



2024

ANNUAL REPORT

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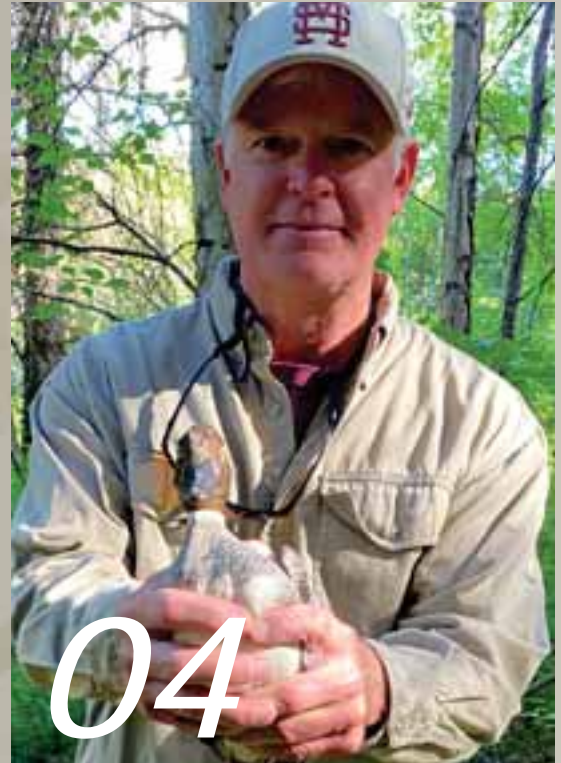
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from the DIRECTOR

I am proud to share an update on the 2024 activities of the Mississippi State University James C. Kennedy Endowed chair in Waterfowl and Wetlands Conservation. It was another exciting and productive period filled with meaningful collaboration among students, colleagues, and the broader waterfowl and wetlands community. Our work spans North America and involves a wide range of partners, including federal and state agencies, non-governmental organizations, private landowners, and supporters. It truly takes all of us, working together, to sustain waterfowl populations and wetland habitat.

In 2024, our program supported 10 graduate student research projects, including many that were supported by external federal or state awards. In addition, our team mentored two undergraduate students on research projects in Wildlife, Fisheries & Aquaculture and in Mechanical Engineering. We were also proud to award nine College of Forest Resource scholarships to deserving students in 2024.

Our team also continued collaborating on large-scale efforts, such as the long-running box-nesting wood duck study. This project operated for four successful years across eight eastern and southeastern states—from Delaware to Mississippi and Louisiana. We launched a study on Wetland Reserve Easement lands in Mississippi, in partnership with faculty and students from South Dakota, Missouri, Arkansas, Texas, and Louisiana. We're grateful to the USDA Natural Resources Conservation Service and Dr. Mike



Greetings from DR. J. BRIAN DAVIS

Eggleton of the University of Arkansas at Pine Bluff for originating and supporting this effort.

Another highlight was our work in the Boreal Forest of central Alaska (Fairbanks), where we participated in a long-term study on box-nesting Common Goldeneyes along the Chena River. This study, initiated in 1997, is led by the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and other partners.

We are also conducting exciting new research in South and North Carolina, exploring waterfowl diets and winter foraging habitat along the Atlantic Flyway. Additional studies include work on shorebird populations in restored and non-restored wetlands in Mississippi, and a unique project on the interaction between native bees, red imported fire ants, and wetland habitats. These efforts reflect both novel research directions and the need for up-to-date information on migration patterns, species abundance, and habitat use. It was a busy and successful year for presentations: my students and I delivered thirty-two oral and seven poster presentations at professional meetings. A major highlight was

the North American Duck Symposium (Ducks9) held in Portland, Oregon, in February. In terms of outreach and scholarship, we produced eight peer-reviewed publications, five podcasts, and numerous reports highlighting our work.

Our students received several honors in 2024, featured in the "Accolades" section of this report. Beyond academia, we provided technical assistance to private landowners or others in multiple states, advising on habitat management, wood duck nest boxes, and wetlands conservation.



Students and Alumni of the Kennedy Program

I'm especially proud of our Bulldog Chapter of Ducks Unlimited, whose members continue to dedicate time and energy to organizing events each fall and spring. We're also turning more attention toward emerging issues—such as Mallard genetics, non-breeding Mallard habitat selection in Mississippi, migrations into the Mississippi Alluvial Valley, and the potential effects of wind energy development on waterfowl.

This year, we also made great strides in outreach and visibility, especially through social media. Huge thanks to Angel Parrish,

graphic designer in Wildlife, Fisheries and Aquaculture, for helping put our work on the digital map.

As always, we extend our deepest thanks to Mr. Jim Kennedy and all our program's supporters—state, federal, and non-governmental partners—who make our work possible. We're especially grateful to Mr. Rance Moring, manager at Mr. Kennedy's York Woods property in the Mississippi Delta, and his outstanding team. Their support with field logistics, housing, vehicle maintenance, and tours of York Woods has been invaluable.

On a personal note ... I was honored to receive a 15-year service award from Dr. Keith Coble, Vice President of the Division of Agriculture, Forestry & Veterinary Medicine, in May 2024. It's hard to believe it's been 15 years—time truly flies when you're doing what you love.

With gratitude,

J. BRIAN DAVIS

James C. Kennedy Professor
of Waterfowl and
Wetlands Conservation



new and transitioning TEAM MEMBERS



JAMES CALLICUTT

Extension Instructor, Wildlife, Fisheries and Aquaculture

James Callicutt is a native Mississippian and Extension Instructor in the Department of Wildlife, Fisheries, and Aquaculture at Mississippi State University, serving as the Waterfowl and Upland Gamebird Extension Specialist. He holds both a B.S. and M.S. in Wildlife Biology and Management from MSU and brings over 16 years of experience in the research, conservation, and management of waterfowl, other gamebirds, and the wetland and upland habitats they rely on.

Before joining MSU Extension faculty, Callicutt worked as a State Waterfowl Biologist and Private Lands Biologist for the Mississippi Department of Wildlife, Fisheries, and Parks, as well as a Private Lands Biologist for Ducks Unlimited. His deep-rooted passion for bird hunting—especially waterfowl—shaped his career path in gamebird conservation and management.

As the leader of the MSU Extension Gamebird Program, Callicutt translates research into practical management strategies, providing landowners, land managers, producers, and hunters with science-based guidance to enhance gamebird habitat and overall wildlife conservation. His outreach extends across Mississippi and beyond, fostering collaboration among diverse stakeholders.

Outside of work, Callicutt enjoys gardening, hiking, and hunting with his partner, Heidi, and their Gordon Setter, Eleanor.

Contact James at 662.325.2478 or james.callicutt@msstate.edu.



LOGAN TOMLINSON

Extension Associate I, Wildlife, Fisheries and Aquaculture

Logan Tomlinson is an Extension Associate I in the College of Forest Resources, Department of Wildlife, Fisheries, and Aquaculture at Mississippi State University. She holds a B.S. in Conservation Biology from MSU.

As an undergraduate, Tomlinson was involved in a variety of research projects focused on waterfowl ecology, including studies on abundance, web tagging, banding, habitat management, and duckling survival. She also contributed to a wetland monitoring project, where she gained hands-on experience in water quality analysis, soil conservation, species monitoring, and sampling macroinvertebrates, fish, and amphibians.

Tomlinson is currently active in the MSU Gamebird Program, which delivers science-based information to support the conservation and management of gamebird species across Mississippi.



Outside of her professional role, Tomlinson is passionate about volunteering with equine therapeutic riding programs, where she assists children with disabilities. She also enjoys spending time with her own horses, riding and competing. A lifelong nature enthusiast, Tomlinson loves being outdoors and is always planning her next national park adventure.

welcome new members to the **JAMES C. KENNEDY ENDOWED** waterfowl and wetlands conservation program!



DR. AQIL TARIQ

Postdoctoral Associate, Department of Wildlife, Fisheries and Aquaculture

Aqil Tariq's academic and research background is grounded in geospatial intelligence, climatology, geographic information science and technology (GIST), hydrology, and human-environment interactions. He holds a Ph.D. in Photogrammetry and Remote Sensing from Wuhan University, China, where he conducted research at the State Key Laboratory of Information Engineering in Surveying, Mapping, and Remote Sensing (LIESMARS). Tariq's dissertation focused on precision agriculture, natural hazards, Geo-AI, and remote sensing. He continued this work during a postdoctoral fellowship at Wuhan University, expanding into geophysics and geo-environmental studies.

Tariq's current research integrates advanced remote sensing techniques with machine learning algorithms to assess the effects of climate change on hydrological and wetland systems. One of his ongoing projects involves linking water and landscape dynamics to duck abundances in the Mississippi Alluvial Valley. In other work, Tariq focuses on precision agriculture and hydrology, using multi-source remote sensing data—including synthetic aperture radar (SAR) and LiDAR—to develop predictive models under different climate scenarios. These models are influential for understanding how agricultural practices influence water resource management, especially in drought-prone regions.

In 2024, Tariq was recognized among the top 2% of scientists worldwide, according to the Elsevier-Stanford global rankings. Over the course of his research career, Tariq has collaborated with scientists from over 25 countries, working to advance geospatial tools in hydrology, natural resource management, precision agriculture, and natural hazard assessment. These international partnerships continue to drive innovative, impactful solutions for today's pressing environmental challenges.

MSU'S DR. AQIL TARIQ
ranked as
TOP 2% SCIENTISTS
by Stanford University and Elsevier

Tariq, Aqil
Mississippi State University, USA

Year 2024 Rank: 63064

Sub Field: Geological & Geomatics Engineering
Rank in the SubField: 768

Main Field: Engineering
H-index: 10, i10-index: 6/56

Top 2% Listed Year(s): 2024

<https://topresearcherlist.com/>

MISSISSIPPI STATE UNIVERSITY -
DEPARTMENT OF WILDLIFE,
FISHERIES AND AQUACULTURE

CHAIR



ANGEL PARRISH

Graphic Designer, Wildlife, Fisheries and Aquaculture

Angel Parrish is the graphic designer and chair of the Communications Committee for the Department of Wildlife, Fisheries and Aquaculture at Mississippi State University. A proud MSU alumna, she holds a Bachelor of Fine Arts in Graphic Design from Mississippi State.

Parrish leads the department's outreach and communications efforts, creating visual content and strategic messaging that highlights the people, research, and mission of the department. She collaborates with faculty, staff, and students to support marketing, recruitment, public relations, and grant initiatives. From designing recruitment materials to producing visuals for research proposals, Parrish plays a key role in telling the department's story and promoting its work to train the next generation of conservation leaders.

Her creativity and dedication have significantly elevated the department's visibility and impact across multiple platforms.

Outside of work, Parrish enjoys time with her two children—cheering on her son at soccer games and supporting her daughter, who is currently in nursing school. She is active in her church's youth ministry, loves the outdoors, and treasures Sunday family gatherings.



new graduate STUDENTS



KARA HALL

Kara Hall is a master's student at Mississippi State University and a native of Rocky River, Ohio. Hall earned her B.S. in wildlife conservation from Virginia Tech in 2019.

