

# Mississippi Cooperative Fish and Wildlife Research Unit

## 41 years of fish and wildlife conservation



RESEARCH FOR SCIENCE-BASED DECISION MAKING IN NATURAL RESOURCES

### RESEARCH HIGHLIGHTS

#### AVIAN COMMUNITIES AND MOURNING DOVE-HABITAT RELATIONSHIPS IN MANAGED FIELDS OF CENTRAL MISSISSIPPI: A MULTI-SCALE APPROACH

The mourning dove (*Zenaida macroura*) is the most harvested migratory game bird in the U.S. Mourning doves are valued by the public in rural, suburban, and urban locales because they occur widely, nest readily around yards and farms, and are frequent visitors to bird feeders. The economic impact of dove hunting is considerable. Despite the widespread distribution and abundance of the mourning dove, there is concern among managers regarding potentially declining populations in some portions of their ranges based on available data from the Mourning Dove Call Count Survey and North American Breeding Bird Survey. Compared to other small game species in the state, mourning dove research in Mississippi has been relatively limited. Research in Mississippi has been limited compared to other dove hunting states in the Eastern Management Unit. Previous dove research in Mississippi characterized long-term changes in landscape structure and composition within dove call-count routes and movements and survival from band recoveries.

We are conducting research on avian community structure and mourning dove abundance patterns and multi-scale use of managed fields in Wildlife Management Areas (WMA) managed by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP). Starting June 2020, research will be conducted in several WMAs across central Mississippi where fields are actively managed using dove attracting crops and with varying levels of

### ABOUT THE UNIT

The Mississippi Cooperative Fish and Wildlife Research Unit has been a 41-year collaborative effort between the Mississippi Department of Wildlife, Fisheries and Parks, Mississippi State University, U.S. Fish and Wildlife Service, U.S. Geological Survey, and Wildlife Management Institute, all contributing resources and expertise to solve natural resource problems through applied science, technical assistance, and graduate training.

Mississippi is home to the Mississippi River, oxbow lakes, abundant fisheries and wildlife resources, and enthusiastic fishers and hunters. We address problems of international, national, regional, and state importance to promote fish and wildlife conservation and associated habitat management. For additional information:

<https://www.coopunits.org/Mississippi/>

### PERSONNEL

- UL** - Steve Miranda
- AUL** - Francisco Vilella
- AUL** - vacant
- Admin Asst** - Nicole Medeiros
- MS students:** G. Coppola, D. Norris, J. Ray, M. Rhodes, S. VanderBloemen
- PhD students:** C. Aldridge, R. DeVries, N. Fauchaux, A. Naveda
- Post-Doc:** C. Ramirez



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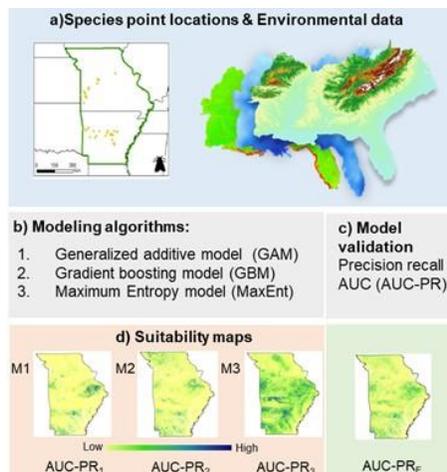
hunting pressure and harvest. Study sites include Black Prairie WMA, Okatibbee WMA, William C. Deviney WMA, and Muscadine Farms WMA. Further, dove fields on private lands near selected WMAs may be included in the study contingent on securing the support of landowners and trespass permission. Our objectives include: 1) determining avian community structure and composition in managed fields, 2) determine annual patterns of mourning dove abundance in managed fields, 3) band mourning doves in WMAs selected to determine survival patterns using live recaptures and dead recoveries, and, 4) develop dove-habitat relationship models in WMAs of central Mississippi.

