted across much of the United States since 1935. However, sampling strategies have generally relied on professional judgment rather than probability to establish "representative" samples, making wide inferences and comparisons of estimates among years and studies difficult. Surveys in the MAV are typically conducted using aerial fixed width strips; aerial surveys have the advantages of extensive coverage at relatively low cost, the ability to survey areas difficult to assess by ground, and elimination of double counting by traveling faster than the waterfowl can fly. However, these waterfowl surveys are complicated by a high degree of variability due to the clumped distributions of birds and the ephemeral nature of the habitats used by waterfowl; precipitation and wetland conditions vary within and among years leading to highly dynamic usage of habitat by waterfowl.

In response to these challenges, a statistically robust sampling design for aerial surveys of mallards and other waterfowl in the Mississippi portion of the MAV was designed. Beginning in 2005, the Mississippi Department of Wildlife, Fisheries, and Parks, in cooperation with Dr. Aaron Pearse and Mississippi State University , has annually conducted aerial surveys following this protocol and estimated abundance and distribution of mallards and other waterfowl four times each winter. Based on that success, the Arkansas Game and Fish Commission (AGFC) adopted the same protocol for its aerial surveys of the Arkansas portion of the MAV. However, implementation of these protocols in Arkansas was time consuming for the AGFC staff (e.g., three weeks of staff time to select randomized transects for one survey). Geospatial processing of the data collected was also time consuming. To overcome these issues, we developed of a user-friendly graphical user interface in program R. This interface randomly selects transects, stratified by region, for aerial surveys and outputs the selected transects into a format that can be read by the software used for the aerial surveys. Additionally, this tool rapidly processes the collected data to generate estimates of duck abundance with bootstrapped 95% confidence intervals. This increases the speed of dissemination by reducing processing time, thus allowing for faster management responses in the event of rapid declines or shifts in abundance.

CURRENT WILDLIFE PROJECTS



Wood Duck (Aix sponsa)

From left AGFC Biologist Benny Bowers, AGFC Biologist Kevin Lynch, and Graduate Student Tyler Pittman releasing a female eastern wild turkey on White Rock Wildlife Management Area

The Effects of Prescribed Fire on the Nesting Ecology of the Eastern Wild Turkey in the White Rock Wildlife Management Area, Arkansas

Funding Sources:	U.S. Forest Service Arkansas Game and Fish Commission
Project Duration:	January 2011 to January 2014
Principal Investigator:	DAVID G. KREMENTZ
Graduate Research Assistant:	TYLER PITTMAN (Ph.D. Student)

Research Objectives:

1. To determine the cause(s) for the decline of the eastern wild turkey population on White Rock Wildlife Management Area
2. To assess the effect of the prescribed fire management regime on nesting habitat and ecology of eastern wild turkeys
3. To estimate the population and vital rates of eastern wild turkeys on White Rock Wildlife Management Area

Management Implications:

1. To determine if the prescribed fire management regime is appropriate for supporting a population of eastern wild turkeys or the cause of their decline

2. To determine if an alternative forest management regimes or technique can satisfy the requirements of the eastern wild turkey and the U.S. Forest Service

Project Summary:

The eastern wild turkey (*Meleagris gallopavo silvestris*) has been one of the most sought after gallinaceous birds in North American. In the early 20th century, the wild turkey had almost been extirpated from Arkansas, but with help of a major restocking effort and significant changes to the management regulations, the subspecies has rebounded to >100,000 birds statewide (Widner 2007). This statewide success has however not been sustained in all areas of the state, especially White Rock Wildlife Management Area (WMA) on the Ozark-St. Francis National Forest. In this region of the western Ozark Mountains, steady decreases in harvest numbers have been observed over recent years causing concern for the wild turkey population. One possible cause of this decline in population numbers could be the extensive and intensive prescribed fire regime that the U.S. Forest Service employees. This burning method may be reducing availability of nesting habitat and destroying early nests. Our study is designed to investigate the relationship between prescribed fire practices and the nest ecology of turkeys at the White Rock WMA through the use of satellite transmitters.

Starting in late fall of 2011 (Nov. –Dec.), we began scouting possible flocks and trapping locations in the study area. After this period in early January, we began baiting locations with whole corn to attract turkeys to these areas for trapping. Once the birds were regularly coming to the bait sites, we prepared the locations for trapping. On February 17th we captured our first turkeys of the season, 14 females and one Juvenile male. On the 23rd we captured our second group of turkeys, 10 females and 3 juvenile males, and on the 24th we captured our third group consisting of 10 females. In total we captured and marked 38 turkeys, fitting 34 females with 90-100g Platform Transmitter Terminals (PTTs) with GPS capability and 4 juvenile males with Arkansas Game and Fish Commission aluminum leg bands. Currently we have had two capture-related mortalities from the females captured this year and have recovered one of the malfunctioning transmitters from 2011. We are monitoring the remaining 32 females for mortalities every two days and tracking them using the GPS locations transmitted from the PTTs. We are also continuing our trapping efforts until April 1st 2012 in hopes to redeploy any transmitters we may recover in the meantime and the 5 replacement transmitters from 2011 upon their arrival.

The remainder of the spring and summer will be devoted to nest determination and location, and vegetation sampling. We will be using the GPS locations transmitted from the PTTs to help us locate and mark all nest attempts made by the 32 remaining marked females. At all nest sites either after hatch or destruction, we will determine the number of eggs laid and measure the vegetation characteristics immediately at the nest and at surrounding locations to determine variables affecting nest site selection and nest success. The broods resulting from the successfully hatched nests will be monitored at two and four weeks to determine brood survival rates. We also will be incorporating all of this information and our vegetation sampling from 2011 with new vegetation sampling throughout the study area to better assess the types and characteristics of the available habitat.

Since winter of 2011 we have been moving forward with a population genetics project to look at possible problems with turkey population at the state level. This has stemmed from state wide decline in harvest numbers in recent years. Also the extensive trap and transplant operation

carried out by the AGFC has added concern for possible issues with the gene pool of the Arkansas turkey population. This spring we are sending mailers to the Arkansas sportsmen and women who already receive turkey observation packets from the AGFC. We are asking these people to send us feathers from the turkeys they harvest themselves, or from those harvested by their friends and family this season. We hope to obtain enough samples to examine the genetic characteristics of the turkey population. After analysis of these feathers, we will be able to determine if genetics are a possible cause for the decline and what steps to take to further understand any results from this project.

King Rail fitted with VHF transmitter, Red Slough WMA, 2011

King Rail Breeding and Brood Ecology

Funding source:	U.S. Fish & Wildlife Service
Project Duration:	May 2011 to September 2014
Principal Investigator:	DAVID G. KREMENTZ
Graduate Research Assistant:	KAREN WILLARD (Ph.D. Student)

Research Objectives:

1. Document nesting habitat, clutch size, nest success rate, and source of nest loss for king rails (*Rallus elegans*) under various water level management options at Red Slough Wildlife Management Area (WMA), Grassy Slough WMA, and privately owned WRP wetlands in Oklahoma.
2. During the brood rearing period, document brood movements, habitat use, sources of fledgling loss and estimate fledgling survival rates for king rails under various water level management options at Red Slough Wildlife Management Area (WMA), Grassy Slough WMA, and privately owned WRP wetlands in Oklahoma.

