# OSBORNE LAB ANNUAL REPORT

Waterfowl Research, Education, and Outreach

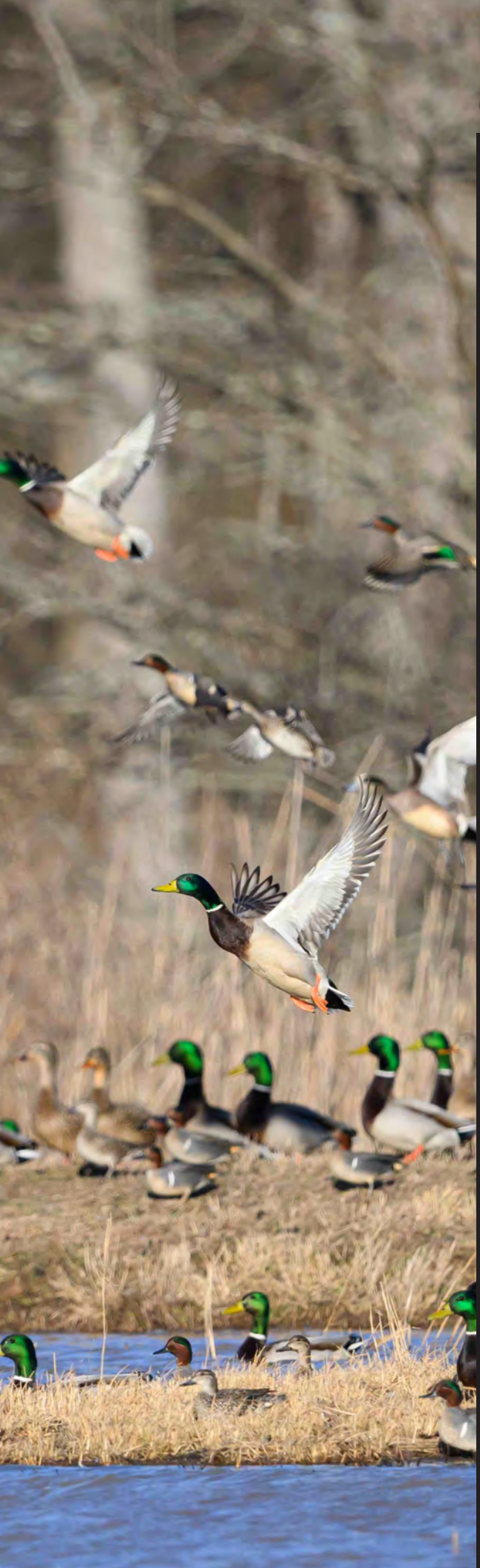
2024-2025


UofA DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

COLLEGE OF FORESTRY, AGRICULTURE & NATURAL RESOURCES

OSBORNE LAB

# ANNUAL REPORT
2024-2025



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ABOUT

# THE LAB

***Reflections on Fourteen Years: Building the Future of Waterfowl Conservation at UAM***

As I look back on my first fourteen years as a university professor, I often reflect on how a family from Illinois and Pennsylvania found their way to South Arkansas—and more importantly, why we stayed. To be honest, we came for the ducks. But we stayed because of the people.

Southern hospitality here is unlike anything I've experienced elsewhere. From the moment we arrived, the community welcomed us like family. And it was the rich, deeply rooted tradition of waterfowling in this region that connected me to others who share a profound respect for the sport and the habitat it depends on.

**The Osborne Lab** was established at the University of Arkansas at Monticello (UAM) in July 2012. From the very beginning, my vision for the Lab has been student-centered—focused on mentorship, academic preparation, professional development, networking, critical thinking, and effective communication. We aim not only to conduct sound science but to shape the next generation of waterfowl professionals.

Our research encompasses a range of topics: migration and movement ecology, body condition, habitat selection and management, landscape ecology, and population demographics. This work is designed to support both public and private landowners with better management practices and to provide policymakers with the data needed to make informed decisions.

In 2015, we launched a long-term **winter Mallard banding program**, which has become a cornerstone of our student training, innovative research, and outreach efforts. The 2018 revision of the North American Waterfowl Management Plan underscored the need to connect people, waterfowl, and wetlands—and called on the academic community to "bolster training programs for future waterfowl management professionals." Our winter banding program has answered that call. It connects people of all ages to Arkansas's hunting heritage while giving our students hands-on experience that prepares them to compete—and thrive—in this rewarding but highly competitive field.

***A New Chapter Begins***

In the past few years, two major developments have forever changed the trajectory of the Waterfowl Program at UAM. These initiatives reflect the depth of Arkansas's waterfowling tradition and the passion of the individuals behind them.

In December 2020, Mr. George Dunklin and I established a public-private partnership between Five Oaks Duck Lodge, the University of Arkansas Division of Agriculture, and UAM. This collaboration created the **Five Oaks Ag Research and Education Center**, which offers an immersive, one-year graduate certificate in **Waterfowl Habitat and Recreation Management**. Through this program, four students each year receive $20,000 scholarships to study the operations of a private duck property. To date, **15 students have completed the program—with a 100% job placement** rate in private, state, federal, and non-profit sectors.

Then, in October 2025, a second transformative initiative took shape. Mr. Merrit Dyke and Mr. David Snowden established the **Dyke-Snowden Endowed Chair of Waterfowl Ecology at UAM**. These men recognize the many challenges to waterfowl and its habitat, the decline in university programs dedicated to this field, and the perpetual

need for sustainable funding for training, science and research. They appreciate the importance of the next generation of conservation leaders. Their thoughts are valid—and their actions are powerful.

It was Mr. Snowden's passion, rooted in a lifetime of waterfowl hunting, that led to the philanthropic leadership needed to establish the **Snowden Waterfowl Center of Excellence**. He rallied 12 additional supporters—individuals, families, and corporations—who came together around a shared vision: to ensure that UAM becomes a world leader in waterfowl research and education.

When I first shared my vision for the Center with Mr. Snowden, I thought it might be too ambitious. But momentum built quickly. Within just six weeks, our funding goal was met.

To everyone who supported this effort: thank you. Your investment means undergraduate scholarships, graduate stipends, tuition waivers, and sustained research and professional development opportunities for years to come. Because of you, we are strategically positioning one of the largest **endowed waterfowl programs in America** at the very heart of the **midcontinent Mallard wintering grounds**.

Your support ensures that future generations of researchers, managers, and leaders will be equipped to carry the torch. You have created something that will leave a lasting legacy—not just in Arkansas, but across North America.

***A Personal Thank You***

To all who partnered with me to help establish the Snowden Waterfowl Center: thank you. This journey is far greater than any one individual. Together, we've built something powerful, and I'm honored to continue working with you as we pursue the vision that began 14 years ago.

