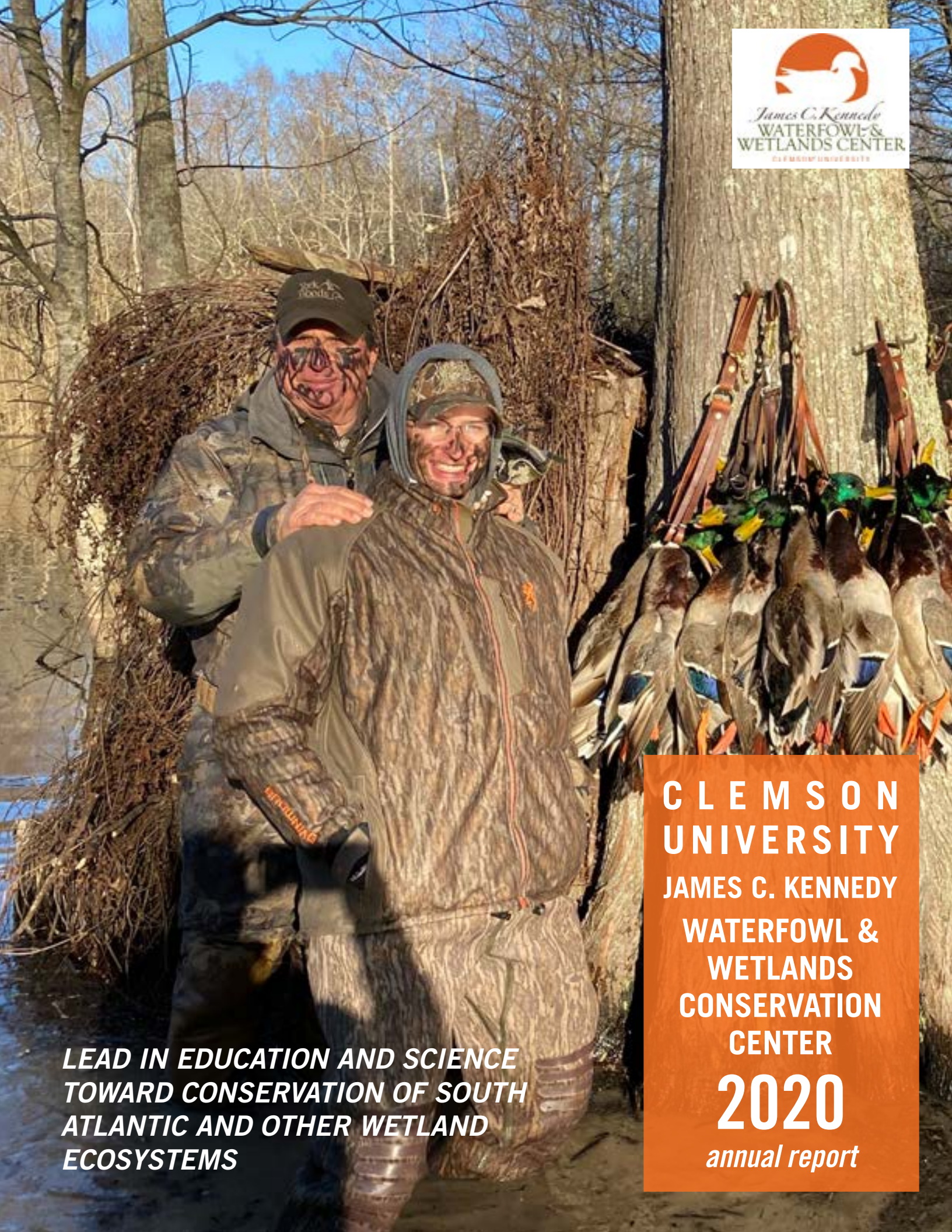


James C. Kennedy WATERFOWL & WETLANDS CENTER

CLEMSON UNIVERSITY

JAMES C. KENNEDY WATERFOWL & WETLANDS CONSERVATION CENTER

2020

annual report

LEAD IN EDUCATION AND SCIENCE TOWARD CONSERVATION OF SOUTH ATLANTIC AND OTHER WETLAND ECOSYSTEMS

Thank you to our sponsors, cooperators, and friends:

James C. Kennedy

Mr. Tom Yawkey
Yawkey Wildlife Foundation

Mr. Dan Ray

NEMOURS WILDLIFE FOUNDATION

Flyway Foundation .org

U.S. FISH & WILDLIFE SERVICE

SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES

UNITED WATERFOWLERS - FLORIDA

DELTA WATERFOWL

Atlantic Coast Joint Venture

South Carolina Waterfowl Association

On our front cover
James C. Kennedy and son, Jamie, after a successful hunt
at Kennedy's York Woods, Mississippi

On our back cover
Mr. and Mrs. Kennedy at York Woods, Mississippi

FROM THE DIRECTOR

FAIR WELL BUT NOT FAREWELL

The years keep ticking by, and October 2020 marks 70 fortunate ones for me. I give heartfelt thanks for these years, especially the past half century since I met Loretta, we dated, we married and raised our family, and now plan to spend increasing time with our children and grandchildren following retirement after the hiring of a new Director of Clemson University's James C. Kennedy Waterfowl and Wetlands Conservation Center. The position was advertised in March but was frozen by university closure from COVID. I am told an excellent cadre of semi-finalists have been identified for interviews. Meanwhile, all is well and progressing in the Kennedy Center, as you'll read in this 2020 annual report.

I'm also grateful for combatting two bouts with cancer to increase my chances of realizing increased family time while continuing to contribute professionally and personally in the coming years. Indeed, I view retirement, not as termination, but a transition to engage meaningfully and enjoyably. Teaching my grandchildren hunting and fishing will be paramount.

This editorial may not be the appropriate place to summarize remembered highlights from my time on earth, but I've decided to take this opportunity to archive the 'flyways' that led to my career in waterfowl and wetlands teaching, research, and service over the past near half century. It reflects fulfillment of my childhood dreams and is a prelude of some personal dreams for continuance of waterfowl and wetlands science and conservation. My journey and dreams that came true for me may inspire others to chase theirs.