Management Implications:

1. Knowing how king rails respond to water level management during the breeding season will allow managers to better manage wetlands for rails and other secretive marsh birds as a trade-off to managing wetlands for waterfowl and other taxa.

Project Summary:

King rails, north of the Gulf Coast, in the Central and Mississippi Flyways are endangered, threatened or a species of concern. One estimate of the current population size of the migrant king rails in the Upper Mississippi River Valley and Great Lakes Waterbird Region is between 137 and 443 breeding pairs. The precipitous decline of the once 'common' king rail, at least in the Mississippi Flyway, over the past 50 years has been attributed to several causes including wetland loss and degradation, rice habitat loss, harvest and other threats. At the FWS king rail Conservation Plan Workshop and at the Priority Information Needs for Rails and Snipe, experts determined that the brood survival and brood habitat use were considered major unknowns and warranted immediate research. Recent work on secretive marsh birds, including the king rail, have all suggested that water level management may play a critical role in the survival of marsh birds from fledging to fall flight.

We intend to use radio telemetry to investigate both breeding and brood ecology of king rails with respect to water level management during both nesting and brood rearing periods. This study revolves around the capture and marking of both adult and fledgling king rails with VHF transmitters. Once a king rail is captured, the bird will be weighed, wing chord and tarsal length measured and a feather sample taken. The feather sample will be provided to James Maley, LSU graduate student, who is currently developing a genetic method for separating king from clapper rails. VHF marked birds will be relocated every day and at different times of the day. To sample unused habitats, survey points will be randomly selected with the study site for habitat measurement. Water depth (cm) will be measured at the center and at 5 m in the 4 cardinal directions at each point to calculate the mean water depth. Dominant plant species (covering the greatest area) will be determined within a 30-m radius. Marsh birds appear to select habitat based on emergent plant structure rather than species composition, thus for analysis, emergent vegetation species will be lumped into three groups based on predominant habitat association and the height of each species at maturity: short emergents, tall emergents, and woody vegetation.

We will estimate habitat selection using resource selection functions as well as using logistic regression. Nest success, and fledgling and brood survival can all be estimated using Program MARK. For nests, we will make nest fate observations at a low frequency (~6 days) to reduce the probability of disturbing the nesting adults. For fledglings, we will make daily observations to determine fate.

A total of 3 king rails, 1 adult and 2 juveniles, were captured and fitted with VHF transmitters at Red Slough Wildlife Management Area during the 2011 field season. One of the marked juvenile birds was found dead two days after its release, cause unknown. The second juvenile had lost its transmitter one day after its release. The adult rail was tracked daily for 17 days. The individual remained in an area dominated by ovate false fiddleleaf (*Hydrolea ovata*) for eleven days. The site had high interspersion with patches of both saturated soil and standing water. Mean water depth ranged from 0 to 15 cm at telemetry point locations. Standing water was found only in the borrow ditches surrounding the unit and not in the marsh interior when the adult left the site and traveled approximately 3 km. The bird was then tracked for five days until its transmitter fell off. The final fate of the adult was unknown. The rail's movements appeared to be in response to availability of standing water in the wetland unit and this habitat feature will be explored in future field seasons.

Wildlife

American Woodcock

Assessment of Open Habitat Types Used at Night by American Woodcock on Fall Migration through National Wildlife Refuges in the Arkansas Delta to Integrate Woodcock and Migratory Bird Management in a Decision Making Context

Funding Sources:	U.S. Fish and Wildlife Service
Project Duration:	October 2010 to May 2012
Principal Investigator:	DAVID G. KREMENTZ
Co-Principal Investigator:	RICHARD CROSSETT

Research Objectives:

1. Document the relative use of open habitat types in waterfowl impoundments at night by woodcock and shorebirds on fall migration through the Arkansas Delta.
2. Estimate important habitat covariates that explain among and within habitats use by fall migrating woodcock and shorebirds,
3. Document woodcock migration chronology, and
4. Document waterfowl habitat types, juxtaposition, and flooding regimes (current mgmt.) within these impoundments.

Management Implications:

1. To determine which crop types and harvest practices are most attractive to migrating woodcock,
2. To determine if current harvest regulation season dates are appropriate, and
3. To determine if timing of impoundment flooding can be integrated to meet the needs of both woodcock, shorebird and waterfowl.

Project Summary:

The American woodcock (*Scolopax minor*) is a species of high concern not only to the U.S. Fish and Wildlife Service, but to other working groups like the U.S. Shorebird Conservation Plan (working group) where the woodcock has a priority score of 4 (out of 5). Recently a group of recognized experts in woodcock biology met and developed a priority information needs for the woodcock. One of four priority information needs identified was to improve the understanding of migration, breeding, and wintering habitat quality for woodcock. These experts also identified that information for most aspects of woodcock biology are largely lacking for migration periods, and that identification of important habitats used during migration is considered a key area for additional research. Finally, they identified that habitat and habitat management is critical to woodcock conservation. With additional information about habitat use by woodcock during migration, uncertainty in current management practices might be reduced. Our proposed study will document what types of open habitats are used at night during fall migration through the Arkansas Delta. We are focusing on nocturnal habitat because it is during the night that woodcock primarily forage and a substantial proportion of mortality is thought to occur in these habitats. A large portion of the open habitats used at night on NWRs in the Arkansas Delta are in impoundments that are managed specifically for waterfowl. Waterfowl management directly affects woodcock use through habitat management within those impoundments (e.g. planting & moist-soil mgmt.) and through fall flooding. Waterfowl impoundment flooding typically impacts woodcock because woodcock cannot tolerate any flooding. Flooding regimes often begin in November when woodcock are still migrating. Not only do woodcock vacate these impoundments upon flooding but also late migrating shorebirds like Wilson's snipe (*Gallinago delicata*), dunlins and dowitchers do to. Thus with better information on types of nocturnal fields (waterfowl habitat & juxtaposition) used and better understanding how woodcock and other shorebirds respond to current flooding regimes, we should be able to better integrate woodcock and shorebird (later migrating species) habitat management with waterfowl management. Finally, recent research on migration chronology of birds has indicated that spring migration has shifted later in response to changing climate patterns but the impacts of changing climate on fall migration patterns of birds are not well known. If fall migration chronology of woodcock is shifting, such timing might affect management schedules and activities.