**Here's to the future of waterfowl, the students who will protect it, and the shared passion that brought us all together.**

**- Dr. Douglas Osborne**



# OSBORNE LAB GRADUATES

***Graduate student, alumni, and job placement listed for program graduates.***

*GC–Graduate Certificate, MS-Masters Student*

**MacKenzie Wirick** (GC 2024; MS 2025) Forester, Ducks Unlimited Missouri

**Brendan Hood** (GC 2025) Biologist II, Arkansas Game and Fish Commission

**Emily Van Der Veer** (GC 2025) Seasonal Biologist, Five Oaks Ag Research and Education Center

**Tyler Wick** (GC 2025) Environmental Impacts Manager, Indiana Department of Transportation

**Katherina A. Schroyer** (MS 2024) Research Associate Osborne Lab, University of Arkansas Monticello

**Blake Bartels** (GC 2024) Biologist, Wisconsin Waterfowl Association

**Scott Herman** (GC 2024) MS student at Northern Illinois University

**Coleman Nadeau** (GC 2024) Biological Technician, Ducks Unlimited North Dakota

**Patrick Whitington** (GC 2024) Biologist, Ducks Unlimited Arkansas

**Clayton Ernzen** (GC 2023), Private Land Biologist, Texas Ranch, TX

**Eli Stenson** (GC 2023), Assistant Manager with USFWS at Cache River NWR

**Elijah Wojohn** (GC 2023), Biologist at Manomet Shorebird non-profit, LA

**Katherine Allen** (GC 2022; MS 2023) WMA Coordinator, Ohio Depart. of Natural Resources

**Katharine Cody** (MS) Colorado Biologist with Ducks Unlimited

**Callie Moore** (MS) Fish and Wildlife Biologist, Washington Department of Fish and Wildlife

**Brandon Bennett** (GC 2022) Biologist, Five Oaks Ag Research and Education Center

**Cole Howard** (GC 2022) Biologist, Mid-Columbia River NWR Complex

**Delanie Warren** (GC 2022) Biologist with Ducks Unlimited Colorado

**Ethan Dittmer** (MS 2022) PhD student at the University of Nebraska Lincoln

**Jacob Bethell** (MS 2022) Private Land Biologist at Strait Lakes Duck Lodge, McCory, AR

**Cody Martin** (MS 2021) Soil Conservationist at USDA-NRCS

**Jakeb Spears** (MS 2020) Arkansas Biologist with Ducks Unlimited

**Taylor Linder** (MS 2020) Program Coordinator, N.A. Grouse Partnership

**Pedro Ardapple** (MS 2018) Karst Biologist with USFWS Ecological Services

**Ethan Massey** (MS 2017) Regional Biologist with Ducks Unlimited

**Ryan Askren** (MS 2016) Director of Five Oaks Ag Research & Education Center

**Kathryn Brautigam** (MS 2015) Postdoctoral research associate at North Carolina State University


MACK'S
MIGRATORY BIRD HUNTING AND CONSERVATION STAMP
$25

# STAFF PROFILES

## Drew Berdo
### Program Technician

Drew Berdo is a Program Technician in The Osborne Lab. A freshly minted Arkansan by way of Texas, he recently completed his Masters in Wildlife Ecology at Texas State University where he examined the potential impact of wind turbines on abundance and richness of grassland birds for his thesis. He brings to the table experience in avian field surveys, geographic information systems and statistical analysis. Prior to his master's, he spent three summers conducting backcountry avian point-count surveys across the State of Montana and has gained recent waterfowl experience as an intern with the Texas Parks and Wildlife Department along the State's Gulf Coast. He originally hails from the Washington, DC suburbs of Northern Virginia and received his BS in Geographic Science from James Madison University in Virginia's beautiful Shenandoah Valley. He is excited to learn about the ecological processes present in Arkansas and immerse himself in the state's varied geography. He likes music, birds, hiking, riding bikes, paddling and exploring public lands.

## Katie Schroyer
### Project Leader

Katie Schroyer grew up in California, where she regularly went waterfowl hunting in the Sacramento Valley with her father. She obtained her BSc in Wildlife Biology from the University of Montana, Missoula. She then worked as a seasonal Biological Technician at Bear Lake National Wildlife Refuge with the U.S. Fish and Wildlife Service in southeast Idaho for 3 years. During the winter of 2022, she was a banding technician for The Osborne Lab and stayed on after the field season for graduate school. Katie earned her MSc in Forest Resources with emphases in Wildlife Ecology and Management and in Geospatial Sciences from UAM in December 2024. Her project explored remote monitoring options of wetland vegetation communities while also looking at waterbird response to a drawdown at Big Lake National Wildlife Refuge. She was then hired as a Biological Technician at Cache River National Wildlife Refuge where she helped coordinate waterfowl banding efforts, waterfowl habitat management activities, invasive species removal, and analyze wintering mallard movements. Katie once again joined The Osborne Lab as a Program Technician to assist in the ongoing waterfowl research projects and lead the winter banding and field research program. Katie's expertise is in waterfowl ecology, adaptive habitat management, and geospatial sciences.

PROJECT

# ABSTRACTS

The dedication and innovation demonstrated by our students and faculty make the UAM Waterfowl Program truly one of a kind. Their research not only advances the scientific understanding of waterfowl ecology but also plays a meaningful role in conservation efforts across the region and beyond. The following project abstracts offer a glimpse into the impactful work being done—and how these students are contributing significantly to the future of waterfowl and their habitats.

# THE JOURNEY BACK NORTH:
## IDENTIFYING AREAS OF IMPORTANCE ON THE SPRING MIGRATION FOR HEN MALLARDS IN THE MIDCONTINENT POPULATION

***Pasquale Palumbo, BS Hobart & William Smith Colleges***

*Graduate research assistant, working under the supervision of Dr. Douglas Osborne (UAM), Dr. Ryan Askren (Five Oaks Ag Research & Education Center), Dr. Bradley Cohen (TN Tech), and Dr. Heath Hagy (USFWS)*

States in the southern portion of the Mississippi Flyway such as Arkansas and Missouri hold key wintering grounds for the midcontinent mallard population. After hunting season, these birds begin their spring migration where they make their way to the breeding grounds. This important life-history event receives less attention than its counterpart, the fall migration. Spring migration connects the wintering grounds to the breeding grounds. Cross-seasonal and carry-over effects ecologically connect these distinct parts of the mallard's life history. An event on the wintering grounds or during spring migration can affect subsequent reproduction, resulting in those cross-seasonal effects. This is why habitat is important not only on the wintering grounds but also during spring migration. Hens must maintain body condition for energetically demanding migratory flights, but also to reproduce upon arrival to the breeding grounds. In this study, we aim to identify key stop-over areas for hen mallards of the Midcontinent population during the spring migration. This objective is being achieved using ~266 GPSM backpack transmitters deployed on hen mallards in Arkansas and Missouri in conjunction with various remotely sensed environmental covariates spanning from the southern Mississippi Flyway to its most northern reaches. Covariates include publicly available data such as landcover, monthly inundation, latitude, protected areas, and various metrics calculated using these sources. Environmental covariates inform species distribution models utilizing known occurrence locations from the transmitters to determine which environmental covariates best explain hen mallard presence on the spring migration. Those covariates are then used to predict across the whole range of midcontinent population where we would expect hen mallards to occur during the spring migration. These results will help us better understand what hen mallards are doing in preparation for breeding. By understanding what areas they utilize on the spring migration, we can inform landowners and public agencies how to better support hen mallards as they prepare for the most important event of the year: recruiting new mallards for the subsequent fall flight.