The early years

My wife Loretta and I grew up in Two Rivers and Manitowoc, Wisconsin, respectively, less than 10 miles apart. I may have espied her on the sidelines of gymnasia, when I was playing basketball for St. Mary's Catholic School (1962-1964), and she was a cheerleader for St. Mark's School during the same years. However, we didn't meet until after our high school graduation in 1968.

Being the first child to attend university from both sides of my family, I fulfilled my parents' wishes and matriculated in fall 1968 to Marquette University in downtown Milwaukee, Wisconsin, in hopes of earning a degree in dentistry or medicine. However, I really dreamed about studying waterfowl and wetlands, having admired the annual passages of ducks, geese, and swans over my hometown on Lake Michigan. I also was a zealous hunter and fisher, but my folks demanded I needed a profession that paid instead of only costing like hunting and fishing. Back in those days, the only natural resources career known to me was becoming a game warden, which was not my passion. I didn't know then that people earned degrees in wildlife ecology and could specialize in waterfowl and wetlands through post-graduate studies. Some of the pioneers in waterfowl biology and management were students and professors at nearby University of Wisconsin-Madison, only 90 miles from my home. We didn't have a clue!

I honored my parents' wishes and went to Marquette University in September 1968. I completed that fall semester but never returned to the university because I was out of my societal and academic niches. I had two options in January 1969: (1) enlist in the military and likely go to Vietnam, or (2) seek a student deferment and enroll in the University of Wisconsin Center in Manitowoc—a bridge program to four-year universities. I chose the latter and learned the University of Wisconsin-Stevens Point had an excellent B.S. degree program in Wildlife Management. I enrolled in Point and matriculated there in fall 1969. I also

knew then that the University of Wisconsin-Madison (UW) had an excellent program in Wildlife Ecology established by Aldo Leopold, the Father of Wildlife Management, but my dad would not allow me to attend UW because of protesting and rioting there in the late 1960s. déjà vu, été 2020?

Indeed, Point was an excellent choice for an undergraduate education in natural resources. Loretta and I continued dating during my Point years, and we wed in September 1972. I graduated with my B.S. in Wildlife Management and Biology in December 1972 and bartended at the Stevens Point Country Club, while I sought graduate school opportunities and took calculus during spring semester 1973.

Our final months in Point and years at Michigan State University

I applied to a number of universities across the country while at Point but received no offers until April 1973, when Dr. Harold H. Prince, a leading waterfowl biologist and professor at Michigan State University (MSU), contacted and offered me a M.S. degree opportunity. We were so happy I applied to Michigan State. In September 1973, Loretta and I loaded most of our worldly belongings into a U-Haul and Toyota Land-Cruiser and set sail from Manitowoc across Lake Michigan on the ferry. We had never driven through Chicago, Illinois, so fearing major traffic chaos, we ferried across the lake to Michigan. Across the lake, we landed in Ludington, Michigan and drove to East Lansing—home of MSU. Upon arrival to MSU, we learned there was no room in married student housing. I don't recall if Loretta teared in sadness or strategic persuasion, but the housing manager finally gave us a shabby apartment in married student housing—1402 Spartan Village. Loretta always did her magic in painting, sewing drapes, and decorating our transient domiciles during our early migratory years.

At MSU, I studied nesting giant Canada geese at a time when waterfowl biologists feared this race of geese may go extinct. Perhaps widespread translocation of these birds to urban environments in North America resurrected this race to burgeoning population levels that now live amid people, agriculture, lawns, golf courses, and ponds, but experience insufficient harvest for population management.

I graduated with my M.S. degree from MSU in fall 1975. One of Dr. Prince's Ph.D. students was a Canadian, Dr. Bruce D. J. Batt, who became the Science Director of the Delta Waterfowl and Wetlands Research Station (DWWRS) in Delta, Manitoba, Canada, where decades of waterfowl professionals studied, including Drs. Batt and Prince. Dr. Batt was conducting his doctoral research at DWWRS on heredity of reproductive traits in mallards. Drs. Prince and Batt encouraged me to pursue a doctorate through MSU, conducting my research on the legendary Delta Marsh through DWWRS. Loretta and I never feared opportunity for travel and exposure to new cultures and environments, because these were lacking in our parochial backgrounds growing up. Thus, we traveled to Delta in summer 1975, and I interviewed to become a doctoral student under Dr. Prince, who was at Delta that summer on a sabbatical leave from MSU. I designed and conducted a field experiment in the Delta Marsh (1976-1978) to test predictions of the 'hemi-marsh' theory (Weller and Fredrickson 1973, *The Living Bird*) in relation to wetland use by dabbling ducks and aquatic invertebrates (Kaminski and Prince 1981, *Journal of Wildlife Management and The Auk*). I'll forever be grateful to Harold, Bruce, Pete Ward (Director, DWWRS), Pat Caldwell (Ducks Unlimited-Canada), Bob Jones (Delta Marsh Manager, Manitoba Branch of Wildlife [MBW]), George Richardson (Winnipeg), John Larson (MBW), my field and lab assistants (notably Little Louie Ducharme, Pat Godin, Henry Murkin, Jeff Nelson, and Shirley Rushforth), and the workshop crew (Alf, Godfrey, Kevin, Les, Miles, Redge, and Russel) for either facilitating or supporting my doctoral degree program. Most of the students at Delta during the 1970s were/are leaders in the waterfowl and wildlife profession across Canada and United States. You know who you are, and Loretta and I are grateful for our friendship continuing strong over all these years. Indeed, Delta was an initial destiny for many of us!

Starting a family, our final year at MSU, and returning to Canada

I must tell here that my beloved mother, Jeanne, missed my doctoral graduation and births of our two children; she passed in March 1978 at 55 young years of life, while I was traveling through Manitowoc back to Delta for my final field season of research. I received my doctorate in May 1979 and continued working in Dr. Prince's lab at MSU on publications from my dissertation and waterfowl i.d. modules for his waterfowl class and subsequently mine years later. Our son, Matt, was born in Lansing, Michigan in August 1979. I got a job with Ducks Unlimited Canada (DUC), so we embarked for Canada in November 1979, with U-Haul and Ford Pinto in tow and a pickup truck with duck boats following behind. My dad, Al, drove my truck, with Loretta and baby Matt snuggled on her lap. Car seats for children were optional in those days. In North Dakota, we encountered a white-out blizzard which slowed our progress, but we eventually crossed into Canada and settled into a rental home in Winnipeg, Manitoba. My dad was relieved when I took him to the airport in Winnipeg to return to seemingly balmy-like Wisconsin compared to "Winterpeg" in late November 1979.