## FRAS<sub>PS</sub>: A PLANNING SUPPORT TOOL FOR INLAND FISHERIES

Organizing and planning are among the most demanding tasks of fisheries professionals. Often this process is overwhelming and clear linkages between agency-wide goals, management plan objectives and actions, and monitoring metrics are non-existent. We are developing an online computer application for MDWFP to support structuring and regimentation of management plans. The tool steers the user through a series of menus to build a management plan that outlines objectives, management actions, monitoring protocols, and outcome evaluation. This system uses existing monitoring data, conditional logic, and user input to provide the user with up-to-date, lake-specific information. While still in early development, the application is designed to link monitoring to agency-specified objectives and actions. This coordination can help fisheries professionals more efficiently and effectively organize and plan management activities and pave the way for management decision optimization.

## MODELING SPECIES AT RISK TO SUPPORT SPECIES STATUS ASSESSMENTS IN THE SOUTHEAST

Effective conservation planning requires reliable information on the geographic distribution of organisms, something often incomplete for many species, especially for rare ones, due to limited observation data. Species distribution models (SDM) are highly valuable in determining critical remaining and potential habitats of at-risk species for conservation planning. Despite the proliferation of SDM and tools in the past two decades, management programs have not fully adopted them to inform species surveys and other monitoring efforts; instead, many rely on expert knowledge and other traditional methods to locate extant populations.



Species Status Assessments (SSAs) are a recent development intended to increase scientific rigor, streamline and improve efficiency and effectiveness in listing and management of species under the Endangered Species Act. In the last 27 months our modeling team has worked with USFWS and state agency cooperators in Arkansas, Georgia, South Carolina, and Florida to develop an ensemble SDM approach for rattlesnake master borer moth (*Papaipema eryngii*), Ocmulgee skullcap (*Scutellaria ocmulgee*),

purple-disk honeycomb-head (*Balduina atropurpurea*), hairy-peduncled beakrush (*Rhynchospora crinipes*), and Florida nutmeg (*Torreya taxifolia*). We are presently in discussions with USFWS to target other at-risk and endangered species for modeling. The original project (i.e., Phase I) centered on development of ensemble SDMs for each of the three initial species (*P. eryngii*, *S. ocmulgee*, *B. purpurea*). The project was extended to a phase II project to continue modeling efforts for these species and extend work to a different suite of at-risk species and included *R. crinipes* and *T. taxifolia*. We are working closely with the USFWS to develop modeling approaches and deliver outputs.

## MUDFLATS TO MARSHES: PLANTING THE RESERVOIR REGULATED ZONE (COMPLETED)

Winter drawdowns in flood control reservoirs create expansive mudflats that lack the vegetation typical of littoral zones, which reduces the amount of structure available for fish habitat. This study investigated the feasibility of establishing agricultural plantings as a management action to ameliorate mudflats by providing structural cover following reservoir refilling. We tested cool-season annual grasses and clovers applied in several mixed and monoculture treatments that were sown on the mudflats of Enid Reservoir during the winter drawdown of three consecutive years. Plantings were monitored until the following spring to evaluate effectiveness of establishment through ground coverage, height, and stem density sampling. Plots were assigned a seeding treatment of either grasses (Ryegrass *Lolium* sp. or Triticale x *Triticosecale* sp.), clovers (Balansa *Trifolium michelianum* or Berseem *Trifolium alexandrinum*), both (mixed plantings), or an unseeded control. Soil productivity within the study area was poor all three years. However, grasses germinated both when disked into the soil



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and when top sown, while clover only germinated when disked. Plots seeded with grasses performed better than control plots with respect to stem density, height, and ground coverage, while plots seeded with grass/clover mixtures performed better than control plots only with respect to height, and plots seeded with clover did not perform significantly better than control plots. Results serve as an evaluation of the efficacy of agricultural plant establishment on the mudflats of a flood control reservoir, inform the direction of future research, and identify considerations regarding the application of agricultural plantings as a management tool to create fish habitat.



