2010 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 2010

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

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 22 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 51 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 Post Doctoral 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.

Leah Scott Collecting Data

PERSONNEL AND COOPERATORS

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CURRENT GRADUATE STUDENTS

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

RECENTLY GRADUATED GRADUATE STUDENTS

Jason Bolenbaugh (M.S., Wildlife – Krementz)
Leah Scott (M.S., Wildlife – Krementz)

INTERNSHIP PROGRAM WITH AGFC

Jenna Swain Innis

HOURLY TECHNICIANS

Kwasi Asante – Mallard tracking
Devin Eby-Bosler – Shorebirds
Giles Courtney – General help (Work-study)
Bobby Douangpangna – General help (Work-study)
Anna Fasoli – Snipe
Philip Firth – King Rail (Red Slough)
Scott Longing – Crayfish
Kerri McCabe – Crayfish
Jake Oats – Snipe
John Stewart – General help (Work-study)
William Thompson – Snipe

RESEARCH AND FACULTY COLLABORATORS

Dr. Sammy King – Louisiana Cooperative Fish and Wildlife Research Unit
Dr. Tom Cooper – U.S. Fish and Wildlife Service
Ms. Molly Bunch – University of Arkansas
Mr. Robert J. DiStefano – Missouri Department of Conservation
Mr. Jacob Westoff – Ph.D. Student, University of Missouri
Mr. Jeffrey W. Quinn – Stream Management Biologist, AGFC
Dr. Scott Longing – Post-doctoral Research Associate, ARCFWRU, University of Arkansas
Dr. John Jackson – Department of Biological Sciences, Arkansas Tech University
Mr. Josh Duzan – Biohydrologist, The Nature Conservancy
Mr. Jim Petersen – Hydrologist Study Unit Chief, Ozark Plateaus Study Unit USGS Arkansas Water Science Center

COMPLETED WILDLIFE PROJECTS

Black-bellied Whistling Ducks Red Slough Wildlife Management Area

Wildlife

Canada Geese

Abundance Trends of Giant Canada Geese in Bella Vista, Arkansas

Funding source:	U.S. Geological Survey
Project Duration:	June 2009 to May 2011
Principal Investigator:	DAVID G KREMENTZ
Graduate Research Assistant:	MOLLY K BUNCH (Undergraduate Thesis)

Research Objectives:

1. To estimate the population size of Giant Canada Geese in Bella Vista, Arkansas

Management Implications:

1. To assess whether a goose control program was meeting population goals.

Project Summary:

We estimated the population size of Giant Canada geese (*Branta canadensis maxima*) in Bella Vista, Arkansas to determine if a recent control program there had been successful. We captured geese during the summers of 2009 and 2010 and marked them with unique alphanumeric coded neck collars. We conducted a series of re-sighting surveys in the Bella Vista area through summer 2011. We used Bowden's estimator and the Lincoln-Peterson mark-recapture method to estimate population size of the resident populations. We estimated the 2009 resident geese population was 1,225 (95% CI 840-1788) and the 2010 resident geese population was 804 (95% CI 495-1112). Although the point estimates declined, the confidence intervals overlapped greatly indicating that no change in the population has occurred since the control program was initiated. Our study provides wildlife managers with a baseline estimate to compare future populations of resident geese to.

Least Sandpiper

Concentration Area Demarcation and Abundance Estimation of Fall Migrating Shorebirds through the Lower Mississippi Alluvial Valley

Funding source:	U.S. Fish & Wildlife Service
Project Duration:	September 2008 to February 2010
Principal Investigator:	DAVID G. KREMENTZ
Postdoctoral Researcher:	SARAH E. LEHNEN

Research Objectives:

1. Determine chronology, dispersion, and traditional areas of high shorebird use in the Lower Mississippi River Alluvial Valley (LMAV) during fall migration by reviewing surveys conducted 1990-2008, particularly for shorebirds at risk of transmitting the highly pathogenic avian influenza (H5N1).
2. Produce current abundance estimates of shorebirds in the LMAV by conducting surveys during the 2009 fall migration season.

Management Implications:

1. Information on shorebird fall migration concentration areas and timing in the LMAV will allow managers to better manage habitat for maximum shorebird use.
2. With this information, the FWS should be able to rapidly respond to a reported HPAI event in shorebirds in the LMAV should one occur.

Project Summary:

Wild birds are believed to be the reservoirs of the influenza virus that infects other species including humans. Recently, outbreaks of the highly pathogenic avian influenza (HPAI) H5N1 virus in wild birds in Asia have created concern over the potential for an outbreak in North America. Shorebirds in particular are considered at high risk of transmitting the virus to North America because their behavior and long migration routes may bring them into contact with

infected Asian birds. Of particular concern are shorebirds species that regularly migrate through the Lower Mississippi River Alluvial Valley (LMAV) as they move between their breeding and wintering grounds via the Mississippi Flyway.