Hall is currently working alongside fellow graduate student, Avery Wissmueller, on the development of an ecological monitoring framework for Wetland Reserve Easements (WRE) in Mississippi and Louisiana. Her research focuses on monitoring the abundance and diversity of water birds, songbirds, and aquatic macroin-

vertebrates across 38 study sites.

Before joining MSU, Hall gained valuable field experience as a seasonal biotechnician across the United States. She contributed to research on a wide range of species, including black brant, mallards, trumpeter swans, grey fantails, and sagebrush songbirds.



AVERY WISSMUELLER

Avery Wissmueller is a master's student at Mississippi State University and a native of Detroit, Michigan. Wissmueller earned her B.S. in Natural Resources Management from Grand Valley State University in 2021.

Wissmueller is working alongside fellow graduate student Kara Hall on the WRE monitoring project in Mississippi and Louisiana. Her focus is on evaluating water quality and phytoplankton presence at 38 study sites. She collects and analyzes more than 400 water samples, measuring in-field water

quality indicators and conducting lab-based nutrient and algae analyses.

Prior to joining MSU, Wissmueller worked as a GIS Intern with Ducks Unlimited, where she contributed to updating the National Wetlands Inventory for Michigan and West Virginia.



HALEY HUGHES

Haley Hughes is a master's student at Mississippi State University and a native of Hattiesburg, Mississippi. An alumna of MSU, she earned her B.S. degree in the Department of Wildlife, Fisheries and Aquaculture in 2018.

Hughes' research focuses on how native bee communities respond to seasonal wetland management practices designed to promote early-succession wetland plants and other food sources for migrating and wintering waterfowl. She is also examining the impact of red imported

fire ants on native, ground-nesting bee communities.

Before returning to MSU for graduate school, Hughes gained diverse field experience across the eastern United States, working with species such as white-tailed deer, red-cockaded woodpeckers, gopher tortoises, dusky gopher frogs, and black pine snakes. She has a strong interest in wildlife habitat management and the use of prescribed fire as a conservation tool.



DUNCAN FRASER

Duncan Fraser is a master's student at Mississippi State University and a native of Rolesville, North Carolina. Fraser's research focuses on how shorebirds and other migratory waterbirds respond to wetland restoration efforts across national wildlife refuges and wildlife management areas in the Mississippi Delta.

Before coming to MSU, Fraser earned his degree from North Carolina State University and gained extensive field experience on various avian monitoring projects. His past work includes conducting nest sur-

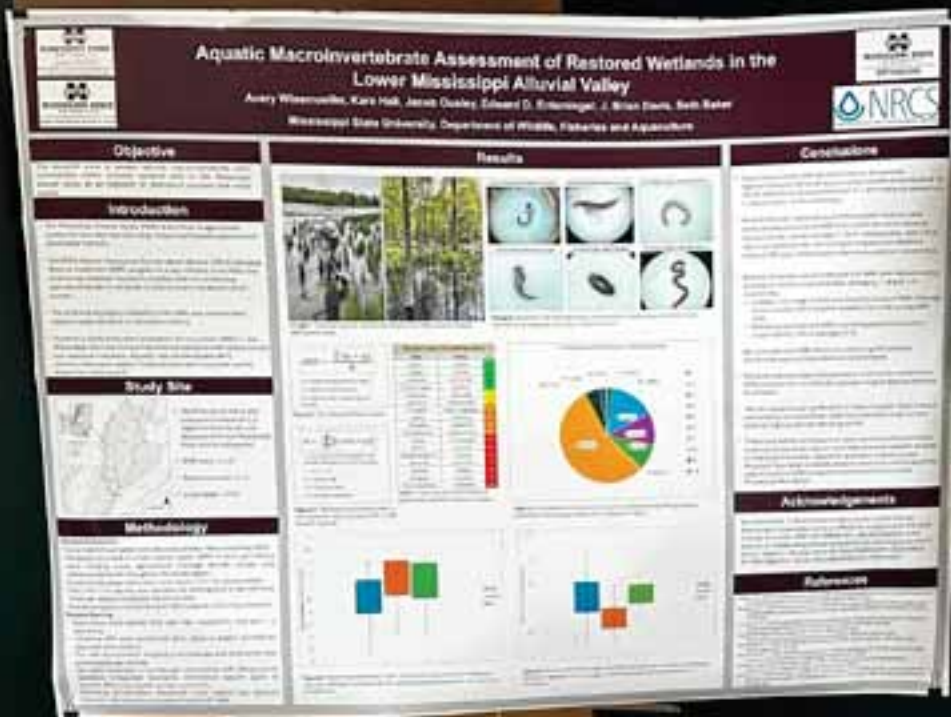
veys of Roseate Spoonbill and Reddish Egret with the Audubon Society in the Florida Keys, and performing avian point count surveys in Fort Bragg, North Carolina, and southern Indiana. Most recently, he served as the Coastal Plain crew lead for the North Carolina Bird Atlas with the North Carolina Wildlife Resources Commission.

Widely regarded as an exceptional birder, Fraser brings valuable expertise that will contribute important, up-to-date knowledge on shorebird migrations and habitat use in Mississippi.

PROJECTS AND STUDENT ABSTRACTS

My students and I had an exceptionally busy year of conference presentations in 2024. As part of their professional development, I encouraged many graduate and undergraduate students to present on topics outside their own research areas. While some were initially hesitant, every one of them rose to the challenge and delivered outstanding presentations. I couldn't be prouder of their effort and growth.

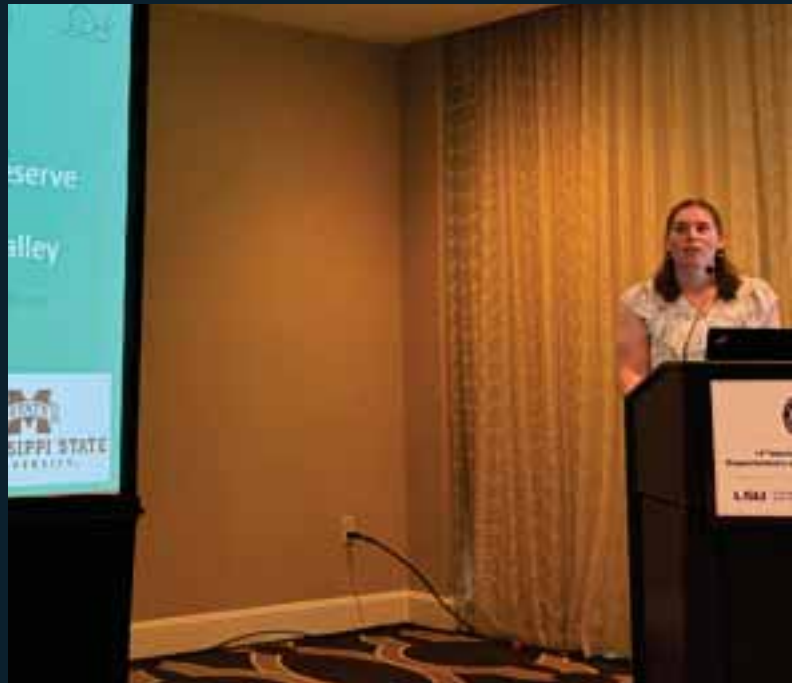
Below are a selection of abstracts from these presentations, along with logos from many of the conferences we attended.



AFO-SCO-WOS
2024 Joint Meeting

July 29 - August 1, 2024 | Peoria, Illinois



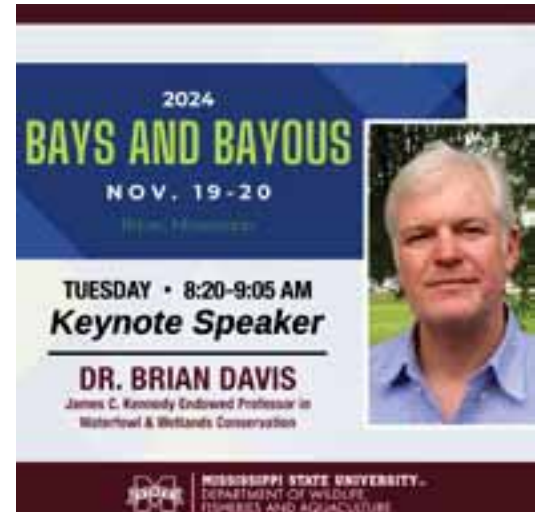


INVITED PLENARY PRESENTATION

Waterfowl Conservation: Bridging Science, Habitat, and Humans

Davis, J. B.

Waterfowl and wetlands conservation imparts more than a century-long impact on natural resources in North America. The conservation transformation mostly stemmed from overharvest and habitat loss in the late 1800s-early 1900s, along with other deleterious impacts including the Dust Bowl and the Wall Street Crash of 1929. Important legislation such as the Lacey Act (1900), Migratory Bird Treaty Act (1918) Pittman-Robertson (1937) and many other initiatives helped stem the tide of declining waterfowl populations. Research on waterfowl populations, diseases, habitats and birds' resource needs have helped lead research, education, and conservation in the greater wildlife field since the early 1900s. Approximately 55 waterfowl species exist in North America and rely on essentially every Biome continentally. Thus, waterfowl conservation was instrumental in spawning many other avian initiatives and joint ventures that also are critical. Waterfowl hunters and other conservationists continue to invest significantly in waterfowl and wetlands in North America, which also contributes to biodiversity. However, avian scientists and conservationists from all walks will be instrumental as we continue to battle prairie, coastal, and other habitat losses, climate effects, human population growth or redistribution (e.g., coastal environments), and other uncertain challenges. It will take all of us to continue championing habitat conservation that works on behalf of waterfowl and many other avian guilds across North America.



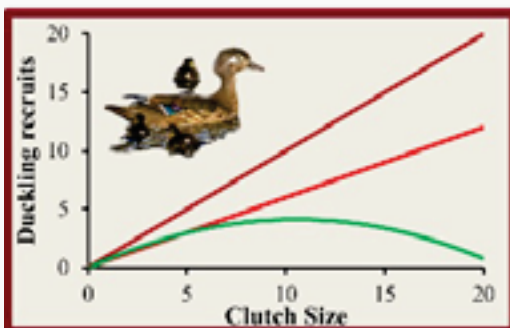
INVITED KEYNOTE, 2024 BAYS & BAYOUS SYMPOSIUM, BILOXI, MISSISSIPPI, NOVEMBER 19, 2024

OTHER CONFERENCE PRESENTATIONS

Clutch and brood size optima in wood ducks?

Davis, J. B., D. Bakner, R. M. Kaminski, J. Lancaster, and R. R. Cox, Jr.