We built a home in Winnipeg in 1980. Our daughter, Shannon, was born there in February 1981. We enjoyed our years in Winnipeg and my work for DUC, which took me across Canada from British Columbia to the Maritimes. I thank Dr. Pat Caldwell for hiring me and our many colleagues and friends in Canada. In 1983, I resigned from DUC to take a position as Assistant Professor of Wildlife at Mississippi State University because of my keenness to teach, conduct research with graduate students, and provide service through a land-grant university.

Starkville becomes home

Moving from Winnipeg, Manitoba to Starkville, Mississippi indeed was a stark transition for us, having never previously been south of Chicago. We settled in Starkville, Mississippi, home of Mississippi State University. Few people are fortunate to affiliate with two MSU's in life. As the years evolved into decades, Starkville (aka as StarkVegas nowadays) became our home and rearing grounds of our children. The children garnered great educations in the Starkville Public Schools, and Loretta worked for Starkville Public School Child Nutrition Program for nearly 30 years. Our son, Matt, graduated in Wildlife Science from Mississippi State and then earned his M.S. in wildlife ecology at State University of New York (SUNY) in Syracuse, New York, under the late great Dr. Guy Baldassarre. Matt has been an employee of Ducks Unlimited, Inc. ever since graduating from SUNY in 2005. Like the southern adage, "some 'akerns' don't fall far from the tree." Matt and his family reside in Fresno, California. Shannon attended Mississippi State for a couple years before completing her B.S. in Nursing from Louisiana State University. She is a nurse at Children's Hospital in New Orleans, and she and her family live in Madisonville, Louisiana. We are blessed for our children and grandchildren—Tanner and Penelope Mayberry and Madison Kaminski. I also must give grateful thanks to our daughter-in-law and son-in-law, Molly Kaminski and Neil Mayberry. Thank you Molly and Neil for falling in love for life with our children and parenting your children.

We spent 32 years at Mississippi State University. I relished my career there and deeply appreciate our colleagues and friends there immensely. I am grateful to Dr. Dale H. Arner, who believed in and hired me to establish a waterfowl and wetlands program in Mississippi State's Department of Wildlife, Fisheries, and Aquaculture (WFA). Dr. and Ms. Julia Arner created a "family" for the faculty, students, staff, and their families in WFA for decades. You had to experience that "family" environment to understand and treasure the truth of my words. Over the years, I served as an assistant, associate, and full professor in WFA under Drs. Arner, Robert Brown, Randy Robinette, and Bruce Leopold, and Associate Dean to Dr. George Hopper, College of Forest Resources (CFR). I appreciate all the Department Heads and especially Dr. Hopper's mentorship, guidance, leadership, friendship, and understanding, and I wish him well in his recent retirement. I also will never forget and always cherish Matt's and my friends with whom we hunted ducks passionately in Mississippi with two great Labrador retrievers, Coot and Beaux. Terra succeeds Beaux now; she's my retirement retriever.

Thank you Mr. Kennedy

I owe extreme gratitude to Mr. James C. Kennedy. Mr. Kennedy and I met in 2000, when I began advising him and his manager, Rance Moring, on restoration and management of York Woods, Mr. Kennedy's 6,000-acre property and waterfowl conservation area in Tallahatchie County, Mississippi. I had twice published results reporting a significant decline in university-based waterfowl and wetlands programs in North America. Mr. Kennedy was convinced of this decline, recognized the need for sustaining such programs, and thus established at Mississippi State the first endowed university chair in waterfowl and wetlands—the James C. Kennedy Waterfowl and Wetlands Conservation Chair in 2008. I was named the inaugural Chairperson and served that privileged role until 2015, when I retired from Mississippi State. Dr. J. Brian Davis, a former graduate student of mine and Mississippi State WFA alumnus, now leads that program with excellence.

In spring 2014, Mr. Kennedy, greatly impressed by our accomplishments through the Kennedy Chair at Mississippi State, decided to establish another university waterfowl and wetlands program in South Carolina, where he lived as young person and started waterfowl hunting. In fall 2014, Mr. Kennedy endowed Clemson University's James C. Kennedy Waterfowl and Wetlands Conservation Center at the Belle W. Baruch Institute of Coastal Ecology and Forest Science in Georgetown, South Carolina. In June 2015, I became the inaugural director of the Kennedy Center and have served this cherished role since that time. Loretta and I plan to retire nearby in Pawleys Island, South Carolina. We have been blessed, and I could have not succeeded without Loretta's pioneering character to travel and live across flyways and her tolerance of a swashbuckler professor like me.

Thank you for reading these highlights of my personal and professional dreams that came true. I hope they inspire some people to follow their dreams. This editorial is my "swan song," but I hope to remain engaged to help perpetuate life cycles of waterfowl, their habitats, and recruit people to revere and contribute to these birds and wetlands.

NAWMP and NAWPEP: THE FUTURES FOR WATERFOWL CONSERVATION

I've said for decades that the North American Waterfowl Management Plan (NAWMP) is the grandest example of an ecosystems management plan worldwide. The NAWMP continues to foster availability of wetlands and other habitats in North America for waterfowl and wetland wildlife and provide ecosystem services for humans. However, management and conservation do not occur without people, who are the primary drivers of NAWMP and other conservation initiatives. We must continue to provide academics and field experiences for the generations who will succeed us in study and conservation of waterfowl, wetlands, and other natural resources. Accordingly, several of us from across North America are engaging through NAWMP and have helped develop a sub-unit of it—the North American Waterfowl Professional Education Plan (NAWPEP). Its goal is *to engage and assist universities, colleges and NAWMP partners with establishing, sustaining, and enhancing academic and experiential programs in waterfowl and wetlands science and management, in order that sufficient numbers of inclusively diverse professionals with this expertise from across North America are available to sustain professional capacity and excellence of future waterfowl science and management*. Indeed, conservation can occur naturally but not as rapidly and effectively without human inputs amid climate, human, cultural, political, financial, and other constant dynamics. Appropriately, NAWMP has integrated a human dimensions component to recognize the critical role of people in conservation and promote recruitment, retention, and reactivation (R3) of waterfowl hunting conservationists. The NAWPEP will promote training of people with passion for waterfowl and wetlands from across North America who will continue in the important roles of science and management for waterfowl-wetland conservation.