Following the "Early Detection and Response Plan for Occurrence of Highly Pathogenic Avian Influenza in Wild Birds", we assisted with the identification of areas federal and state wildlife agencies should target their search efforts for infected shorebirds during the fall period if and when the virus arrives in the Mississippi Flyway. We focused on the fall period because shorebirds are more dispersed during the spring migration in the LMAV and because shorebirds are at greater risk of contracting H5N1 on their breeding grounds. The shorebirds targeted by this study were those species identified by the Mississippi Flyway Council as being at high-risk for contracting H5N1: pectoral sandpiper (*Calidris melanotos*), dunlin (*Calidris alpina*), long-billed dowitcher (*Limnodromus scolopaceus*), and to a lesser extent greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*T. flavipes*), and ruddy turnstone (*Arenaria interpres*).

We evaluated dispersion and chronology for interior migrating shorebirds through the LMAV using surveys from a variety of sources that were conducted during fall migration between 1990-2008 and from standardized surveys during fall 2009. Although 34 shorebird species were observed in the LMAV between 1990-2008 and 28 species were observed during fall 2009, six species: least sandpiper (*Calidris minutilla*), killdeer (*Charadrius vociferous*), pectoral sandpiper, semipalamated sandpiper (*Calidris pusilla*), black-necked stilt (*Himantopus himantopus*), and lesser yellowlegs, accounted for 80% of the observations between 1990-2008 and 92% of the observations during fall 2009. For the shorebirds species considered at highest risk of transmitting the H5N1, only the pectoral sandpiper and to a much lesser extent long-billed dowitcher occurred in high numbers in the LMAV; for lower risk species, greater and lesser yellowlegs were the only abundant species. Pectoral sandpiper migration through the LMAV was shorter in duration (95% of birds observed within the 85-day interval between 15 July and 8 October) than long-billed dowitcher migration (95% of birds observed in the 126-day interval between 27 July and 27 of November), lesser yellowlegs migration (95% of birds observed in the 131-day interval between 13 July and 21 of November), and greater yellowlegs migration (95% of birds observed in the 158-day interval between 9 July and 14 of December). The killdeer was widely dispersed whereas the most patchily distributed species tended to be shorebirds uncommon in the LMAV, such as white-rumped sandpiper (*Calidris fuscicollis*) and buff-breasted sandpiper (*Tryngites subruficollis*); all other shorebirds species had intermediate levels of dispersion.

We estimated the overall number of shorebirds using the LMAV between 17 July to 23 September 2009 to be 409,679 (estimate using most conservative rule: 320,618, estimate using most liberal rule: 567,248). For shorebirds at risk of contracting H5N1 as well as for shorebirds overall Catahoula Lake and drained aquaculture ponds supported the most shorebirds in the LMAV, with an estimated 72% of shorebirds using these areas. Additional survey sites with high counts included Bald Knob National Wildlife Refuge in Arkansas, Coldwater and Yazoo National Wildlife Refuges in Mississippi, and T. E. Maxson Wastewater Treatment Plant in Tennessee.

Pied-billed Grebe

Occupancy and Habitat Selection of Secretive Marsh Birds in the Western Arkansas River Valley

Project Duration:	January 2009 - December 2010
Principle Investigator:	DAVID G. KREMENTZ
Graduate Research Assistant:	LEAH A. SCOTT (M.S. student)

Research Objectives:

1. Document the distribution and estimate the occupancy of secretive marsh birds on public lands along the Arkansas River west of Little Rock
2. Evaluate habitat use by marsh birds there
3. Relate wetland management practices to marsh bird occupancy

Management Implications:

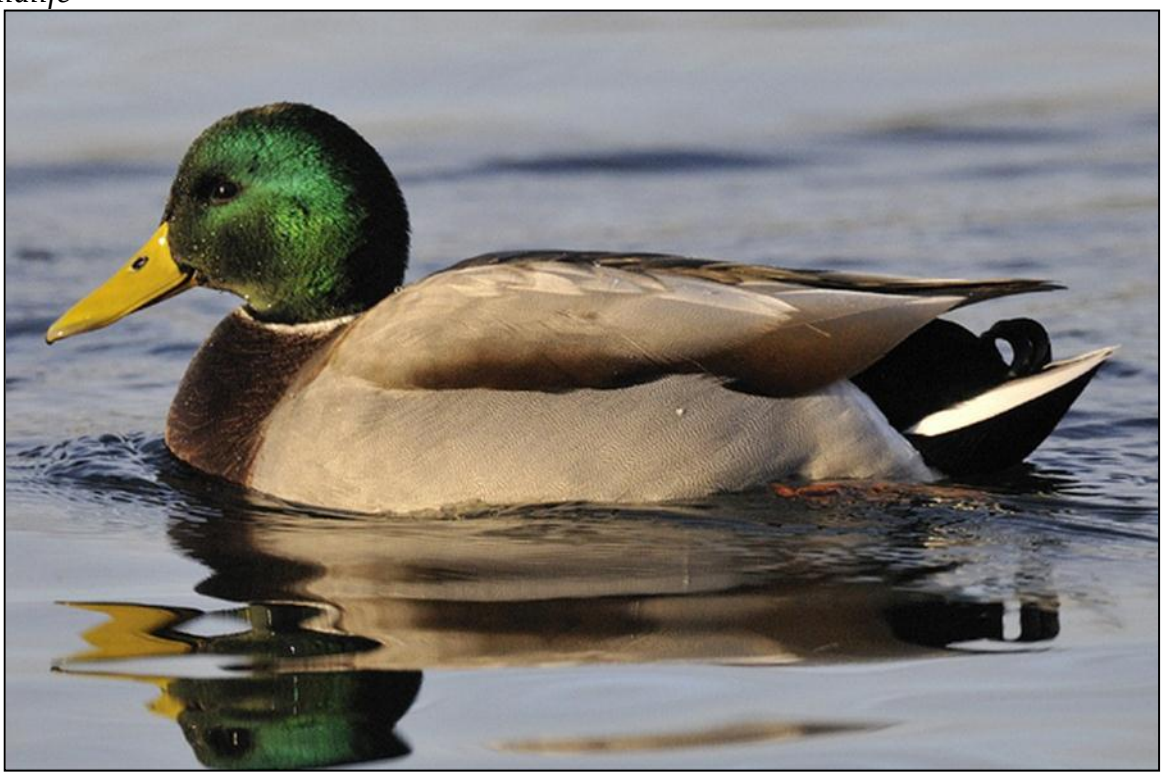
1. Determine habitat characteristics that are important to marsh bird occupancy that could help guide managers
2. Provide managers with information about which management practices would most effectively provide usable habitat for marsh birds on public wetlands