Nesting and brood rearing are critical annual-cycle periods for Nearctic waterfowl. Nutrient and energetic investments in eggs were long regarded as principal drivers of clutch size in ducks, whereas less is known about the effect of brood size on recruitment. North American wood ducks (*Aix sponsa*) engage in parasitic egg laying, and supernormal clutches are common. These large clutches and resulting broods call into question whether an optimal brood size(s) exists at nest exodus. Previous evidence indicated that survival of wood duck ducklings was greater for broods of six compared to broods of 14. Despite apparent fitness benefits to female wood ducks tending smaller broods, we questioned whether net duckling recruits may be greater from larger than smaller broods. We monitored 429 radiomarked ducklings from 129 broods in Mississippi and Alabama. Brood sizes at nest exodus ranged from 3 to 20 and 3 to 21 ducklings, respectively in Mississippi and Alabama. Our index of duckling recruits was the number of 30-day old ducklings per radiomarked female in these two distinct populations of box-nesting wood ducks. At both study areas, duckling recruits increased with brood size from 3 to 12 ducklings, then an asymptote occurred at a brood size of about 12, resulting in a net loss of recruits. Our results correspond to what had been suggested as optimal brood sizes in a previous manipulative experiment of mallard (*Anas platyrhynchos*) clutch size and subsequent duckling survival and recruitment. Moreover, the optimal brood size from this study (~12 ducklings) aligns with the standard clutch size of captive female wood ducks where conspecific brood parasitism was absent. Based on our findings, excessive brood parasitism does not benefit wood duck duckling recruitment, which suggests that parasitism probably evolved as an evolutionary stable strategy primarily benefiting other aspects of reproduction.



Moreover, the optimal brood size from this study (~12 ducklings) aligns with the standard clutch size of captive female wood ducks where conspecific brood parasitism was absent. Based on our findings, excessive brood parasitism does not benefit wood duck duckling recruitment, which suggests that parasitism probably evolved as an evolutionary stable strategy primarily benefiting other aspects of reproduction.

ORAL PRESENTATION at the 2024 Joint Meeting of the Association of Field Ornithologists, Society of Canadian Ornithologists and Wilson Ornithological Society July 29 - August 2, 2024, Peoria, Illinois

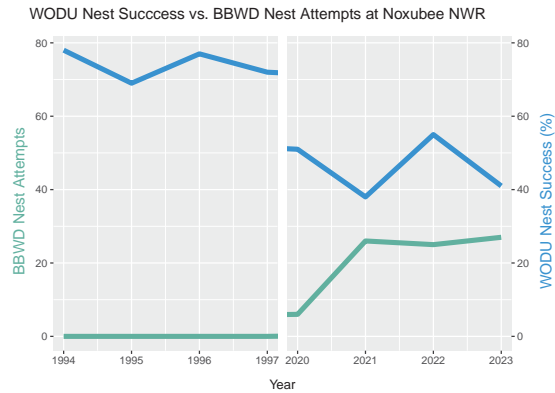
This project is investigating relations among some 'theoretical maximum' fledging rate (i.e., no mortality; maroon line), fledging rate if mortality factors affect all clutch sizes equally (red line), and fledging rate if per capita costs increase with clutch size (green line). Our forthcoming analysis seeks to find the tradeoffs in clutch size and duckling recruitment after broods depart the nest.

STUDENT ACCOMPLISHMENTS- SCIENTIFIC ABSTRACTS

Egg morphometrics and egg hatchability in box-nesting wood ducks

H. E. Mentges, J. B. Davis, P. Adhikari, S. A. Rush, and B. Bauer

The avian eggshell is among the most impressive and unique structures in the natural world. However, in wild birds, little is known about the relationship between egg morphometrics and hatchability. Chicken eggs are well studied because of their economic importance and the greatest hatchability occurs in medium-sized eggs compared to small and large eggs. In lesser snow geese (*Anser caerulescens*), goslings hatched from heavier eggs survived starvation longer than goslings hatched from lighter eggs. Given this intriguing but relatively understudied topic, we studied the egg dynamics of box-nesting wood ducks (*Aix sponsa*) in Mississippi. Understanding egg hatchability in this species may be especially important as wood ducks commonly share nest space with hooded mergansers (*Lophodytes cucullatus*) and black-bellied whistling ducks (*Dendrocygna autumnalis*). Moreover, ducklings produced from larger eggs often survive better than those emerging from smaller eggs.



To better understand egg breakage characteristics in wood duck eggs, we marked wood duck eggs uniquely with non-toxic markers and collected mass (g), length (mm), and width (mm) measurements from each along with other clutch metrics. We will analyze data from successful nests and treat eggs as either hatched or unhatched. We will then use variables of clutch size, egg mass, egg length, and egg width to examine how they ultimately affect the hatching probability of an individual egg.

ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

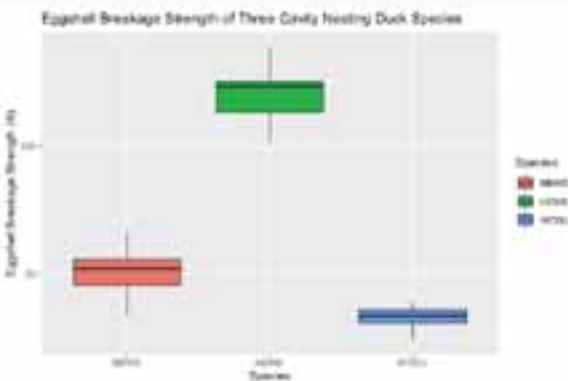
Wood duck (WODU) nest success before and since black-bellied whistling ducks (BBWD) arrived and began using nest boxes designed for wood ducks at the Sam D. Hamilton Noxubee National Wildlife Refuge. The left panel of the slide is from a publication by J.B. Davis, et al., (1999) when no BBWDs were present and that on the right from the thesis of Hunter Mentges, MSU, 2024.



Eggshell strength in three cavity-nesting ducks in Mississippi

H. E. Mentges, J. B. Davis, P. Adhikari, I. Poudel, and S. A. Rush

Wood ducks (*Aix sponsa*), hooded mergansers (*Lophodytes cucullatus*), and black-bellied whistling ducks (*Dendrocygna autumnalis*) are secondary cavity-nesting duck species with geographical overlap in the southeastern United States. Interspecific clutches are common, eggs accumulate in nests from parasitic laying, and strife between females may occur, all of which potentially subject eggs to breakage. Understanding the durability of eggs of these species is important for explaining variation in nest and egg hatching success. Based on egg dynamics in these species, we predicted that eggshell breaking strength (EBS: eggshells most resistant to breakage) of hooded merganser eggs would be the greatest among the three species. We collected a total of 67 fresh eggs of all three species from nest boxes at two sites in Mississippi in spring-summer 2021. We measured eggshell strength using an Instron Universal Testing Machine (Model 3345; Instron Inc., Norwood, MA) and eggshell thickness using a micrometer (Ames, IA). We measured EBS (Newtons) at the equators of all eggs. We used analysis of variance followed by a Tukey's pairwise comparison to test for differences in eggshell strength among species. Mean EBS differed among all species ($P < 0.001$) and was greatest in hooded merganser, followed by black-bellied whistling duck, and wood duck. The EBS was 120.05 (SD = 12.03, $n = 7$) for hooded merganser, 52.44 (SD = 10.04, $n = 30$) for black-bellied whistling duck, and 32.95 (SD = 3.90, $n = 30$) for wood duck. Our results are preliminary, but eggs of hooded merganser had the highest EBS, likely attributed to greater eggshell thickness among these species. Further analyses will explore if eggshell strength correlates inversely with egg breakage, investigate mineral composition of eggshells for the three species, and how eggshell strength and thickness vary with latitude, species, and biotic and abiotic conditions at nest sites.



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POSTER PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

The strength of hooded merganser (HOME) eggs may be 2-3 times greater than those for wood ducks (WODU) and black-bellied whistling ducks (BBWD).



Nest box selection by breeding common goldeneye (*Bucephala clangula*) in the Chena River System, interior Alaska

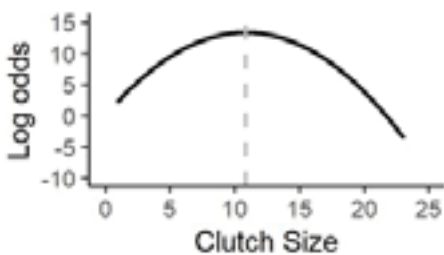
Riley D. Porter, J. B. Davis, M. R. Boudreau, G. Wang, and E. Taylor.

The Common Goldeneye (*Bucephala clangula*) is a cavity nesting sea duck that predominately breeds in boreal forest systems. Goldeneyes spend 7 to 8 months of their annual cycle in both freshwater and marine environments but subsequently return inland to freshwater habitats to breed. Artificial nest boxes are used to increase breeding populations of goldeneyes and other waterfowl in Europe and North America. In 1993, the University of Alaska student chapter of The Wildlife Society received funding from Ducks Unlimited to assess nesting ecology of common goldeneyes at the northern limit of their breeding range. Starting in 1997, 150 nest boxes were deployed in the 639 km² Chena River State Recreation Area, located approximately 48 km northeast of Fairbanks, Alaska. Although productivity, duckling survival, nest attendance, and other aspects of common goldeneye breeding ecology have been reported, no information exists on how environmental variables may potentially impact goldeneyes' choice of nest boxes. Because approximately

30% of the boxes have remained unoccupied since 2005, we assess how resource characteristics at various scales influence nest box selection by breeding goldeneyes. Here, we report on how distance to nearest occupied nest box, nest box visibility, and other factors potentially influence nesting site selection. Results of this study will increase our understanding of nest site selection at multiple scales to better evaluate boreal wetland habitats for this species in interior Alaska.

ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

In this 25-year study, we found that the largest clutch size with the greatest odds of hatching all ducklings was 10.9 eggs per clutch.



An alternative for evaluating the energetic landscape for mallards (*Anas platyrhynchos*) in the Mississippi Alluvial Valley, USA.

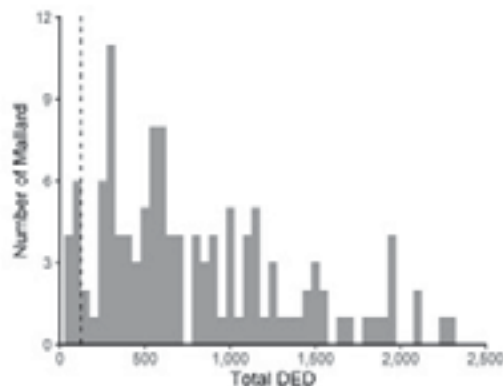
Fraser, D., M. R. Boudreau, J. D. Lancaster, D. Adjaye, J. Dentinger, L. Dolan, G. Ripa, C. R.-Reyes, C. Sklarczyk, B. Thornton, H. Todaro, R. M. Kaminski, and J. B. Davis

Habitat conservation planning for wintering waterfowl in North America aims to support energetic carrying capacity of regional populations using a landscape-population perspective. However, because spatial and temporal configuration of resources can influence individual animal space use, there may be benefits to considering the potential availability of energy from the individual's perspective in conservation planning. This possibility was evaluated for mallards (*Anas platyrhynchos*) wintering in the Mississippi Alluvial Valley using: (1) published energetic values for different landcover types (quantified as duck energy days; DEDs/ha), (2) maps of landcover and water availability, and (3) winter home range estimates created using location data from 128 radiomarked birds. Per current methods used in regional assessments, landcover types were first transformed into their corresponding DED values, and then the amount

of energy considered possibly accessible to mallards within their home ranges was restricted using water availability and DED decay rates. Relatively energy-rich landcover types, such as moist-soil wetlands and croplands, were less likely to be accessible given water coverage. Moreover, a large proportion of mallard locations were in areas that provided no apparent energetic value. Most (> 90%), but not all, home ranges surpassed minimum winter energetic needs (i.e., 123 DEDs). We suggest that waterfowl habitat conservation planning should consider our alternative individual bird, home-range approach for DED assessments of focal waterfowl species and use those assessments to begin examining potential gaps in landscape water coverage, provision of habitat complexes, and resource patch adjacency at the home range scale.

ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

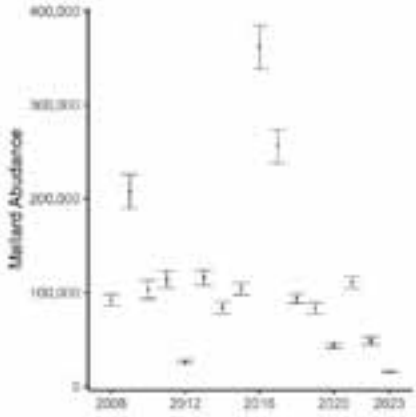
This study used 128 radiomarked female mallards to investigate whether the number of duck-energy-days (DED) were sufficient within a home range of each mallard in the Mississippi and Arkansas Deltas during winters 2010/11–2014/15. We estimated that an individual mallard needed the minimum number of DEDs for a 123-day wintering period. We found that 10 females (7.8% of all the radiomarked mallards) did not have the adequate food energy in their home ranges. More research is needed to understand this dynamic and potential consequences.



Long-term population trends of wintering waterfowl in the Mississippi Alluvial Valley

Hall, K., M. R. Boudreau, J. B. Davis, R. M. Kaminski, G. M. Street, H. Havens, L. Naylor, and B. Leach

Recently, literature has reported that mallard (*Anas platyrhynchos*) and other ducks are wintering farther northward in relation to increased winter temperatures, presumably from climate warming. The Mississippi Department of Wildlife, Fisheries, and Parks and Arkansas Game and Fish Commission have conducted line-transect, fixed-wing aerial surveys across their portion of the Mississippi



Alluvial Valley (MAV) for nearly 20 years, allowing us to estimate long-term population trends for a variety of wintering duck species, including mallards, gadwall (*Mareca strepera*), green-winged teal (*Anas crecca*), northern shoveler (*Spatula clypeata*), northern pintail (*Anas acuta*), and wood duck (*Aix sponsa*). We used data collected from aerial surveys, as well as from citizen science sources (e.g., Christmas Bird Counts), to examine long-term trends of these species in the Arkansas (2009-2021) and Mississippi (2002-2021) portions of the MAV. Christmas bird counts indicate that trends for each species were similar across states. While population numbers can vary widely from year to year, Arkansas and Mississippi have seen overall increases in gadwall, northern shoveler, and green-winged teal, with an average 5-6%, 2-3%, and 0-1% increase, respectively. In contrast, mallard, northern pintail, and wood duck abundances have remained relatively stable. Preliminary analyses of aerial transect data also follow these trends.

ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

This figure demonstrates the variation in mallard abundances across winters in the Mississippi Delta, 2008-2023.

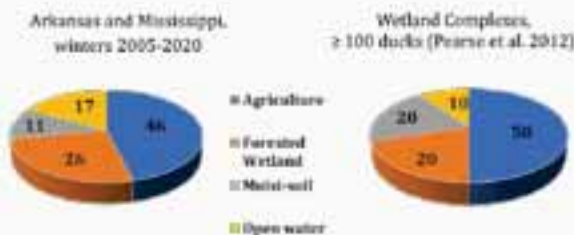


Occurrence and abundance of wintering ducks detected on aerial surveys in the Lower Mississippi Alluvial Valley

A. Wissmueller, J. B. Davis, M. R. Boudreau, J. T. Callicutt, R. M. Kaminski, G. M. Street, H. Havens, L. Naylor, and B. Leach

Mallards and other ducks require diverse resources to meet daily energy and other socio-biological needs to survive during winter. Previous work reported that a complex of landcover types—including 50% agriculture, 20% forested wetlands, 20% emergent herbaceous wetland, and 10% permanent water—attracted the greatest abundance of mallards (*Anas platyrhynchos*) in Mississippi’s Alluvial Valley (MAV). While this ‘habitat complex’ has been described for mallards, it is uncertain for other species. Herein, we used winter (November-January) detections of mallards and other species obtained from stratified random diurnal aerial surveys in the MAV and related occurrence and abundance of species to aforementioned landcover types along with a measure of landscape complexity and an index of water recurrence. We consistently detected six duck species during surveys, including mallards, gadwall (*Mareca strepera*), northern pintail (*Anas acuta*), green-winged teal (*A. crecca*), northern shoveler (*Spatula clypeata*), and wood duck (*Aix sponsa*). Complexes with a greater amount of agriculture increased mallard, green-winged teal, and pintail occurrences along with mallard, gadwall, and shoveler abundances. A greater coverage of emergent herbaceous wetlands also increased mallard and pintail occurrences and mallard abundance. Forested wetland prevalence was associated with an increase in mallards and wood duck occurrence. Across species, an increase in landscape complexity also increased occurrence or abundance, except for mallards, which had greater abundances in less diverse landscapes. Finally, complexes more prone to flooding were positively associated with all species occurrence and abundance. Despite different niches and habitat affinities, mallards, gadwall, pintail, and shoveler were in greatest abundances in a complex similar to what has been previously described. However, gadwall and wood ducks required complexes low in agricultural composition. As agricultural land use dominates the MAV

landscape, our results signal a continued need for assertive inclusion of natural wetland conservation within MAV habitat complexes.



ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

This information demonstrates the habitats used by mallards detected on annual winter aerial surveys in Mississippi and Arkansas. The figure on the left is our contemporary estimates compared to those of the Mississippi State University former study (Pearse, et al., 2012) conducted in the early 2000s.



Evaluating the diets of ducks using South Atlantic coastal wetlands

Clements, S. A., J. B. Davis, B. A. Bauer, H. M. Hagy, P. Lavretsky, D. J. Morin, and G. Wang

Diets of North American ducks are quite diverse and correctly identifying and including various prey items in analyses is fundamental to estimating energetic carrying capacity. Waterfowl food habits studies in the South Atlantic region were conducted extensively during the 1960s and 1970s, mostly reporting on food contents in gizzards of various species. Methodologies for collecting food habits data have substantially evolved to avoid potential biases in food habits estimation. The South Atlantic region remains important to numerous waterfowl species; thus, contemporary region-specific food habits data is needed to improve estimates of energetic carrying capacity. A powerful and advantageous technology is the use of DNA to determine diet composition from birds' feces, which does not require lethal collection of the target species by researchers. This technique is especially useful for the South Atlantic region where many public and private waterfowl hunting areas prioritize minimizing waterfowl disturbance, including traditional waterfowl collections that involve shooting actively foraging waterfowl. To acquire challenging but important data, we designed a study to: 1) compare duck diets revealed through morphological (i.e., traditional) and molecular (i.e., DNA) diet identification methodologies and 2) compare diets



among those duck species collected. We have completed two of three field seasons to date and have collected 702 feces samples from nine species of hunter-harvested ducks and harvested 85 actively foraging ducks. Preliminary results indicate that the collective diets of ducks foraging in managed tidal impoundments primarily consists of seeds (53%), especially those from submersed aquatic vegetation that are purposefully promoted by wetland managers. However, diets varied by species. For example, gadwall (*Mareca strepera*) consumed 56% vegetation and blue-winged teal (*Spatula discors*) diets were 62% invertebrates. Further analysis will be conducted as DNA sequencing continues.



ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

This graphic reveals types of foods consumed by blue-winged teal (BWTE), gadwall (GADW), and American green-winged teal (GWTE) in wetlands of the lowcountry of South Carolina, winters 2021-2023.

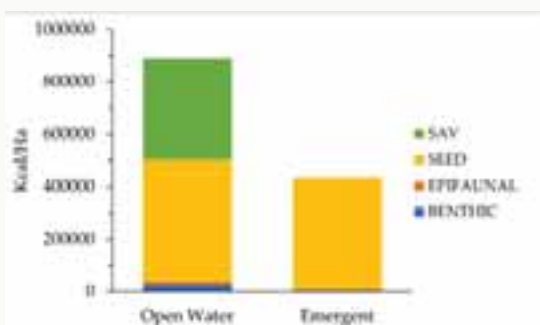
Estimating energetic density of winter foraging habitat in South Atlantic coastal wetlands

Clements, S. A., J. B. Davis, B. A. Bauer, H. M. Hagy, P. Lavretsky, D. J. Morin, and G. Wang

The South Atlantic region of the U.S. contains diverse wetlands including tidal managed and non-managed marshes, inland bottom-land swamps, and impounded agricultural crops. These systems are all used by migrating and wintering waterfowl, however hydrologically managed tidal impoundments (MTIs) along the coast are among the most important aquatic resources for waterfowl and other waterbirds in the Atlantic Flyway. Many of the MTIs in the region are managed for naturally occurring submersed aquatic vegetation (SAV) and associated seeds, tubers, and aquatic invertebrates. However, these systems face threats from sea-level rise and tropical storm severity and frequency. Concomitantly, region-specific estimates of waterfowl forage production in MTIs and other managed wetlands are lacking. Therefore, we devised a study to estimate forage biomass and subsequently, energetic density, of three managed wetland types in coastal North Carolina and South Carolina. During late-summer and early-fall of each field season, we sampled MTIs, moist-soil wetlands, and impounded corn fields using a multi-stage sampling design to obtain forage production estimates prior to the arrival of migratory ducks. In the MTIs, we collected SAV samples and soil cores to estimate the biomass of vegetation, seeds, and macroinvertebrates. For moist-soil and flooded corn impoundment sampling, we used field proven rapid assessment techniques. During the 2021 and 2022 field seasons,



we collected 366 SAV samples and 847 soil cores from 44 MTIs and conducted 45 and 39 moist-soil and corn assessments, respectively. Preliminary results indicate that the forage biomass production was 619, 254, and 4,092 kg/ha in SAV, moist-soil, and flooded corn wetlands, respectively. Although corn impoundments have a greater biomass, all the sampled wetland types function collectively to meet the nutritional requirements of waterfowl. Thus, understanding forage production in managed coastal wetlands will benefit mitigation efforts as the integrity of coastal wetlands is altered from sea-level rise, tropical storms, or other challenges.



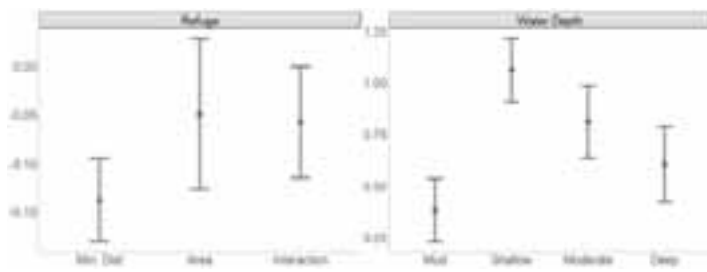
ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

This figure depicts the amount of food energy available in wetlands in the form of submersed aquatic vegetation (SAV), seeds, epifaunal (insects), and benthic (foods in the soils) in wetlands of the low country of South Carolina, winters 2021-2022.