Preliminary surveys of nocturnal open habitat types used in the Arkansas Delta at Cache River National Wildlife Refuge by one of us (Richard Crossett) indicated that a variety of field types are used by woodcock. Field types include both harvested and unharvested soybeans, moist-soil units, and fallow fields. Several field types not used by woodcock were corn, and milo. Rice fields were not surveyed. We propose to survey all field types previously surveyed as well as rice, but we will reduce our survey effort in corn and milo fields. We will survey woodcock beginning no sooner than 1 hr after dark until no later than midnight during all phases of the moon except for 5 days either side of the full moon. Woodcock tend not to use nocturnal fields during the full moon. Surveys will be conducted from ATVs traveling at slow speeds while systematically searching fields using a hand-held spotlight. We will use $\geq$2 ATVs per night to cover a larger area and for safety reasons. During each survey, we will record time in each field, # ATVs, average speed, distance traveled (kms), air temperature, cloud cover, moon phase, precipitation, management treatment (harvested, disked, burned, etc.) general habitat description of the vegetation in the field, and at each woodcock capture/sighting location,

coordinates of birds, soil moisture and other micro habitat information. We will use categorical data analyses to examine relative nocturnal field use. We will develop resource selection functions to examine the importance of particular habitat covariates in explaining within field habitat use. Migration chronology in our study will be compared to woodcock migration chronology from woodcock band recovery and parts collection records. Traditional/current waterfowl habitat management activities in surveyed impoundments will be conducted and parameters documented during this study. The study area will include Wapanocca, Bald Knob, Cache River, and White River NWR's.

We conducted 79 surveys across Cache River (n=36), Wapanocca (n=21), White River (n=13) and Bald Knob refuges (n=9). Some 11 field habitat types with 6 harvest treatments within those field habitat types were surveyed. The most commonly surveyed field habitat types were moist soil (n= 24), soybeans (n=22) and milo (n= 12); no other habitat type was surveyed more than 5 times. Across all surveys we traveled a total of 114 kms at an average of 1.5 kms surveyed per field. The median field size was 35 ac and fields ranged from 5-203 ac. Only 23 woodcock were detected between 1 Nov and 7 Dec. The highest number of woodcock detected on one survey night was 12 of which 7 were detected in a single disked moist-soil unit at Wapanocca. Most fields that had woodcock in them only had a single bird detected. The highest woodcock counts occurred during the last two weeks of November. Only 4 Wilson's snipe were detected and only 3 killdeer were detected.

The severe drought during the fall in the Delta was not conducive to woodcock foraging. Dry soil conditions make foraging for soil invertebrates, especially earthworms, difficult if not impossible. Evidence for this confounding influence on nocturnal field use was that when we conducted several "nocturnal crepuscular flight surveys" where observers positioned themselves along field borders during the time when woodcock fly into nocturnal fields, we detected woodcock flying towards fields that were subsequently surveyed by ATV's but no woodcock were detected in those fields. We suspect that woodcock either flew into the fields and upon sampling the soil they returned to diurnal habitat or they never settled in the field. Another possible explanation for the low number of woodcock detections is that woodcock somehow assessed the habitat conditions in the Delta and chose to fly over the region to areas with higher soil moisture levels. A final explanation is that few woodcock use the Delta. Myatt and Krementz (2007) documented that few radio-marked woodcock used the Delta during fall migration.

Hopefully with improved soil moisture conditions during Fall 2011, we can increase the number of detections of both woodcock and late-migrating shorebirds to formally test our hypotheses.

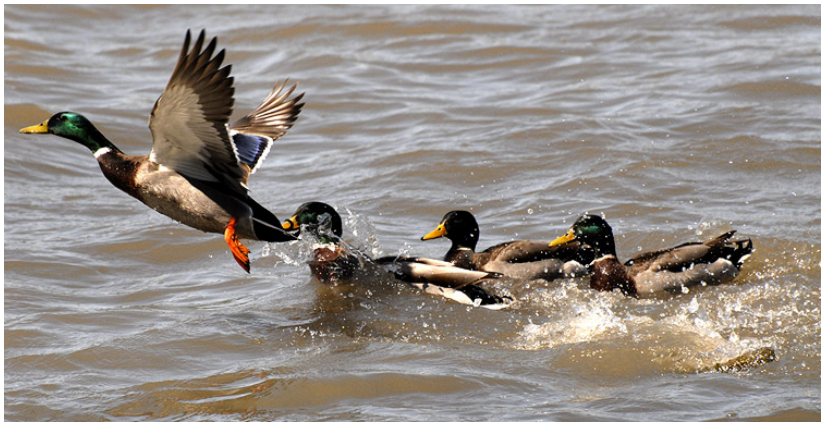
Literature Cited

Myatt, N. A., and D. G. Krementz. 2007. Fall migration rates, and habitat use of American woodcock in the Central United States. Journal of Wildlife Management. 71:1197-1205.

NEW WILDLIFE PROJECTS

Placing turkeys in National Wild Turkey Federation boxes after capture

Wildlife



Mallards

Monitoring the Effects of Climate Change on Waterfowl Abundance in the Mississippi Alluvial Valley: Optimizing Sampling Efficacy and Efficiency

Funding source:
Project Duration: November 2011 to September 2012
Principal Investigator: DAVID G. KREMENTZ
Postdoctoral Researcher: SARAH E. LEHNEN

Research Objectives:

1. Reduce staff time associated with design and analysis of aerial surveys for winter waterfowl.
2. Generate comparable estimates of waterfowl abundance for multiple regions (Arkansas, Louisiana, and Mississippi).
3. Increase precision of estimates of waterfowl abundance by redesigning strata boundaries (Arkansas).
4. Increase accuracy of waterfowl estimates by estimating effects of canopy cover and observer on waterfowl detection probabilities (Arkansas).
5. Relate estimated waterfowl abundance to local (transect level), landscape (strata level), and weather (temperature and snow cover) characteristics.

Management Implications:

1. Increases the speed of dissemination by reducing processing time, thus allowing for faster management responses in the event of declines or shifts in abundance.
2. Increases the accuracy and precision of estimates, thus increasing the probability that changes in abundance will be detected.

Project Summary:

Given the potential for dramatic changes to wildlife distribution and abundance under various climate change scenarios, there is a great need to quickly collect and process reliable

information on wildlife populations. Wintering waterfowl, in particular, provide an excellent bellwether for the effects of climate change as changes in their abundance and distribution reflect both a direct response to climatic variables (e.g., temperature and precipitation) and an indirect response to climate change mediated through habitat alterations. The Mississippi Alluvial Valley (MAV) is a continentally important region for migrating and wintering waterfowl in North America, and the single most important region for wintering mallards.

Beginning in 2005, the Mississippi Department of Wildlife, Fisheries, and Parks, in cooperation with Dr. Pearse and Mississippi State University, has annually conducted aerial surveys using a stratified random design and estimated abundance and distribution of mallards and other waterfowl four times each winter. Based on that success, in 2009 the Arkansas Game and Fish Commission (AGFC) adopted the same protocol for its aerial surveys of the Arkansas portion of the MAV. However, implementation of these protocols in Arkansas was time consuming for AGFC staff (e.g., three weeks of staff time to select randomized transects for one survey). Summarizing and geospatial processing of the data collected was also time consuming. To overcome these issues, we developed of a user-friendly graphical user interface in program R (R Development Core Team 2011). This interface randomly selects transects, stratified by region, for aerial surveys and outputs the selected transects into a format that can be read by the software used for the aerial surveys. Additionally, this tool rapidly processes the collected data to generate estimates of duck abundance with standard errors and bootstrapped 95% confidence intervals and generates a kernel density map illustrating the spatial distribution of the surveyed waterfowl. This increases the speed of dissemination by reducing processing time, thus allowing for faster management responses in the event of rapid declines or shifts in abundance.