Project Summary:

Secretive marsh birds which include the King Rail (*Rallus elegans*), Virginia Rail (*R. limicolor*), Sora (*Porzana carolina*), American Bittern (*Botaurus lentiginosus*), Pied-billed Grebe (*Podilymbus podiceps*) and Common Moorhen (*Gallinula chloropus*) occupy wetlands throughout North America. Recent evidence suggests that most secretive marsh bird populations are in decline which is most strongly related to the decline of palustrine emergent wetlands in North America.

Recently in Arkansas, surveys of habitat use by secretive marsh birds were assessed in the Delta, however, secretive marsh bird distribution, abundance and habitat use outside of the Delta is poorly understood. As well, the effects of management practices being used on publicly owned wetland units in the Arkansas River Valley are also poorly understood for marsh birds.

We conducted repeated broadcast surveys at 30 sites in 2009 and detected 37 pied-billed grebe, 5 American bitterns, 3 least bitterns, 1 king rail, 3 soras, and 89 American coots while in 2010, we surveyed 33 points and detected 27 pied-billed grebe, 5 American bitterns, 4 least bitterns, 1 king rail, 19 soras, and 161 American coots. To determine effects of habitat composition on marsh bird occupancy, we used binomial regression analysis to test the fit of our data across a series of models containing habitat variables measured within 50 m (open water, tall emergent vegetation, and interspersion) and 400 m (emergent herbaceous wetland and pasture). Both tall emergent vegetation and interspersion had a positive effect on marsh bird detections. Emergent herbaceous wetland had a positive effect on marsh bird detections. To determine effects of water level management, we modeled species richness as a function of drawdown timing, survey year, impoundment, and wildlife management area using simple logistic regression. We found that delaying draining of wetland impoundments until after migration and nest initiation had a positive effect on secretive marsh bird species richness.



Mallard

Migration movements of Arkansas-marked Mallards with satellite transmitters

Funding Source:	Arkansas Game and Fish Commission
Project Duration:	15 May 2009 to 1 June 2010
Principal Investigator:	DAVID G. KREMENTZ
Co-Principal Investigator:	LUKE W. NAYLOR
Graduate Research Assistant:	KWASI ASANTE

Research Objectives:

1. Track movements and phenology of mallards captured in Arkansas during spring and autumn migration.

Management Implications:

1. With a better understanding of mallard migration biology, managers can make better decisions on how to properly manage habitat for migrating mallards.

Project Summary:

The mallard (*Ana playtyrynchos*) is the most abundant, most sought-after and most hunted duck in North America. Because of this agencies like the Canadian Wildlife Service (CWS)

and the United States Fish and Wildlife Services (USFWS) closely manage harvest regulations and lands for this duck.

Mallard migration studies are largely based on migration surveys, analyses of hunter-killed mallards, and on conventional VHF radio-telemetry. These studies have uncovered many findings but there are still many unanswered questions partly because the technologies required for more in-depth studies have, until recently, been unavailable to biologists. Advancements in radiotelemetry now allow researchers to use satellite transmitters (PTTs) to study migration movements of mallards.