During my career, we learned to understand critical temporal, spatial, physiological, and behavioral connections among the biological phases of the annual and life cycles of waterfowl. I mention a few retired or now passed legends, Drs. Mike Anderson, Bruce

Batt, Milton Weller, Leigh Fredrickson, Harold Prince, Dennis Raveling, Guy Baldassarre, Jim Nichols, Ken Reinecke, Mickey Heitmeyer, Jim Sedinger, and other pioneering colleagues, including yours truly, for initially championing these notions in the 'waterfowl world' in the 1970-1980s. Recently, research has focused appropriately on linking individuals' and populations' seasonal and yearly dynamics to demographic metrics, such as survival, genetics, breeding propensity, recruitment, and resulting sustainability and economics of management strategies and programs. However, I posit that we cannot sustain waterfowl and wetlands on the "wings and wallets of ducks and duck hunters alone," respectively, especially considering aging and declining populations of hunters. We must determine, economically evaluate, and communicate the diverse ecosystem services and values of wetlands and associated habitats worldwide to people. We know these systems provision habitat to sustain waterfowl and other wetland wildlife, but how much do they (1) protect us from sea-level rise and catastrophic storms, (2) reduce green-house gas emissions and capture carbon and other nutrients, (3) cool the planet, (4) reservoir freshwater and recharge aquifers, (5) improve water quality, and (6) influence economies for provision of these services? Might there even be organic or inorganic "ingredients" in wetlands to signal and thwart spread of COVID and other diseases? We don't know or know incompletely, but we know that all people don't need ducks but all humans need clean air and water. Thus, if we determine these ecosystem services of wetlands and, importantly, their economic values, perhaps through the carbon or other markets, we can educate humanity and persuade them to contribute financially to conserve these "diamonds" of planet Earth.

I would describe myself as an eager and even impatient person. We must act promptly but effectively to determine and inform humankind of wetland and other ecosystem services and their economic values. This knowledge should justify for all who need clean air and water and capable of contributing financially to help conserve these life essentials linked to wetlands. I also have a dream that government passes legislation to impose state and national contributions by citizens for conservation (call it a tax if you must), and as in Missouri, perhaps a miniscule percentage of each penny (1/8) spent by all people could be directed to natural resources education, science, and conservation. What an incredible conservation platform for the President of the United States. Additionally, developers and industry should be required to mitigate financially for each acre of impervious surface they install and thereby cause mortality of photosynthesis, oxygen production, and water percolation on such land bases. Moreover, I dream that NAWPEP and other partners will sustain and grow university/college-based waterfowl, wetlands, and wildlife programs to graduate next generations of skilled scientists and stewards of these resources. The NAWMP functions successfully because of partnerships between public and private-sector cooperators for science-based waterfowl and wetlands conservation. I have a dream for increased inclusivity among North Americans working to sustain NAWMP and NAWPEP. We must introduce and provide incentives for minorities to matriculate to colleges/universities with natural resources programs to yield a workforce of professionals who represent all North Americans, not only historically Caucasian conservationists. In addition to needed cultural inclusivity, we must assure genuine and transparent partnering among university and other waterfowl science and conservation colleagues to maximize mixing and sharing our expertise, cooperative discoveries, funding leverages, and benefits of 'flocking,' as do waterfowl. The Southeast Regional Waterfowl and Wetlands Research Consortium, including the Nemours Wildlife Foundation (http://nemourswildlifefoundation.org/research), university faculty and students, Ducks Unlimited, U.S. Fish and Wildlife Service, private land-owners, and currently eight Southeastern states is a model example of inclusive partnership for science-advancing waterfowl and wetlands conservation. Additionally, cross-flyway teaching, research, and service exchanges, continued symposia and conferences, online courses and workshops, webinars, and other forums for waterfowl and wetlands students and professionals would promote continental scaled discoveries to benefit North American waterfowl and conservation of natural resources and unite a diverse work force across the continent. And while we are thinking big, let's think globally to unite with our European colleagues studying and conserving waterfowl and wetlands to

resolve uncertainties of waterfowl species and populations, so many of which are the same or similar across the northern hemisphere. Online distance education through university and Zoom platforms now thrive and thus can be used to educate people locally and afar in waterfowl ecology and management, as I'm proud to say we're accomplishing through Clemson University (https://www.clemson.edu/online/programs/mwfr.html). Several of we endowed chairs have discussed how university waterfowl programs could be an initial network for student and faculty exchanges and research consortia across the flyways. For example, the Nemours Wildlife Foundation (South Carolina), the Kennedy Center, several universities (Clemson, Delaware, Louisiana State, and Mississippi State), and other public- and private sector partners are collaborating to study waterfowl and wetlands topics considered priorities by these partners across the Southeast. Indeed, acquiring cross-flyway knowledge and experience would be invaluable for waterfowl scientists and stewards who endeavor to study and conserve migratory birds and their habitats continentally and globally.

Am I dreaming? Perhaps but I pledge in my remaining able years to help the cause of waterfowl and wetlands science for conservation and humankind. I recall beginning my dreams to study and steward waterfowl and wetlands in the 1950s, when I watched early TV and Walt Disney nature episodes. I remember Mr. Disney encouraging we Baby Boomers, "All dreams can come true, if you have the courage to pursue them." That is why I left Marquette University to discover a career in waterfowl and wildlife unknown to my parents and me a half century ago. It was a huge risk but well worth the gamble. Dr. Prince unlocked the gate and let me enter the waterfowl world. About 10 years later and then a waterfowl biologist for DU-Canada in 1979, I believed and still ascribe to the words of then Edmonton Oilers' hockey ace, Wayne Gretzky, who said, "You miss 100 percent of the shots you never take."