*Figure 1: Pasquale Palumbo and Dr. Osborne in Missouri.*

# Quantify the Effects of Structural Characteristics of Forest on Mallard Selection in The Lower Mississippi Alluvial Valley

***MacKenzie Wirick, BS University of Florida***

*Graduate research assistant, working under the supervision of Dr. Douglas Osborne (UAM), Dr. Ryan Askren (Five Oaks Ag Research & Education Center), and Dr. Hamdi Zurqani (UAM)*

The Lower Mississippi Alluvial Valley (LMAV) supports a large proportion of the wintering population of midcontinent mallards (Anas platyrhynchos). Historically, expansive tracts of bottomland hardwood forest across the LMAV provided quality escape cover and foraging habitat for mallards, containing a diversity of nutrition and structure to support mallard during the wintering months. Due to agricultural expansion, altered hydrology, and poor water management these forested wetlands have been degraded, and much of the remaining forest have experienced decline in individual tree vigor and shifts in species composition to more water tolerant species. To guide management of these forests for ecological function and wildlife habitat, resource professionals developed a prescription to maximize the benefits of forested wetlands for wildlife termed desired forest conditions for wildlife. Desired forest conditions for wildlife offer a set of guidelines for management to maintain ecologically healthy forests. To assess how mallards utilize the remaining forests in this region, we deployed 247 GPS transmitters on mallards between November 2019 and December 2024 to track movements across the LMAV during the wintering period. Airborne flown LiDAR data was used to estimate canopy height, stem density, and canopy openness within the Bayou Meto and White River Basins to understand mallard selection of structural characteristics within forested areas. Using integrated step selection functions in a use-available framework, we assessed fine-scale habitat selection by mallards within the forest. These results will provide insights of mallard forest selection at a fine-scale for future management of bottomland hardwood forests and highlights the need for future research to evaluate fine scale patterns in mallard land cover selection.

*Figure 1: Emily Van Der Veer and MacKenzie Wirick finishing up a transmitter attachment procedure.*

# ABUNDANCE AND DIRECT HARVEST RATES OF MALLARDS WINTERING IN ARKANSAS:
## A POST-SEASON BANDING APPROACH

***Maddison Allen-DeVries, BS Michigan Technological University***

*Graduate research assistant, working under the supervision of Dr. Douglas Osborne (UAM), Dr. Ryan Askren (Five Oaks Ag Research & Education Center), Dr. Aaron Pierce (Ducks Unlimited), and Dr. Donnell White (UAM)*

Bird banding has a rich history rooted in the scientific pursuit of understanding migratory bird behavior and population abundance. Banding generally occurs at two distinct times of the year, with pre- and post-season banding programs serving complementary purposes in monitoring waterfowl populations. While pre-season (summer) banding has traditionally guided harvest regulations, post-season (winter) banding offers underutilized opportunities to assess harvest and population trends following the hunting season. This study evaluated winter banding data to examine demographic trends of mallards (Anas platyrhynchos) wintering in Arkansas, using federal band-recovery data from 1960 to 2024. We estimated age- and sex-specific direct harvest rates (i.e., harvested in the first hunting season after banding) and population abundance using Lincoln's estimator. A total of 55,567 mallards were banded in Arkansas between 1960 and 2023, of which a cumulative 2,447 were directly harvested during the subsequent legal hunting season. Adult male direct harvest rates were nearly twice as high as all other age-sex cohorts, indicating a strong adult male bias in harvest. Overall, direct harvest rates for winter-banded mallards in Arkansas declined at an average annual rate of 0.11% (± 0.029%; SE). Significant declines in the direct harvest rate were detected for adult males (0.11% ± 0.030%) and females (0.12% ± 0.030%), though juvenile cohorts showed no clear trends, likely due to limited sample sizes. Sex and year together explained only 26.62% of the variation in harvest rates, suggesting that additional ecological and regulatory factors are likely also influencing trends. Wintering mallard population estimates declined by >50% from 2016 to 2022. This coincides with long-term declines in direct harvest rates, which may reflect changes in harvest regulations, hunter behavior, and environmental conditions affecting overwintering distribution and survival. These findings demonstrate the value of winter banding for further understanding population trends across the annual mallard cycle. However, because Arkansas-banded birds represent only a portion of the midcontinent population, expanded post-season banding efforts across the Mississippi Flyway are essential to improve population monitoring and regulatory decision-making.

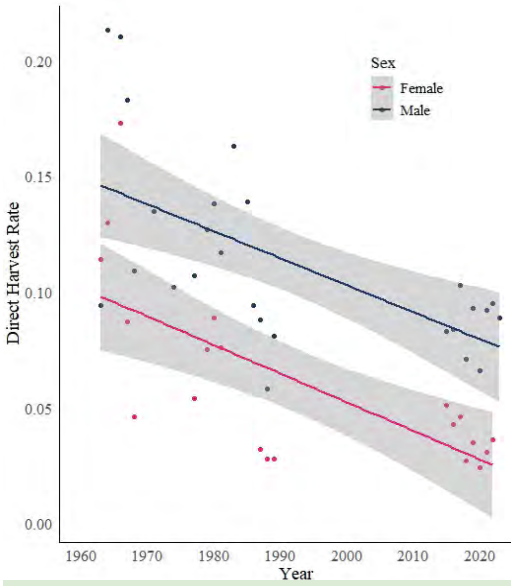


*Figure 1: Direct harvest rates of mallards show long-term decline.*

*Figure 2: Maddison releasing newly banded mallard.*

# CO-BENEFITS OF CLIMATE-SMART REFORESTATION ON MIDCONTINENT WINTERING MALLARDS

***Alyssa Tomb, BS Shippensburg University of Pennsylvania***

*Graduate research assistant, working under the supervision of Dr. Douglas Osborne (UAM), Dr. Ryan Askren (Five Oaks Ag Research & Education Center), and Dr. Donnell White (UAM)*

The bottomland hardwood forests provide critical habitats for wildlife and multiple climate benefits within the Lower Mississippi Alluvial Valley (LMAV) but are now threatened by human-caused degradation and deforestation. They also provide important habitats for wintering mallards (Anas platyrhynchos), offering food and shelter after their fall migration. The purpose of this component of research is to demonstrate the ecological co-benefits of bottomland hardwood reforestation to wintering mallards. We will use solar-powered GPS/GMS transmitters to evaluate mallard use of bottomland hardwood forests relative to other available habitats and predict the future distribution of wintering mallards if priority bottomland hardwood forests are restored. Starting in October 2024, we will deploy 70 transmitters per year on mallards, of which 35 will be in the Red River Valley and 35 will be in the Lower Mississippi Alluvial Valley regions. This technology will allow tracking of individual fine-scale movements of mallards. We will quantify and compare the characteristics of mallard habitat selection using publicly available landcover raster datasets, such as the 2021 National Land Cover Dataset, the 2019-2023 Cropscape datasets, and the 2021 National Tree Canopy Cover Dataset, in areas used and areas not used by transmitter-marked mallards to determine factors influencing habitat selection decisions. To predict the impact of future bottomland hardwood forest restoration on wintering mallards, a maximum entropy approach will be used, which will simulate the species distribution if priority areas are restored. These priority areas will be based on the Lower Mississippi Valley Joint Venture's Forest Breeding Bird Decision Support Model. This research will quantify the biological impacts of the investment in reforestation to guide conservation planners, practitioners, and policymakers.

