KENNEDY ENDOWED PROGRAM

WATERFOWL & WETLANDS CONSERVATION

2017–2018

ANNUAL REPORT

MISSISSIPPI STATE UNIVERSITY™
FOREST AND WILDLIFE RESEARCH CENTER

2017-2018

Kennedy Endowed Program in

WATERFOWL AND WETLANDS CONSERVATION

Annual Report

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Winter 2017–2018 was stamped with periodic, punishing blows of snow and bitter cold, but these in turn moved waterfowl to Mississippi and other southern clines. I hope you found some hotspots amidst the birds either in open water prior to or simultaneous with freeze-up, on ice itself, or in the slush and some open water. As fellow colleagues/hunters and I reminisced lately, there were likely generations of mallards and other waterfowl that had never ventured this far south. It was not uncommon this winter to watch a small bunch of ducks swell ever-so-quickly into a swarm over grain fields, pressed to access vital carbohydrates during bouts of severe cold or snow. It was a rare winter that senior colleagues in Mississippi had not witnessed since the late 1980s.

This year was also marked by some unique professional experiences. I traveled to the campus of Colorado State University in mid-September 2017. I had the privilege of collaborating with an outstanding cadre of fellow waterfowl professionals from land-grant universities, Ducks Unlimited, Inc., DU-Canada, and Delta Waterfowl. Our weekend mission was to envision and chart the course for future endowed waterfowl professorships in North America—not a simple task. Our caucus convened to mold multiple criteria regarding where and why future endowments might exist. The momentum of this caucus did not brew overnight, but rather incubated and incrementally grew for years, particularly following the initial paper published in *The Wildlife Society Bulletin* in 2002 by Dr. Rick Kaminski entitled, "Status of Waterfowl Science and Management Programs in United States and Canadian Universities."

Greetings

From that seminal and a more recent survey of university waterfowl professionals by Kaminski, we learned that a 44 percent decline in professorships with expertise in waterfowl and wetlands in U.S. and Canadian universities has occurred in the past few decades. Additional positions are at risk now because nearly half of the existing waterfowl professors may retire in less than 10 years. This obvious need in waterfowl expertise at North American universities stimulated our Colorado State caucus, and from it, we identified and ranked priority endowments as Tier 1 universities in both Canada and the United States, Tier 2 institutions, and the need for an Advisory Board to help steer these efforts. Details of these efforts are provided in an article authored by our caucus team entitled, "Who Will Mind the Marsh?" This article, generously produced by Delta Waterfowl Foundation, appears at the end of this report.

Along with Dr. Kevin Hunt, WFA human dimensions professor, I attended the North American Waterfowl Management Plan (NAWMP) Future of Waterfowl 2 Workshop at the National Conservation Training Center in Shepherdstown, West Virginia. The NAWMP was conceived in 1986 and is considered the most comprehensive wildlife ecosystems management plan ever developed. The NAWMP has emphasized identifying and implementing conservation resources and strategies to regions and habitats most important to waterfowl. The NAWMP has endured several updates or revisions (1994, 1998, 2004, and 2012), with another emerging in 2018. The 2012 NAWMP revision emphasized a renewed focus on resources in landscapes that had the greatest influence on waterfowl populations and on people who hunt and view waterfowl. By 2015, the NAWMP Science Support Team (NSST) helped identify specific priority areas that should receive habitat conservation at multiple spatial scales that considered both waterfowl populations and human dimension considerations. Indeed, the events helped shape the opinion piece on pages 4-7 of this report.

Last but not least, we had another great year with graduate and undergraduate students. We are very proud to have completed doctoral dissertations from Justyn Foth, Joe Lancaster, and Joe Marty. You can read more about their work in this report. We hired a postdoctoral research associate, Dr. Jessica Klassen, who will revisit and analyze long-term aerial survey data of wintering ducks, first spearheaded by Mississippi State scientists Drs. Aaron Pearse, Rick Kaminski, Ken Reinecke, and Steve Dinsmore in the early 2000s. Other ongoing projects include depredation of bait fish in aquaculture facilities by scaup and cormorants and a study of native bee use of seasonal wetlands and associated habitats in the Mississippi Delta. We also garnered seasonal internship positions for 11 of our undergraduate students in 2017. Students worked for federal, state, and private lands entities, and their stories appear later in this report on page 18. Finally, we learned in December 2017 that we secured a National Academy of Sciences grant to work on marsh terrace research in gulf coastal Louisiana. There will be much more on this in 2018, as the project serves as a great launching pad into this new year. Thank you to Mr. Jim Kennedy and every single supporter of our program who makes our work possible! I am indebted to you.

Sincerely,

Dr. J. Brian Davis
Associate Professor

FWRC
Forest & Wildlife
Research Center

The North American Waterfowl Management Plan, Waterfowl Hunting & Tragedy of the Commons

J. Brian Davis
Associate Professor
Waterfowl & Wetlands Conservation

The tragedy of the commons is all around us. Published by ecologist Garret Hardin in 1968, he remarked, "Individuals acting rationally and independently, according to their own self-interest, will deplete a shared resource, even if it is contrary to the best interest of the group." Hardin illustrated this concept with a cow pasture and herders. A herder who wants to expand his/her personal herd will introduce additional animals onto 'common' pasture lands (owned by a group of people), but costs of grass consumption and soil depletion will be borne by all owners; whereas, individuals will retain economic benefits of having additional cattle to sell. Ultimately, the 'commons' became overstocked and overgrazed and eventually couldn't support animals. The collapse of the once incredible Newfoundland Grand Banks cod industry by 1992, corporate environmental pollution, and associated human cooperation and selfishness are some examples of this principle intersecting humans and natural resources. Connecting with waterfowl hunting and remembering my youth, I recall hearing more than one sage adult duck hunter lamenting, "As soon as they put a boat ramp in here, the hunting is over."

I am grateful for being invited to the Future of Waterfowl Workshop 2, held at the U.S. Fish and Wildlife Service's National Conservation Training Center in Shepherdstown, West Virginia in September 2017. The meeting concerned the North American Waterfowl Management Plan (NAWMP), its current impacts, and planning for future NAWMP effectiveness across North America (including Mexico), and Japan and Russia. The NAWMP was conceived in 1986 and arguably remains the most comprehensive wildlife 'conservation plan' implemented worldwide. The ambitious plan was developed during a time of drought and declining waterfowl populations to satisfy long-term coordinated management of critical continental habitats. The 2017 meeting was

Jim Kennedy after a hunt.

represented by a cadre of people including university professors in wildlife ecology and human-dimensions, federal and state waterfowl scientists, waterfowl and wetland managers, conservation planners, policy makers, and others. The charge of this core group was to reflect on past NAWMP accomplishments, and evaluate strengths, weaknesses, threats, and opportunities as the waterfowl management community looks forward. These efforts would also help critically guide the 2018 Update of NAWMP. We convened to develop new ideas, including potential innovations stemming from "non-traditional" views, or from people less familiar with the history of NAWMP, but who are currently invested in its concept and might divulge novel and innovative strategies for its enhancement.

Approximately nine groups composed of 20 or so people each were charged with identifying and discussing strengths and weaknesses in confronting external opportunities and threats, with the goal of sustaining healthy wetlands and waterfowl populations. The article space here does not permit me to fully synthesize details of the meeting, or to describe the full charge of NAWMP. However, a growing issue is the overall decline in numbers of waterfowl hunters and its potential impact to conservation. Some of the NAWMP discussions were about retaining hunters, but they also entertained the feasibility of inviting other interest groups into the NAWMP tent. And, there were discussions toward reconciling whether or not NAWMP remained a "waterfowl" plan, mostly in light of the waterfowl hunter decline, or whether it had morphed into something else. During the meeting's concluding session, discussions flourished, and I sat patiently, wondering where we were headed. And then the proverbial ice broke, as one lady stood and proudly proclaimed, "We are waterfowl hunters and conservationists and we shouldn't apologize for it!" Later, an enthusiastic scientist from the USFWS also was unequivocal, "This is a duck plan! I am not scared. We must go outside the tent to find young men and ladies and invite them to our tent. We will not change – we have done a great job." Along with a deep breath, I said an internal, 'Amen.'