In addition, we increased the precision of the surveys in Arkansas by reconfiguring the strata boundaries, resulting in a reduction of the estimate of total standard error of 39%. We also wanted to increase the accuracy of waterfowl abundance estimates by addressing factors known to effect detection in aerial surveys of waterfowl, namely canopy cover and observer. To this effect, we used a double observer approach to estimate of visibility correction factor for observer and canopy cover (open or closed). Using these corrected estimates of waterfowl abundance, future analysis will relate waterfowl abundance to local (transect level), landscape (strata level), and weather (temperature and snow cover) characteristics.

Literature Cited

Pearse, A. T., S. J. Dinsmore, R. M. Kaminski, and K. J. Reinecke. 2008. Evaluation of an aerial survey to estimate abundance of wintering ducks in Mississippi. Journal of Wildlife Management 72: 1413-1419.

R Development Core Team. 2011. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.

CURRENT FISHERIES PROJECTS

Arkansas Saddled Darter (Etheostoma euzonum)

Matt Nolen Strawberry River

The Imperiled Coldwater Crayfish (*Orconectes eupunctus*) in the Black River Drainage of Missouri and Arkansas: Factors Affecting Distribution and Decline

Funding Source:	Missouri Department of Conservation
Project Duration:	July 2010 to May 2013
Principal Investigator:	DANIEL D. MAGOULICK
	ROBERT J. DISTEFANO
Graduate Research Assistant:	MATTHEW NOLEN (M.S. Student)

Research Objectives:

1. Determine how anthropogenic and natural factors influence the observed distribution and densities of coldwater crayfish populations at multiple spatial scales.
2. Determine the probability of occurrence at any given stream segment within the known distribution of the coldwater crayfish.

Management Implications:

1. Results will allow managers and policy makers to access the importance of various landscape factors to coldwater crayfish.
2. Results will prioritize target streams and stream reaches for conservation and mitigation.

3. Results will identify potential streams and habitats that may contain and continue to support viable coldwater crayfish populations.

Project Summary:

We determined distribution and abundance of populations of coldwater crayfish in the Black River drainage by sampling stream segments. A minimum of four riffle habitats or "sites" (*sensu* MacKenzie et al. 2006) and four run sites were identified within each sampling reach. Riffles and runs were delineated by qualitatively assessing depth and flow rate of the stream. We used a quantitative kicknet method to determine densities of crayfish in each stream segment. Crayfish were dislodged from a randomly chosen 1-m^2 quadrat "sub-sample" area by thoroughly kicking and disturbing the substrate directly upstream of a 1.5 x 1.0-m seine net (3-mm mesh). Replicate kicknet surveys consisting of multiple sub-samples were collected from each riffle or run site. At all sampling reaches, physical characteristics of riffle and run sites were collected. Decision tree analysis (CART) will be used to produce probability-based models of *O. eupunctus* occurrence and densities within the Eleven Point River, Spring River, Strawberry River, and lower Black River watersheds, collectively. Both the presence/absence data and the density data will serve as the two primary response variables for use in CART, while the natural and anthropogenic variables will serve as explanatory variables. These models will provide a measure of influence of the explanatory variables on the response variables of *O. eupunctus* occurrence and density. The models will then be incorporated into ArcView 10.0 (ESRI, Redlands, CA) and projected to all stream segments in the basin, yielding a distribution-wide probability of occurrence map that incorporates unsampled sites. In addition to CART, principal component analysis (PCA) will be used to explore associations between explanatory variables.

In total, 104 sites were sampled from the 365 perennial stream segments in the drainage, and *O. eupunctus* was collected from nine of these segments, including two previously unknown sites. Preliminary examination of the data indicates that *O. eupunctus* inhabits large, swift, and cold rivers.

Fisheries

Turkey Creek, Upper Little Red River Basin

Classification of Arkansas Flow Regime, Regional Ecological-flow Response Relationships and Environmental Flows Assessment for the Ozark Region

Funding Source:	Arkansas Game and Fish Commission
Project Duration:	September 2010 to March 2013
Principal Investigator:	DANIEL D. MAGOULICK
Postdoctoral Research Associate:	SCOTT LONGING
Graduate Research Assistant:	DUSTIN LYNCH (Ph.D. Student)

Objectives:

1. Classify stream types within Arkansas based on hydrology and geomorphology.
2. Develop regional-level hydrology-biology response relationships for a portion of the Ozarks.

Management Implications:

1. Products of this study, including a statewide river classification system and regional ecological-flow relationships, will form the scientific framework for environmental flow standards and aid studies involving the impacts of global climate change on Arkansas's unique streams and rivers.

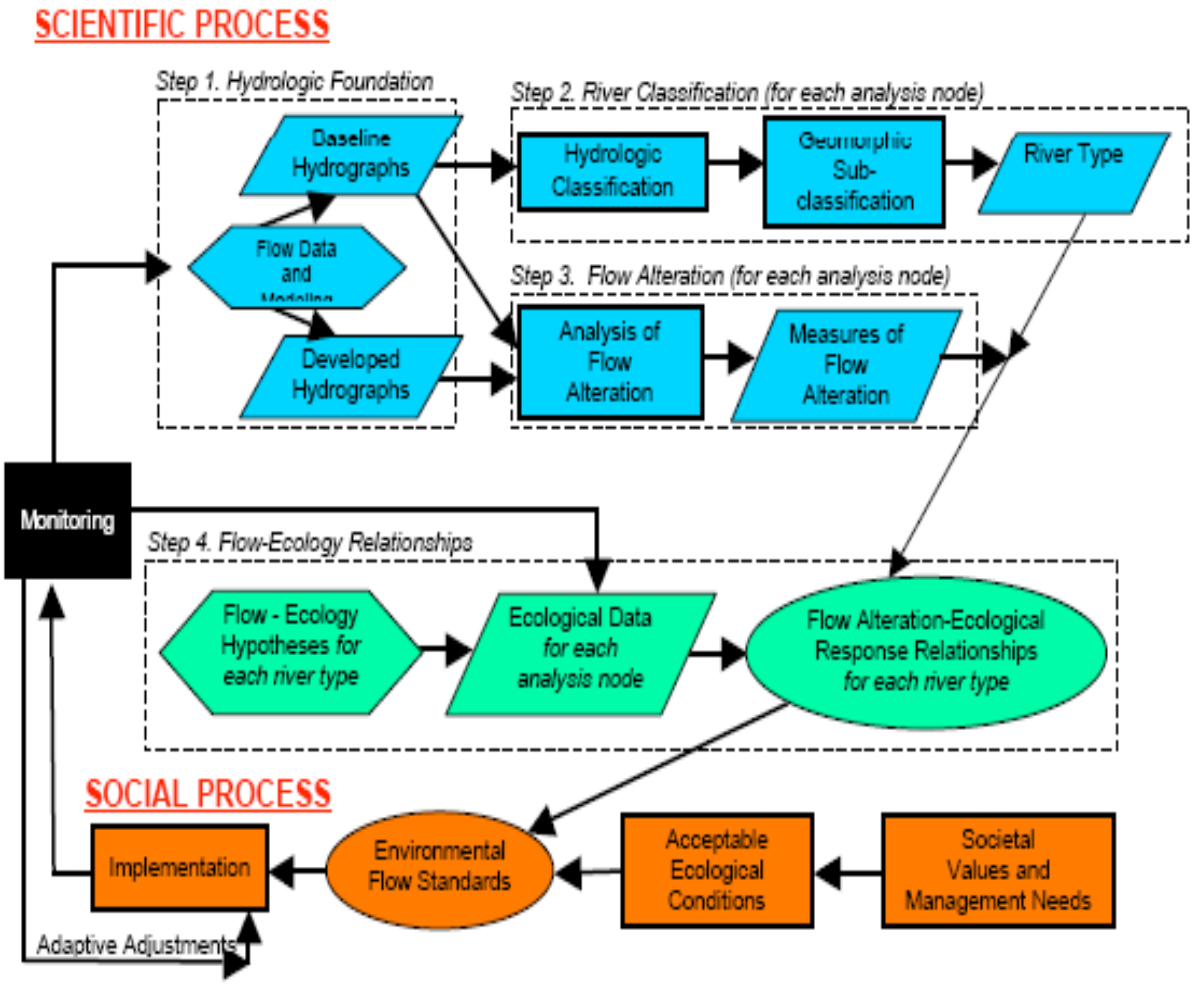
Project Summary:

Providing adequate water quantity and quality in streams and rivers is a pressing issue worldwide. It is crucial to determine appropriate environmental flows in streams. This proposal develops the first phase in a multi-year study, involving many partners and a series of steps towards the goal of producing the scientific basis for environmental flow standards within Arkansas. Products of this study, including a statewide river classification system and regional ecological-flow relationships will form the scientific framework for setting environmental flow standards and understanding impacts of global climate change. These ecological-flow response

relationships will help determine instream flow needs in the Ozarks and will provide the basis for conservation of at least 9 fish species, 11 crayfish species, and 11 insect species of greatest conservation need, including yellowcheek darter, Arkansas darter, Ozark shiner, longnose darter, silver redhorse, stargazing darter, Ozark chub, and current darter. This work will positively impact many species and ecosystems statewide, those of greatest conservation need and otherwise.

The hydrologic foundation, reflecting natural flow regimes of different river types, is currently being developed. Statewide streamflow data acquired from the National Water Information System (USGS gages) has been collated and processed. A total of 290 USGS gages were identified from across Arkansas, Missouri Ozark Highlands, and the Oklahoma Ozark Highlands, Boston Mountains, Arkansas River Valley, and Ouachita Mountain ecoregions. From these 290 gages, a total of 48 reference gages (watersheds) were selected that indicated the least altered watershed conditions based on selected landscape criteria. Hydrologic indexes for these gages are being classified to define stream flow types. Biological data (e.g., fish and macroinvertebrate occupancy, abundance, and functional traits) will then be related to levels of flow alteration within particular river types defined by flow. Biological will be acquired from the Arkansas GAP analysis to relate to levels of flow alteration within each determined streamflow class and field studies are being designed to further elucidate flow-ecology relationships using current and historical biological data.

Preliminary biological sampling was conducted from July 6th to July 22nd, 2011, at 9 sites in the Upper Little Red River watershed in north-central Arkansas based on the presence of already-established Nature Conservancy and USGS stream gauges. Sampling was stratified by habitat at each site to include three units each of riffles, pools, and runs with all units at least 100 m away from road crossings to avoid the hydrologic influence of bridge abutments, culverts, or any other man-made structures that could influence physical stream habitat characteristics or create artificial fish habitat. Habitat variables such as stream width, flow velocity, water depth, and substrate composition were taken at each site for all units of the reach. Fish were collected using a modification of electroshocking and seining methods previously developed for Ozark streams in all pools and runs. Prior to sampling, we placed block nets at the end of each unit, then conducted two upstream sampling passes with a backpack electroshocker followed by two downstream passes with a 6 m, 0.635 cm2 mesh seine. Because of the presence of a newly listed endangered species in the system, the Yellowcheek Darter (*Etheostoma moorei*), we implemented a different protocol for sampling in riffles, since the species is known primarily to inhabit riffles and seldom enters pools or runs, and could potentially be harmed by electroshocking. Our riffle protocol consisted of kick-seining in a 1 m2 pvc quadrat frame at 20 randomly determined subsamples throughout each riffle, after placement of block-nets at either end of the riffle. All fish were identified to the level of species and released back into the stream. We obtained hydrologic and geomorphologic data collected at all gauges from the Nature Conservancy.


SCIENTIFIC PROCESS
Step 1. Hydrologic Foundation
Baseline Hydrographs
Flow Data and
Developed Hydrographs
Step 2. River Classification (for each analysis node)
Hydrologic Classification
Sub-classification
River Type
Step 3. Flow Alteration (for each analysis node)
Analysis of Flow Alteration
Measures of Flow Alteration
Monitoring
Step 4. Flow-Ecology Relationships
Flow - Ecology Hypotheses for each river type
Ecological Data for each analysis node
Flow Alteration-Ecological Response Relationships for each river type
SOCIAL PROCESS
Implementation
Environmental Flow Standards
Acceptable Ecological Conditions
Societal Values and Management Needs
Adaptive Adjustments

NEW FISHERIES PROJECTS

Above Logperch (Percina caprodes), below Central Stoneroller (Campostoma anomalum)

Fisheries

Yellowcheek Darter

Distribution and Abundance of the Yellowcheek Darter in the Little Red River Drainage of Arkansas

Funding Source:	U.S. Fish & Wildlife Services
Project Duration:	July 2011 to June 2012
Principal Investigator:	DANIEL D. MAGOULICK
Graduate student:	DUSTIN LYNCH

Research Objectives:

1. To determine current status of yellowcheek darter populations in the upper Little Red River watershed.
2. To estimate the distribution (occupancy rate and probability of detection) and abundance of yellowcheek darters in streams of the Little Red River drainage of Arkansas.

Management Implications:

1. Assess importance of various landscape factors to yellowcheek darter.
2. Prioritize target streams and stream reaches for conservation and mitigation.
3. Identify potential streams and habitats that may contain and continue to support viable yellowcheek darter populations.