Wetland bird use and management of Louisiana and Texas Gulf-Coast rice lands

Buderman, F., R. M. Kaminski, J. R. Marty, M. G. Brasher, S. A. Rush, and J. B. Davis

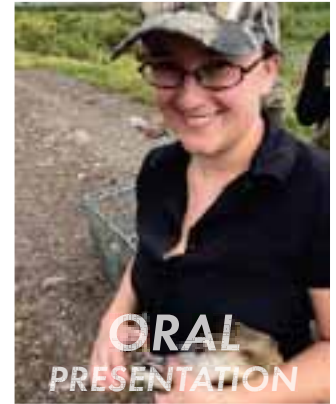
Agricultural lands are dominant features of landscapes across North America. Croplands, wetlands, and uplands juxtaposed within these landscapes form habitat complexes that influence abundance and distribution of waterfowl and other wetland birds. Within the Gulf of Mexico coast prairie, the Chenier Plain of Louisiana and the Texas Mid-Coast are agricultural lands that are used mainly for rice production. These rice lands also provide habitat for millions of resident and migratory waterbirds, as they are often comprised of interspersions of production and temporarily idled rice fields, other agricultural lands, natural wetlands, pastures, and may occur adjacent to forests and urban areas. To explore how agricultural activities and land use composition influenced the distribution and abundance of waterbirds we quantified factors associated with waterbird species richness by conducting diurnal surveys in production, seed, and idled rice fields from August–March 2010–2013. This period of fall–early spring spanned rice-harvest, fall-migration, wintering, and spring-migration periods for waterfowl and other birds. We conducted 5,002 wetland bird surveys in 142 fields and detected the following number of species by taxon: 20 waterfowl, nine shorebirds, 14 waders, three rails, and seven species of other birds. In modeling species richness, we found water depth (ordered from highest to lowest richness: shallowly flooded, moderately flooded, deeply flooded, and mud), vegetation density (negative relationship), and proportion of the field inundated (positive relationship) best explained variation in waterbird richness. In addition, there was a negative relationship between the richness of waterbird assemblages and distance to the closest protected wetlands (e.g., state or federal refuge). Future analyses will estimate abundances of waterbirds, all of which will be important for informing landscape waterbird conservation in this critical landscape.



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ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

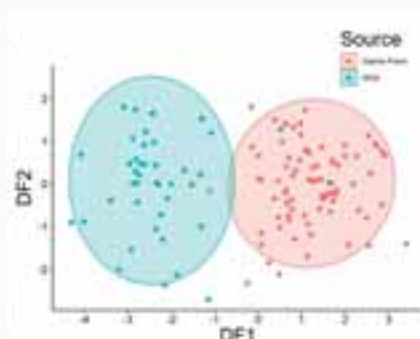
This figure illustrates the importance of shallow water (fields flooded 1-15 centimeters deep) in rice and crawfish fields of south Louisiana during 3 winter periods. The greatest number of waterbird species were detected in the water depth category (1-15 cm), and proximity to a refuge or sanctuary was also beneficial to some species.



Morphology and food intake rate of wild and game-farm mallards

Halligan, S., M. L. Schummer, P. Lavretsky, A. Fournier, J. B. Davis, and C. Downs

Large-scale releases of domesticated, game-farm mallards to supplement wild populations have resulted in wide-spread introgressive hybridization that changed the genetic constitution of wild populations in eastern North America. The resulting gene flow is well-documented between game-farm and wild mallards, but the mechanistic consequences from such interactions remain unknown in North America. We provide the first study to characterize and investigate potential differences in morphology between genetically known, wild and game-farm mallards in North America. Concurrently, we studied feeding rates of wild-caught and game-farm mallards in a captive study because it was previously determined that their bill morphology differed in ways that may affect foraging. We used nine morphological measurements to discriminate between wild and game-farm mallards at 96% accuracy. Compared to their wild counterparts, game-farm mallards had longer bodies and tarsi, shorter heads and wings, and shorter, wider, and taller bills. The nail on the end of the bill of game-farm mallards was longer, and game-farm mallard bills had a greater lamellae:bill length ratio than wild mallards. Moreover, wild-caught mallards ingested food at 52% greater rate than game-farm mallards. We provided the range of food sizes available to mallards in the wild and detected that game-farm mallards ingested food at about half the rate of wild mallards. We posit that 1) game-farm mallards

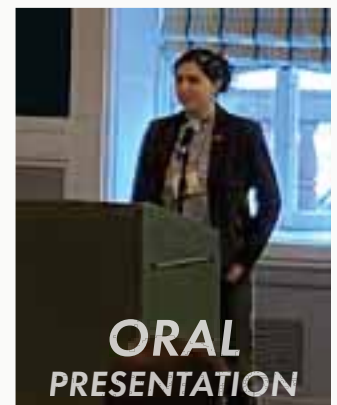


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have diverged from their wild ancestral traits of flying and filter feeding towards becoming optimized to run and peck for food; 2) game-farm morphological traits optimized over the last 400 years in domestic environments are likely to be maladaptive in the wild; and 3) the introgression of such traits into wild populations is likely to reduce fitness. Understanding effects of game-farm mallard introgression requires analysis of various game-farm × wild hybrid generations to determine how domestically-derived traits persist or diminish with each generation.

ORAL PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

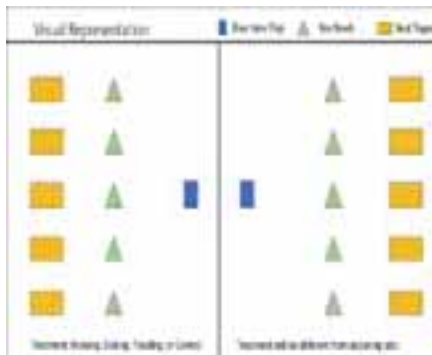
This plot demonstrates the distinctness in nine morphological (e.g., leg length, bill width, etc.) measurements of captive wild (n = 41) and game-farm (n = 80) mallards in Illinois (2021-2022) and Louisiana (2021-2022). We could correctly classify 95.1% of wild and 97.5% game-farm mallards in this study based on those measurements.



Native bees, fire ants, and waterfowl habitat management in Mississippi's Alluvial Valley

Hughes, H., J. B. Davis, K. Parys, and C. Fortuin

Seasonal wetlands help meet the biological needs of various autumn migrating and wintering waterfowl species in the southern United States. Management of seasonally-flooded impoundments often use soil and vegetation disturbances to promote early succession plants that produce abundant seeds for foraging birds. Native bees (*Hymenoptera: Anthophila*) and red imported fire ants (*Solenopsis invicta*) also occupy these wetland habitats, however, how these insects are affected by water and vegetation manipulation is unknown. We designed an experiment on several areas including Panther Swamp and Sam D. Hamilton Noxubee National Wildlife Refuges, and private lands in Mississippi's Alluvial Valley (Delta). We identified 12 wetland sites and created 10-acre plots, subdividing them into two 5-acre plots. We randomly assigned wetland management methods that included either a disking, mowing, flooding, or control treatment to each of the 5-acre plots, ensuring equal representation. We established bee bowls, blue vane traps, and trap nests throughout the 5-acre plots to evaluate native bee abundance and responses to each of the assigned managements. We are also evaluating native bee response to the presence of red imported fire ants. Six of the twelve 10-acre sites were treated with an insecticide for fire ants, while the other half serve as a control group (no insecticide treatment). Two weeks following the insecticide treatment, pitfall trap surveys were conducted to evaluate insecticide success. We will collect bees once monthly during the project's duration. Preliminary data were not yet available at the time of this submission. However, this study will be informative on how disturbances to water and vegetation in seasonal wetlands influences native bees and red imported fire ants with respect to common waterfowl management practices.



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POSTER PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

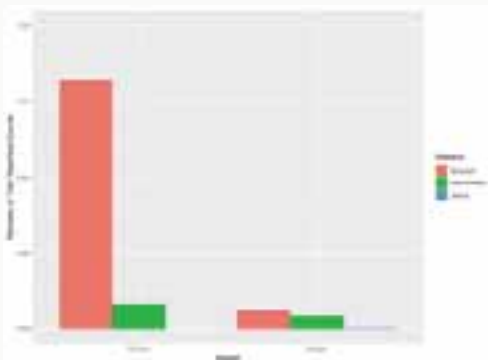
This study investigates response of native bees and red-imported fire ants to traditional wetland management techniques used to promote herbaceous plant and invertebrate foods in seasonal wetlands for waterfowl in autumn and winter in Mississippi.



Avian use of marsh terraces in coastal Louisiana

McFarland, M., J. B. Davis, M. G. Brasher, M. Woodrey, and F. Vizcarra

Louisiana's coastal wetlands support millions of resident and migratory birds annually. Louisiana accounts for approximately half of the coastal wetlands in the conterminous United States but, by some estimates, accounts for 80% of the nation's coastal wetland loss. At this rate of loss, Louisiana's coast may be incapable of supporting historically large populations of migratory and resident birds. Marsh terracing is a common restoration technique that uses *in situ* sediment to construct segmented ridges in open water areas to enhance marsh conditions, subsequently re-establishing vegetation that benefits wetland-estuarine dependent fauna. Despite widespread use, their value as avian habitat has received limited study. Using both ground and aerial surveys, we evaluated avian use of marsh terraces across 24-paired sites (terraced and adjacent non-terraced sites) in coastal Louisiana. Avian surveys focused on breeding secretive marsh birds (SMB) and wintering waterfowl. Results indicate that presence or absence of marsh terraces influenced numbers of ducks detected, though relative abundance varied spatially and temporally. Preliminary results of the SMB analysis reveal that non-terraced sites were used by a greater abundance and diversity of SMBs than terraced sites, though analysis is ongoing. We suspect that site-specific characteristics and two catastrophic hurricanes that occurred during our study likely influenced observed patterns of avian use of paired sites. Our study will better inform decisions on restoration techniques used to minimize marsh loss and improve avian habitat availability at local and regional scales.



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POSTER PRESENTATION at the North American Duck Symposium (Ducks9), Portland, Oregon, February 5-9, 2024.

This figure represents the percentage of waterfowl counts by wetland type and region, either the southeastern Louisiana Delta (Deltaic) or the Chenier, southwest Louisiana, as detected on aerial surveys in autumn-winter 2020. The Chenier region accounted for nearly 91% of all birds counted on surveys, whereas the Deltaic region contained 9.3%. Brackish wetlands accounted for 88% of all waterfowl counted, followed by intermediate wetlands (12%).