## INVENTORYING A NATIONAL TREASURE (COMPLETED)

The alluvial valley of the Mississippi River is an extensive area harboring hundreds of lakes created by fluvial dynamics. The lakes are scattered throughout the valley and carved over thousands of years by shifting river courses and other hydro-fluvial processes associated with contemporary and prehistoric rivers. These lakes have significant ecological importance as they support a large component of North American biodiversity. We applied remote sensing to inventory lakes, characterize geomorphology, and construct a typology via cluster analysis. We identified over 1,300 lakes totaling over 100,000 ha. The lakes were classified into 12 types



according to lake size, shape, depth, connectivity, inundation frequency, and surrounding landcover. We anticipate that biotic characteristics differ among the 12 types, but large-scale systematic analyses of biotic assemblages of oxbow lakes in the region are mostly absent. Additional research is needed to define their ecological conditions. Our typology can provide the framework essential for organizing research to define water dynamics, water quality, and ecological conditions such as forests, mussel, fish, and avian communities to construct conservation plans. The typology encourages a large-scale view of the properties of oxbow lakes in the alluvial valley. It is a functional tool that can be used to identify conservation and research needs, adapt monitoring and management programs, customize environmental programs, and use conservation resources more effectively to achieve large-scale management objectives

## MIGRATION ECOLOGY OF NORTH AMERICAN TURKEY VULTURES *CATHARTES AURA* WINTERING IN THE NEOTROPICS: SPATIAL AND POPULATION DYNAMICS

Landscape composition and configuration may influence migration of raptors. The ecological and functional roles that landscape, at multiple scales, and weather may have on the migration strategies of North American Turkey Vultures has not been studied. Furthermore, there is limited information on factors triggering the processes of outbound and return

migration in the Turkey Vulture. Limited studies on Turkey Vulture movements have been conducted, however, information gaps remain particularly related to migration.

This study is utilizing a database of > 60 vultures radiomarked with satellite transmitters during the last decade. Our objective in this research is to fill knowledge gaps focusing on the three North American Turkey Vulture subspecies *C. a. meridionalis*, *C. a. septentrionalis* and *C. a. aura* across North America to understand their movement ecology across the annual cycle. Our research is testing ecological hypotheses on migration strategies, landscape connectivity, space use, resource selection



and survival of vulture populations and the influence that multi-resolution landscape characteristics, anthropogenic disturbance and weather conditions play in the life cycle of this North American raptor.

## TRIBUTARIES AS BIODIVERSITY PRESERVES IN THE PARANÁ RIVER (COMPLETED)

Conservation of fish assemblages in the Paraná River, the second largest river in South America and the most severely impounded, has focused on providing longitudinal and lateral connectivity along the mainstem. Less attention has been given to tributaries, some of which remain unimpounded. We are studying how biodiversity of fish in tributaries to a large reservoir contributes to overall biodiversity in the river. Preliminary results suggest that tributaries enrich biodiversity by providing access to a



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variety of environmental conditions and mitigate the adverse influence of impoundments. Conservation in tributaries may emphasize managing quality of inflows from catchments, preserving suitable instream habitats and flows, and preserving access to smaller but more numerous floodplains.



## YAZOO STREAM FISH RELATIVE TO INSTALLED INSTREAM STRUCTURES

The Yazoo Basin in Northwest Mississippi have a long history of erosion. As the area was settled in the early 1800s, the native hardwood forest was cleared for farming. As a result, the loess topsoil washed downstream exposing the underlying sand. When exposed to spring torrential rains, sandy ditches turned into deep gullies that literally ate away the fields. Starting in the 1930s, several federal agencies began working with landowners to promote soil conservation and reforest the gullies. While these efforts were successful in curbing sheet erosion, the



streams were still undergoing dramatic changes. Beginning in the early 1980s,

several types of instream erosion control structures were installed and tested. These structures have successfully stabilized streams. Our study focuses on documenting how these conservation actions impacted the stream fish assemblages. We are evaluating the long-term effects of these conservation actions at various spatial and temporal scales to inform future conservation actions.