Mallards were captured in Arkansas between 2004 and 2007 and marked with PTTs. The individual duck spatial data was divided into spring and autumn records, after which season-specific analyses are conducted. Of the 143 marked mallards that migrated from Arkansas, the mean departure date from Arkansas was 19 March (SE = 1.01 days; range 18 February - 20 April) and that departure date was not related to sex or year. For those mallards that stopped for >1day before entering the prairie pothole region (PPR) ('stopover'), the average length at each stop was 12 days (SE = 0.90 days, range = 2 - 54 days). Females made significantly more stopovers in 2007 than in any other year. Mallards migrated on average 1,184 km (SE = 25.8) between Arkansas and next in the PPR. Mallards arrived in the PPR significantly earlier in 2006 (Least Squares Mean [LSM] = 30 March) than in 2005 (LSM = 7 April). Females spent significantly more days on migration in 2007 (28 days) than during any other year (range LSM 2004 -2006 = 8-18 days). Females traveled significantly further during each migration movement (671 km) than did males (573 km). Mallards moved significantly further per migration movement in 2004 (LSM = 757 km) and in 2006 (LSM = 664 km) than in 2005 (LSM = 446 km). Females nested across 10 Breeding Conservation Regions and South Dakota was the most frequented state (n = 9) where nesting occurred. The average date when females nested was 19 April (SE = 2.44 days, range = 12 Mar – 26 May). Of those mallards that were still alive on 15 Sep (n = 55), the average southward departure date after then was 23 Oct (SE = 2.62 days; range 17 Sep - 7 Dec). For those mallards that stopped for >1 day on migration, the average length was 15.5 days (SE = 1.45). Ten mallards migrated non-stop to wintering sites where they remained through 1 January. The total distance migrated per mallard averaged 1,407 km (SE = 89.55 km; range 142 – 2947 km). The average time spent on migration per individual between 15 Sep and 15 Dec was 27 days (SE = 2.88 days; range 2 – 84 days). The state where most mallards were located on 15 Dec (our arbitrary autumn migration cut-off date) was Missouri (11) followed by Arkansas (8), while 5 mallards were still in Canada on 15 Dec. No drake mallards returned to Arkansas by 15 Dec. Our data provides the first individual tracking information on the chronology, phenology and philopatry of spring and autumn migrating mallards in the Mississippi Flyway and should be useful in refining and managing mallard populations and habitats during migration.

Wildlife

King Rail

Assessing an Expert-Based Landscape Approach to Predict King Rail Habitat in the Upper Mississippi River/Great Lakes Joint Venture

Funding Source:	U.S. Fish & Wildlife Service
Project Duration:	January 2008 to September 2010
Principal Investigator:	Dr. David G. Krementz
Graduate Research Assistant:	Jason R. Bolenbaugh (M.S. Candidate)

Research Objective:

1. To evaluate the predictive ability of the king rail (*Rallus elegans*) Landscape Suitability Index (LSI) model.
2. To determine the distribution of the king rail in the Upper Mississippi River/Great Lakes Region Joint Venture (JV).
3. To identify areas of high king rail abundance within the JV.
4. To provide recommendations that will assist in creating a more reliable LSI model for future king rail management.

Management Implications:

1. The information gathered will allow federal and state agencies to better assess the current status of king rails throughout the JV.
2. The information gathered will also allow the JV to assess the current LSI model and make possible improvements for future king rail management.
3. The habitat use information will allow agencies to better manage for king rails throughout the JV.

Project Summary:

Recent advances in geographic information systems (GIS) and remote sensing technologies have enabled researchers to use sampling strategies that result in inferences over large landscapes. When combined with predictive models such as Landscape Suitability Index (LSI) models, researchers can examine how occupancy of target species relates to varying habitats across the landscape. LSI models can be especially important when managing for rare species, such as the king rail, and can be used to facilitate protection and restoration of critical habitats.

Our study area was located in the Upper Mississippi River/Great Lakes Joint Venture region, hereafter referred to as the JV. The king rail population in this region is considered migratory, has an estimated population of ~350 individuals, and is considered threatened or endangered in 8 of the 10 states that comprise the JV. Severe population declines over the last 30 – 40 years have been attributed to habitat loss and degradation caused by agricultural practices and urban development.

We conducted call-playback surveys during the breeding seasons of 2008 and 2009 following the North American Marsh Bird Monitoring Protocol. In addition to surveying king rails, we surveyed for all other secretive marsh birds as their ecology is largely unknown. We surveyed 264 high, moderate, and low suitability sites on 3 separate occasions during either morning or evening. At each site we estimated local habitat variables such as the proportion of open water, short and tall emergent vegetation, woody vegetation, and interspersion within a 50-m radius centered at the survey point. We also used FRAGSTATS 3.3 to estimate landscape parameters within a 5-km radius believed to influence marsh bird occupancy.