The NAWMP is a waterfowl plan. But with that could bring a future challenge, if numbers of waterfowl hunters decline, their concomitant decreased financial and political support would seemingly encourage a greater proportion of non-hunters beneath the tent, so to speak, to ameliorate for the losses. The NAWMP has recently expanded goals to include consideration of human objectives and desires. Much like we have and continue to do for decades in scientifically estimating waterfowl populations, today NAWMP is urging us to think similarly for the human component of waterfowl and wetland management. Does that create an identity crisis? I don't know, but I cling to the notion that nothing can replace the financial and sheer will of waterfowlers to manage and protect critical habitats, along with the spirituality and connectedness that is forged though harvesting an animal. Yes, many bird watchers are passionate people, who search for birds under less than ideal environmental conditions, and they help protect avian and other wildlife habitats and critical resources. But, the waterfowling 'land ethic,' is fueled through hunting. Waterfowl hunters would cease investing millions to billions of dollars to purchase ammunition, equipment, licenses, stamps, etc., much less be so committed to managing habitat all across North America, to watch and not harvest birds in fall-winter. The chance to legally harvest birds is paramount to conservation. Yes, duck hunter numbers are declining, but I dare say we will never completely vanish, so long as we have biologically sustainable populations of birds to hunt and science to guide habitat

and population management. But at least one of the central questions that we will one day face is, "how critical are hunter dollars to sustaining what we deem contemporarily as rather strong waterfowl populations, barring a few species?" And if we hit some critical threshold of insufficient funding to at least maintain habitats, then what? What non-hunting conservationists will assume this niche?

Relative to the boat ramp ideology, I applaud the NAWMP for emphasizing the need to monitor and evaluate objectives and desired outcomes, one of them being the recruitment and retention of waterfowl hunters. One objective of NAWMP going forward is to understand how the complexity of harvest regulations affects hunter attitudes. For example, one question relates to parsing out those regulations that maximize hunting and harvest opportunities versus those that conserve particular waterfowl species, and how the two might influence hunter behavior. However, I must ask, 'How complicated is that?' We have basically had regulations allowing six ducks per day for a 60-day season, granted with some species restrictions, in the Mississippi Flyway, for example, since the USFWS adopted the concept of adaptive harvest management in 1995. I contend that we have more pressing issues, such as hunters' ability to access land, which influences one's view of hunt quality. I cannot recall the last time I heard someone frustrated with waterfowl hunting acknowledge complex regulations as their angst, notwithstanding some long-term contention over restrictive bag limits, such as with northern pintail. But, frustrations over too many people competing for limited hunting spots, skybusting, hunting parties on top of one another, boats being swamped by some inconsiderate hunter, and other examples reverberate frequently. These frustrations are not new to waterfowling, but they have been the subject of renewed dialogue among waterfowl professionals, particularly the subject of future access to land by hunters. Today's world is more strikingly unique than ever before, in that now we can nearly instantly learn about a recent migration, or know exactly where ducks are swarming into an area that can legally be hunted. Computers, migration maps, cell phones, Facebook, and gobs of other electronic euphoria are chipping away at the sanctity of the waterfowl heritage. Every year, I hear the same echo, "If duck hunters are declining, why are there so many everywhere I want to go?" Hunter recruitment, a NAWMP mission, is certainly a critical metric, but hunter mobility also matters, as it ultimately becomes a people density issue.

Waterfowl hunting quality and one's experience encompass a broad spectrum. No one definition can possibly explain hunt quality. For many of the younger and more novice hunters, shooting six birds may be important, and it doesn't matter if birds were pass shot or decoyed. For other hunters, having ducks pass right over or just to the side of them warrants a shot. For others, if birds don't light right in front of the blind or pit, no one better dare shoot. These are all real examples of how people view quality experiences, and there are many others, of course. I personally lie somewhere between numbers two and three—I would rather hunt three ducks than shoot six. More extreme examples of hunter discontentment with crowds include individuals moving from one state or province that allows rather liberal access to private lands for hunting, to states that limit non-resident hunters. Other hunters have just given up with increased competition for limited spots, on both public and private land. In my mind, these are relevant issues in the world of waterfowling and hunter retention.

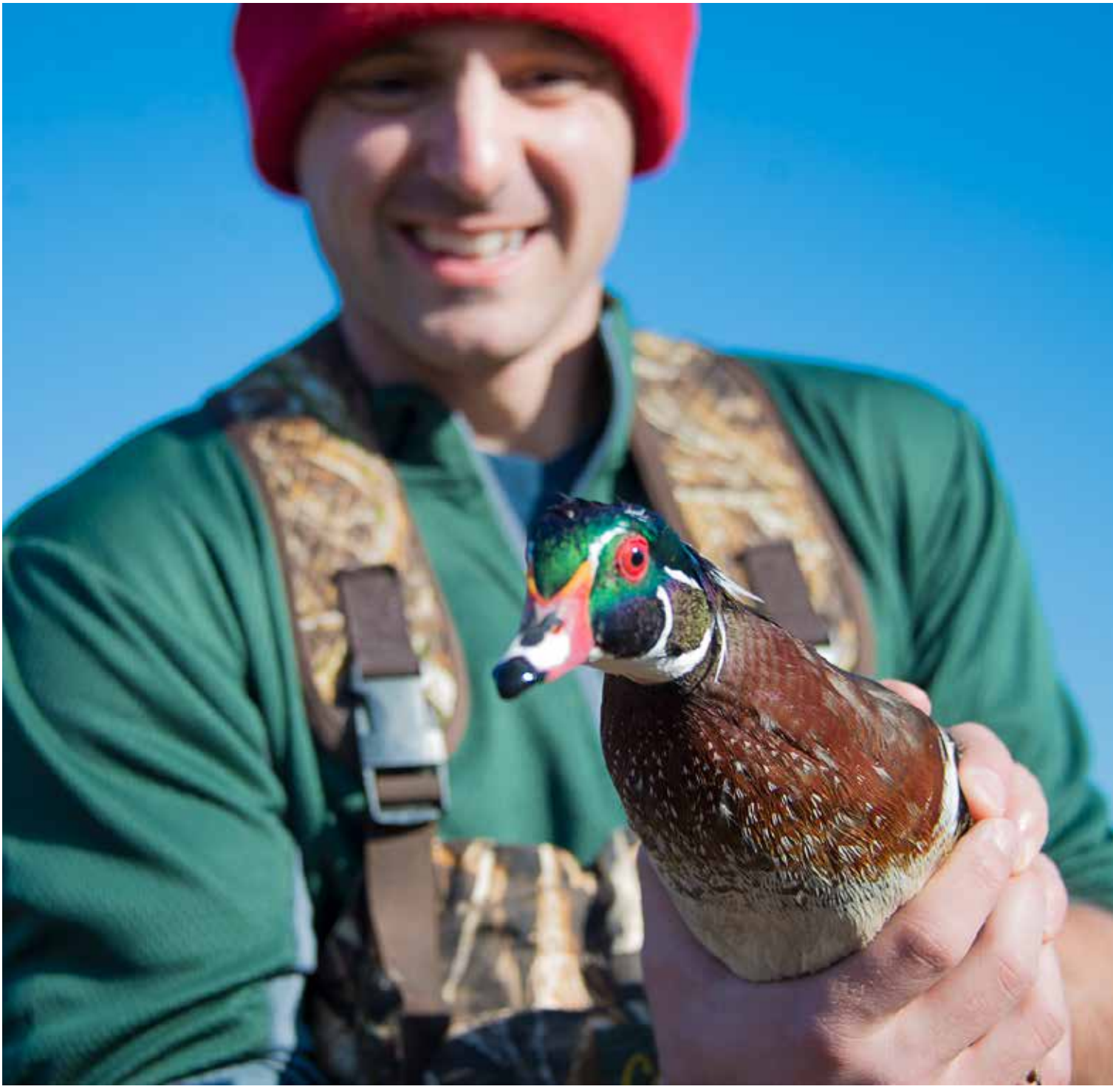
"Computers, migration maps, cell phones, Facebook, and other electronic euphoria are chipping away at the sanctity of the waterfowl heritage."

And now to end—back at the boat ramp. We are fortunate that some agencies in this country have the resources to manage high quality waterfowl habitat. This is much better than the alternative. We should all be grateful for the chance to experience well-managed, high quality wetland habitats on public lands, and as taxpayers, we are fortunate. However, along with quality management sometimes comes easy and non-regulated hunter access and the domino effect: intense competition for hunting spots, which spawns more innovative methods (legal or otherwise) to get to those spots before the next guy beats you, and generally increasing the densities of people, "the commons." People yell at each other in a honey hole, boats get swamped, tickets are written, and ultimately a general souring of experiences result for some people, especially within our older cohort of hunters that ridicule such behavior. And with boat ramps what often follows are increased water depths, and a price to pay in the loss of some fundamental biological diversity, the cliché of, "ankle-deep water," disappearing—as do the green-winged teal. Seemingly the last domino is that: "hunting" ducks is commonly reduced to competitive shooting at birds, birds modify their behavior, such as abandoning an area or becoming nocturnal, which in turn ignites more hunter frustration.