## RAPID ASSESSMENTS AND HABITAT EVALUATION OF THE ENDANGERED SHARP-SHINNED HAWK AND PLAIN PIGEON IN PUERTO RICO AFTER HURRICANE MARIA (COMPLETED)

Hurricanes constitute a major disturbance to terrestrial ecosystems in the Caribbean islands and their effects play a major role in forest succession. Microclimate, rainfall patterns, nutrient cycling, and litter fall are among some of the aspects of terrestrial ecosystems disrupted by intense hurricanes. Further, forest-specialist birds may shift habitat use patterns after hurricanes. On 20 September 2017, Hurricane Maria moved across the island of Puerto Rico from southeast to northwest with sustained winds of 250 km/hr. This major hurricane caused extensive damage and alteration of forest structure, including loss of tree branches and the opening of the forest canopy with a consequent increase in understory and midstory cover. We conducted rapid assessments on two listed avian species, the Puerto Rico Sharp-shinned Hawk *Accipiter striatus vennator* (SSHA) and the Puerto Rico Plain Pigeon *Patagioenas inornata wetmorei* (PLPI) to document impacts to habitat and short-term population responses to the hurricane.

Damage to SSHA habitat from hurricane Maria was widespread, with forests exhibiting approximately 90% canopy loss. There were extensive areas of near total defoliation and trees suffered major breakage and uprooting. Importantly, most trees used for nesting by SSHA pairs were toppled over by the

hurricane. Of 21 known nest trees used by SSHA during 2014-2016, only 9 were still standing. Hurricane Maria greatly modified the vegetation structure of SSHA occupied habitat and likely affected basic ecological processes. Consequently, post-hurricane forest conditions may have reduced value as suitable habitat for the SSHA. Given the precarious situation of the endangered island raptor, research is needed on SSHA survival and movements following hurricane Maria to avoid the extinction of this critically endangered species.



Spatial modeling of PLPI habitat after hurricane Maria indicated considerable heterogeneity with respect to disturbance intensity within the study area of east-central Puerto Rico. A rapid visualization analysis on the magnitude of disturbance heterogeneity illustrated the northeastern and southeastern sections of the study area experienced the most severe deforestation. Our analysis indicated a substantial amount of habitat loss based on changes to non-photosynthetic vegetation ( $\Delta NPV$ ) values for various protected areas within the region. Populations of the PLPI were negatively impacted by hurricane Maria. Data on PLPI presence along monitored survey routes before the hurricane averaged  $\geq 50$  individuals. After the hurricane number of PLPI by route averaged approximately 3 individuals per survey ranging from 1-17. Surveys conducted for this rapid

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assessment suggest PLPI detections were reduced more than half after the storm. Damage to PLPI habitat in the municipalities encompassing our study area was widespread, with varying intensity depending on individual sectors in each municipality. Like the SSHA, research is needed on the PLPI to determine potential shifts in post-hurricane geographic distribution, movements and dispersal to fully assess the impacts of hurricane Maria to the Plain Pigeon.

## BIGHEADED CARPS IN THE TENNESSEE RIVER AND TENNESSEE-TOMBIGBEE WATERWAY

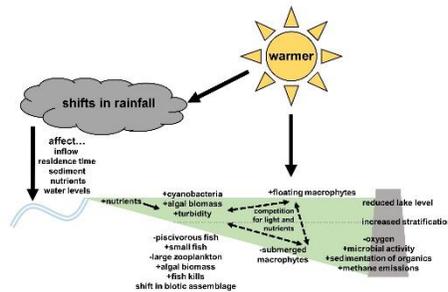
Bigheaded carps have been expanding through the Tennessee River and are now relatively common in Kentucky Lake but also occur in Pickwick Lake and as far upstream as Wheeler Lake. The Tennessee-Tombigbee Waterway, connected to Pickwick Lake, is the newest concern regarding the invasion of the bigheaded carps. If they enter the Tennessee-Tombigbee Waterway they could access various river systems that drain into the Gulf of Mexico. Colonization by bigheaded carps presents an imminent threat to these aquatic systems as they could be detrimental to native fish assemblages. The objectives of this study



include investigating if bigheaded carps have expanded into Bay Springs Lake at the start of the Tennessee-Tombigbee Waterway; determine whether seasonal water level patterns encourage movement of bigheaded carps; and test whether there have been changes in the fish assemblages of Kentucky and Pickwick lakes that could be attributed to the expansion of bigheaded carps.