Only 13 king rail detections were made over the 2 breeding seasons making validation of the LSI not possible. Occupancy rate estimates in 2008 were 55% for pied-billed grebes (*Podilymbus podiceps*), 25% for American bitterns (*Botaurus lentiginosus*), 25% for least bitterns (*Ixobrychus exilis*), 14% for sora (*Porzana carolina*), and 31% for common moorhens (*Gallinula chloropus*). Occupancy rate estimates in 2009 were 45% for pied-billed grebes, 37% for American bitterns, 30% for least bitterns, 33% for Virginia rails (*R. limicola*), and 21% for common moorhen. Local habitat covariates such as interspersion, the proportion of open water, and the proportion of tall emergent vegetation had the greatest influence on occupancy, while the proportion of emergent herbaceous wetlands within 5km of a wetland complex had the greatest effect on occupancy at the landscape scale. The proportion of woody wetlands within 5km of a wetland complex was found to negatively affect occupancy of only least bitterns and pied-billed grebes, and the proportion of woody vegetation on a local scale was only found to negatively affect occupancy of pied-billed grebes and common moorhens. We suggest wetland managers promote interspersion ratios that approach a 50:50 ratio of open water and emergent cover. We also suggest when exploring future areas for wetland restoration, protection, or development for the benefit of secretive marsh bird habitat, managers should target landscapes that already contain a high proportion of emergent herbaceous wetlands.

CURRENT WILDLIFE PROJECTS

King Rail captured at Red Slough Wildlife Management Area, Idabel, OK

Wildlife

Wilson's Snipe

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

Funding Source:	U.S. 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.

Management Implications:

2. Knowledge of habitat-specific detection probabilities, and important survey-specific covariates will lead to an efficient Wilson's snipe winter survey design.
3. With population abundance and trend information, managers will be better able to make sound harvest regulation decisions.

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.

We 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. We conducted transects in random selected townships and those based on previous Christmas Bird Count (CBC) data. In 2009 we surveyed in 49 townships and we detected 1,492 snipe in 757 km of survey effort. In 2010 we surveyed in 84 townships, and we 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. 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 we 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, our abundance estimate was 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. Our abundance estimate from both years pooled was 529,155 (95%CI: 385,072-726,791) snipe wintering within the study area.

The overlapping confidence intervals of random and CBC township densities indicated 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, we 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 ($p < 0.05$ in 2009 and $p < 0.005$ in 2010). Overall, we found that CBC sites had higher snipe counts than our systematic road survey method. Our results indicate that CBC's detected more snipe than our systematic road survey method and therefore could contribute to different population trend information and may not reflect true snipe abundance or population trends.

Our results indicate that the road transect survey method is effective for estimating wintering snipe density in the lower Mississippi Flyway. We 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.

Dr. Pearse 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
Post-doctoral 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.

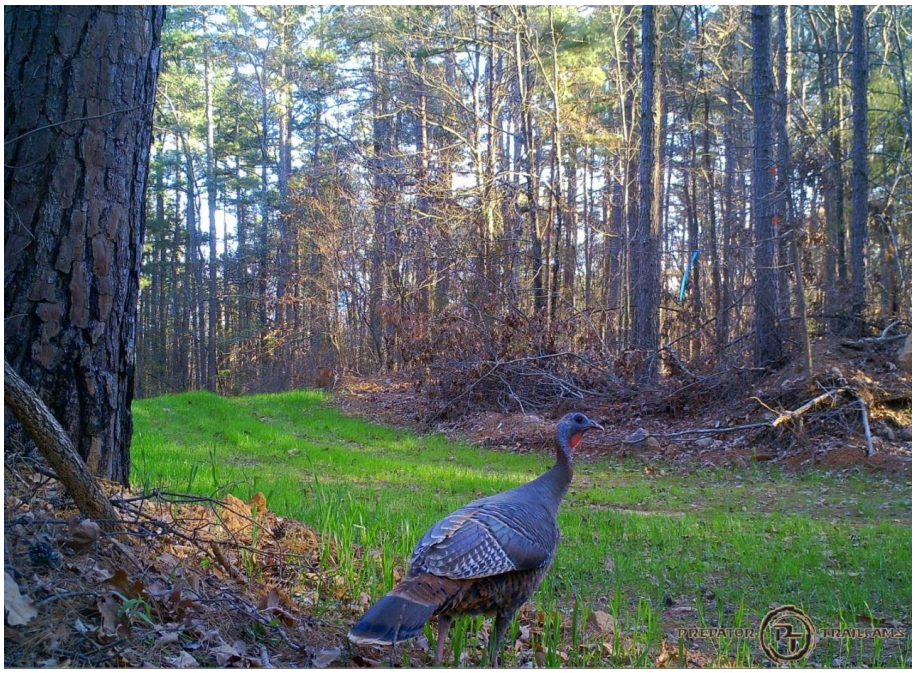
Winter waterfowl surveys have been conducted across much of the United States since 1935. However, sampling strategies have generally relied on professional judgment rather than probability to establish "representative" samples, making wide inferences and comparisons of estimates among years and studies 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.

NEW WILDLIFE PROJECTS

Tagging Female Wild Turkey

Wildlife



Female Wild Turkey at Burr Ridge 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.