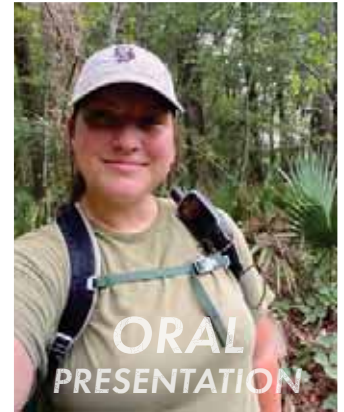


Assessing swamp rabbit genetic structure and gene flow in response to habitat loss and fragmentation in the core of their Range

Beall, C. S., M. D. McConnell, N. R. Campbell, J. P. Brooks, R. K. Smith, L. K. Berkman, J. B. Davis, and D. J. Morin

Swamp rabbits (*Sylvilagus aquaticus*) are a bottomland hardwood specialist species and a potential bioindicator for wildlife habitat in that ecosystem. Large scale conversion to agriculture has resulted in significant reduction and fragmentation in bottomland hardwood forest, with most of the remaining forest area restricted to the Lower Mississippi Alluvial Valley, including the Mississippi Delta. Swamp rabbits are a game species and in parts of their range, also a species of conservation concern. Previous swamp rabbit monitoring has focused on population parameters at the northern extent of their range where they are thought to be declining, but there are limited data on population-level metrics at the core of their range. We assessed population genetic structure among several subpopulations across the Mississippi Delta at the core of their range with a focus on metrics expected to reflect the impacts of habitat fragmentation and loss of gene flow. We collected fecal pellets at 10 sites across the Mississippi Delta and used the newly developed genotyping-in-the-thousands (GT-seq) panel for swamp rabbits to assess population and individual genetic structure. We estimated effective population size, genetic differentiation, nucleotide diversity, expected and observed heterozygosity, and individual inbreeding coefficient. We also calculated the correlation between geographic and genetic differentiation using a partial mantel test to estimate the effect of isolation-by-distance. This study provides the first genetic data for swamp rabbits in Mississippi and will help inform management across the species' range.

ORAL PRESENTATION at The Wildlife Society's Annual Conference, Baltimore, Maryland, October 19-23, 2024.



STUDENT PROFESSIONAL DEVELOPMENT

WETLANDS ECOLOGY & MANAGEMENT, FALL 2024



Outdoor labs and field trips offer invaluable hands-on learning experiences for both graduate and undergraduate students. In Fall 2024, students in the Wetlands Ecology & Management course enjoyed several memorable and enlightening field experiences. The highlight of the semester was a four-day trip to south Louisiana, featuring visits to Rockefeller Wildlife Refuge, Cameron Prairie National Wildlife Refuge, the Louisiana State University AgCenter's Caffey Rice Research Station in Rayne, and several other key sites.

As the saying goes, a picture is worth a



thousand words—and many of the images that follow capture the energy and excitement of those four action-packed days and nights. You'll also find reflections and highlights directly from the students, who best convey the impact of the experience in their own words.

Personally, I was thrilled to return to the Chenier Plain, as it was our first class visit since fall 2019, due to hurricanes, the COVID-19 pandemic, and other challenges. No matter how many times one visits coastal Louisiana, its beauty, complexity, and ecological, and cultural richness never fails to mesmerize and inspire.



laissez les bons TEMPS ROULER!

It's no exaggeration to say this trip was life-changing for many of our students:



"Thank you for sharing the marsh with us. It was my first trip to coastal Louisiana and I will never forget it."

"Thank you for everything you showed us this week. Everything from the airboats, black-bellied whistling duck banding, cute alligators, and hearing people's stories made the trip incredible. And thank you for showing me a crab boil and aspects of coastal life."

"Thank you to everyone in Louisiana for making our field trip a success, a true highlight of my time at MSU."



"This was my first time being at Rockefeller and it was life changing. I always heard about the land loss in south Louisiana but seeing it in person gave me a different perspective. Being able to not only hold a black-bellied whistling duck but also band one was the highlight of my year! The blue crab and etouffee were amazing! It's remarkable the amount of work you all do in and out of the refuge."

"Wetlands' ecology and management are my passion and this trip only solidified my decision to pursue that even further, especially after seeing all your contributions to help manage and restore the Louisiana coastline. You are truly inspirational!"



"I learned more than I ever could have imagined. The work y'all do has such a significant impact on the lives of folks like me. From the airboats, the whistling ducks, to strolling the beach in the sunset hours, I was truly having the time of my life. Thank you all for this once in a lifetime experience made possible."

"Rockefeller is like a place I have never experienced. Experiencing this isolated paradise was breathtaking. It was the first time I ever went shrimping, airboat riding, crabbing, or held an alligator. And – it was the first time I peeled my own shrimp! I can't thank you enough – best field trip ever!"

WETLAND DELINEATION AT THE SAM D. HAMILTON NOXUBEE NATIONAL WILDLIFE REFUGE, FALL 2024

In Fall 2024, WFA alumnus Will Piggott of the U. S. Army Corps of Engineers visited the Sam D. Hamilton Noxubee National Wildlife Refuge to lead a hands-on lesson in wetland delineation for students in the Wetlands Ecology and Management course. Wetland determinations are critical for legal, ecological, and policy-related decisions, and students gained practical experience identifying key indicators such as soil types, vegetation, waterlines, and debris marks. Will's enthusiasm for teaching and mentoring made a strong impression—he's a success story from our department, and we're deeply grateful for his continued involvement.



STUDENT EXPERIENCES

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UNDERGRADUATE STUDENT INTERNSHIPS AND RESEARCH FIELD EXPERIENCES

Through internships and hands-on research experiences, students often discover a lasting passion for waterfowl and wetlands conservation, leading many to pursue careers or advanced studies in these fields. In collaboration with Dr. Leslie Burger, undergraduate coordinator in Wildlife, Fisheries and Aquaculture, and Ms. Lanna Miller, student services coordinator in the College of Forest Resources, we successfully placed students in a variety of internship and summer positions during 2024. These opportunities focused on waterfowl, wetlands, and related conservation projects, and provide invaluable experience and professional growth.



DUCKS UNLIMITED NATIONAL HEADQUARTERS, FALL 2024



Another highlight of the semester was a visit to the Ducks Unlimited national headquarters (NHQ) in Memphis, Tennessee. Students heard from DU scientists and program leaders about the organization's conservation mission, volunteer legacy, and ongoing work. The visit also included a tour of the DU Waterfowling Heritage Center and Bass Pro Shops at the Pyramid, a unique collaboration between DU and Bass Pro Shops. This day wrapped up with a memorable lunch at the iconic Huey's in Memphis, Tennessee—a great end to an inspiring field trip. We are most grateful to Drs. Mike Brasher, Ellen Herbert, Jerad Henson, and other DU staff for their time and expertise.

KIRSTEN COOPER: Undergraduate Research (summer-fall 2024). Species richness and diversity of amphibians on Wetland Reserve Easements in Mississippi. Co-supervised with Dr. Beth Baker. Cooper also held a James C. Kennedy Waterfowl and Wetlands Conservation Internship in 2024, mostly assisting master's students Kara Hall and Avery Wissmueller with their research projects.



**KIRSTEN
COOPER**

CONNOR FUNG-A-FAT: WFA alum 2024. Fung-A-Fat secured a biological tech position in the Sacramento Valley of California, working for a doctoral student at the University of California, Davis, on a wetland/mosquito abatement research project.



**CONNOR
FUNG-A-FAT**

JOHN GIVENS: Undergraduate Research (summer-fall 2024). Testing seed strength of common moist-soil seeds. Co-supervised with Dr. Matthew W. Priddy and Michael W. Hall from the MSU School of Mechanical Engineering.



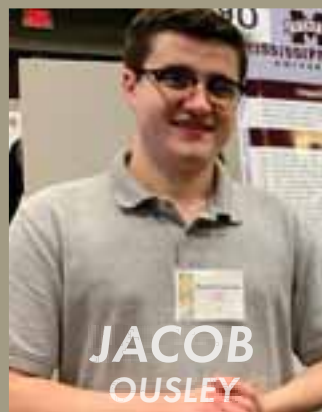
**JOHN
GIVENS**

AVERY HOLT: James C. Kennedy Waterfowl and Wetlands Conservation Internship, 2024. Holt is assisting master's student Duncan Fraser on his shorebird monitoring project in Mississippi.



**AVERY
HOLT**

JACOB OUSLEY: Undergraduate Research (summer-fall 2024). Aquatic macroinvertebrate assessment of restored wetlands in the Lower Mississippi Alluvial Valley. Co-supervised with Dr. Beth Baker.



JORDAN PROCTOR: James C. Kennedy Waterfowl and Wetlands Conservation Internship, 2024. Proctor is identifying wetland plant seeds collected in doctoral student Stephen Clements' project in South Carolina.

ALEXANDRIA (ALLIE) RATCLIFF: James C. Kennedy Waterfowl and Wetlands Conservation Internship, 2024. Ratcliff is also identifying wetland plant seeds collected in doctoral student Stephen Clements' project in South Carolina.



ALLYSON TRAHAN: James C. Kennedy Waterfowl and Wetlands Conservation Internship, 2024. Trahan is also identifying wetland plant seeds collected in doctoral student Stephen Clements' project in South Carolina.

EVIE VON BOECKMAN: WFA alumna. Secured a permanent position with the Minnesota DNR at the Roseau River Wildlife Management Area, northern Minnesota. Von Boeckman successfully graduated from Iowa State University with her master's degree in summer 2024.



THE BULLDOG CHAPTER OF DUCKS UNLIMITED

An amazing group that works hard to benefit wetlands and waterfowl habitats and conservation. Some of the photos below highlight 2024. Several students participated in the DU Campus for Waterfowl podcast hosted by WFA alum, Dr. Mike Brasher, senior waterfowl scientist, Ducks Unlimited.



The chapter had a first-of-its kind concert with musician Sam Barber (middle back row) to raise funds for wetlands conservation.





This wonderful team of folks organizes and runs the Oktibbeha Chapter of Ducks Unlimited, headed by Mr. Gary Blair. We are indebted to Gary and DU's Hunter Pridgen (WFA alum) for operating this committee and the fall banquets held each year.

guest TEACHING



related to diet and foraging behavior. Their excitement and curiosity were inspiring.

I wrapped up the final session with a pot of white-fronted goose and sausage mac-n-cheese—and that's when I really had their full attention! It was an unforgettable experience for everyone involved.

In summer 2024, I had the wonderful opportunity to share my passion for waterfowl and wetlands ecology and management with students across the Mississippi State campus. I delivered two presentations to graduate students enrolled in EDE 8733 (College of Education), a course focused on "Teaching Physical, Life, and Earth Science in the Elementary and Middle School Classroom."

It was a true joy to teach and engage with these future educators. In addition to traditional lectures, I created hands-on experiences—students examined waterfowl wings and full-mounted specimens to learn how bill shapes, sizes, and other adaptations related to diet and foraging behavior.