Again, I thank Mr. Kennedy for establishing the Kennedy Center in perpetuity at Clemson University, your extraordinary philanthropy to endow four university waterfowl and wetlands programs singly or in partnership with Mr. David Grohne, your support of landscape-scale habitat conservation by Ducks Unlimited and The Nature Conservancy, our friendship and trust in each other, and shared times at York Woods. I sincerely thank my Clemson colleagues, with whom I worked closely in establishing the Kennedy Center: Drs. George Askew, Keith Belli, Skip Van Bloem, and Greg Yarrow, and Development Foundation Executive, Margaret Owens. I also thank Dr. Tom Straka for leading the Department of Forestry and Environmental Conservation (FEC) as Interim Chairperson after Dr. Yarrow stepped down, and I wish Dr. Todd Petty great success as our new Chairperson of FEC. I also am most grateful for the collegiality and assistance provided by FEC and Baruch faculty, staff, and students—indeed a treasured family environment. I also thank Dr. Ernie Wiggers, Beau Bauer, Paul Schmidt, and the board of directors of the Nemours Wildlife Foundation for affiliation, collaboration, and fiscal support of the Kennedy Center. Together, we will be a model for waterfowl and other wildlife science and conservation. Moreover, I thank the advisory council and dear friends of the Kennedy Center for their counsel and support. Among them, I'll single out my South Carolina Department of Natural Resources colleagues and friends, Derrell Shipes and Bob Perry (both retired from SCDNR), Billy Dukes, Emily Cope, Alicia Farrell, and Molly Kneece for SCDNR support and allegiance. In 1985, we initialized winter waterfowl research in coastal South Carolina. I met a cadre of brilliant "gentlemen of the marsh," Bob Perry, Michael Prevost, Tommy Strange, Phil Wilkinson, and R. Kenny Williams. Available in their heads and willing to share are about 250 combined years of knowledge of wetland and waterfowl ecology and management in the Lowcountry. There's no way I could thank all my students, colleagues, and friends across the Flyways over the decades, but you know you're not forgotten and always dear to the Kaminski family.

So, I say FAIR WELL but not farewell. I pledge to stay engaged while able. As the lyrics of the Lawrence Welk show song said each Saturday evening on TV, "And now 'til we meet again, here's a wish and a prayer that every dream of yours (and mine) comes true." Lastly, I dream the world will benefit in some ways from COVID 19; perhaps medical science will discover

vaccines to defeat this deadly virus and other pathogens to save lives of humans—some who will become waterfowl and wildlife scientists and conservationists. The Center for Disease Control reported that "Mice, pigs, chickens, and ducks do not seem to become infected or spread the infection," which is good news but we don't know if wild Anatids were involved in these tests. Perhaps bat populations, wherein the virus is believed to have originated, will become sentinel organisms for COVID outbreaks and justify monitoring of bat populations worldwide. Some of my students asserted that the quarantine period enabled them and their families to make direct contact with nature and thus establish or enhance a conservation ethic for natural resources. What a wonderful outcome from the pandemic. To close on COVID, may we also consider an alternative positive meaning for the acronym COVID; i.e., Conserving Ours Vigilantly In-Definitely. Let "Ours" be your personal passions, hopefully which will include conservation of waterfowl and wetlands.

With utmost appreciation and gratefulness to my students, colleagues, and friends, I thank all of you and pledge to continue in teaching, research, and service to waterfowl, wetlands, and humankind in the coming years. Most importantly, I also thank my family (pictured below) who have been my pillars of support and who have helped me understand fully the truth in the quote by my dear late friend and colleague, Dr. Guy Baldassarre (State University of New York-Syracuse): "Family is first; there is no second." Finally, if you're not born with perseverance, acquire it early in life and practice it steadfastly life-long. Leaders persevere; followers get passed.

Thank you for reading my final editorial as Director of the Kennedy Center. I will remain engaged to assist my successor. If some or all of our dreams come true, then indeed we should agree with the words sung by Louis Armstrong in 1968, "What a wonderful world."

Fair well,

Richard M. Kaminski, Ph.D.
Director

Back row from left: Molly and Matt Kaminski, Loretta and Rick Kaminski, Neil and Shannon Mayberry. Front from left: Madison Kaminski and Penelope and Tanner Mayberry (Caledonia Plantation, Pawleys Island, SC; December 2019).

The 8th North American Duck Symposium:

Winnipeg, Manitoba, Canada
26-30 August 2019

The 8th North American Duck Symposium convened in Winnipeg, Manitoba, Canada, 26-30 August 2019. The symposium occurrs every three-four years, generally alternating between sites in Canada and the United States. It attracts conferees from across North America and Europe, and is the largest waterfowl conference in the world. The 8th symposium was hosted by Ducks Unlimited-Canada, the Province of Manitoba, and the Canadian Wildlife Service.

Clemson University current and former graduate students of the James C. Kennedy Waterfowl & Wetlands Conservation Center and Nemours Wildlife Foundation (Beau Bauer, Gillie Croft, Nick Masto, and Lauren Senn) attended and presented their research at the symposium.

Dr. and Mrs. Kaminski also attended the symposium and enjoyed visiting with their friends in Canada, returning to the Delta Marsh and Delta Waterfowl and Wetlands Researh Station, and returning to view their previous homes in Winnipeg, when Dr. Kaminski worked for DU-Canada nearly 40 years ago. Below is a picture that depicts some of the current students and alumni of Mississippi State University (MSU) or Clemson University, who studied under Drs. Kaminski and J. Brian Davis (MSU) and attended the symposium. All are studying or working in the field of waterfowl science and conservation in the USA or Canada. Momma and Poppa Duck are proud of their flock.

FEATURE ARTICLE
COVID-19 Didn't Break Our Spring Break

Emily M. Miller and Jacob A. Shurba
M.S. students, Clemson University

In March 2020, 10 students of Clemson University's James C. Kennedy Waterfowl and Wetlands Conservation Center and Creative Inquiry course embarked on an educational and enjoyable spring break field trip to Gulf of Mexico coastal wetland ecosystems in Mississippi and Louisiana. Our goals were to learn about different wildlife species in this region and habitat management techniques, how Louisiana is combating sea level rise at Rockefeller Wildlife Refuge, and experience Gulf coastal culture and cuisine.