*Figure 1: Maddison Allen-DeVries and Alyssa Tomb transmitting a hen mallard after-hours.*

# MAPPING WETLAND VEGETATION FOR SECRETIVE MARSH BIRD HABITAT CONSERVATION USING GEOAI AND REMOTE SENSING

***Obioma Ogwo (Obi), BS University of Ibadan, Nigeria***

*Graduate research assistant, working under the supervision of Dr. Hamdi Zurqani (UAM), Dr. Douglas Osborne (UAM), and Dr. Ryan Askren (Five Oaks Ag Research & Education Center)*

Wetlands are among the most productive ecosystems on Earth, offering critical refuge and food for countless species, including some of the most elusive, secretive marsh birds, such as the king rail. These birds are notoriously difficult to detect and monitor due to their cryptic behavior, low vocal activity, and the dense vegetation they inhabit. This makes it especially challenging to understand their population status or manage the habitats they rely on. To address this knowledge gap, our research leveraged high-resolution National Agriculture Imagery Program (NAIP) data and advanced Geospatial Artificial Intelligence (GeoAI) techniques to classify and map vegetation across five important wetland habitats in Arkansas, Oklahoma, and Missouri. This study plays a critical role in identifying vegetation structures and wetland types that provide suitable environments for king rails and other marsh-dependent species. We conducted a detailed analysis comparing three prominent deep learning models: U-Net, PSPNet, and DeepLabV3. The results revealed that DeepLabV3 consistently delivered the highest classification accuracy, especially in handling diverse wetland structures and rotated imagery. The study highlighted how emergent marsh vegetation, rich in grasses, sedges, and aquatic plants, forms the backbone of a suitable habitat for secretive marsh birds. Accurate classification of these areas is essential for guiding conservation priorities, evaluating habitat quality, and informing land managers about which regions offer the most ecological value. As threats such as land use change and climate variability continue to challenge wetland ecosystems, tools such as remote sensing and machine learning offer powerful, scalable solutions to monitor and protect these critical habitats.

*Figure 1: Fieldwork at Choctaw Island Wildlife Management Area (WMA), where our research team Dr. Hamdi Zurqani, Dr. Douglas Osborne, Dr. Ryan Askren, and graduate student Obioma Ogwo collaborated with the Arkansas Game and Fish Commission to study wetland vegetation and habitat conditions (Oct 10, 2024).*

# DIET ANALYSIS OF WINTERING MALLARDS IN THE LOWER MISSISSIPPI ALLUVIAL VALLEY USING METABARCODING

***Dr. Ryan Askren, PhD University of Illinois***

*Director (Five Oaks Ag Research and Education Center), in collaboration with Dr. Douglas Osborne (UAM)*

Diet is a fundamental aspect of a species ecology and prerequisite for effective habitat management. Contemporary methods of studying waterfowl diets require their collection during active feeding and are limited by location of collection, costly processing of esophageal contents, and differences in digestive rates of softer food items. To improve our knowledge of foraging ecology and quantify changes throughout the wintering period, we used metabarcoding to examine diets of 120 hunter harvested mallard (Anas platyrhynchos) from the Bayou Meto Basin in Arkansas between November 2021 – January 2022. We referenced DNA amplified from fecal samples against known genetic samples of plant and animal matter, to quantify occurrence and number of DNA reads, correlated to amount of biomass, of diet items of wintering mallards. Our results indicate that waterfowl consumed a diversity of vegetation and invertebrate genera, with smartweeds (Polygnum), oaks (Quercus), panicums (Panicum), and millets (Echinochloa) being the most frequently consumed and greatest quantity of DNA reads. We did not find any differences in invertebrate consumption throughout the winter period, contrary to previous studies suggesting a decrease during cold periods. Metabarcoding methodology is a rapid and effective method to quantify duck diets and is more robust to biases of collection location and timing. This method can provide key insights into patterns in diet that will aid in energetic resources planning at local and regional scales.

*Figure 2: Acorns*

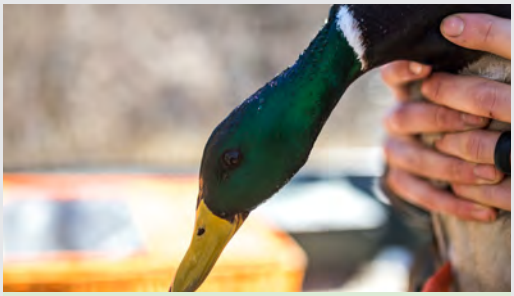

*Figure 3: Maddison releasing newly banded mallard.*

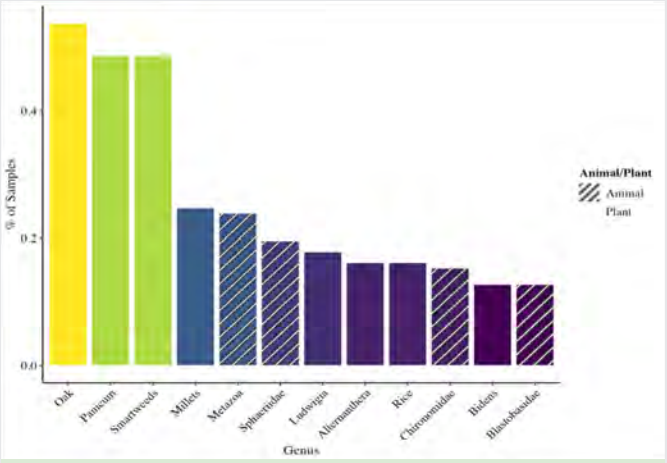


*Figure 1: Metabarcoding occurrence*

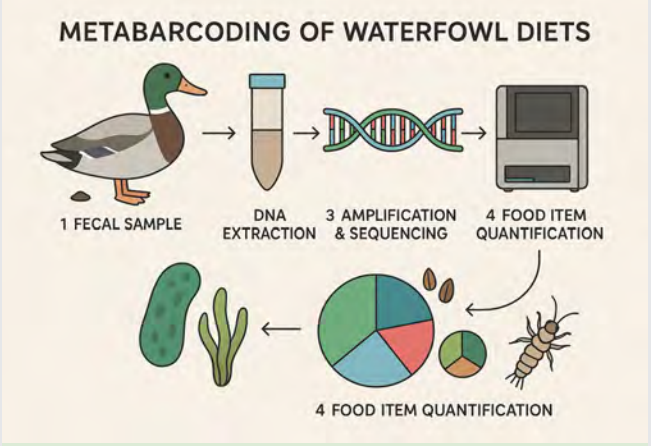


*Figure 4: Metabarcoding of waterfowl diets*

# OCCUPANCY AND ASSOCIATION OF SECRETIVE MARSH BIRDS IN THE ARKANSAS DELTA THROUGH AUTONOMOUS RECORDING UNITS (ARUS)

***Drew Berdo, MS Texas State University***

*Program Technician, working in collaboration with Dr. Douglas Osborne (UAM) and Dr. Anne Mini (Lower Mississippi Valley Joint Venture)*