Project Summary:

The yellowcheek darter (*Etheostoma moorei*) is currently designated as critically imperiled with declining populations (Arkansas Game and Fish Commission 2005) and extremely rare in Arkansas and critically imperiled globally (Arkansas Natural Heritage Commission 2007 – S1/G1). The yellowcheek darter is geographically restricted and isolated within its range. Populations of the yellowcheek darter are limited to the Middle, South, Archey, and Devils Forks of the Little Red River in Arkansas (Robison and Buchanan 1988). A dam on the Little Red River to create Greers Ferry Reservoir in 1962 has reduced the range of yellowcheek darter, which no longer occur in the mainstem Little Red River (Robison and Buchanan 1988). Populations of yellowcheek darter have declined approximately 80% in numbers in the past twenty years (Mitchell et al. 2002). Additionally, populations are now isolated due to the reservoir (Johnson 2009).

There has been some research done on the yellowcheek darter, but given the potential threats and its status as candidate for listing, much more needs to be done. Major questions that need to be addressed include: Are the populations of yellowcheek darters continuing to decline? What is the current distribution and abundance of yellowcheek darters? How do anthropogenic and natural factors influence the observed distribution and densities of yellowcheek darter populations at multiple spatial scales? Therefore, we propose a study to address some of these questions.

We will monitor the status of the yellowcheek darter population in the Little Red River drainage at previously by sampling sites that were previously sampled (Wine et al. 2000) and in newly selected sites. Sites that were previously sampled will be sampled again with similar methods. Additionally, new sites will be sampled using a quantitative kicknet method to determine densities of individual yellowcheek darters at each site. Darters will be dislodged from a 1-m^2 area by thoroughly kicking and disturbing the substrate directly upstream of a 1.5 x 1.0-m seine net (3-mm mesh). Darters dislodged from the substrate will be washed into the seine net with the aid of the current and by pulling the seine through the sample area. Replicate kicknet samples will be collected from riffle habitats in each of 10 previously sampled sites and 10 newly selected sites. A minimum of three riffle habitats will be identified within each sampling reach. New site selection will be random but also based on accessibility (e.g., landowner permission), and sample locations within habitats will be randomly chosen. Habitat types will be delineated by qualitatively assessing depth and flow rate of the stream. At all sampling locations, physical characteristics of habitats will be collected. Substrate size composition within the habitat will be quantified by visually estimating percent area of silt (<0.02 cm diameter), sand (0.02-0.1 cm), gravel (0.1-3 cm), pebble (3-6 cm), cobble (6-25 cm), and boulder (≥ 26 cm) within the 1m^2 sample area. Following collection of darters, stream depth and mean (0.6 depth) current velocity in front of the sample area will be determined using a meter stick and Marsh-McBirney® flow meter.

PRODUCTIVITY

Brianna Olsen and Jared Schluterman Kick-seining

HONORS AND AWARDS

Magoulick, D.D. – USGS, CRU Science Excellence Award, 2010

COURSES TAUGHT

Magoulick, D.D. – Fish Ecology – Spring 2011

PUBLICATIONS AND PROFESSIONAL PAPERS PRESENTED

Scientific Publications

Hodges, S.W. and **D.D. Magoulick.** 2011. Refuge Habitats for Fishes During Seasonal Drying in an Intermittent Stream: Movement, Survival and Abundance of Three Minnow Species. Aquatic Sciences 73:513-522.

Krementz, D.G., and E.E. Gbur, Jr. 2011. American Woodcock Wingbee Reliability. Pages 195-201. *In* (Stewart, C.A., and V.R. Frawley, eds.) Proceedings of the Tenth American Woodcock Symposium, Roscommon, MI. Allen Press, Inc. Lawrence, KS

Larson, E.R. and **D.D. Magoulick.** 2011. Life History notes on *Cambarus hubbsi* (Hubbs Crayfish) from the South Fork Spring River, Arkansas. Southeastern Naturalist 10:121-132.

Cooper, T.R., J.R. Kelley, Jr., S.J. Williamson, M. Banker, D.R. Dessecker, **D.G. Krementz,** D.G. McAuley, W.L. Palmer, and T.J. Post. 2011. Development of Habitat Goals for the American Woodcock conservation Plan and Recommendations for Implementation. Pages 13-23. *In* (Stewart, C.A., and V.R. Frawley, eds.) Proceddings of the Tenth American Woodcock Symposium, Roscommon, MI. Allen Press, Inc. Lawrence, KS

Darrah, A.J., and **D.G. Krementz.** 2011. Habitat Use of Nesting and Brood-Rearing King Rails in the Illinois and Upper Mississippi River Valleys. Waterbirds 34:160-167.

Theses and Dissertations

Carroll, J.M. 2011. The Development of a Winter Survey for Wilson's Snipe in the Mississippi Flyway. M.S. Thesis, University of Arkansas.

Papers Presented

Magoulick, D.D., S.W. Hodges, M.K. Scott, C.M. Bare, M.P. Dekar, and G.R. Huxel. 2010. Effects of Stream Drying on Fish Refuge Use and Species Persistence: Forecasting Effects of Global Climate Change. University of Missouri.

Magoulick, D.D. 2010. Does Juvenile Competition Explain Displacement of Imperiled Big Creek Crayfish by Invasive Woodland Crayfish? International Association of Astacology, Columbia, Missouri.

Krementz, D.G., K. Asante, and L.W. Naylor. 2010 Fall Migration Ecology of Satellite-marked Mallards. Mississippi Flyway Technical Section Meeting. Migration Committee.

Krementz, D.G. 2010. Secretive Marsh Bird Species Co-occurrences and Habitat Associations across the Midwest. Kansas State University.

Magoulick, D.D. 2011. Fish Harvesting and Management: Approaches and Implications for Sustainable Harvests Using Ecological Theory and Application. Special Session on *Fish Ecology: Sustainability* at the Fulbright Colloquium: Integral Approaches to Knowledge, University of Arkansas, Fayetteville, Arkansas.

Magoulick, D.D. 2011. Inter-basin Introductions of Crayfish. Aquatic Nuisance Species Task Force. Little Rock, Arkansas.

Krementz, D.G., K. Asante, and L.W. Naylor. 2011. Spring Migrations of Mallards from Arkansas as Assessed by Satellite Telemetry. Joint Meeting of 11th North American Crane Workshop and 34th Annual Meeting of the Waterbird Society.

Magoulick, D.D., and J.M. Flinders. 2011. Examining Assumptions of Stable Isotope Analysis and Assimilation Efficiency in Rainbow Trout: Are you what your eat? Trout Unlimited. Fayetteville, Arkansas.

Magoulick, D.D., J.M. Flinders, and A.W. Cushing. 2011. Effect of Catch and Release Areas on Rainbow and Brown Trout Movement, Survival and Bioenergetics in Arkansas Tailwater Rivers. Trout Unlimited, Mountain Home, Arkansas.

Magoulick, D.D., and J.M. Flindgers. 2011. Rainbow Trout: Are They What They Eat? White River Fisheries Partnership, Mountain Home, Arkansas.