The trip began early Friday morning, March the 13th, which jinxed our group, as you will learn by reading this story. So, please continue.

From Clemson, South Carolina, students were accompanied by Dr. Rick Kaminski, Director

of the Kennedy Center and his three graduate students, Lauren Senn (Ph.D. candidate), Emily Miller (M.S.), and Jacob Shurba (M.S.). The group drove through Georgia and Alabama to arrive at the Grand Bay Coastal Resources Center near Moss Point, Mississippi—our domicile for Friday and Saturday nights. We learned about the wildlife, fisheries, and wetlands research conducted at the Center, did some exploring and birding, and then joined Dr. Kaminski's family from Louisiana for a seafood dinner at a nearby restaurant, named The Crabby Shack.

On Saturday morning, we arrived at Mississippi Sandhill Crane National Wildlife Refuge (NWR), also near Moss Point. We were greeted by a spectacle of a large longleaf pines and wet savanna habitats. Some other native species included pitcher plants, sundews, cotton and wire grasses, and crawfish. The savanna contains pyric plants, meaning they are fire adapted, and the savanna is maintained by periodic prescribed burns. When the savanna begins to dry in spring-summer, the crawfish burrow and estivate (remain underground) until fall-winter rains return and they can emerge into the wet savanna. We did not

espy any crawfish, but we knew they were present below ground from their above-ground mud chimneys resulting from their burrowing.

Next, we entered the visitors' center and watched an informational video about the refuge and Mississippi sandhill cranes. The last population of this sub-species of cranes is located at the refuge. Unfortunately, only 3% of their original habitat remains. When development of U.S. Highway 10 was put on the table for debate, Jake Valentine, a wildlife biologist, lobbied for the Mississippi sandhill cranes and was determined to see their last remaining habitat protected. With the Endangered Species Act recently passed back in 1973, the Mississippi Sandhill Crane NWR was the first NWR established under the Act, protecting the last population of Mississippi sandhill cranes and their dwindling habitat. A memorial to Mr. Valentine exists in the visitors' center.

Even with their remaining habitat under protection, the cranes have a long recovery ahead, especially considering there are only about 100 total individuals remaining and less than 30 breeding pairs. Mississippi sandhill cranes usually only lay 2 eggs per clutch and normally only one chick, called a colt, survives. As part of the largest crane reintroduction effort, a single egg is taken from the nest and incubated at the USGS Patuxent Wildlife research Center in Beltsville, Maryland. When hatched, the colts are cared for by caretakers dressed as cranes to imprint them to crane-appearing organisms. Then, when the cranes are old enough, they are released back at the refuge with unique color-coded leg bands, so refuge workers can identify individuals. The oldest crane alive on the refuge is 31 years of age. We wondered about inbreeding in this population without gene flow from another population of cranes.

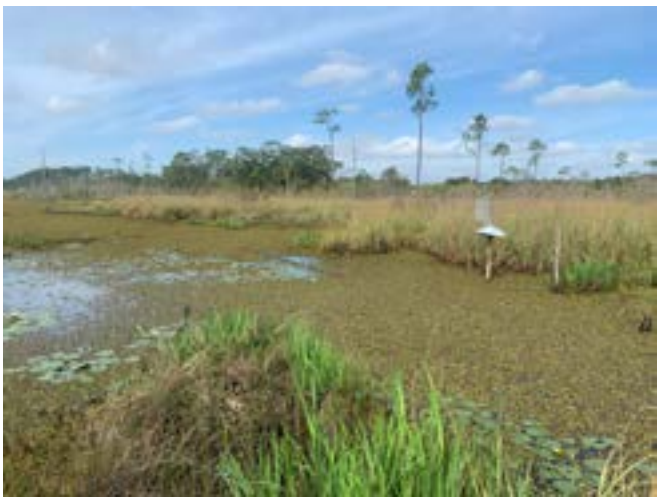
Guided tours of the refuge are available to visitors. You are taken to areas of the refuge that are not accessible to the general public with the hopes to see endangered and threatened species. We were taken to areas on the refuge where cranes had been located previously; however, the tourists before us didn't spot any. Luckily, the cranes decided to appear for our tour. First, we saw about eight individuals in a group well over five hundred yards away. Even through a spotting scope, the distinct outlines of cranes were visible. However, they eventually became a mirage due to the Mississippi heat and the smoldering remains of a prescribed burn. Because our first crane sighting was at a distance, our tour guides knew how to get us an up close view of these amazing birds.

We went farther into the refuge and came across two cranes. Corporal Coconut (foreground in photo) and Sargent Banana (background in photo) are two cranes who have tolerance to the tours and are habituated to humans. We hoped a bobcat wouldn't emerge from the dense understory and depredate Coconut and Banana.

We continued our tour through the refuge and saw two bald eagle nests, one with a nestling who was leg banded earlier that week by one of Dr. Kaminski's colleagues from Mississippi State University, Dr. Scott Rush.

In a perfect way to end our tour through the refuge and Mississippi, we were driven off the refuge to a private residence with a small backyard pond. There, we were lucky to see a female Mississippi sandhill crane incubating her eggs. Hopefully, with the current conservation efforts in place and continued education and awareness of this species, they will experience a successful recovery.

Early Sunday morning, we departed Mississippi for Louisiana. Along the way near New Orleans, we visited Big Branch NWR. There, we hiked along a boardwalk through a wetland that once contained abundant pine trees from which resin was harvested for glue, turpentine, and fuel for lanterns. The wetland now has been invaded by Salvinia, or floating fern, which is an exotic surface water plant. Up close, it looks like moss. Managers must spray the plant to control its spread. Additionally, we saw an early blooming beautiful purple and yellow plant, a native Louisiana iris. The colors of the iris closely resemble those of Louisiana State University (LSU), at least through our eyes.



We departed Big Branch NWR to head westward into Louisiana. We passed through Baton Rouge, the capital city and home of LSU, and crossed the Mississippi River via I-10. We traversed the vast Atchafalaya Basin on an 18-mile-long bridge. Despite the grandeur of the swampy landscape, there was uncertainty for the remainder of the trip, with the threat of COVID-19 looming. Nonetheless, we drove on and hoped for the best.