Marsh birds are associated with shallow, emergent wetlands and are often secretive in their habits, meaning they are rarely seen and call infrequently. Freshwater emergent wetlands have declined drastically in the Arkansas Delta from their historic levels, reducing the amount of available habitat for secretive marsh birds. The king rail in particular has been affected by these losses, and the American Bird Conservancy estimates its population to have dropped 86% in the past 50 years. Their paramount research needs are to determine their current distribution and abundance, according to the Arkansas Wildlife Action Plan. This project aims to provide foundational data on occurrence, species associations and habitat of secretive marsh birds in the Arkansas Delta, with an emphasis on King Rails. Due to the cryptic nature of King Rails and other secretive marsh birds, as well as the logistical challenges posed to human-observers for 'on-the-ground' surveys, the use of Autonomous Recording Units (ARUs) were employed. ARUs capture the sounds of the surrounding landscape at set intervals, and output spectrograms which visually display the frequency and volume of the dominant sounds in a recording. The audio was analyzed by scientists at Cornell University, and the bird species in each recording were identified and provided with a certainty score. Funding is administered by The Lower Mississippi Valley Joint Venture. The primary goals of this project are to 1) determine secretive marsh bird species composition, and 2) assess environmental factors influencing occupancy of secretive marsh birds. Twenty-one ARUs were deployed across three field locations in Arkansas County- Arkansas Post National Memorial (National Park Service) and two private land holdings. ARUs recorded from 30 minutes before to two hours after sunrise and 2 hours before to 30 minutes after sunset during both the 2020 Spring and Fall migrations. Using multispecies-multiseason occupancy models, occurrence of six secretive marsh bird species (King Rail, Virginia Rail, Least Bittern, Purple Gallinule, Common Gallinule, and Sora) will be analyzed in relation to multiple local habitat characteristics as well as species co-occurrence with King Rails. ARUs are powerful pieces of equipment for monitoring wildlife populations and are available to the public for purchase. Private landowners and land managers can utilize them to monitor a variety of local species to inform management decisions and reduce the need for scouting during hunting seasons. They should be considered by anybody wishing to improve their wildlife management regime.

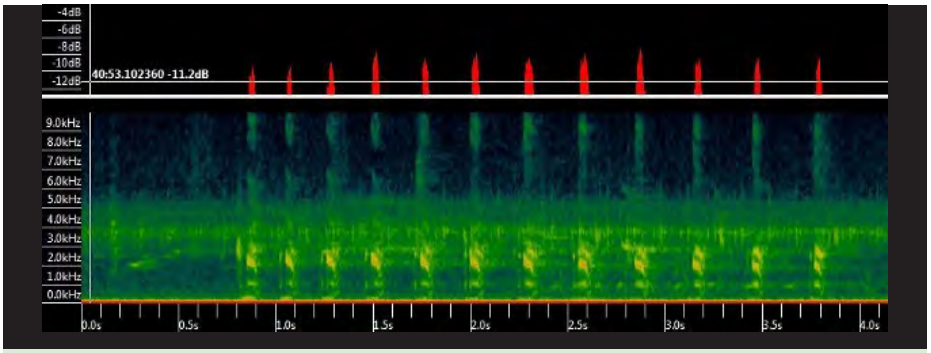


*Figure 1: Frequency graph from a king rail call recorded at Arkansas Post National Memorial using Wildlife Acoustics ARUs.*

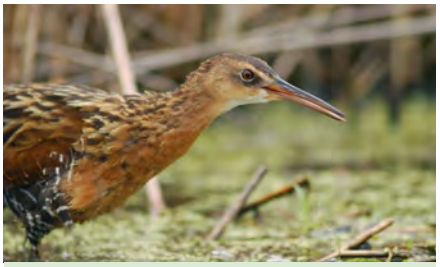

*Figure 2: Audubon - King Rail*

# TRANSMITTER ATTACHMENT INFLUENCES MIGRATORY BEHAVIOR OF SPRING MIGRATING MALLARDS

***Dr. Douglas Osborne, PhD Southern Illinois University Carbondale***

*Professor (UAM), in collaboration with Dr. Ryan Askren (Five Oaks Ag Research and Education Center)*

Modern transmitter technology has allowed for collection of animal movement behavior at scales not previously possible. While this technology has been widely used to answer important, applied ecological questions, potential effects of transmitters on bird movement and behaviour have often been ignored. Backpack and implant transmitters represent differences in trade-offs between potential negative influences and usability of attachment methods. To examine effects of transmitter attachment, we fitted mallards (Anas platyrhynchos) with backpack transmitters, using two harness attachment methods and abdominally implanted transmitters to quantify transmitter effects during spring migration. We aimed to compare migratory movements and survival of female mallards among transmitter types to inform the utility of and inform standardization of methodologies used to understand avian movement. We deployed 204 GPS transmitters (n = 72 backpack with single-loop harness, n = 72 backpack with double-loop harness, and n = 60 implants) across six sites in Arkansas and Missouri during February 2022 and 2023. We modeled daily movement distance, migratory step length, and latitude of female mallards by attachment type during spring migration. Overall, mean step length was greater for implants ($\bar{x}$ = 2,277 m; SE = 1,514 m), relative to single loop ($\bar{x}$ =1,393 m; SE = 1,091 m), and double loop backpacks (x = 1,216 m; SE = 747 m). Likewise, implants were located at higher latitudes ($\bar{x}_{April}$ = 45.2 ± 2.8) during migration on average compared to single-loop ($\bar{x}_{April}$ = 42.9 ± 3.4) and double-loop ($\bar{x}_{April}$ = 43.0 ± 3.6) harness backpacks. A clear understanding of the effects of different transmitter attachment methods on free-ranging mallards is necessary to ensure information gleaned from these data are representative of the populations from which we wish to draw conclusions.

*Figure 1: Female mallard under anesthesia during surgery to insert an abdominal implanted GPS tracking device.*

*Figure 2: Female mallard under anesthesia during surgery to insert an abdominal implanted GPS tracking device.*

# DRAWN BACK TO SAFETY: RECURSIVE MOVEMENTS BY WINTERING MALLARDS TO WATERFOWL SANCTUARIES ON THE CENTRAL ARKANSAS NATIONAL WILDLIFE REFUGE COMPLEX

***Katherina A. Schroyer, M.S., University of Arkansas at Monticello***

*Program Technician, working in collaboration with Dr. Douglas Osborne (UAM)*

National Wildlife Refuges (NWR's) in the Lower Mississippi Alluvial Valley are designated as critical wintering areas for migratory waterfowl. As waterfowl populations exhibit declines in abundance, it is essential to ensure closed-access spatial sanctuaries are achieving their desired outcome while simultaneously providing quality waterfowl hunting experiences. Thus, understanding waterfowl behavioral responses and movements in and among sanctuaries on refuge lands is warranted. We explored how the current placement of closed-access spatial sanctuary and associated habitat type use in proximity to other habitat types and sanctuaries (state/ private) influences functional connectivity of wintering mallards in the Central AR Complex during Nov-Feb 2023-2025. We deployed 113 global positioning system (GPS) backpack transmitters on mallards on closed-access spatial sanctuaries at Bald Knob (n=33), Cache River (n=55), and Holla Bend (n=25) NWRs during Nov-Dec 2023 and 2024. We recorded hourly GPS fixes to quantify revisitation patterns of sanctuary areas and other land cover types using a recursion analysis. We used a generalized linear mixed-effect model to predict sanctuary use based on age, sex, day of season, and year of deployment. Individual deployments were included as a random effect since individual movements are not independent. The binary model showed that female mallards (0.03, 95% CI [0.01, 0.12], p <0.01) were significantly predicted to use sanctuary earlier day of season (day 20, 0.47, 95% CI [0.18, 0.77], p<0.01) more than males. The model explained a substantial proportion of the variance of sanctuary use, with a conditional R squared of 0.87. Research on waterfowl sanctuary recursions and fine-scale habitat associations could provide information on the juxtaposition of addition sanctuary that may benefit both waterfowl and waterfowl hunters.