Committees/Task Forces/Recovery Teams

Krementz, D.G. – Chair of Webless Committee of the Mississippi Flyway Technical Section
Magoulick, D.D. – Inter-agency Climate Change Workshop Group
Krementz, D.G. – Woodcock Harvest Strategy Working Group
Magoulick, D.D. – Nature Conservancy Science Advisory Board

Krementz, D.G. – West Gulf Coastal Plain/Ouachita Landbird Technical Working Group
Magoulick, D.D. – Fish Taxa Team, Arkansas Wildlife Action Plan
Krementz, D.G. – Research Grad Evaluations Panel
Magoulick, D.D. – Crayfish Taxa Team, Arkansas Wildlife Action Plan
Krementz, D.G. – National Resource Conservations Service Arkansas Wildlife Sub-Committee on Marsh Birds
Magoulick, D.D. – U.S. Fish and Wildlife Services Aquatic Nuisance Species Task Force
Magoulick, D.D. – Arkansas Invasive Species Task Force

TECHNICAL ASSISTANCE

Training Received

Magoulick, D.D. – Introduction to Structured Decision Making Course, National Conservations Training Center, 2011
Pittman, H.T. – Program MARK Intermediate Workshop, Colorado State University, Fort Collins, Colorado
Pittman, H.T. – Principles of Modeling with Spreadsheets, National Conservation Training Center
Pittman, H.T. – Hierarchical Modeling, United States Geological Survey Patuxent Wildlife Research Center, Webinar
Pittman, H.T. – CPR and First Aid Training, 2010

GRADUATED COOP UNIT STUDENTS AS OF JUNE 2011

Thoniot Prabhakaran (PhD 1989)
Comparative evaluation of four methods of age and growth assessment of Largemouth bass from Lake Elmdale, Arkansas.
Southwest Texas State University

Chris Coody (MS 1991)
An improved census technique of the northern bobwhite (*Colinus virginianus*) using recorded calls of the female.
Unknown

Mike Scott (MS 1991)
Body fat prediction, nutrition and reproduction of black bears in the interior highlands of Arkansas.
PhD University of Tennessee

Brad Dabbert (MS 1991)
Nutrition and the physiological status of wintering mallards.
PhD Oklahoma State; Assistant Professor, Texas Tech. University

Barbara Raulston (MS 1992)
Effects of cavity restrictors on red-cockaded woodpeckers.
U.S. Bureau of Reclamation, NV

Lynda Hustead (MS 1992)
Selection and monitoring of stenothermal algal assemblages in Logan Cave Spring and its associated stream.
Water Quality Lab, City of Rogers, AR

Gary Siegwarth (MS 1992)
Channel catfish of the Buffalo National River, Arkansas: population abundance, reproductive output, and assessment of stocking catchable size fish.
Iowa Dept. of Natural Resources

Mitzi Pardew (MS 1992)
Dispersal of stocked young of year smallmouth bass (*Micropterus dolomieu*) in Beaver Reservoir, northwest Arkansas in 1990.
U.S. Forest Service, GA

Joe Neal (MS 1992)
Factors affecting breeding success of red-cockaded woodpeckers in the Ouachita National Forest, Arkansas.
U.S. Forest Service, AR

Cindy Timmerman (MS 1992)
The morphometrics of the feeding apparatus in relation to the behavior of larval and juvenile *Micropterus salmoides* as related to their transition in diet.
PhD University of Florida

David Barber (MS 1993)
Effects of alternate host densities on brown-headed cowbird parasitism rates in black-capped vireos.
Naturalist, Hawk Mountain Sanctuary, PA

Jody Walters (MS 1993)
Intraspecific habitat segregation of smallmouth bass in the Buffalo River, Arkansas.
Idaho Dept. of Game and Fish

Darrell Bowman (MS 1993)
Black bass in Beaver Reservoir and its tributaries: distribution and abundance in relation to water quality.
Pond Management Biologist, City of Bella Vista, Bella Vista, AR

Madeleine Lyttle (MS 1993)
Impacts of gravel mining on fish communities in three Ozark streams.
U.S. Fish and Wildlife Service, VT

Eric Dibble (PhD 1993)
A patch-dynamics study of habitat use by juvenile Centrarchids in an Ozark reservoir: factors affecting habitat availability and an experimental test of the predator avoidance hypothesis.
Assistant Professor, Mississippi State University

Myron Means (MS 1993)
Population dynamics and movements of Ozark cavefish in Logan Cave NWR, Benton County, Arkansas with additional baseline water quality information.
Assistant Supervisor, Arkansas Game and Fish Commission, Russellville

Dean Heckathorn (MS 1993)
Polychlorinateddibenzo-para-dioxins and pesticides in Bayou Meto and the ecology of a contaminated stream in east-central Arkansas.
U.S. Fish and Wildlife Service, Al

Krzysztof Zyskowski (MS 1993)
Nest-site selection in orange-crowned and Virginia's warblers in high-elevation forests of the Mogollon Rim (Arizona): variation in nest placement, phenology, and microclimate.
PhD Univ. of Kansas; Collections Manager, Peabody Museum, Yale University

Andrew Thompson (MS 1994)
Environmental assessment of the benthic macroinvertebrate community of Bayou Meto, Arkansas.
North Dakota Dept. of Game and Fish

Scott Shull (MS 1994)
Management of nuisance black bears (*Ursus americanus*) in the interior highlands of Arkansas.
Deceased

Alex Badyaev (MS 1994)
Spring and breeding dispersal in an Arkansas Ozark population of wild turkeys: causes of and consequences for reproductive performance.
PhD University of Montana; Postdoctoral Fellow, Auburn University

Pingjun Li (PhD 1994)
Breeding productivity, microhabitat requirements, and parental care of neotropical migrant birds in the Ozarks of Arkansas.
University of Arkansas (Entomology)

Kristine Herbert (MS 1994)
Drift of aquatic macrofauna in Logan Cave stream, Benton County, Arkansas.
Westark College, AR

Tim Burnley (MS 1994)
Wild and hatchery reared largemouth bass, *Micropterus salmoides*: condition factor in four small Arkansas lakes and habitat selection comparisons.
Research Biologist, Arkansas Game and Fish Commission, Brinkley

Laurel Moore (MS 1995)
Factors influencing reproductive success of wild turkeys (*Meleagris gallopavo*) in the Ouachita Mountains in Arkansas.
U.S. Forest Service, SC

April Hargis (MS 1995)
A comparative study of the flora, fauna, and water quality of springs in the Ozark National Forest, Arkansas.
U.S. Forest Service, NB

Elena Kupriyanova (MS 1995)
Biotic interactions between benthic macroinvertebrates and largemouth bass (*Micropterus salmoides*) during the fish reproductive period in Lake Wedington, Arkansas, U.S.A.
PhD University of Miami, FL

Zack Brown (MS 1996)
Population dynamics and growth of Ozark cavefish in Logan Cave National Wildlife Refuge, Benton County, Arkansas.
University of Arkansas (Entomology)

Rebecca Allee (PhD 1997)
Use of satellite imagery to monitor various parameters of Bull Shoals Reservoir, Arkansas, USA.
National Marine Fisheries Service, Washington, DC