After stopping at a grocery store in Lafayette, Louisiana for necessary vittles, we traveled the remaining two hours to Rockefeller Wildlife Refuge, owned and managed by the Louisiana Department of Wildlife and Fisheries (LDWF). Along the way, we passed vast tracts of rectangular ponds with rows of plastic and mesh bucket-like structures in them. Dr. Kaminski explained the devices were crawfish traps. Crawfish are a huge cuisine commodity for Louisiana and a spring-time staple for many Louisianans. Read on to learn how we sampled this cuisine.

Pulling into the lot at Rockefeller, we caught a glimpse of our temporary abode, and more importantly, our views for the next few days. Looking across the marshes with the sun shining across them, one can't help but feel amazed at the beauty and immenseness of this place in spite of sea-level rise reducing vast acreages of Gulf coastal marsh annually. The refuge was donated to the state of Louisiana by the Rockefeller Foundation in 1919 through a deal parlayed between the Foundation and the McIlhenny family, famous for their Tabasco sauce.

For the next two days, we had opportunity to assist the waterfowl biologists at the Refuge, one of whom is a former student of Dr. Kaminski at Mississippi State, Dr. Joe Marty. Dr. Marty is the research scientist at the Refuge

The majority of our time was spent applying leg bands and PIT tagging (Passive Integrated Transponder) black-bellied whistling ducks. These small pill-sized tags, like chips placed in pets, are inserted under the shoulder skin of the duck and allows researchers to mark individuals uniquely to monitor their movements in and out nest boxes. When PIT tags and metal leg bands were applied, the ducks were released in the hopes that they would return to the Refuge and private lands with nest boxes erected for these and wood ducks. In total, we handled over 200 whistling ducks and PIT tagged over 150 birds.

Besides capturing and marking whistling ducks, we were chauffeured via airboats to small man-made islands named terraces. Terraces are constructed in a network in the marsh to reduce wave action and accrete sediments to restore marshland. Our job was to search the terraces for nesting mottled ducks, a native nonmigratory mallard-like duck that inhabits Gulf coastal marshes and rice lands.

To conclude our first full day of working with the state of Louisiana biologists, we spent the afternoon on their fleet of airboats cruising through the marsh and seeing "tons" of teal, shorebirds, waders, and sea birds. We all were able to check multiple species off of our life list of birds. Birds like the American avocet, king rail, fulvous whistling duck, and roseate spoonbill are species that some of us have been trying to see for years, and we finally got the opportunity. If you've never had an opportunity to airboat, jump on this aquatic craft to view a still vast Louisiana Gulf coastal marshland.

We were brought to three different locations across the marsh including an area of the coast where staff are attempting to rehabilitate the shoreline by placing jetties of rock and large bags of soil dug up from the same area to provide the shoreline with some form of respite from the onslaught of waves. We were told by the manager that originally the land equaled a total of 86,000 acres. Unfortunately, due to sea level rise and catastrophic storms, erosion has eliminated 15,000 acres.

As a fitting end to our trip, we had a true Cajun crawfish boil as our last dinner together as

a group before we had to depart early Tuesday for Clemson due to COVID-19. Students assisted Dr. Marty in preparing the boil by rinsing the crawfish and cutting the potatoes, lemons and oranges. Dr. Marty's wife, Deanna, son Noel, and the biologists joined us for the feast. We all sat down together with piles of fresh crawfish on the tables and quite literally got cracking the mudbugs before social distancing was required. Throughout dinner, while some learned the proper way to eat crawfish, we all reviewed and reflected on this once in a lifetime experience to be repeated again.

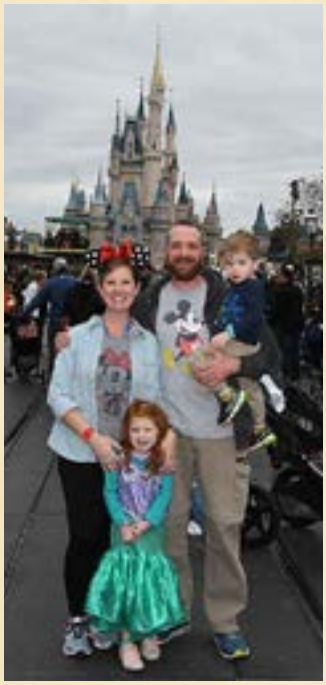
With so many memories, we asked the students who traveled to name their three favorite moments of the trip. One of everyone's favorite memories was when we air boated. With everyone split up between four airboats, we saw an indescribable number of different bird species, making this trip something extremely special. The next memory mentioned by students was banding the black-bellied whistling ducks. This was a wonderful experience for all of us to get our hands on some birds and help the LDWF in their attempts to further their understanding of black-bellied whistling duck ecology. The last memory students mentioned was probably the most surprising and thoughtful; i.e., their appreciation and fond memories of camaraderie among all travelers and an original Cajun crawfish boil (Aaaeeeh!). In spending countless hours together in the vans driving, viewing, and cooking, we all truly became a group of students who were eager to learn and gain valuable experience and friendships for life. All of this would not be possible without Dr. Kaminski, who is a true mentor to everyone under his wing, as well as Dr. Marty, the LDWF, and each site we visited. Even though our trip was jinxed and cut short by COVID-19, our spirits were still strong, appreciating everything we had learned and seen, and we all gained valuable experience and memories that will last a lifetime. Thanks for reading our memorable story.

WHERE HAVE ALL THE GRADUATES GONE?

This is a new section of the Kennedy Center annual report. It follows up on the Center's and Clemson's graduate students after completing their degree. Since inception of the Kennedy Center in 2015, three students have completed their M.S. degrees and are gainfully employed in the wildlife profession or continuing their education toward the doctorate.

Beau Bauer, M.S., December 2018

I was in the unique situation of being employed as the staff biologist for Nemours Wildlife Foundation, Yemassee, South Carolina, while pursuing my M.S. in Wildlife and Fisheries Biology through Clemson University and being the inaugural graduate research assistant of the James C. Kennedy Waterfowl and Wetlands Conservation Center. I completed my M.S. in December 2018 and have continued my position with Nemours Wildlife Foundation. The skills acquired working under and closely with my advisors (Drs. Rick Kaminski, J. Drew Lanham, and Patrick Gerard) greatly enhanced my growth as a biologist. My first publication from my thesis is in press in the Wildlife Society Bulletin; it is titled, Hydrological management for submersed aquatic vegetation in South Carolina coastal impoundments. A second paper on the same topic of how water management relates to aquatic invertebrates is in preparation and destined for the *Journal of Fish and Wildlife Management*.