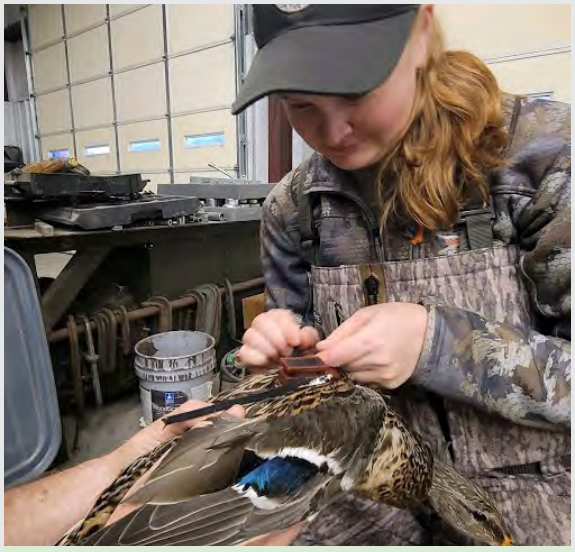

*Figure 1: Katie Schroyer fixing a transmitter to a female mallard.*

*Figure 2: Alyssa Tomb and Emily Van Der Veer supervising the trapping efforts as ducks are removed.*

# REMOTE MONITORING OF VEGETATION COMMUNITIES AND WATERFOWL RESPONSES TO A DRAWDOWN ON BIG LAKE NATIONAL WILDLIFE REFUGE

***Katherina A. Schroyer, MS, University of Arkansas at Monticello***

*Graduate research assistant, working under the supervision of Dr. Douglas Osborne (UAM), Dr. Hamdi Zurqani (UAM), and Dr. Ryan Askren (Five Oaks Ag Research & Education Center)*

Semi-permanent, passively managed emergent wetlands in the southeast tend to be dominated by nuisance and invasive vegetation that provide limited nutritional value to migrating and wintering waterfowl. For instance, Big Lake National Wildlife Refuge (NWR) is a wetland complex in northeast Arkansas that has open water areas currently dominated by American Lotus (Nelumbo lutea). Since Big Lake NWR has been passively managed the past 10 years, the refuge is not meeting its founding objective, including vegetation management for wintering waterfowl. Therefore, we aimed to evaluate the response of waterfowl and waterbirds, vegetation communities, and soil compaction to a drawdown at Big Lake NWR during 2022–2024. We created monthly land cover classification models for 6 land cover types using 3x3 meter resolution PlanetScope imagery to monitor vegetation community and waterfowl energy day response to the drawdown in June of 2022. We conducted aerial surveys recording wintering waterfowl and waterbird observations during November – February and constructed migration curves using eBird data. The overall accuracy of the land classification model outputs varied from 80% to 90% for each month. Depending on the month and year, each model was statistically substantial with kappa coefficients that ranged 0.647–0.847.

Classification accuracy did not seem to improve from the initial model to those trained with multiple years of data. Furthermore, classification accuracy of models trained on one site was poor when applied to other sites (Mathews Brake NWR; 3.5%–81.3%) despite occurrence in the same geographic region and having similar vegetation community composition, suggesting site specific training is necessary. While the one-time drawdown did not effectively achieve the management objective of decreasing nuisance American lotus, the secondary goal to increase non-persistent (moist-soil) vegetation was achieved. This increase in non-persistent emergent plants improved the available waterfowl energy days by 54% (2,666,288 to 5,376,107 WEDs) at Big Lake. However, since Big Lake NWR did not conduct a drawdown the following year, American lotus remained, and continues to remain, a problem. Collectively, these monitoring tools will help wetland managers in other areas with similar vegetation communities better understand the effects of passive versus active management practices across the southeast on meeting wintering habitat objectives for waterfowl and waterbirds.

*Figure 1: Katie Schroyer with USFWS staff conducting vegetation surveys at Big Lake NWR.*

*Figure 2: Katie Schroyer conducting waterfowl and waterbird surveys over Big Lake NWR.*


CURRENT

# COURSES

The University of Arkansas College of Forestry, Agriculture, and Natural Resources offers a range of degree options from 1-year specialized work force development certificates in waterfowl and forestry, to a master's degree in Forest Resources with emphasis areas in waterfowl, forestry, and geospatial sciences.

Dr. Douglas Osborne currently offers the following courses at the University of Arkansas at Monticello:

| | |
|---|---|
| Wetland Ecology & Management | Fall, annually |
| Waterfowl Ecology & Management | Spring, annually |
| Science Writing | Spring, when requested |


Our outdoor classrooms with a purpose:

***Tell students twice they will forget, show students once they will learn.***

FIVE OAKS

# GRADUATE CERTIFICATE PROGRAM

The graduate certificate in Waterfowl Habitat and Recreation Management is a 2-semester, 18 credit hour program accompanied by a $20,000 scholarship. The curriculum involves two core field-based courses and one elective each semester. Applications are solicited in January, an in-person interview weekend occurs in March, program acceptance is recognized in April, and students arrive on campus in August.

Students spend a substantial amount of time on the Five Oaks property learning and applying the tools and skills they learned in the classroom. Students are exposed to many resource professionals from natural resource agencies and organizations through annual FOAgREC field day events and travel to local and regional meetings and conferences. The Five Oaks property in Humphrey, Arkansas

is the program's field station and learning lab. Students have access to a dormitory/lab/workspace on the property, and equipment to support their educational and research activities.

**To obtain regular admission to the Graduate Certificate in Waterfowl & Recreation Management, applicants must:**

- Have a baccalaureate degree from an accredited institution
- Have a grade point average (GPA) of 2.70 or higher (on a 4.00 scale) on all coursework, or a GPA of 3.00 or better on the last 60 hours of coursework taken before the receipt of a baccalaureate degree from an accredited institution of higher education
- Be accepted for graduate study by the UA at Monticello College of Forestry, Agriculture and Natural Resources Dean, Graduate Coordinator, and faculty director of the certificate program
- Must be passionate about waterfowl and wetland management, self-motivated, and hard-working

Additional information about the program can be found at https://www.uamont.edu/academics/CFANR/waterfowlhabitat.html.