AWARDS- ACCOLADES

UNDERGRADUATE STUDENT AWARDS

ANDREW (DREW) BROWN: Mark A. Schmoll Memorial scholarship

KATHRYN FUJIWARA: Paul and Susan Meng scholarship

LILY LANGSTAFF: Paul and Susan Meng scholarship

HENRY WILLIAMS: Paul and Susan Meng scholarship

GRADUATE STUDENT AWARDS

STEPHEN CLEMENTS (PHD): James C. Kennedy Waterfowl and Wetlands Conservation scholarship

DUNCAN FRASER (M.S.): James C. Kennedy Waterfowl and Wetlands Conservation scholarship

KARA HALL, (M.S.): Thomas A. Plein Graduate Student scholarship

HALEY HUGHES (M.S.): James C. Kennedy Waterfowl and Wetlands Conservation scholarship

AVERY WISSMUELLER, (M.S.): Thomas A. Plein Graduate Student scholarship



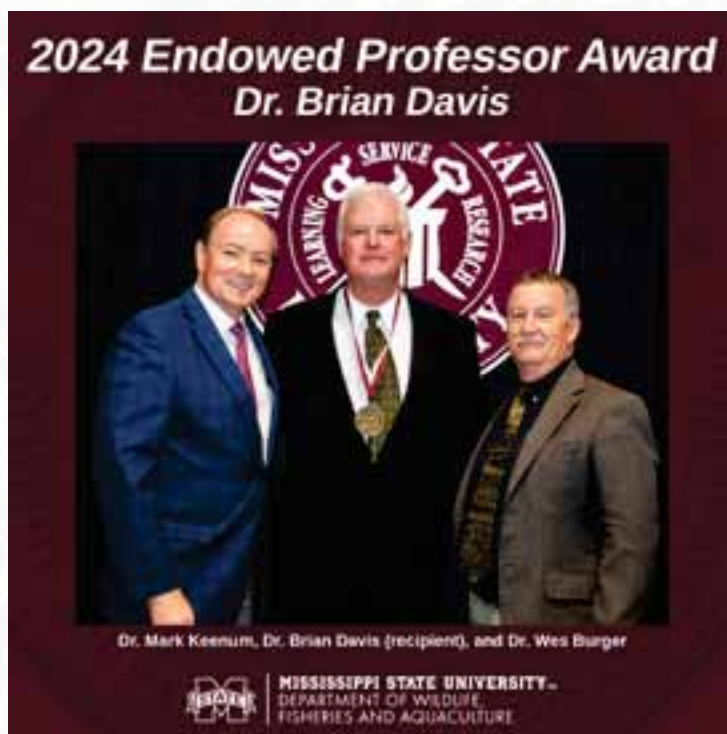
OTHER ACCOLADES

STEPHEN CLEMENTS, Ph.D. student, 2024 Gluesing Outstanding Graduate Student Award, Doctoral Level.

KARA HALL master's student, was selected to attend the 2024 Graduate Waterfowl Field Course in prairie Canada and North Dakota, sponsored by the Delta Waterfowl Foundation. This 2-week science and conservation-based field course is invaluable for future waterfowl scientists and conservationists.

KARA HALL master's student, earned semi-finalist, and Riley Porter, master's student, earned honorable mention in a research competition entitled Image of Research. Students used visual forms or photographs to showcase their research. Competition promoted by MSU Graduate School.

MADIE MCFARLAND, master's student, and former undergraduate, **EVIE VON BOECKMAN,** were featured by Ducks Unlimited in a national video entitled, Women and Waterfowl (Ain't No Mountain High Enough). The video was broadcast at DU's 2024 National Convention and elsewhere.



J. B. DAVIS invited to give a Keynote/Plenary Address at the Bays & Bayous Symposium, University of Southern Mississippi, Biloxi, Mississippi, November 2024. Talk entitled Waterfowl conservation: Bridging science, habitat, and humans.

J. B. DAVIS received an endowed program chair medallion from MSU President Dr. Mark Keenum, November 2024. This medallion ceremony was the first for MSU to honor endowed faculty.

PROUD MOMENTS GRADUATION!



MCFARLAND, MADELYN (MADIE):

2024. Master of Science in Wildlife, Fisheries and Aquaculture

THESIS TITLE: *The efficacy of marsh terraces in enhancing and restoring Gulf coastal wetlands*



MENTGES, HUNTER:

2024. Master of Science in Wildlife, Fisheries and Aquaculture

THESIS TITLE: *Regional examination of the contribution of nest boxes to wood duck recruitment in the Southeast and Mid-Atlantic United States*



PORTER, RILEY:

2024. Master of Science in Wildlife, Fisheries and Aquaculture

THESIS TITLE: *Ecology of breeding common goldeneye and other cavity-nesting birds in central Alaska*

PRESENTATIONS

ORAL PRESENTATIONS (*) denotes student

Invited Keynote (n = 1)

Davis, J. B. 2024. Waterfowl conservation: Bridging science, habitat, and humans. Keynote/Plenary Address. Bays & Bayous Symposium, Biloxi, Mississippi.

Peer Reviewed (n = 22)

*Beall, C. S., McConnell, M. D., Campbell, N. R., Brooks, J. P., Smith, R. K., Berkman, L. K., Davis, J. B., and Morin, D. J. 2024. Development of a GT-seq marker panel for individual identification of noninvasive samples: Lessons learned. The Wildlife Society, Baltimore, Maryland.

Buderman, F. E., Kaminski, R. M., Marty, J. R., Brasher, M. G., Rush, S. A., and Davis, J. B. 2024. Wetland bird use and management of Louisiana and Texas Gulf-Coast rice lands. Ducks9, North American Duck Symposium, Portland, Oregon.

*Clements, S., Davis, J. B., Hagy, H. M., Bauer, B., Lavretsky, P., McFarland, L., Morin, D., and Wang, G. 2024. Evaluating the diets of ducks using South Atlantic coastal wetlands. Ducks9, North American Duck Symposium, Portland, Oregon.

*Clements, S., Davis, J. B., Hagy, H., Bauer, B., Morin, D., and Wang, G. 2024. What's at stake: A contemporary assessment of the energetic carrying capacity of South Atlantic coastal wetlands. Southeastern Association of Fish and Wildlife Agencies (SEAFWA), Augusta, Georgia.

*Clements, S., Davis, J. B., Hagy, H., Bauer, B., Morin, D., and Wang, G. 2024. Estimating energetic density of winter foraging habitat in South Atlantic coastal wetlands. Ducks9, North American Duck Symposium, Portland, Oregon.

Davis, J. B., Bakner, D., Kaminski, R. M., and Lancaster, J. D. 2024. Clutch and brood size optima in wood ducks. Joint meeting of the AFO-SCO-WOS, Wilson Ornithological Society, Peoria, Illinois.

Davis, J. B., Boudreau, M., Boudreau, M. R., Havens, H., Hardesty, D., Leach, B., and Callicutt, J. T. 2024. Long-term trends in duck abundance in Mississippi and Arkansas. Mississippi chapter of The Wildlife Society, Starkville, Mississippi.

Davis, J. B., Buderman, F. E., Kaminski, R. M., Marty, J. R., Brasher, M. G., and Rush, S. A. 2024. Wetland bird use and management of Louisiana and Texas Gulf-Coast ricelands. Joint meeting of the AFO-SCO-SOC, Wilson Ornithological Society, Peoria, Illinois.

Davis, J. B., McFarland, M. B., Brasher, M. G., and Woodrey, M. 2024. The efficacy of marsh terraces in enhancing and restoring Gulf coastal wetlands. Southeastern Association of Fish and Wildlife Agencies (SEAFWA), Augusta, Georgia.



*Fraser, D. J., Boudreau, M., Lancaster, J. D., Adjaye, D. F., Dentinger, J. E., Dolan, L. A., Ripa, G. N., Ramirez-Reyes, C., Sklarczyk, C. A., Thornton, B. S., Todaro, H. M., Kaminski, R. M., and Davis, J. B. 2024. An alternative for evaluating the energetic landscape for mallards (*Anas platyrhynchos*) wintering in the Mississippi Alluvial Valley. Ducks9, North American Duck Symposium, Portland, Oregon.

*Fraser, D. J., Davis, J. B., Iglay, R. B., and Ayers, C. R. 2024. Shorebird use of restored wetlands in the Mississippi Delta. Annual Meeting of the Mississippi Chapter of The Wildlife Society, Starkville, Mississippi.

*Hall, K., Boudreau, M., Davis, J. B., Havens, H., Callicutt, J. T., Kaminski, R. M., Naylor, L., and Leach, B. 2024. Longterm trends in duck abundance in Mississippi and Arkansas. Ducks9, North American Duck Symposium, Portland, Oregon.

*Hall, K., *Wissmueller, A., Ayers, C., Baker, B., and Davis, J. B. 2024. Evaluating avian use of Wetland Reserve Easement lands, reference wetlands, and croplands in the Alluvial Valleys of Mississippi and Louisiana. Annual Meeting of the Mississippi Chapter of The Wildlife Society, Starkville, Mississippi.

*Halligan, S., Lavretsky, P., Fournier, A., Davis, J. B., and Downs, C. 2024. Morphology and food intake rate of wild and game-farm mallards. Ducks9, North American Duck Symposium, Portland, Oregon.

*Halligan, S., Schummer, M., Fournier, A., Lavretsky, P., and Davis, J. B. 2024. Morphology and food intake rate of wild and game-farm mallards. The Wildlife Society, Baltimore, Maryland.

*Hughes, H., Davis, J. B., Parys, K., and Fortuin, C. 2024. Native bee response to mechanical and hydrologic manipulations and red imported fire ants in seasonal wetlands. Annual Meeting of the Mississippi Chapter of The Wildlife Society, Starkville, Mississippi.

*Mentges, H. E., Davis, J. B., Adhikari, P., Poudel, I., and Rush, S. A. 2024. Eggshell strength in three cavity-nesting ducks in Mississippi. Ducks9, North American Duck Symposium, Portland, Oregon.

*Mentges, H., Davis, J. B., Adhikari, P., Rush, S. A., and Bauer, B. 2024. Egg morphometrics and egg hatchability in box-nesting wood ducks. Joint meeting of the AFO-SCO-WOS, Wilson Ornithological Society, Peoria, Illinois.

*Mentges, H. E., Davis, J. B., Adhikari, P., Rush, S. A., and Bauer, B. 2024. Egg morphometric effects on egg hatchability in box-nesting wood ducks. Ducks9, North American Duck Symposium, Portland, Oregon.



**RILEY
PORTER**

*Porter, R. D., Davis, J. B., Wang, G., Boudreau, M., and Taylor, E. J. 2024. Nest box selection by common goldeneye (*Bucephala clangula*) in the Chena River system, interior Alaska. Ducks9, North American Duck Symposium, Portland, Oregon.



**STEPHEN
CLEMENTS**

*Porter, R. D., Davis, J. B., Wang, G., Boudreau, M., and Taylor, E. J. 2024. Nest box selection by common goldeneye (*Bucephala clangula*) in the Chena River system, interior Alaska. 7th International Sea Duck Conference 2024, USFWS-Canadian Wildlife Service (Virtual meeting).

*Wissmueller, A. J., Davis, J. B., Boudreau, M., Callicutt, J. T., Kaminski, R. M., Street, G. M., Havens, H., Naylor, L., and Leach, B. 2024. Occurrence and abundance of wintering ducks detected on aerial surveys in the Lower Mississippi Alluvial Valley. Ducks9, North American Duck Symposium, Portland, Oregon.

Not Peer Reviewed-Oral Presentations (n = 10)

*Clements, S. A., Davis, J. B., Hagy, H., Bauer, B., Lavretsky, P., *McFarland, L., Morin, D. J., and Wang, G. 2024. Using DNA to evaluate the diets of ducks in South Atlantic coastal wetlands. ACE Basin Symposium 2024: Water Connects Us All, South Carolina Coastal Information Network, Walterboro, South Carolina.

*Clements, S. A., Davis, J. B., Hagy, H., Bauer, B., Lavretsky, P., McFarland, L., Morin, D. J., and Wang, G. 2024. Waterfowl diets and forage biomass in South Atlantic coastal wetlands. James C. Kennedy Center Advisory Board Meeting, Clemson University, Georgetown, South Carolina.

PRESENTATIONS cont.