## RESERVOIR FISH HABITATS: A PERSPECTIVE ON COPING WITH CLIMATE CHANGE (COMPLETED)

The effects of climate change are increasingly evident and are anticipated to profoundly affect our ability to conserve



fish habitats and fish assemblages. Reservoirs are important structures for coping with projected shifts in water supply, but they also provide refuge for riverine fishes and retain distinct fish assemblages that support diverse fisheries. The effects of climate change on reservoirs are unique among aquatic systems because reservoirs have distinctive habitat characteristics due to their terrestrial origin and strong linkage to catchments. This article reviews (1) the projected effects of rising temperature and shifting precipitation on reservoir fish habitats, and (2) adaptation strategies to cope with the anticipated effects. Climate warming impacts to reservoirs may include higher water temperatures and shifts in hydrology that can result in reduced water levels in summer and fall, altered water residence cycles, disconnection from upstream riverine habitats and backwaters, increased stratification, eutrophication, anoxia, and

a general shift in biotic assemblages including plants, invertebrates, and fishes. What is needed to adapt to these changes is a perspective that focuses on maintaining ecosystem functionality rather than on retaining a certain species composition. To that end, various strategies organized into planning, monitoring, and managing compartments were identified.

## SPATIAL FISH DIVERSITY IN THE DUCK RIVER (COMPLETED)

We investigated the spatial organization of fishes in a river system to evaluate if richness of uncommon species changed longitudinally. We anticipated that overall richness of the fish community would increase in a downstream direction along with habitat volume, but that more uncommon species would occur upstream due to greater among-site heterogeneity. Fish were collected between 1995 and 2014 at 85 sites distributed throughout the Duck River Basin, Tennessee, USA. A site usually consisted of four habitat types: riffles, runs, pools, and shoreline. Each habitat type was sampled with a multi-pass backpack electrofishing protocol. We collected 136 native fish species. Of these, 71% were classified as uncommon and represented 16% of the total number of fishes collected. Whereas overall species richness increased downstream, unexpectedly uncommon species did too. Some uncommon species were restricted exclusively to tributaries and headwaters, some to tributaries and mainstem, many to mainstem only, and the largest fraction of uncommon species were scattered



throughout the basin, but even this latter group increased in richness downstream. Because conservation often focuses on uncommon species, our study suggests

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that a greater number of uncommon species can be conserved with an emphasis on large downstream reaches, which not only include larger habitat volume to support larger concentrations of fish, but also harbor more of the uncommon species often most in need of protection.

## PROPOSED RESEARCH

Avian, invertebrate and plant community ecology in coastal wetlands of Puerto Rico: a restoration and management approach. Puerto Rico Department of Natural and Environmental Resources

## PUBLICATIONS 2018-2020

- Calamari, N.C., F.J. Vilella, Y. V. Sica, P.A. Mercuri. 2018. Patch and landscape responses of bird abundance to fragmentation in agroecosystems of east-central Argentina. *Avian Conservation and Ecology* 13 (2): [online] URL: <http://www.ace-eco.org/vol13/iiss2/art3/>
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- Kroboth, P.T., D.A. Hann, M.E. Colvin, P.D. Hartfield, H.L. Schramm Jr. 2020. Pallid sturgeon seasonal habitat selection in a large free-flowing river, the lower Mississippi River. *Journal of Applied Ichthyology* <https://doi.org/10.1111/jai.14000>.
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## PRESENTATIONS

Unit staff and students made over 25 presentations:

- The 5<sup>th</sup> Uruguay Zoological Congress, Montevideo
- Neotropical Ornithological Congress, San Jose, Costa Rica
- Joint Meeting of the American Fisheries Society and The Wildlife Society, Reno, NV
- Annual Meeting of the Southern Division, American Fisheries Society, Little Rock, AR
- Annual Meeting of the Mississippi Chapter, American Fisheries Society, Gulfport, MS
- Southeastern Association of Fish and Wildlife Agencies, Hilton Head, SC
- Midwest Association of Fish and Wildlife Agencies, Springfield, IL
- Southeastern Fishes Council, Knoxville, TN

## AWARDS

David Norris, Jenkins Memorial Scholarship, Reservoir Committee, American Fisheries Society