During the late winter (Mid-January to 1 April 2011) we trapped eastern wild turkey females in the White Rock WMA using rocket nets at trap sites baited with cracked corn. After capture, females were each fitted with a 90-100g Platform Transmitter Terminals (PTTs) satellite transmitter using a modified backpack harness. These PTTs are capable of transmitting Global Positioning System (GPS) coordinates along with sensor data via the Argos-Trios Satellite system every 120 hrs. The GPS coordinates consist of four locations per day during the nesting period (1 March – 1 September) and one location per day during the winter season (1 September – 1 March). The PTT units are equipped with a radio transmitter (VHF) for location of nest sites and mortality. We collected the body mass (kg) and tarsal lengths (cm) of each female to be used as a winter condition index. Before release, we placed an aluminum butt end band with our contact information and a sequential identification number. These will be used to identify previously captured hens that have slipped their transmitter. After processing, we released each female at the trap site.

Despite extensive trapping effort, only 5 hens were captured and marked. Of the 5 PTT units deployed, 4 are still transmitting. One unit malfunctioned shortly after deployment and is currently missing. Of the four functioning units, two hens nested and 1 is currently incubating while the other nest was destroyed shortly after initiation. We have not located a nest for the other 2 hens. Of the two nests located, both were destroyed during the incubation period.

The response of vegetation to the prescribed fire is an important aspect of our study. We plan to take vegetation measurement at each nest location and random locations in the area of available habitat for each female. We will use these vegetation measurements to explain nest site selection, nest success and brood movements all within the context of prescribed fire treatments.

King Rail

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
Postdoctoral Researcher:	KAREN WILLARD

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, 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, 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 at Red Slough Wildlife Management Area in southeastern Oklahoma 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. In addition to VHF transmitters, we have 8 solar powered satellite-transmitters (PTTs) that we will deploy on any rails captured after 15 April. Should these PTT-marked birds migrate, we hope to be able to document both spring and fall migration routes, breeding location, and most importantly, winter location. VHF marked birds will be relocated at least every other day and at different times of the day. If habitat measurements at the site of the marked rail can be conducted without disturbing the bird, then surrounding each detection location, $\geq$10 individual points spaced >15 m apart will be randomly selected in all directions. To sample unused habitats, survey points will be randomly selected across Red Slough WMA 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 10-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 upland 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.

COMPLETED FISHERIES PROJECTS

Orangethroat Darter

Big Creek Crayfish

Is Interspecific Competition a Mechanism of Displacement of Imperiled Big Creek Crayfish by Invasive Alien Woodland Crayfish in The St. Francis River Drainage?

Funding Source:	Missouri Department of Conservation
Project Duration:	July 2009 to June 2010
Principal Investigator:	DANIEL D. MAGOULICK, ROBERT J. DISTEFANO
Graduate student:	JACOB WESTHOFF (Ph.D. Student)

Objectives:

1. Determine effects of invasive woodland crayfish on growth and survival of native Big Creek crayfish.
2. Determine ability of woodland crayfish to grow and survive in their former native range.

Management Implications:

1. Results should determine mechanisms responsible for the disappearance of the imperiled *O. peruncus* from St. Francis River drainage streams.
2. Results will allow managers to identify conservation/management alternatives.

Project Summary:

The Big Creek Crayfish, *Orconectes peruncus,* is native to the St. Francis River drainage in Missouri, USA and is often absent at locations where the introduced Woodland Crayfish, *Orconectes hylas,* has become established. We performed a field experiment to determine whether effects of current abiotic conditions and interspecific competition with *O. hylas* were

responsible for displacement of *O. peruncus* from parts of their former range. We examined growth and survival of juvenile male *O. peruncus* exposed to juvenile male *O. hylas* in enclosures at two sites in the former range of *O. peruncus* using different crayfish densities and controls. Juvenile *O. peruncus* were able to survive and grow in portions of their former range, implicating biotic versus abiotic factors in the displacement of *O. peruncus*. Survival rates of *O. peruncus* did not differ among treatments at either site. *Orconectes peruncus* showed significant growth in all treatments and interspecific effects were not greater than intraspecific effects on *O. peruncus* growth rates. High density treatments showed significantly reduced *O. peruncus* growth rates compared to low density treatments, except in Carver Creek interspecific treatments. When considered in the context of previous studies examining the effects of *O. hylas* on *O. peruncus*, results suggest that neither direct competition between juvenile males of the two species or abiotic change are responsible for the extirpation of *O. peruncus* from much of its former range. Additional research is required to determine the mechanism(s) driving the displacement of *O. peruncus*.

Coldwater Crayfish

Distribution of the Imperiled Coldwater Crayfish (*Orconectes eupunctus*) in the Black River Drainage of Missouri and Arkansas: Examination of Occupancy Estimation

Funding Source:	Missouri Department of Conservation
Project Duration:	July 2009 to June 2010
Principal Investigator:	DANIEL D. MAGOULICK, ROBERT J. DISTEFANO
Graduate student:	JACOB WESTHOFF (Ph.D. Student)

Objectives:

1. Determine effectiveness of occupancy estimation approach for determining distribution of coldwater crayfish.
2. Determine important covariates of occupancy for coldwater crayfish.

Management Implications:

1. Results will inform a proposed larger study to examine population ecology of coldwater crayfish.
2. Results will allow determination of needed samples sizes for occupancy estimation for coldwater crayfish.