Like many of you, I have watched ducks in many parts of this country for decades. I know full well that ducks move around, daily for example, for reasons we will never fully understand. Beyond the obvious like severe weather and overbank flooding, or moon phases and changes in barometric pressure that redistribute some ducks, many other subtler cues also influence their behavior. Ducks are often here today and gone tomorrow, sometimes unexplainably so. Therefore, I am not wholeheartedly claiming that curtailed diurnal use of public wetlands by ducks during the hunting season is entirely attributed to hunting pressure, but it is relevant. Furthermore, I am not writing here to close all boat ramps on wetland areas, or that every area should manage hunter numbers on a per acre basis. Many agencies do not have the fiscal capacity to intensively manage hunter activity. However, I believe we should think deeply about how habitat quality and access influence our very different cohorts of hunters, and where huntable habitats need to be enhanced or restored. Drive to a boat ramp or parking lot sometime during duck season and check out the license plates, stickers on the windows, and other clues. You can learn a lot. Basically, other people are where you want to be because the hunting is poorer where they came from, there are already too many people, or access is minimal (not mutually exclusive from too many people). As the tragedy of the commons mounts, we risk losing some cohorts of hunters. Compounded with the

subsequent loss of hunting license and stamp sales, economic support of conservation organizations, or one's zeal to fight on behalf of important land policy, such as grassland/wetland conservation programs.

Being an active waterfowl hunter now for over 40 years, it is my view that land (wetland) access and quality hunting experiences will be critical going forward. I view these as internal challenges to the waterfowl community. This is not to mention all the external challenges facing us, such as continuing disconnect to the land and increasing urbanization. I don't have all the answers, but we need to understand and respond to the trade-offs between maximizing hunter access and hunt quality. Perhaps one solution is to manage for quality waterfowl habitat, minus some of the engineering. The fact that a bottom floods unpredictably and is sometimes really tough to get to, is the very thing that makes all of this so enticing—ducks acting like ducks, long before we came along.



Student Abstracts

Part of the professional training of graduate students is their participation in scientific or other technical conferences and venues.

Several students of the Kennedy program presented at conferences in 2017, and the following pages include abstracts or modifications of them.

The complete list of presentations is available under the Presentations section.

Terrel Christie

Predation Risk of Double-Crested Cormorant (*Phalacrocorax Auritus*) on Commercial Catfish Production in the Mississippi Delta.

Christie, T. W., J. B. Davis, B. S. Dorr, K. C. Hanson-Dorr, L. Roy, A. Kelly, C. Engle

Double-crested cormorants (*phalacrocorax auritus*) have historically impacted commercial aquaculture across the United States and are considered the greatest avian predators of catfish at aquaculture facilities. Cormorants are especially problematic where catfish production is concentrated in the 7000 square mile region of western Mississippi (the Delta). The highly visible, densely-fish stocked aquaculture ponds provide ideal wintering and foraging areas for cormorants. Much research has been done but recent changes in aquaculture practices, regulatory policy, and cormorant populations have heightened the need for new research on cormorant and aquaculture facility dynamics. For example, declines in aquaculture acreage from a peak of about 112,700 acres to 34,400 acres in 2016, changes in fish stocking densities, use of hybrid catfish and a reduction in average pond size may affect use and impact by cormorants. To address these concerns, we flew aerial night roost surveys from October-April, 2016-2017, to study cormorant distribution and estimate birds' abundances across the Delta. We also collected 390 cormorants from night roosts to analyze stomach contents and understand foraging ecology. We hope to identify cormorant night roost locations in the Delta that contribute disproportionately to contemporary levels of aquaculture depredation. With this information we will then model predation risks imposed by cormorants and devise means to ameliorate fish losses on aquaculture facilities.

Poster presentation at the
2017 Joint Annual Meeting of the Alabama and Mississippi Chapters of The Wildlife Society,
Meridian, MS,
September 7–8, 2017.

Stephen Clements

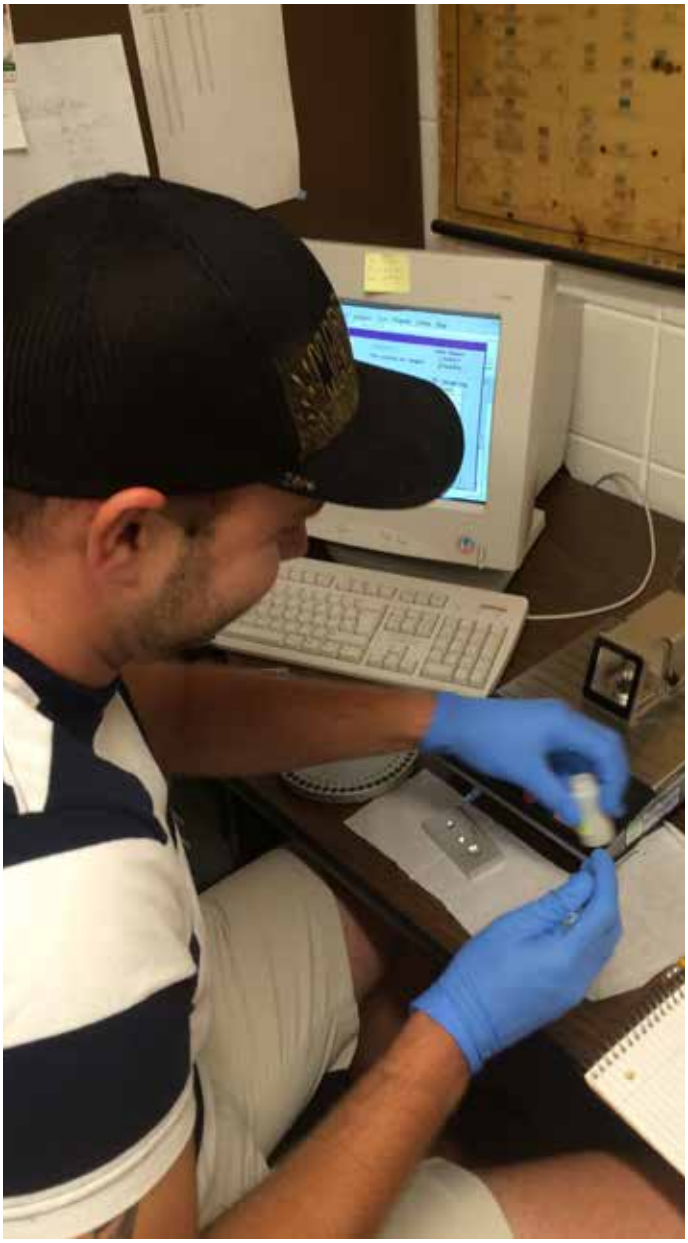
Foraging Habits of Lesser Scaup (*Aythya Affinis*) and Greater Scaup (*Aythya Marila*) on Commercial Baitfish and Sportfish Farms in Eastern Arkansas

Clements, S. A., J. B. Davis, B. S. Dorr, K. C. Hanson-Dorr, L. A. Roy, A. M. Kelly, C. Engle

There are concerns among Arkansas' commercial baitfish and sportfish producers regarding lesser and greater scaup's perceived increase in consumption of fish. Research is needed to estimate scaup abundances and food consumption from commercial ponds, and to estimate associated economic impacts. We surveyed approximately 800 baitfish and sportfish ponds (n = 15 individual farms) in Lonoke and Prairie Counties, Arkansas in winter 2016-2017. The primary species produced on surveyed farms were golden shiners (*Notemigonus crysoleucas*), fathead minnows (*Pimephales promelas*), bluegill (*Lepomis macrochirus*), and goldfish (*Carassius auratus*). In addition to the winter surveys, we collected 294 foraging scaup from ponds. We transported collected scaup to the Mississippi State Field Station necropsy lab and removed and identified all food items in the gastrointestinal tract above the gizzard. Food items were classified as fish, invertebrate, and plant seed categories, all of which were dried and weighed. All gizzards were examined for presence of fish parts, but contents were not included in the overall diet analysis. We detected fish parts in 2 percent of 294 scaup examined. Bird surveys and collections will resume in winter 2017-2018 to better understand temporal variation in scaup abundance, distribution, and food habits on aquaculture facilities. Rigorous economic analyses will follow once all bird survey and diet data are analyzed.

Poster presentation at the
2017 Joint Annual Meeting of the Alabama and Mississippi Chapters of The Wildlife Society,
Meridian, MS,
September 7–8, 2017.

Justyn Foth



Aquatic Invertebrate Community Composition, Diversity, and Biomass from Sweep-Net Samples in Non-Impounded Bottomland Hardwood Forests and Greentree Reservoirs.