***"Five Oaks values our waterfowl and wetland resources and understands the most effective way to conserve both is through science-based management. Our aim is to understand all aspects of the ecology of these wetlands; everything from the soils and forest to our focus, mallards and other dabbling ducks. We hope the work and training we are doing here will improve wetlands for waterfowl nationwide."***

- Dr. Ryan Askren

PROGRAM

# OUTREACH

The purpose of this program's outreach is to foster meaningful connections among students, wildlife and resource professionals, land managers, scientists, and biologists across the nation and around the world. By building these relationships, we aim to inspire greater care, understanding, and passion for the environment.

## Wonders of Waterfowl

The third annual Arkansas 4-H Wonders of Waterfowl Workshop was coordinated by the University of Arkansas Division of Agriculture and UAM on February 1, 2025, at the Cache River National Wildlife Refuge. For the third year running the program reached full registration capacity of 50 students of the ages 9-19. The event offered hands-on learning about waterfowl and wetland habitat conservation. Students rotated through four educational stations that were taught by undergraduate and graduate students, research staff, and local 4-H extension agents. The stations consist of

waterfowl species identification, waterfowl habitat and diet, hazards of migration, duck banding and transmitter deployment, and migration patterns using GPS backpack transmitter technology. Students observed the waterfowl banding and transmitter deployment process. Students were taught about career options and daily activities of a wildlife biologist. The Wonders of Waterfowl Workshop has been a foundational event for our program where students acquire a newfound passion for waterfowl and wetland conservation and management. The Workshop ended on a high note with students holding and releasing the banded ducks back into the wild.

**For more information about the program and registration for future events, visit: https://www.uamont.edu/academics/CFANR/osbornet.html**

***Scan the code to view a short clip of the event.***

*Figure 1: 4H Wonders of Waterfowl participant releasing a wood duck after banding.*

*Figure 2: Tiffany Osborne, Wonders of Waterfowl Coordinator and UAM wildlife instructor.*

***"The more connected these students are to waterfowl and the wetland habitats, the better stewards of the earth they will become."***

- Tiffany Osborne

*Figure 2: The program participants receiving parting gifts and closing statements from the Coordinator*

STUDENT

# PROFESSIONAL DEVELOPMENT

Travel to professional conferences and meetings serves as an important opportunity for students share their research with their peers and the broader scientific community. These conferences also provide an important networking opportunity.

Over the past year our Lab attended and presented papers at The Arkansas Chapter of the Wildlife Society at Mt. Magazine State Park in March. Dr. Douglas Osborne and Dr. Peter Ungar from the University of Arkansas co-hosted the Conserve the Natural State Forum at the Rockefeller Institute in September. Most recently, we presented 3 oral presentations and 2 posters at the Southern Association of Fish and Wildlife Agencies Conference in Biloxi, Mississippi.

Throughout the year students attended various training events including rocket net, boat, and hunter education along with the Delta Waterfowl Prairie Potholes Summer Field course.

**Allen-DeVries, M.K.**, and **D.C. Osborne**. Abundance and direct harvest rate of mallards wintering Arkansas: A post-season banding approach. Southeast Association of Fish & Wildlife Agencies 79th Annual Conference, Biloxi, Mississippi, 26-29 October 2025.

**Tomb, A.J.**, and **D.C. Osborne**. Winter habitat selection and bottomland hardwood forest use by midcontinent mallards in Arkansas. Southeast Association of Fish & Wildlife Agencies 79th Annual Conference, Biloxi, Mississippi, 26-29 October 2025.

**Schroyer, K.A.**, E. Stinson, R.J. Askren, and **D.C. Osborne**. Wintering mallard habitat use of waterfowl sanctuaries on and around the Central Arkansas National Wildlife Refuge Complex. Southeast Association of Fish & Wildlife Agencies 79th Annual Conference, Biloxi, Mississippi, 26-29 October 2025.

**Palumbo, P.**, C. Watt, R.J. Askren, H.M. Hagy, and **D.C. Osborne**. Key stopover locations during spring migration of female mallards wintering in the southern Mississippi Flyway. Southeast Association of Fish & Wildlife Agencies 79th Annual Conference, Biloxi, Mississippi, 26-29 October 2025.

Berdo, D., **G. Hargrove**, A. Mini, and **D.C. Osborne**. Estimating occupancy and habitat associations of King Rails through autonomous recording units in the Arkansas Delta. Southeast Association of Fish & Wildlife Agencies 79th Annual Conference, Biloxi, Mississippi, 26-29 October 2025.

**Allen-DeVries, M.K.** and **D.C. Osborne**. Survival and population dynamics of mallards wintering Arkansas: A two-season banding approach. Conserving the Natural State, Morrilton, Arkansas at the Winthrop Rockefeller Institute 6-8 September 2024.

**Hood, B., E. Van Der Veer, T. Wick**, R.J. Askren, and **D.C. Osborne**. Five Oaks Ag Research & Education Center: A Graduate Certificate Program and Training Program for Early-Career Waterfowl Habitat and Wetland Management Professionals. Conserving the Natural State, Morrilton, Arkansas at the Winthrop Rockefeller Institute 6-8 September 2024.

**Tomb, A.**, and **D.C. Osborne**. Implications of Climate-Smart forestry on mallard distribution in the MAV. Conserving the Natural State, Morrilton, Arkansas at the Winthrop Rockefeller Institute 6-8 September 2024.

**Wirick, M.**, R.J. Askren, H. Zurqani, and **D.C. Osborne**. Mallard-Bottomland Hardwood Relationship in the Bayou Meto Basin, Arkansas. Conserving the Natural State, Morrilton, Arkansas at the Winthrop Rockefeller Institute 6-8 September 2024.

**Herman, S., C. Nadeau, B. Bartles**, R.J. Askren, and **D.C. Osborne**. Diet analysis of wintering mallards in the Lower Mississippi Alluvial Valley using metabarcoding. Arkansas Chapter of The Wildlife Society, Mt. Magazine State Park, Arkansas 14-15 March 2024.

**Palumbo, P.**, R.J. Askren, and **D.C. Osborne**. Spring migration habitat selection of hen mallards wintering in the Mississippi Flyway. Arkansas Chapter of The Wildlife Society, Mt. Magazine State Park, Arkansas 14-15 March 2024. Poster

Hug, C., P. Saud, R.J. Askren, and **D.C. Osborne**. Quantifying individual tree health of red oaks (Quercus spp.) within greentree reservoirs and implications for mallard (Anas platrhynchos) use. Arkansas Chapter of The Wildlife Society, Mt. Magazine State Park, Arkansas 14-15 March 2024. Oral presentation.

**Schroyer, K. A.**, J. Chapman, C. Ham, K. Holman, E. Huddleston, S. Mills, T. Whited, **P. Palumbo**, and **D.C. Osborne**. Evidence of changing demographics and distributional patterns from post-season winter mallard banding. Arkansas Chapter of The Wildlife Society, Mt. Magazine State Park, Arkansas 14-15 March 2024. Oral presentation.

2024-2025

# PEER-REVIEWED PUBLICATIONS

**Obioma, O.C.**, H. Zurqani, **D.C. Osborne**, A. Mini, and R.J. Askren. 2025. The roles of spectral and spatial features in enhancing wetland classification using deep learning. IEEE Conference on Technologies for Sustainability (Sustech) 20-23 April 2025. https://doi.org/10.1109/SusTech63138.2025.11025639.