Project Summary:

We determined distribution and abundance of populations of coldwater crayfish in the Eleven Point River using occupancy estimation methods by sampling stream segments. A minimum of three riffle habitats or "sites" (*sensu* MacKenzie et al. 2006) and three 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. Sampling will occur only in water depths of $\leq$1 m because we are unable to use the 1-m^2 kick seine in deeper water.

At all sampling reaches, physical characteristics of riffle and run sites were collected. We will use crayfish presence data to estimate occupancy rates using program PRESENCE. Relationships between occupancy rates and environmental variables will be determined using covariates. We will use power analysis to determine needed sample sizes for additional proposed work.

CURRENT FISHERIES PROJECTS

Longear Sunfish

Coldwater Crayfish

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 student:	MATTHEW NOLEN

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 using occupancy estimation methods by sampling stream segments. A minimum of three riffle habitats or "sites" (*sensu* MacKenzie et al. 2006) and three 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. Sampling will occur only in water depths of $\leq$1 m because we are unable to use the 1-m^2 kick seine in deeper water. At all sampling reaches, physical characteristics of riffle and run sites were collected. We will use crayfish presence data to estimate occupancy rates using program PRESENCE. 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.

NEW FISHERIES PROJECTS

Crayfish

Bear Creek in the Boston Mountains

Classification of Arkansas flow regimes, 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
Post-doctoral Research Associate:	SCOTT LONGING
Graduate Research Assistant:	DUSTIN LYNCH

Objectives:

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

Management Implications:

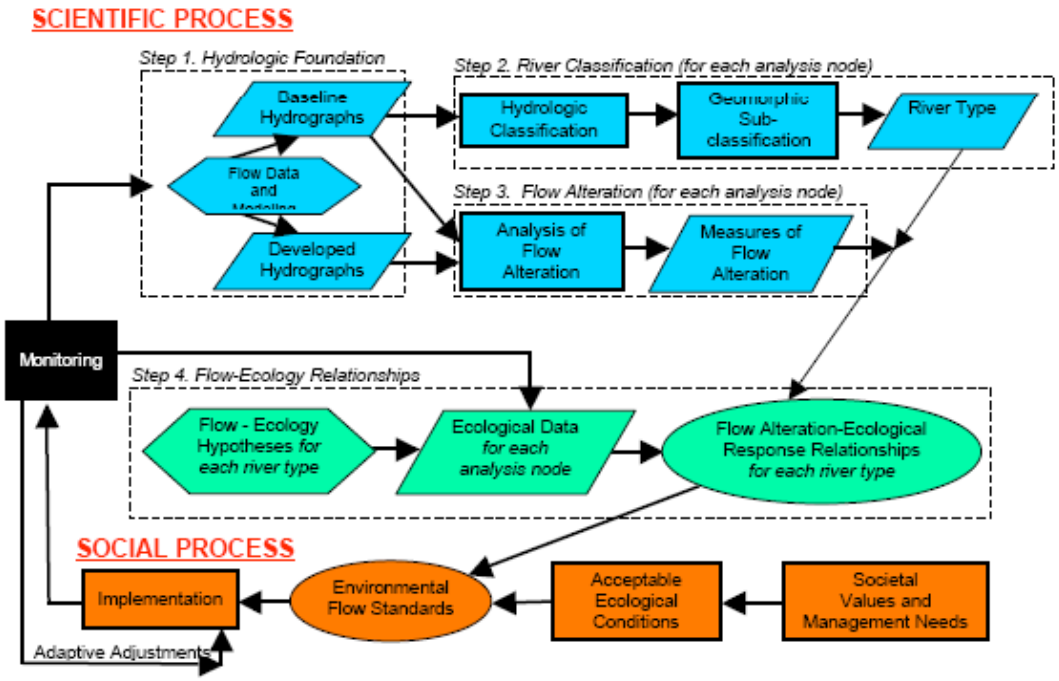
1. Products of this study, including a statewide river classification system and regional ecological-flow relationships, will form the scientific framework for environmental flow standards and aid studies involving the impacts of global climate change on Arkansas's unique streams and rivers.

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) is currently being collated and processed using the Hydrologic Index Tool software of the Hydroecological Integrity Assessment Process. This analysis will provide the flow parameters required to define stream classes and natural flow regimes. Landscape attributes for each gaged watershed are concurrently being compiled to further elucidate hydrologically-altered and reference conditions. 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. Overall results of project will help to guide watershed management options for sensitive species of concern and entire aquatic communities and for sustaining important ecosystem processes supported by natural flow regimes.



PRODUCTIVITY

Matt Carroll Recording Data at Red Slough Wildlife Management Area

HONORS AND AWARDS

COURSES TAUGHT

Magoulick, D.D. – Biomety – Spring 2010
Krementz, D.G. – Wildlife Management and Techniques – Spring 2010

PUBLICATIONS AND PROFESSIONAL PAPERS PRESENTED

Scientific Publications

Budd, M.J., and **D.G. Krementz.** 2010. Habitat Use by Least Bitterns in the Arkansas Delta. Waterbirds 33:140-147.