Foth, J. R., R. M. Kaminski, J. B. Davis, J. N. Straub, T. D. Leininger

The Mississippi Alluvial Valley once had extensive bottomland hardwood forests, however, less than 25 percent of this area remains forested today. Impounded greentree reservoirs, have been managed for wintering waterfowl since the 1930s, and provide a source of aquatic invertebrates and acorns for foraging ducks and other wildlife. However, few studies of invertebrate community-composition, diversity, and biomass have been conducted at regional scales. We collected samples of aquatic invertebrates from three hardwood bottomlands in the Mississippi Alluvial Valley and one in the Mississippi Interior Flatwoods region during winters 2008–2010. We compared community composition metrics of aquatic invertebrates between naturally flooded forests and greentree reservoirs. Five families occurred more frequently in greentree reservoirs than naturally flooded forests ($P < 0.01$); these were Asellidae, Chironomidae, Cragonyctidae, Daphniidae, and Sphaeriidae. The naturally flooded forests had greater invertebrate familial diversity than their paired greentree reservoirs for most winter months. Across winters, we found 65 percent [early winter] and 82 percent [late winter] invertebrate families associated with sites in naturally flooded forests and greentree reservoirs with depths from 4 to 16 inches. Because greentree reservoirs are typically flooded to greater depths than this range, and flooding of most greentree reservoirs results in relatively stable hydroperiods, we re-emphasize the need for managing hydrology of greentree reservoirs similarly to local naturally flooded forests, which may promote increased invertebrate diversity and biomass.

Oral presentation at the
Southeastern Association of Fish & Wildlife Agencies 71st Annual Conference,
Louisville, Kentucky,
October 30, 2017.

Joe Marty

An Index of Spent Shotshell Pellets in Louisiana and Texas Gulf Coast Prairie Ricelands

Marty, J. R., J. B. Davis, R. M. Kaminski, M. G. Brasher, E. Brinkman

An estimated 2-3 percent of North American waterfowl die annually from lead poisoning despite the long-term ban on lead shotgun shells for waterfowl hunting. The Chenier Plain of Louisiana and Texas and the Texas Mid-Coast are popular hunting areas that winter millions of waterfowl and other birds annually. Production and idled ricelands in the Chenier Plain and Texas Mid-Coast provide high energy foods for waterfowl, such as waste rice, natural seeds, tubers, and aquatic invertebrates. Recent evidence suggests that migrant and resident waterfowl within the regions continue to ingest lead pellets despite strict shotshell regulations. Thus, we randomly collected and radiographed soil cores (four inch diameter and depth) from production and idled ricelands (n = 500 from each type) in the Chenier Plain (n = 760) and Texas Mid-Coast (n = 240, respectively) in November 2013. We washed soil cores through a series of graduated sieves (4.75 mm–300 µm) to recover shot pellets. Across all regions and field types, we detected only one lead pellet and zero nontoxic pellets, despite 100% detection of known numbers of pellets in test samples. The single lead pellet was recovered from a production rice field in the Chenier Plain, yielding an estimated density of 1,019 lead pellets/hectare (95 percent CI: 0–3,034) in this sampling region. Failure to detect lead pellets in other regions and nontoxic pellets across all regions precluded estimation but suggested pellet densities less than 3,000 pellets per hectare. We speculate that regular soil tillage incorporates spent shot into the soil, likely rendering all or most unavailable to our sampling and foraging waterfowl. We recommend that future research estimate densities of spent shotshell pellets in areas where they may be concentrated (e.g., hunting blinds), where dove hunting occurs, and in other heavily hunter waterfowl habitats in the Gulf Coast (e.g., coastal marsh).

Poster Presentation,
Louisiana Association of Professional Biologist Annual Meeting,
Lake Charles, LA,
August 10–11, 2017.

New Members *of* Team Duck

Jessica Klassen

Jessica joined "Team Duck" in July 2017 as a postdoctoral research associate. She will be working on the project entitled, long-term influences of winter abundance and distribution of mallards and other ducks in the Mississippi Delta. This project revisits annual aerial survey data collected each winter by the Mississippi Department of Wildlife, Fisheries and Parks. The research began in 2002 and resulted in a 2007 dissertation by Aaron Pearson. The surveys have expanded to include Missouri and Arkansas, neighboring states in the Mississippi Alluvial Valley. Klassen is developing a water/flooding prediction model for most of the Mississippi Alluvial Valley. The second phase of her work will be the analysis of the distribution and abundance of mallards and other ducks in Mississippi and in neighboring states where aerial survey data are available. We anticipate approximately 15 years of survey data will be analyzed.

Sharilyn Taylor

Sharilyn is a master's student working on a project entitled, pollinator species abundance and richness in wetlands and associated resources of the Mississippi Delta. During spring-fall 2017, Taylor collected native bees from seasonal wetlands and associated habitat in the Mississippi Delta. She randomly selected 18 properties, including four National Wildlife Refuges, and from 13 Mississippi counties that contained seasonal wetlands and associated habitats such as Conservation Reserve Program buffers. Diverse communities of insects are invaluable for pollination of agricultural crops and flowering plants, but knowledge of pollinator services in wetland and associated non-agricultural habitats of the southeastern United States is basically unknown. Taylor, along with technicians, Corey Yarber and Colt Mooney, collected thousands of native bees and other bycatch from malaise, vane, and elevated bee bowl traps sampled weekly or bi-weekly. As of January 2018, the team had processed and identified 8,000 specimens, and there may be as many as 30,000 total specimens to be examined. Taylor's work will be instrumental in creating basic understanding of relations between pollinators and wetland management habitats.

Jessica Klassen checking a nest.

Undergraduate Student Experiences

Seasonal jobs, internships, volunteer positions, or other interactive activities between students and mentors or employers are vital to student growth and success.

The Kennedy Chair actively promotes professional experience for undergraduate students. The following undergraduate students had opportunities to assist with waterfowl, waterbird, and wetland related projects in 2017.








Taylor Gibson studying breeding ducks in the Prairie Pothole Region of North Dakota.

Jessi Critcher

▪ Waterfowl/wetlands biotechnician on the 7,654 acre Marais des Cygnes Wildlife Area, Kansas Parks and Wildlife, summer 2017.

Taylor Gibson

▪ Biotechnician, Noxubee National Wildlife Refuge. Gibson hired as an undergraduate Kennedy Scholar, to assist undergraduate student Ryan Mann in monitoring wood duck nest boxes, banding nesting females, webtagged ducklings, and capturing and banding wood ducks using rocket nets.
▪ Ducks Unlimited, Inc., Northern Great Plains (North Dakota); study on breeding ducks in the Prairie Pothole Region of North Dakota.

Ryan Mann

▪ Hired as an undergraduate Kennedy Scholar to assist undergraduate student Taylor Gibson in monitoring wood duck nest boxes, banding nesting females, webtagged ducklings, and capturing and banding wood ducks using rocket nets.

Ali Marchant

▪ USDA biotechnician for the scaup and cormorant research projects, assisting master's students Terrel Christie and Stephen Clements in the field and laboratory.

Colt Mooney

▪ Wetlands biotechnician, assisting master's student Sharilyn Taylor with field and laboratory work on monitoring native bees and other pollinators in wetlands and associated habitats of the Mississippi Delta.

Laurel Riebock

▪ USDA biotechnician for the scaup and cormorant research projects, assisting master's students Terrel Christie and Stephen Clements in the field and laboratory.

Haden Roberson

▪ Wildlife biotechnician for Mr. James C. Kennedy on his Trailsend Ranch, Ruby River, near Twin Bridges, Montana.

Wes Thompson

▪ Wildlife biotechnician for Robbie Russell property, a private landholding in western (Bells) Tennessee. Worked alongside forestry student, Tyler Turner.

Tyler Turner

▪ Wildlife biotechnician for Robbie Russell property, a private landholding in western (Bells) Tennessee. Worked alongside wildlife, fisheries and aquaculture student, Wes Thompson.

Corey Yarber

▪ Wetlands biotechnician, assisting master's student Sharilyn Taylor with field and laboratory work on monitoring native bees and other pollinators in wetlands and other conservation lands of the Mississippi Delta.

Field Trips

Waterfowl Ecology & Management, Fall 2017

Coastal Louisiana – Rockefeller Wildlife Refuge,
Cameron Prairie NWR, and the rice country (October 26-29, 2017) –

An airboat ride can do wonders for one's mood! About 16 undergraduate and graduate students of the Waterfowl Ecology and Management class got to experience wetlands and rice fields of coastal Louisiana in fall 2017. We ventured to the historic Chenier Plain of southwest Louisiana, where this trip has become a bit of a tradition. Our first stop was at the National Wetlands Research Center, Lafayette, LA to meet Mike Brasher, science coordinator for the Gulf Coast Joint Venture. As always, Brasher superbly over viewed several Gulf coastal ecosystems and habitats, and discussed science and management priorities for waterfowl and wetlands in this critical region. The Wetlands center and work being conducted there is beyond impressive, and students toured and observed firsthand the vault of ongoing research and monitoring on the ecological and sociological complexities of Gulf coastal habitats.

We were privileged to stay at Louisiana Department of Wildlife and Fisheries Rockefeller Refuge, Grand Chenier, LA. Rockefeller has a legendary history of wildlife professionals, students, and public visitors to this 76,000-acre mecca that borders the Gulf. Our primary host there for the weekend was Joe Marty, a recent MSU doctoral graduate and current biological supervisor at Rockefeller.