Yanez, M.A, P. Garrido, J. Blanco, J. Garjardo, **D.C. Osborne**, and T.L. Osborne. 2025. Effects of burn severity on the diversity and abundance of birds 3-years postfire in a coastal forest of Nothofagus glauca (Phil.) Krasser in central Chile. Journal of Nature Conservation 86: https://doi.org/10.1016/j.jnc.2025.126965.

**Hug, C.**, P. Saud, K. McKnight, R.J. Askren, and **D.C. Osborne**. 2025. Comparing tree stress rank and tree condition to determine red oak (Quercus spp.) health in Greentree Reservoirs in the lower Mississippi Alluvial Valley. Journal of Forestry Research 36, 33. https://doi.org/10.1007/s11676-025-01826-x.

Bakner, N.W., N.M. Masto, P. Lavretsky, C.J. Highway, A.C. Keever, A.G. Blake-Bradshaw, R.J. Askren, H.M. Hagy, J.C. Feddersen, **D.C. Osborne**, and B.S. Cohen. 2025. Mallard hybridization with domesticated lineages alters spring migration behavior and timing. Accepted on 26 November 2024 in Ecology and Evolution 15 e70706 https://doi.org/10.1002/ece3.70706.

**Osborne, D.C.**, R.J. Askren, **S.D. Phelps**, T.L. Osborne, J.R. Henson, and C.N. Nicholai. 2024. Variation in diurnal and nocturnal movement distances revealed in dabbling ducks wintering in the Mississippi Alluvial Valley. Wildlife Biology http://doi.org/10.1002/wlb3.01309.

Masto, N., A.G. Blake-Bradshaw, C. J. Highway, A. C. Keever, J. C. Feddersen, P.T. Link, H.M. Hagy, **D.C. Osborne**, and B. Cohen. 2024. Mallard pre-breeding migration strategies necessitate individual time-energy trade-offs despite wintering origins or migratory destinations. Ornithology ukae044, https://doi.org/10.1093/ornithology/ukae044.

Blake-Bradshaw, A.G., N.M. Masto, C. J. Highway, A. C. Keever, P.T. Link, J. C. Feddersen, H.M. Hagy, **D.C. Osborne**, and B. Cohen. 2024. Caught out in the cold: Impact of an extreme climatic event on survival of a generalist waterfowl species. Ornithological Applications 126: 1–9 http://doi.org/10.1093/ornithapp/duae025.

Beach, C.R., C.N. Jacques, J.D. Lancaster, **D.C. Osborne**, A.P. Yetter, R.A. Cole, H.M. Hagy, and A.M.V. Fournier. 2024. Lessons learned from using wild-caught and captive-reared lesser scaup (Aythya affinis) in captive experiments. Translational Animal Science 8, txae076. https://doi.org/10.1093/tas/txae076.

**Adedapo, S.M.**, H.A. Zurqani, R.L. Ficklin, and **D.C. Osborne**. 2024. Applications of machine learning techniques in predicting selected soil properties in Lower Mississippi Alluvial Valley Green Tree Reservoirs. Proceedings of the IEEE Mediterranean and Middle-East Geoscience and Remote Sensing Symposium. Oran, Algeria 15-17 April 2024. https://doi.org/10.1109/M2GARSS57310.2024.10537504.

**Dittmer, E.M.**, R.J. Askren, H.M. Hagy, A.J. Hitchcock, and **D.C. Osborne**. 2024. All sanctuaries are not created equal: variation in selection of public land sanctuaries by wintering mallards. Journal of Wildlife Management https://doi.org/10.1002/jwmg.22535.

## CONSERVATION & RESEARCH PARTNERS


HONORS

# AND AWARDS

***HONORS AND AWARDS – OSBORNE***

2025 Outstanding Graduate Faculty Award
UAM College of Forestry, Agriculture and Natural Resources

2024 Conservation Educator Award
Arkansas Wildlife Federation, Dec 2024

2024 Outstanding Leader in Waterfowl Science
Arkansas Money & Politics, June 2024

***HONORS AND AWARDS – CURRENT STUDENTS***

2025 Emily Van Der Veer, Outstanding Graduate Certificate Student
UAM College of Forestry, Agriculture and Natural Resources

2025 Alyssa Tomb, Global Climate Change Fellowship,
SE Climate Adaptation Science Center

2024 Mackenzie Wirick, Dr. Robert Burch Waterfowl Endowment Recipient

# SNOWDEN WATERFOWL CENTER OF EXCELLENCE TAKES FLIGHT

**The University of Arkansas at Monticello is proud to announce the establishment of the Snowden Waterfowl Center of Excellence, a landmark initiative dedicated to the research, education, and conservation of waterfowl and their habitats.**

Our vision is for the Center to become the world's premier institution for waterfowl studies—combining rigorous science, hands-on education, and impactful conservation. Together, the endowed Snowden Waterfowl Center of Excellence and the Dyke-Snowden Chair now form one of the largest academic programs of their kind in the United States.

This achievement is made possible by visionary investors who recognize the critical role that science at UAM can play in protecting our natural heritage. Their support reflects a shared commitment to conservation and a belief in the power of education to make a lasting impact. A list of these generous contributors is included in this report.

The combined endowments will significantly reduce educational costs for students, support cutting-edge research, and allow UAM to leverage matching funds from competitive research grants. With this level of investment, the designation as a "Center" signals to faculty and students across the globe that UAM is a permanent, leading force in the effort to address the complex challenges facing waterfowl and their ecosystems.

Leading the charge is Dr. Douglas Osborne, Director of the Osborne Waterfowl Lab, whose vision for an elite waterfowl program began over a decade ago. Under his leadership, our faculty and students will continue working to solve pressing issues in waterfowl conservation—through science, collaboration, and innovation.

Strategically located on the western edge of the Mississippi Delta—a region synonymous with world-class waterfowling—the Center is uniquely positioned to serve as a global hub for research and learning. It's only fitting that Arkansas, long regarded as a haven for waterfowl, is now home to one of the world's foremost academic programs in the field.

*David Snowden*

***A Personal Note***

**Waterfowling is deeply woven into the fabric of my family's history. Our commitment to conservation has been expressed not only through active participation in conservation organizations but also through the stewardship of our own land. Supporting the academic mission of educating tomorrow's decision-makers brings our family's involvement in conservation full circle. We are honored to lend our name to this Center and proud to play a role in shaping the future of waterfowl conservation.**

**- David Snowden**

# JOIN OUR MISSION

## MISSION

The Snowden Waterfowl Center of Excellence will support waterfowl, their habitats, and the people who manage them by cultivating waterfowl excellence through workforce development, research, outreach, and guidance on management and policy.

## VISION

Through the strength of public-private partnership and philanthropic support, The Snowden Waterfowl Center of Excellence will be among the world leaders in waterfowl research, education, training, and outreach.

MAKE A GIFT

## YOUR GIFT SUPPORTS

- Cutting-edge scientific research
- Increased data processing power
- Student mentorship and training
- Science-based policy guidance
- Waterfowl management and outreach

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