Darrah, A.J., and **D.G. Krementz.** 2010. Occupancy and habitat use of the least bittern and pied-billed grebe in the Illinois and Upper Mississippi River Valleys. Waterbirds 33:367-375.

Krementz, D.G., and J.D. Luscier. 2010. Woodpecker densities in the Big Woods of Arkansas. Journal of Fish and Wildlife Management 1:102-110.

Dekar, M.P., **D.D. Magoulick,** and J. Beringer. 2010. Bioenergetics assessment of fish and crayfish consumption by otter (*Lontra Canadensis*): integrating pre availability, diet, and field metabolic rate. Canadian Journal of Fisheries and Aquatic Sciences 67:1439-1448.

Ludlam, J.P., and **D.D. Magoulick.** 2010. Effects of consumer identity and disturbance on stream mesocosm structure and function. Fundamental and Applied Limnology 177:143-149.

Ludlam, J.P., and **D.D. Magoulick.** 2010. Environmental conditions and biotic interactions influence ecosystem structure and function in a drying stream. Hydrobiologia 644:127-137.

Theses and Dissertations

Bolenbaugh, J.R. 2010. Status, distribution, and habitat use of the king rail and other secretive marsh birds in the Upper Mississippi River/Great Lakes Joint Venture. M.S. Thesis, University of Arkansas.

Scott, L.A. 2010. Species richness and habitat use of secretive marsh birds in managed wetlands in the Arkansas River Valley of Western Arkansas. M.S. Thesis, University of Arkansas.

Papers Presented

Carroll, J.M., and **D.G. Krementz.** 2009. Development of a winter survey for Wilson's snipe in the Mississippi Flyway. Arkansas State Chapter of the Wildlife Society.

Magoulick, D.D., J.T. Westhoff, R.J. DiStefano and C.F.Rabeni. 2010. Does juvenile completion explain displacement of imperiled Big Creek crayfish by invasive woodland crayfish? International Associations of Astacology, Columbia, Missouri

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., and J.M. Flinders. 2010. Bioenergetic evaluation of food supply and consumption demand by brown and rainbow trout in catch-and-release areas of Arkansas tail waters. Trout Unlimited, Fayetteville, Arkansas.

Posters Presented

Bolenbaugh, J.R., and **D.G. Krementz.** 2010. Status, distribution, and habitat use of secretive marshbirds in the Upper Mississippi River/Great Lakes Joint Venture. The Wildlife Society

Magoulick, D.D., J.T. Westhoff, R.J. DiStefano and C.F. Rabeni. 2010. Do invasive Woodland crayfish competivtively displace imperiled Big Creek crayfish? Joint meeting of American Society for Limnology and Oceanography and North American Benthological Society, Santa Fe, New Mexico

Committees/Task Forces/Recovery Teams

Krementz, D.G. – Associate editor for the Proceeding of the Tenth American Woodcock Symposium. Michigan Department of Natural Resources and Environment
Krementz, D.G. – Chairman, Webless Committee of the Mississippi Flyway Technical Section
Krementz, D.G. – Ivory-billed Woodpecker Recovery Team – Biology Working Group
Krementz, D.G. – Lower Mississippi Alluvial Valley Joint Venture Waterfowl Working Group
Krementz, D.G. – West Gulf Coastal Plain/Ouachita Landbird Technical Working Group
Magoulick, D.D. – External Reviewer for Promotion and Tenure Applications, Florida Atlantic University
Magoulick, D.D. – External Reviewer for Promotion and Tenure Applications, York University, Ontario, Canada
Magoulick, D.D. – Inter-agency Climate Change Working Group
Magoulick, D.D. – Nature Conservancy Science Advisory Board
Magoulick, D.D. – Fish Taxa Team, Arkansas Wildlife Action Plan
Magoulick, D.D. – Crayfish Taxa Team, Arkansas Wildlife Action Plan
Magoulick, D.D. – International Union for Conservation of Nature (IICN) Australia Freshwater Fish Conservation Work Group
Magoulick, D.D. – Nature Conservancy In-stream Flows Team

Magoulick, D.D. – Upper White River Basin Foundation Technical Advisory Group
Magoulick, D.D. – U. S. Fish and Wildlife Service Aquatic Nuisance Species Task Force
Magoulick, D.D. – Arkansas Invasive Species Task Force
Magoulick, D.D. – Regional Science Fair judge
Magoulick, D.D. – Science Fair advisor to middle school teachers and students

TECHNICAL ASSISTANCE

Training Offered

Krementz, D.G., and S. King. 2009. King rail ecology and management. National Conservation Training Center Webinar Series

Training Received

Krementz, D.G., CPR and First Aid Training, 2010
Asante, K., CPR and First Aid Training, 2010
Scott, L.A., CPR and First Aid Training, 2010

GRADUATED COOP UNIT STUDENTS AS OF DECEMBER 2010

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

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
Research Biologist, USGS, Columbia River Research Laboratory

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)*
Post-doctoral 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