Friday began with early morning bird-watching followed by a trip into Cajun rice and crawfish country. At a turnabout at the intersection of two backcountry Louisiana highways, rice and crawfish producer Kevin Berken explained the intricacies of the rice and crawfish culture of south Louisiana. Berken invited a few students to join him in his rice harvester but unfortunately rain soaked that plan. After a great session with Berken, we ventured back to Cameron Prairie National Wildlife Refuge. Glenn Harris, USFWS deputy project leader, overviewed the history and importance of refuge lands and other wetlands of the Chenier and how together they help form a larger regional wetland complex critical to multiple species, including millions of birds.

Information came rapid fire to the students during the first day-and-a-half. Saturday will certainly live on in the students' minds, as most of the day was spent in boats. We divided students into two groups with each either riding in airboats or venturing out into the Gulf in Lousiana Department of Wildlife and Fisheries' patrol-style charter. Joe Marty and Gabe Griffin, public information officer, piloted the boats. The boat trips were beyond thrilling – we seemingly crisscrossed miles of Rockefeller wetlands, flushing teal and other waterbirds in every direction, then later that day zipped down wetland canals leading to the Gulf. There, we experienced porpoises, pelicans, and had an opportunity to learn about restoration breaker walls and the local beaches and their importance to wildlife and marsh sustainability. Saturday was amazing. And to top it off, some students capitalized on the challenge of catching blue crabs, which resulted in them landing over 85 crabs.

Sunday dawn came in a flash. We briefly watched birds, cleaned the dorm, packed, and took the traditional group photo, then headed back to campus. The thrill of the trip was all over the students' faces, as it was mine. There is an enduring legacy in these trips, all initiated by Rick Kaminski nearly three decades ago. As a graduate student of Rick's, I and others including Mike Brasher got to experience south Louisiana as graduate students; and Joe Marty accompanied me while he was still an MSU graduate student. Our professional web in south Louisiana remains vibrant with Brasher and Marty helping steward these treasured resources. I am indebted to them, Gabe, and the other wildlife professionals in that area for their engagement with our students. Like previous trips, students undoubtedly saw things they may never see again, such as pieces of Rockefeller's beach disappearing with sea level rise. This was an unforgettable trip.

York Woods Field Trip – November 16 2017

In the second of two primary fall field trips, the waterfowl class visited York Woods, which turned out to be a warm November day. York Woods, owned by James Kennedy, is an incredible habitat mosaic of over 9,000 acres of prime herbaceous wetland, bottomlands and sloughs, and agricultural fields all intensively managed for waterfowl and other wildlife. York Woods is a premiere example of dedicated and high quality waterfowl/wildlife management.

Once again, boats were a significant part of our field trip theme, this time at York Woods. We eased into flooded cypress brakes in jonboats with mud motors. We boated to the historic domicile of York, which still stands firm on its stilts back in the swamp. We discussed the values of brakes as waterfowl habitats and how they complement management of more seasonal habitats. One important topic of waterfowl management is the concept of duck-energy-days, which has been researched for decades in the Mississippi Alluvial Valley. Students learn about food and other values of habitats in the classroom, but walking amid grassy corn fields at York Woods, for example, confirmed that pictures speak a thousand words. York Woods is a premiere outdoor learning environment where students experience firsthand a diversity of important habitats, such as historic cypress brakes, or intensively managed fields of grassy corn.

Cody Pugh and Andy Wright, Mississippi State alumni, are full time wildlife biologists at York Woods, and hosted our trip. We are appreciative to them and Rance Moring, general manager at York Woods, for their relentless pursuit of habitat perfection and unwavering support and education of our students. We can't thank them and other York Woods staff enough for their overall dedication

Service

One of the unique aspects of the land-grant university is service, part of the tripart mission, along with teaching and research. In this role, Kennedy faculty and students help landowners improve their resources for waterfowl and other wildlife.

In 2017, the Kennedy team worked with the following individuals to improve habitat:

John Wilson
Urich, MO,
Developed a corn and moist-soil wetland complex.

Bill Fondren & Lee Shaw
Crowder, MS,
In collaboration with Kevin Nelms, Natural Resources Conservation Service, on habitat enhancements.

Jamie Anderson & family
Anderson Farms, Lonoke, AR,
on habitat enhancements.

Scott Galloway
Galloway Farms, Stuttgart, AR
Undergraduate student team developed restoration plans for the property.

Chris Daniel
Missouri Department of Conservation,
Habitat management recommendations.

Guests *of* Team Duck

Students of Wetlands Ecology & Management, WFS 340

Department of Forestry, Wildlife and Fisheries
University of Tennessee-Knoxville

Matt Gray, professor, and Chris Graves, lecturer, from the University of Tennessee-Knoxville co-instruct a course each fall on the basic principles of wetland ecology and management via class lectures, labs, and field experiences. Each autumn, the wetlands class visits east-central Mississippi, residing for a week at the Sam D. Hamilton Noxubee National Wildlife Refuge. Students experience a variety of field and laboratory activities in that span, including visiting MSU campus to hear wetland-waterfowl presentations and going afield in the refuge's wetlands to learn about seasonal water and vegetation management, estimation of food available to waterfowl, and other biological aspects of wetlands and waterbirds. Davis annually helps co-teach the waterfowl and wetlands program activities. Approximately 40 undergraduate students from the University of Tennessee participated in fall 2017.

Jacob Gross, wildlife refuge specialist, serves as a co-teaching assistant. Gross is an innovative wetland manager who works constantly to improve overall functions and values of Noxubee wetlands.

Awards, Presentations & Publications

Awards-Accolades

J. BRIAN DAVIS | Received the James C. Kennedy associate professor of Waterfowl and Wetland Conservation in fall, 2017

J. BRIAN DAVIS | Nominated for annual CFR Faculty Research Award in 2017

DR. JOSEPH MARTY | Completion of doctoral degree in Forest Resources with a concentration in wildlife, fisheries and aquaculture

DR. JOSEPH LANCASTER | Successfully completion of doctoral dissertation defense, November 21, 2017

Presentations

Scientific or Professional Papers/Presentations.

CLEMENTS, S. A., J. B. DAVIS, B. S. DORR, L. ROY, A. KELLY, C. ENGEL. 2017. | Foraging ecology and the resulting economic impact of lesser and greater scaup on commercial baitfish and sportfish farms in Arkansas. Arkansas Bait and Ornamental Fish Growers Association Annual Meeting (ABOFGA). Lonoke, AR. February 9, 2017.

DAVIS, J. B. 2017. | Evaluations of NRCS's Migratory Bird Habitat Initiative (MBHI). Gulf of Mexico Oil Spill & Ecosystem conference. New Orleans, LA. February 7, 2017.

DAVIS, J. B. 2017. | The state of the waterfowl program at Mississippi State University. Mississippi Department of Wildlife, Fisheries, and Parks Director and Commission and Waterfowl Summit Team. Jackson, MS. June 6, 2017.

DAVIS, J. B. 2017. | Waterfowl management. Mississippi River Landowner's Alliance Member meeting, Vicksburg, MS. March 2, 2017.

FOTH, J. R., R. M. KAMINSKI, J. B. DAVIS, J. N. STRAUB, T. D. LEININGER. 2017. | Aquatic invertebrate community composition, diversity, and biomass from sweep-net samples in non-impounded bottomland hardwood forests and greentree reservoirs. Southeastern Association of Fish and Wildlife Agencies annual conference. KY. October 2017.

KLASSEN, J., J. B. DAVIS. 2017. | Long-term influences of winter abundance and distribution of mallards and other ducks in the Mississippi Delta. Strategic Action Plan for Waterfowl Management in the Southeast Region 2017 Team Meeting. Paris, TN. September 18-20, 2017

Guest lectures

DAVIS, J. B. 2017. | NREC 4423, Environmental Assessments. Topic: Wetland ecology and NEPA regulations. February 28, 2017.

DAVIS, J. B. 2017. | WFA 4223, Wildlife Plant ID. Topic: Management of seasonal wetlands in the Mississippi Alluvial Valley. November 6, 2017.

TAYLOR, S. 2017. | WFA, Ecology and Management of Human-Wildlife Conflicts. Topic: species diversity of native bees in the wetlands of the Mississippi Alluvial Valley. Fall 2017.

TAYLOR, S. 2017. | WFA, Wildlife and Fisheries Communication. Topic: species diversity of native bees in the wetlands of the Mississippi Alluvial Valley. Spring 2017.

Panels

DAVIS, J. B. 2017. | Invited guest to serve on a Caucus to advance endowed university waterfowl and wetlands programs in North America. Colorado State University, Fort Collins, CO. September 15-16, 2017.