Ginny (Adams) Boyd (MS 1997)
Metabolic rates and life history of aquatic organisms inhabitating Logan Cave Stream in Northwest Arkansas.
PhD Southern Illinois University
Assistant Professor University of Central Arkansas

Wayne Thogmartin (MS 1998)
Factors influencing the decline of an eastern wild turkey (*Meleagris gallopavo silvestris*) population in the Ouachita Mountains of Arkansas.
Statistician, USGS

Dwayne Rambo (MS 1998)
Ozark stream fish assemblages and black bass population dynamics associated with watersheds of varying land use.
U.S. Forest Service, MO

Jeff Quinn (MS 1998)
Fish populations and trout microhabitat use of rehabilitated habitat in an Ozark tailwater river.
Biologist, Arkansas Game and Fish Commission, Conway

Danielle Painter-Pender (MS 1998)
Factors influencing brown trout reproductive success in Ozark tailwater rivers.
Unknown

Jennifer Herner-Thogmartin (MS 1999)
Ecology of an introduced Rocky Mountain elk (*Cervus elaphus nelsoni*) herd in Arkansas.
Project manager, United Science Industries

Andrea Radwell (MS 2000)
Ecological integrity assessment of Ozark rivers to determine suitability for protective status.
Research Assistant Professor, Department of Biological Sciences, University of Arkansas, Fayetteville, AR

Brad Schaeffer (MS 2002)
Ouachita wild turkey biology
Environmental Consultant, NY

Franchie Loncarich (MS 2003)
Survival and movements of greater prairie-chickens in the Flint Hills of Kansas
Wildlife Biologist, Missouri Department of Natural Resources

Amy Clifton (MS 2003)
Greater prairie-chicken populations in Chase County, Kansas
Land Management Assistant, The Orianne Society, McRae, Georgia

Benny Thatcher (MS 2003)
Impacts of prescribed burns on Henslow's sparrows (*Ammodramus henslowii*) winter home range and survival in coastal pine savanna habitats.
Wildlife Biologist, U.S. Fish and Wildlife Service

Andrew James (MS 2003)
Population status and distribution of resident Canada geese in the Western Arkansas River Valley, Arkansas
Wildlife Biologist, Natural Resources Conservation Service

Sarah Lehnen (MS 2003) (Ph.D. 2008 Ohio State Univesity)
Turnover rates of pectoral and least sandpipers during fall migration in the Lower Mississippi Alluvial Valley
Post Doc Fellowship, Biological Sciences/Cooperative Research Unit, University of Arkansas

Nick Myatt (MS 2004)
Fall Migration Ecology of American Woodcock in the Central Region of the United States
Wildlife Biologist, Oregon Department of Fish and Wildlife

Michael R. Rabalais (MS 2004)
The Effect of the Invasive Crayfish *Orconectes Neglectus Chaenodactylus* on the Native Crayfish *Orconectes Eupunctus* in the Spring River Drainage on Arkansas and Missouri
Biologist, CH2M Hill, Consulting Firm

Matthew P. Dekar (MS 2004)
Factors Affecting Fish Assemblage Structure and Growth During Seasonal Stream Drying
Ph.D. University of Arkansas

Jason D. Luscier (MS 2004)
Short-Term Responses of Grassland Birds Populations to Timing of Haying in Northwest Arkansas
Assistant Professor at Austin College, Sherman, Texas

Bret A. Collier (Ph.D. 2004)
Evaluating Impact of Selective Harvest Management on Age Structure and Sex Ratio of White-Tailed Deer (O*docoileus virginianus)* in Arkansas
Research Scientist, Institute of Renewable natural Resources, Texas A & M University

Christopher Bare (M.S. 2005)
Movement and Habitat Use of Smallmouth Bass *(Micropterus dolomieu)* in the Buffalo National River drainage of Arkansas
Fisheries Biologist, Oregon Department of Fish and Wildlife

Sarah C. Coulter (M.S. 2005)
The Effects of Forest Management on Wood Thrush in the Bottomland Hardwood Forests of Louisiana
Wildlife Biologist, Westworth Associates Environmental Ltd.

Robert H. Doster (Ph.D. 2005)
The Importance of Lowere Mississippi River Alluvial Valley Resforestation and Wetland Restoration Sites to Wintering Migratory Birds
Wildlife Biologist, U.S. Department of the Interior, U.S. Fish and Wildlife Service

Mandy K. Scott (M.S. 2005)
Effects of Land Use, Stream Flow and Habitat Complexity on Fish Assemblage Structure of Arkansas Ozark Streams
Assistant District Biologist, Texas Parks and Wildlife Department

Adam W. Green (M.S. 2006)
Harvest and Winter Distributions of Mallards in the Mississippi and Central Flyways
Ph.D. Colorado State

Shawn W. Hodges (M.S. 2007)
Movement, Survival and Refuge Use of Three Minnow Species During Seasonal Drying in an Intermittent Ozark Mountain Stream.
Hydrologic Technician, National Park Service, Buffalo National River, Harrison, AR

Eric R. Larson (M.S. 2007)
Effects of an Introduced Crayfish on a Native Crayfish in an Ozark Stream: The Role of Life History and Juvenile Competition.
Ph.D. University of Washington

Aaron W. Cushing (M.S. 2007)
Effects of Catch-and-Release Areas on Movement and Survival of Rainbow Trout in Arkansas tail waters.
Fisheries Biologist, Pacific Northwest National Laboratory

Michael J. Budd (M.S. 2007)
Status, Distribution, and Habitat Selection of Secretive Marsh Birds in the Delta of Arkansas
Private Lands Biologist, U.S. Fish and Wildlife Service

Abigail J. Darrah (M.S. 2008)
Distribution, Habitat Use, and Reproductive Ecology of the King Rail in the Illinois and Upper Mississippi River valleys
Ph.D. University of Arkansas

John P. Ludlam III (Ph.D. 2009)
Effects of Fish and Crayfish on Ecosystem Structure and Function During Stream Drying
Assistant Professor, Fitchberg State University

Matthew P. Dekar (Ph.D. 2009)
Spatial and Temporal Variation in the Structure of Stream Food Webs: Investigating the Effects of Shifting Basal Resources and Predation from a Top Predator, the River Otter (*Lontra Canadensis)*
Postdoctoral Research Fellowship, Center for Reservoir and Aquatic Systems Research
Department of Biology, Baylor University

Jason R. Bolenbaugh (M.S. 2010)
Status, Distribution, and Habitat Use of the King Rail and Other Secretive Marsh Birds in the Upper Mississippi River/Great Lakes Joint Venture
Enforcement Analyst, Arkansas Department of Environmental Quality

Leah A. Scott (M.S. 2010)
Species Richness and Habitat Use of Secretive Marsh Birds in Managed Wetlands in the Arkansas River Valley of Western Arkansas
Biological Scientist II, Florida Fish and Wildlife Conservation Commission

James M. Carroll (M.S. 2011)
The Development of a Winter Survey for Wilson's Snipe in the Mississippi Flyway
Ph.D. Oklahoma State University