*Clements, S., Davis, J. B., Hagy, H., Bauer, B., Lavretsky, P., *McFarland, L., Morin, D. J., and Wang, G. 2024. Waterfowl diets and winter foraging habitat in coastal South Atlantic wetlands: Improving inputs for bioenergetics modeling for regional conservation planning. University of South Carolina Beaufort Seminar Series, Beaufort, South Carolina.

*Clements, S., Davis, J. B., Hagy, H., Bauer, B., Lavretsky, P., *McFarland, L., Morin, D. J., and Wang, G. 2024. Waterfowl diets and winter foraging habitat in coastal South Atlantic wetlands: Improving inputs for bioenergetics modeling for regional conservation planning. USFWS Wetland Management for Wintering Waterfowl course, US Fish and Wildlife Service, Yemassee, South Carolina.

*Clements, S., Davis, J. B., Hagy, H., Bauer, B., Lavretsky, P., *McFarland, L., Morin, D. J., and Wang, G. 2024. Waterfowl diets and winter foraging habitat in coastal South Atlantic wetlands: Improving inputs for bioenergetics modeling for regional conservation planning. Field day, Waterfowl Management workshop, Clemson University/USFWS, Yemassee, South Carolina.

Davis, J. B., Boudreau, M., Boudreau, M. R., Havens, H., Leach, B., and Callicutt, J. T. 2024. Long-term trends in duck abundance in Mississippi and Arkansas. Ducks Unlimited Annual State Convention, Ducks Unlimited, Inc., Starkville, Mississippi.

Davis, J. B., and Boudreau, M. R. 2024. James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation. Mississippi Department of Wildlife, Fisheries & Parks Research Summit, Starkville, Mississippi.

*Fraser, D. 2024. My ornithology career (so far). Friends of Noxubee Refuge, Sam D. Hamilton Noxubee National Wildlife Refuge (NNWR), Louisville, Mississippi.

Hagy, H., Davis, J. B., and Brasher, M. G. 2024. Sanctuary: Is it for the birds? National Science Support Team, U.S. Fish and Wildlife Service, On-line presentation.

*Hall, K., *Wissmueller, A., Davis, J. B., and Baker, B. 2024. Evaluating avian use of Wetland Reserve Easement lands, reference wetlands, and croplands in the alluvial valleys of Mississippi and Louisiana. Oktibbeha Audubon Society, Starkville, Mississippi.

POSTER PRESENTATIONS

*Hughes, H., Davis, J. B., Parys, K., and Fortuin, C. 2024. Native bees, fire ants, and waterfowl habitat management in Mississippi's Alluvial Valley. Ducks9, North American Duck Symposium, Portland, Oregon.

*McFarland, M. B., Davis, J. B., Brasher, M. G., Woodrey, M., Reynolds, L., and Vizcarra, F. 2024. Avian use of marsh terraces in coastal Louisiana. Ducks9, North American Duck Symposium, Portland, Oregon.



*Mentges, H., Davis, J. B., Gibson, T., Poudel, I., Adhikari, P.A., and Boone, S. 2024. Eggshell strength in three cavity-nesting ducks in Mississippi's Alluvial Valley. Ducks9, North American Duck Symposium, Portland, Oregon.



*Ousley, J., *Hall, K., *Wissmueller, A., Entsminger, E. D., Davis, J. B., and Baker, B. 2024. Aquatic macroinvertebrate assessment of restored wetlands in the Lower Mississippi Alluvial Valley. Mississippi State University Summer 2024 Undergraduate Research Showcase, Mississippi State, Mississippi.



Tariq, A., Davis, J. B., and Aslam, R. W. 2024. Spatio-temporal variation in surface water in the Arkansas Mississippi Alluvial Valley using machine-learning methods with time-series remote sensing data. American Geophysical Union (AGU24), American Geophysical Union, Washington, D. C.

*Wissmueller, A., *Hall, K., *Ousley, J., Entsminger, E. D., Davis, J. B., and Baker, B. 2024. Aquatic macroinvertebrate assessment of restored wetlands in the Lower Mississippi Alluvial Valley. Annual Meeting of the Mississippi Chapter of The Wildlife Society, Starkville, Mississippi.

*Ousley, J., *Hall, K., *Wissmueller, A., Entsminger, E. D., Davis, J. B., and Baker, B. 2024. Aquatic macroinvertebrate assessment of restored wetlands in the Lower Mississippi Alluvial Valley. Mississippi Water Resources Research Institute, Mississippi Water Resources Conference 2024, Flowood, Mississippi.

PUBLICATIONS

JOURNAL ARTICLE PUBLICATIONS

Aslam, R. W., Naz, I., Shu, H., Yan, J., Quddoos, A., Tariq, A., Davis, J.B., Al-Saif, A.M., and Soufan, W. 2024. Multi-temporal image analysis of wetland dynamics using machine learning algorithms. *Journal of Environmental Management* 371:123123.

Bakner, D. L., Ringelman, K. M., Reynolds, L. A., Kaminski, R. M., Stephens, S. E., and Davis, J.B. 2024. Wood ducks and hooded mergansers as interspecific brood parasites: An evaluation of parasitic egg survival. *Ecology & Evolution* 14:e11721.

Boudreau, M., Lancaster, J. D., Adjaye, D. A., Dentinger, J. E., Dolan, L. A., Ripa, G. N., Ramirez-Reyes, C., Sklarczyk, C. A., Thornton, B. S., Todaro, H. M., Kaminski, R. M., and Davis, J.B. 2024. An alternative for evaluating the energetic landscape for mallards *Anas platyrhynchos* in the Mississippi Alluvial Valley, USA. *Wildfowl* 74:113-131.

Fatima, B., Rachid, H., Khalil, E. K., Abdeldalil, O., Mohamed, B., Tariq, A., Davis, J.B., and Soufan, W. 2024. Modelling, quantification, and estimation of the soil water erosion using the Revised Universal Soil Loss Equation with Sediment Delivery Ratio and the analytic hierarchy process models. *Earth Surface Processes and Landforms* 49(10):3158-3176.

Lancaster, J. D., Boudreau, M., Kaminski, R. M., Street, G. M., Mini, A. E., Nelms, K. D., and Davis, J.B. 2024. Mallard winter use of conservation program and nonprogram lands in Mississippi. *Wildlife Society Bulletin* 48:e1545(3).

Mustafa, H., Tariq, A., Shu, H., Ul Hassan, S. N., Khan, G., Davis, J.B., Almutairi, K.F., and Soufan, W. 2024. Integrating multisource data and machine learning for supraglacial lake detection: Implications for environmental management and sustainable development goals in high mountainous regions. *Journal of Environmental Management* 370:122490.

Ogawa, R., Burger, L. W., Strickland, B. K., Davis, J.B., and Cunningham, F. L. 2024. Bayesian integrated species distribution models for hierarchical resource selection by a soaring bird. *Ecological Informatics*:102787.

Rehman, A., Islam, F., Tariq, A., Islam, I. U., Davis, J.B., Bibi, T., Ahmad, W., Waseem, L. A., Karuppanan, S., and Al-Ahmadi, S. 2024. Groundwater potential zone mapping using GIS and remote sensing-based models for sustainable groundwater management. *Geocarto International* 39 (1):2306275.

POPULAR ARTICLES AND REPORTS:

Henderson, M., and Davis, J.B. 2024. The decline of the black duck. *Wildlife Mississippi*. Wildlifemiss.org. Winter 2024.

REPORTS, BULLETINS, BROCHURES, INFORMATION SHEETS, AND NEWSLETTERS:

Bauer, B., Anderson, J., Bridges, A., Davis, J.B., Foth, J., Hagy, H., Hepp, G., Kaminski, R., Ringelman, K., Schmidt, P., Wiggers E., and C. Williams. 2024. Regional examination of the contribution of nest boxes to wood duck recruitment in the Southeast and Mid-Atlantic United States. Final Report, Nemours Wildlife Foundation.

Davis, J. B. 2024. Genomic and morphological consequences of landscape-level hybridization between wild and domesticated congeners. Annual Report to the National Science Foundation. Federal Grant #2010697.

Eggleton, M., Hall, K., Wissmueller, A., Davis, J. B., and Baker, B. 2024. Development of an ecological monitoring and assessment framework for the ACEP-WRE program. Annual report to the Natural Resources Conservation Service.

DIGITAL AND OTHER ELECTRONIC MEDIA

Hagy, H., Callicutt, J. T., Davis, J. B. 2024. Sanctuary science: Protecting waterfowl while preserving tradition. *Mississippi State University Gamebird University* podcast.

Lavretsky, P., and Davis, J. B. 2024. The degradation of wild mallard genetics. *Mossy Oak Outdoors* podcast, Episode 243.



Neal, W., Davis, J. B., and Callicutt, J. T. 2024. Managing habitats for fish and waterfowl. *Mississippi State University Fish University* podcast, Episode 18.

Schummer, M., Callicutt, J. T., Davis, J. B. 2024. Forecasting fowl: Understanding duck migration. *Mississippi State University Gamebird University* podcast.

Stephens, S., Brasher, M., and Davis, J. B. 2024. Migration and hunting update from the prairies to Arkansas. *Ducks Unlimited* podcast.

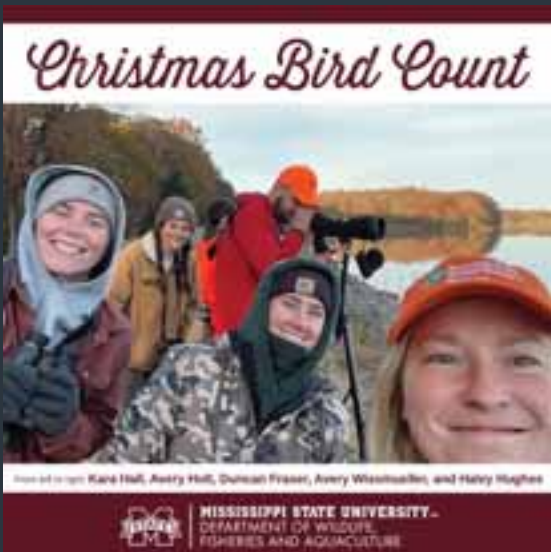
Vest, J., Callicutt, J. T., and Davis, J. B. 2024. Part I-What drives duck populations? Part II-2024 Duck population status. *Mississippi State University Gamebird University* podcast.

on the LIGHTER SIDE

"You're gonna need a bigger boat!" (Chief Brody, Jaws, 1975).



M.S. students Hunter Mentges, Kara Hall, Haley Hughes, Avery Wissmueller, and Duncan Fraser, the Peoria (IL) Riverfront Museum, 2024 Joint Meeting of the Association of Field Ornithologists, Society of Canadian Ornithologists and Wilson Ornithological Society, Peoria, IL, July 29-August 2, 2024.



Kara Hall, Avery Holt, Duncan Fraser, Avery Wissmueller, and Haley Hughes exercising their professional due diligence and assisting with annual Christmas Bird Counts, Sam D. Hamilton Noxubee National Wildlife Refuge, December 2024.

They just had to do it! Halloween morning, 2024. Four of 'my girls' received an "A" for mocking me just before our 8 am class. Graduate students Caroline Teal, Avery Wissmueller, Haley Hughes, and Kara Hall did an impeccable impersonation of me in field, tailgate, hunting, and otherwise "me" modes! Classic.







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