DAVIS, J. B. 2017. | Invited guest to serve on a panel at the North American Waterfowl Management Plan Future of Waterfowl 2 Workshop. National Conservation Training Center (NCTC) of the US Fish and Wildlife Service. Shepherdstown, WV. September 25-28, 2017.

Poster Presentations

CHRISTIE, T., J. B. DAVIS, B. S. DORR, AND K. C. HANSON-DORR. 2017. | Predation risk of double-crested cormorants (Phalaccrocorax auritas) on commercial catfish production in the Mississippi Delta. 2017 Joint annual Meeting of the Alabama and Mississippi Chapters of The Wildlife Society. Meridian, MS. September 7-8, 2017.

MARTY, J. R., J. B. DAVIS, R. M. KAMINSKI, M. G. BRASHER, E. BRINKMAN. 2017. | An index of spent shotshell pellets in Louisiana and Texas Gulf Coast Prairie Ricelands. Louisiana Association of Professional Biologist Annual Meeting. Lake Charles, LA. August 10-11, 2017.

STEPHENS, S. A., J. B. DAVIS, B. S. DORR, K. C. HANSON-DORR, L.A. ROY, A.M. KELLY, C. ENGEL. 2017. | Foraging habits of lesser scaup (Aythya affinis) and greater scaup (Aythya marila) on commercial baitfish and sportfish farms in eastern Arkansas. 2017 Joint annual Meeting of the Alabama and Mississippi Chapters of The Wildlife Society. Meridian, MS. September 7-8, 2017.

Publications

Referred

DAVIS, J. B., F. J. VILELLA, J. D. LANCASTER, M. LÓPEZ-FLORES, R. M. KAMINSKI, J. A. CRUZ-BURGOS. 2017. | Survival of white-cheeked pintail ducklings and broods in Puerto Rico. Condor 119:308-320.

FOTH, J. R., R. M. KAMINSKI, J. B. DAVIS, J. N. STRAUB, T. D. LEININGER. | In press. Aquatic invertebrate community composition, diversity, and biomass from sweep-net samples in non-impounded bottomland hardwood forests and greentree reservoirs. SEAFWA, 2017.

MARTY, J. R., J. B. DAVIS, R. M. KAMINSKI, M. G. BRASHER, AND E. L. BRINKMAN. 2017. | Density of lead and non-toxic shotshell pellets in Gulf Coast prairie ricelands. Journal of Fish and Wildlife Management.

OSBORN, J.M., H.M. HAGY, M.D. MCCLANAHAN, J. B. DAVIS, M.J. GRAY. 2017. | Diurnal habitat selection and activities of non-breeding dabbling ducks. Journal of Wildlife Management 81:1482-1493.

TAPP, J. L., M. W. WEEGMAN, E. B. WEBB, R. M. KAMINSKI, J. B. DAVIS. 2017. | Waterbird communities and seed biomass in managed and non-managed restored wetlands in the Mississippi Alluvial Valley. Restoration Ecology.

Popular Articles

CLEMENTS, S. A., B. DAVIS, B. DORR, K. C. HANSON-DORR, L. A. ROY, A. M. KELLY, C. R. ENGLE. 2017. | Collaborative research on foraging habits and the economic impact of scaup on commercial baitfish and sportfish farms in Arkansas. The Wildlife Society Southeastern Section 59(3):13.

DAVIS, J. BRIAN. 2017. | Waterfowl oddities: A closer look at North America's most unusual waterfowl. Ducks Unlimited magazine, November/December issue.

U. S. FISH AND WILDLIFE SERVICE. 2017. | Natural wetland vegetation buzzing with bees. National Wildlife Refuge System Southeast Region Inventory & Monitoring Branch Fall 2017 newsletter.

Finances

Waterfowl & Wetland Expenditures				
July 1, 2015 - June 30, 2016				
	Kennedy Funds	Mississippi State University	Contracts & Grants	Totals
Kennedy Coordinator	3,099	99,169		102,268
Research Coordinator	3,772		70,623	74,395
Administrative Support		20,000		20,000
Contractual & Commodities	21,461		12,550	34,011
Travel			7,586	7,586
Grand Total	28,332	119,169	90,759	238,260

Sponsors

Duck Unlimited, Inc.
Karl Karrow, Kansas Wildlife, Parks and Tourism
MSU Forest and Wildlife Research Center
US Fish and Wildlife Service
US Department of the Interior

Robbie Russell (private landowner)
Jim Kennedy-York Woods

Mr. Jim Kennedy with a representative of the universities he has supported through his philanthropy and establishment of these Waterfowl/Wetlands Conservation Program Chairs in the United States, and for his continuous passion for intensive management of premier waterfowl/wetlands habitats.

Who Will Mind The Marsh?

ENDOWED UNIVERSITY WATERFOWL & WETLANDS PROGRAMS: EDUCTATING FUTURE GENERATIONS OF WATERFOWL AND WETLAND PROFESSIONALS

Kaminski, R. M., Director, James C. Kennedy Waterfowl and Wetlands Conservation Center, Clemson University, Georgetown, South Carolina 29442

Koons, D. N., James C. Kennedy Endowed Chair of Wetland and Waterfowl Conservation, Colorado State University, Fort Collins, Colorado 80523

Moorman, T. E., Chief Scientist, Ducks Unlimited, Inc., 1 Waterfowl Drive, Memphis, TN, 38120

Eadie, J. M., Dennis G. Raveling Endowed Chair in Waterfowl Biology, Department of Wildlife, Fish & Conservation Biology, University of California, Davis California 95616

Conway, W. C., Bricker Endowed Chair in Wildlife Management, Department of Natural Resources Management, Texas Tech University, Lubbock, Texas 79409

Davis, J.B., James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation, Box 9690, Mississippi State University, USA 39762

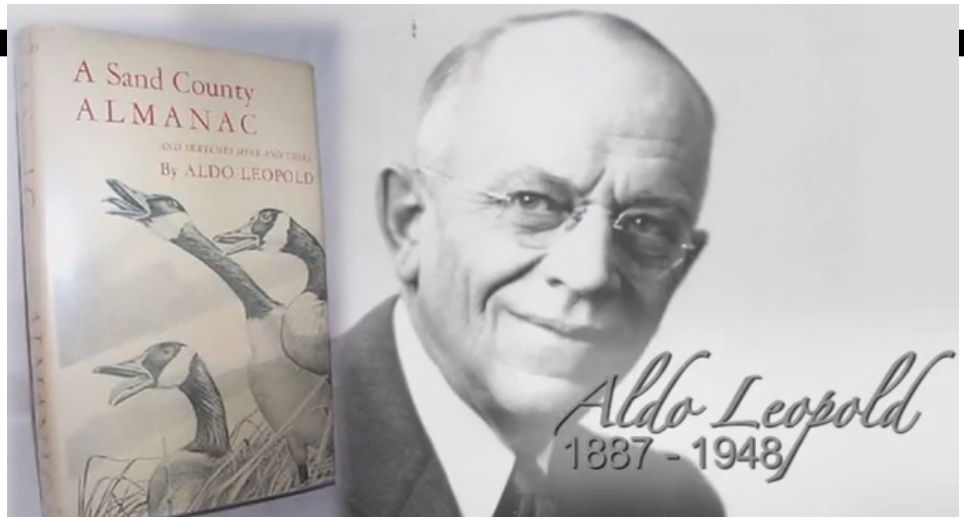
Guyn, K. L., Chief Executive Officer, Ducks Unlimited Canada. Oak Hammock Marsh, Manitoba. R0C 2Z0

Howerter, D., Director, National Conservation Operations, Ducks Unlimited Canada. Oak Hammock Marsh, Manitoba. R0C 2Z0

Petrie, S.A., Chief Executive Officer, Delta Waterfowl Foundation, 1312 Basin Avenue, Bismarck, North Dakota 58504

Ballard, B. M., C. Berdon and Rolanette Lawrence Endowed Chair in Waterfowl Research, Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Texas 78363

Straub, J. N., James C. Kennedy Chair of Waterfowl and Wetlands Conservation, College of Natural Resources, University of Wisconsin-Stevens Point, Wisconsin 54481



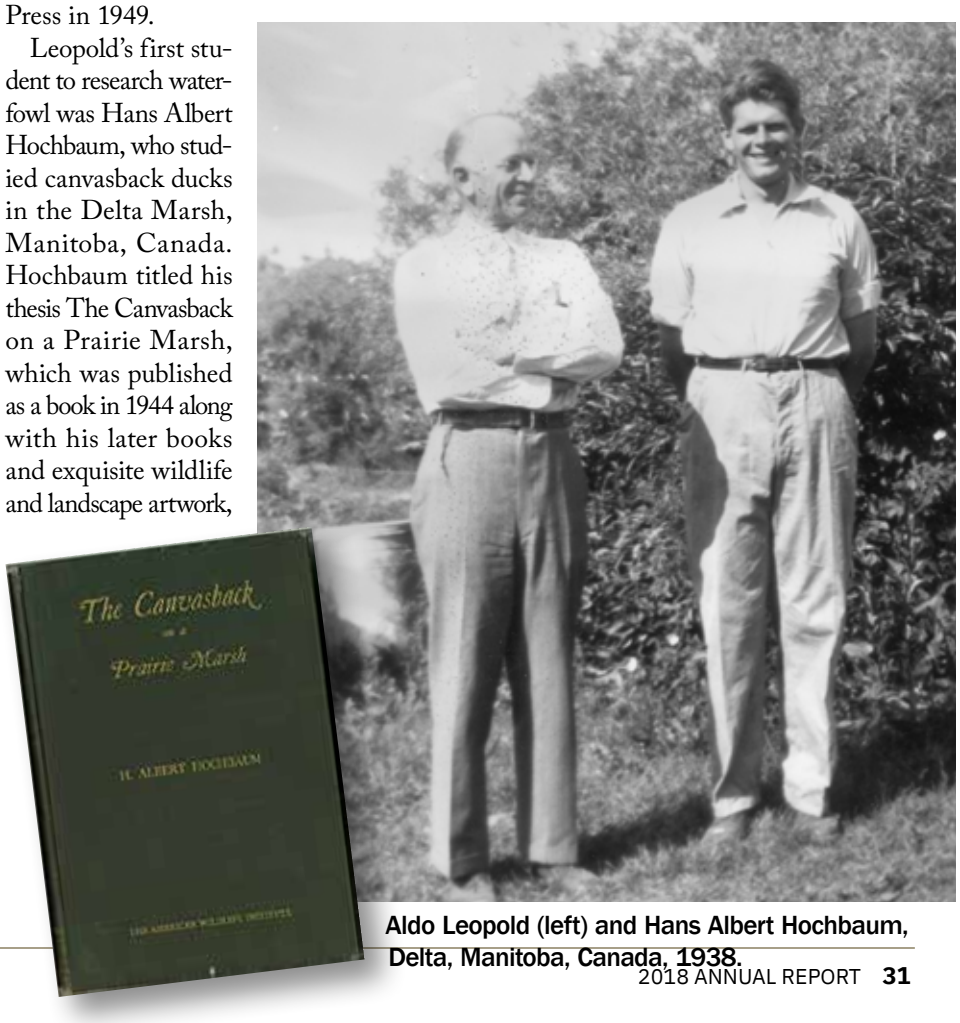
History and Goals

Waterfowl are ecologically, environmentally, economically, and societally important worldwide. The genesis of waterfowl conservation in North America coincided with enactment of the Migratory Bird Treaty Act in 1918, which halted market hunting of waterfowl for restaurants, millinery industries, and fostered resurgence of declining continental waterfowl populations and individual species, such as the wood duck. The "Dirty Thirties" soon followed with widespread drought across the Great Plains, further stoking conservation initiatives that benefited waterfowl and people during the simultaneous "Great Depression." For example, in 1933, President Franklin D. Roosevelt (FDR) established the Civilian Conservation Corps, a federally funded initiative that employed thousands and generated environmental benefits, such as building National Forests and Wildlife Refuges, state wildlife areas and parks, and implementing practices to restore eroded soils, grasslands, and wetlands. Additionally, FDR commissioned Jay Norwood "Ding" Darling in 1934 to create the first Migratory Bird Hunting Stamp ("duck stamp") and become the first Chief of the new Bureau of the Biological Survey—the predecessor of the U.S. Fish and Wildlife Service.

As wildlife conservation advanced during the 1930s, with initiatives by the Bureau, the states, Canadian provinces, and creation of Ducks Unlimited, Inc. in 1937 and Ducks Unlimited-Canada and the Delta Waterfowl Research Station in 1938, visionaries recognized the need for university education and research in forestry, wildlife, and other natural resources. Land-grant universities, which arose from the Morrill Acts of 1862 and 1890, set the stage for these niches in academia. The first university department of wildlife ecology and management worldwide was at the University of Wisconsin-Madison (UW) in 1933, which coincided with creation of the UW Chair in Game Management for Professor Aldo Leopold, who is regarded as the Father of Wildlife Management. Leopold mentored many students and professionals until his passing in 1948, merely one week after receiving notice his classic book, A Sand County Almanac, would be published by Oxford University Press in 1949.

Leopold's first student to research waterfowl was Hans Albert Hochbaum, who studied canvasback ducks in the Delta Marsh, Manitoba, Canada. Hochbaum titled his thesis The Canvasback on a Prairie Marsh, which was published as a book in 1944 along with his later books and exquisite wildlife and landscape artwork, To Ride the Wind and Travel and Traditions of Waterfowl.

Hochbaum also was the first Scientific Director of the Delta Waterfowl Research Station in 1938 until his retirement in 1970. Other renowned waterfowl ecologists to follow Leopold as faculty members at UW were Drs. Joseph Hickey, Robert McCabe, and Donald Rusch. Dr. Rusch, a foremost authority on ruffed grouse and waterfowl, passed away while grouse hunting in 1999 and was not succeeded by a waterfowl specialist at UW. The decision not to



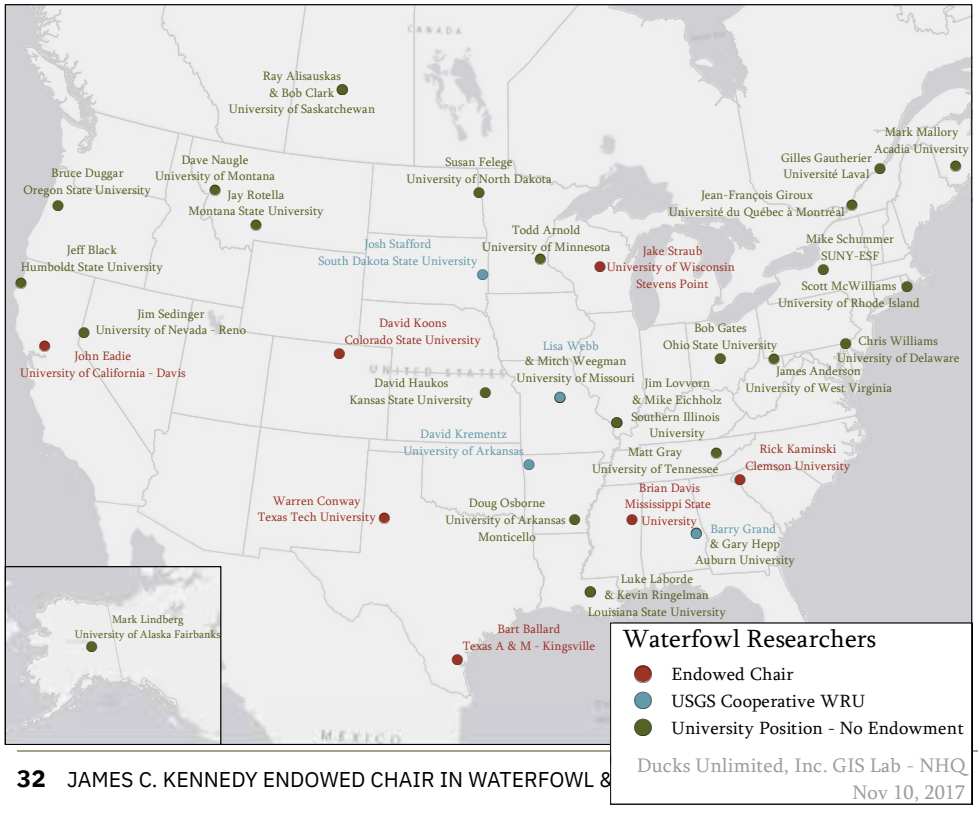
Aldo Leopold (left) and Hans Albert Hochbaum, Delta, Manitoba, Canada, 1938.

refill the position with a person possessing a similar skill set has been repeated at U.S. and Canadian universities, where there has been a 44% decline in professorships with expertise in waterfowl or wetlands. Additional positions are at risk currently given that nearly half of existing waterfowl professors may retire in less than ten years (Kaminski 2002, 2013; Wildlife Society Bulletin and The Wildlife Professional, respectively).

What can preserve these critical university programs that produce the next generations of waterfowl and wetlands scientists and stewards? One solution is to endow existing programs and establish others to secure them in perpetuity. The first such endowments were the Dennis G. Raveling Endowed Waterfowl Professorship and Chair at the University of California Davis (1995-present, Dr. John Eadie) and the James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation at Mississippi State University (2008-2015, Dr. Rick Kaminski; 2015-present, Dr. J. Brian Davis). The next endowments both were in Texas, the C. Berdon and Rolanette Lawrence Endowed Chair in Waterfowl Research at the Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville (2012-present, Dr. Bart Ballard) and the Bricker Endowed Chair in Wildlife Management (including waterfowl, 2014-present; Dr. Warren Conway). The first endowed program in the Atlantic Flyway was the James C. Kennedy Waterfowl and Wetlands Conservation Center at Clemson University (2015-present, Dr. Rick Kaminski). University teaching, research, and outreach in waterfowl and wetlands have returned to Wisconsin with establishment of the James C. Kennedy-David F. Grohne Chair in Waterfowl and Wetlands Conservation at UW-Stevens Point in 2016 (chair holder, Dr. Jacob Straub). And most recently, the James C. Kennedy Endowed Chair in Wetlands and Waterfowl Conservation was established at Colorado State University (2017-present, Dr. David Koons),

Indeed, we are deeply grateful to these philanthropic conservationists who "breathed perpetual life" into these programs. Nonetheless, an urgent need exists to expand efforts for additional endowments to prevent further loss of university programs critical for the future of waterfowl and wetlands conservation in North America. Prominent challenges that require leadership at universities and in conservation include continued efforts to address habitat loss and uncertainties of the quality of remaining habitats amid climate and human dynamics. As habitats wane, so might human interest and understanding in waterfowl and wetland conservation. Some of this interest is attributed to a shift away from "hands-on" and experiential learning that students once cherished and universities nurtured. Today, most students are from urban backgrounds, where opportunity, interest, and passion for the outdoors may not have been fostered compared to those with rural roots. The authors of this plan still revere these values and believe endowments will help revive and perpetuate them. Only seven endowments for waterfowl programs exist in the United States and none exists in Canada or Mexico (see map). Hence, many gaps exist continentally. Clearly, we must strive to establish additional endowments in other important habitat regions across North America to assure people with the proper education will populate future positions in waterfowl and wetlands science and conservation.

For decades, university-based waterfowl



and wetlands programs have been dominant features in higher education in wildlife management and natural resources and served an important niche in education and conducting research and outreach for public and private-sector partners in waterfowl and wetland conservation. Who will "mind the marsh" in this century and subsequently if these academic niches languish and are not re-filled? To paraphrase Aldo Leopold, "To keep every cog and wheel is the first precaution of intelligent tinkering." We believe university waterfowl and wetlands programs and their people are critical "cogs and wheels" to "mind the marsh" in perpetuity. Obviously, conservation doesn't happen without people!

The authors of this document are professionals affiliated with the seven existing endowed university waterfowl and wetlands programs, Delta Waterfowl Foundation, Ducks Unlimited Inc., and Ducks Unlimited-Canada. Because of the dire need to expand endowed university-based waterfowl and wetlands programs, we convened a caucus at Colorado State University on 16 September 2017 to develop this vision and business plan. One of our focal tasks was to identify a priority group of universities in key regions of North America with history and capacities for teaching, research, and outreach in waterfowl and wetlands ecology and management. Herein, we identify these universities, justify their selection as priority candidates for endowment in the next five years and thereafter, and seek to establish an advisory council of philanthropic conservationists who would assist us in finding donors for needed endowments. This plan is ambitious but we believe it is essential for the future of waterfowl, wetlands, and people that benefit from the eco-services of these resources and continued success of the North American Waterfowl Management Plan—the greatest ecosystems conservation plan worldwide.

Priority Endowments

At the Colorado State University caucus, we discussed in detail criteria for prioritizing future endowed chairs or centers at North American universities. Foremost among our identified criteria were geography, including the geographic importance of a region for sustaining continental waterfowl populations, and urgency of preserving academic programs in these regions to train future professionals. Importantly, we are in desperate need of university waterfowl and wetland programs in Canada where Ducks Unlimited-Canada, the provinces, and Environment and Climate Change Canada are experiencing great difficulty in recruiting employees with relevant waterfowl and wetlands education and experience to manage habitats for breeding waterfowl and at major migratory stopover areas. These disciplines are no longer taught at most Canadian universities, and where they are instructed, the experts providing the training will retire soon. In addition to the importance of geography, we also identified other significant criteria important to consider when prioritizing universities that can foster successful waterfowl and wetlands programs:

- Institutional capacity to deliver training in wetlands ecology and management from recognized specialists (if not an expertise of the endowed chair)
- Institutional capacity to deliver training in human dimensions and natural resource policy from recognized specialists (if not an expertise of the endowed chair)

- Institutional capacity for outreach and extension to public and private sector partners
- Institutional capacity to deliver training in basic biology and other essential courses (e.g., ecology, ornithology, populations, communities, statistics, etc.)
- Programs providing training in applied wildlife / natural resource management that qualifies graduates for federal, state, or NGO positions (a minimum of an M.S. degree is now common)
- Program offers B.S., M.S., and Ph.D. degrees
- Existence of strong donor / alumni connections
- Existence of financial development professionals who can help describe and establish donation options, and provide stewardship to donors and partners
- Willingness to network in teaching, research, and outreach with other endowed programs and colleagues to provide cross-region experiences for faculty and students

We evaluated North American universities based on the criteria listed above, to the best of our knowledge. Each individual present at the caucus voted for five universities to be considered a priority for establishing future endowed chairs/programs in waterfowl and wetland conservation. Here, we place universities receving two or more total votes in tier 1, and those receiving one vote in tier 2. We encourage consideration of endowment at tier 1 universities in the next five years (by 2022) but do not discourage any university having the above attributes and fiscal resources from proceeding with plans for an endowment. Additionally, sociopolitical and funding differences between Canada and United States warrant university programs in both countries to provide research and education needs in the geographic regions that are most important for sustaining waterfowl.

TIER 1 UNIVERSITIES, CANADA: Based on the critical importance of the Prairie Pothole Region for breeding waterfowl in North America, its risks from agriculture and energy developments, and the criteria listed above, we agreed that the University of Saskatchewan (Saskatoon) is the priority in Canada for establishing an endowed chair within the next five years. Leading experts at this institution are soon to retire and are federal employees, with no guarantee that Environment and Climate Change Canada will succeed these faculty with waterfowl experts. Additionally, these faculty have demonstrated through their research that the university is also well-positioned to study breeding waterfowl in the boreal forest of Canada and the Arctic. Another tier 1 institution in western Canada is the University of Alberta (Edmonton). Given its importance for fall and spring staging during waterfowl migration, an endowed chair in the Great Lakes Region would be the next priority in Canada. Although several universities could be targeted, we believe the University of Guelph, with its existing wildlife and natural resources curricula, best meets the necessary criteria in the Great Lakes Region. The University of Western Ontario and the University of Waterloo (Ontario) also are possibilities.

TIER 1 UNIVERSITIES, UNITED STATES: In the Prairie Pothole Region, we agreed South Dakota State University best meets the necessary criteria, with the University of Minnesota and the University of Montana being other tier 1 possibilities. In the Great Lakes Region, the State University of New York College of Environmental Science and Forestry is the best choice. We also agreed the University of Alaska (Fairbanks) should be a high priority for establishing an endowed chair because of its strong wildlife program, history of top-tier waterfowl research, and its ideal position to address research, education, and outreach needs in the Arctic and boreal forest regions, which contribute greatly to goose and duck populations in the Pacific Flyway. The importance of the

Gulf Coast region for wintering waterfowl is unparralled, and although there are strong waterfowl and wetland programs in Texas, Mississippi, and Louisiana, the historically strong program at Louisiana State University is not currently endowed and its persistence cannot be guaranteed. Notably, LSU recently executed an agreement with Ducks Unlimited de Mexico (DUMAC) to help with DUMAC's research needs.

TIER 2 INSTITUTIONS: Given its relevance to the history of waterfowling and continued importance for both migrating and wintering waterfowl, the Chesapeake Bay region greatly needs an endowed waterfowl and wetland chair. The University of Delaware has a strong existing waterfowl and gamebird teaching, research, and outreach program and would serve as an excellent choice for an endowed chair in the mid-Atlantic region. Other tier 2 universities that received mention at the caucus are scattered across important waterfowl geographies and include Michigan State University, Oregon State University, University of Missouri, University of Nebraska, and Utah State University.

Need for an Advisory Board

The geographic breadth and overall enormity of the potential to develop future waterfowl conservation programs in North America begs for guidance from, and close communication with, an advisory board composed of philanthropic conservationists. We believe a board of generous individuals of sound business acumen could successfully advocate for the priority universities to philanthropists, NGOs, industries, and foundations who may have interest establishing an endowed waterfowl and wetlands program at suggested or other institutions. Our caucus group desires to work closely with this advisory board and share our institutional knowledge of working in universities and with university development foundations to promote success of new endowments. The cost of endowing professorships, chairs, and centers varies among institutions but generally ranges between $1M-$5M (U.S. currency). A median range for recent endowed chairs in waterfowl and wetlands science and conservation in the U.S. has been $2M-$3.3M.

FOREST AND WILDLIFE RESEARCH CENTER

JAMES C. KENNEDY ENDOWED CHAIR IN WATERFOWL & WETLANDS