My duties have expanded beyond the "gates" of Nemours to include facilitation and coordination of a regional waterfowl research program with various state and federal agencies, NGOs, and university partners. I was honored to be elected to the executive board of the South Carolina Chapter of The Wildlife Society while completing my thesis and continue to serve as President-Elect of the state chapter. I also serve on the steering committee for Clemson Extension's Wildlife Habitat Education Program (WHEP) that delivers basic wildlife habitat management curricula to high school juniors and seniors participating 4-H and FFA organizations. I am excited to begin my initial foray into teaching as a lecturer for Applied Wildlife Habitat Management as part of Clemson's online non-thesis Master's degree in Wildlife and Fisheries Biology program. I strive to continue drawing upon my unique concoctions of "muddy boots" experiences and academics to develop and conduct game and non-game wildlife research and habitat experimentation. Within this context, I am thrilled to continue working with Dr. Kaminski, the Kennedy Center, and the Clemson family.

None of these important roles would be possible without support of my wife, Jessica, and children who kept me focused on what matters most during the last few crazy, but rewarding, years. God Bless and Go Tigers! -Beau

Gillie Croft, M.S., December 2018

Gillie graduated from Clemson University with a M.S. in Wildlife Biology in December 2018. The title of his thesis is: Reproduction and nest-box selection by wood ducks and black-bellied whistling ducks in coastal South Carolina. After graduation during 2019, Gillie was employed

by Nemours Wildlife Foundation, charged with developing a long-range wildlife habitat management plan for the Foundation's thousands of acres near Yemassee, South Carolina in the ACE Basin. Subsequently in 2019, Gillie obtained his current position as a consulting wildlife biologist and forester for Folk Land Management, Inc. in Green Pond, South Carolina. He continues to work with Dr. Kaminski developing manuscripts from this thesis, the first of which on nest-box selection by wood ducks and black-bellied whistling ducks is in press with the *Wildlife Society Bulletin*. A second publication is in development and destined for the *Journal of Southeastern Fish and Wildlife Agencies*. Below is a picture of Gillie checking one of over 300 nest boxes during his nesting duck study.

Nick Masto, M.S., August 2019

Nick Masto's M.S. degree in wildlife biology from Clemson University was conferred in August 2019 after successfully completing all his course work and research on evaluations of aerial transect surveys of fall-winter populations of waterfowl and other waterbirds in South Carolina. Nick and his advisors are working on publications now from Nick's thesis, plus an independent research project with undergraduate interns on rake-sampling to estimate biomass of submersed aquatic vegetation. The latter paper was published in 2020 by the journal, *Wetlands*. Additionally, Nick and co-authors have a paper from his thesis in press for the 2020 edition of the *Journal of Southeastern Fish and Wildlife Agencies*. Following graduation, Nick moved to Cookeville, Tennessee to begin his doctoral studies under the advisement of Drs. Bradley Cohen, Daniel Combs, and Heath Hagy (US Fish and Wildlife Service). Dr. Hagy earned his doctorate under Dr. Kaminski at Mississippi State University.

Nick is part of a collaborative group of two Ph.D. students and a M.S. student, studying different aspects of nonbreeding ecology (autumn–spring migration) of mallards in the Lower Mississippi Alluvial Valley headquartered from western Tennessee. The team began research this past fall and deployed over 120 solar-rechargeable GPS transmitters on male and female mallards from November 2019–January 2020. The new GPS tracking technology will allow the group to monitor fine-scale movements of the birds at great spatial extents which should provide more complete portrayals of life-history strategies of mallards during winter and spring migration.

In his new role at Tennessee Tech, Nick continues to fly aerial surveys. However, during the aerial surveys Nick now conducts in western Tennessee, he is not counting ducks but instead monitoring the extent of flooding in Tennessee's sliver of the Mississippi Alluvial Valley and surrounding regions. By quantifying weekly landscape inundation as a percentage index of flooding extent within a known area, the team hopes to relate mallard movements to modeled dynamics of wetland availability from natural flooding during winter.

Although Nick's new position keeps him busy, he continues to collaborate with Dr. Kaminski, the Kennedy Center, Nemours Wildlife Foundation, and Clemson's Creative Inquiry group. Nick is committed to maintaining these collaborations. Nick also continues to be a devoted father and loving companion to his son, Denham, and partner, Ellie Lane.

RESEARCH ABSTRACT

ADVANCING WATERFOWL ECOLOGY AND MANAGEMENT: ASSESSMENTS OF DISTANCE EDUCATION, PROFESSIONALS' CREDENTIALS, AND GRADUATE STUDENT PUBLICATION PERFORMANCE

Lauren Hernandez-Rubio Senn
Ph.D. Candidate and Fellow, James C. Kennedy Waterfowl & Wetlands Conservation Center
Clemson University

I am in the final year of my 4-year doctoral degree program and am excited to see "light and my diploma at the end of the tunnel." My abstract here is an executive summary of my dissertation topics reflected in the title of this summary. Thank you for perusing it.

To our knowledge, only Clemson University currently offers a distance-education (online) course in Waterfowl Ecology and Management available to undergraduates and graduate students worldwide. Such a course is needed especially by those unable to matriculate to a campus where such a course is offered. As part of my dissertation research, Dr. Rick Kaminski and I have converted his Waterfowl Ecology and Management course from traditional face-to-face lecture and laboratory formats to online presentation, and I am evaluating the transition and students' learning experiences and perceptions of the new online course.

The course has been offered in fall semesters since 2017, as an elective in Clemson University's online Master's degree in Wildlife and Fisheries Resources and for upper division undergraduates (https://www.clemson.edu/online/programs/mwfr.html). The conversion process involved video recording lecture material, using online software to transcribe the audio of each lecture, pairing transcribed video and audio with corresponding lecture slides, and re-recording audio to match videoed lectures. We wrote a script for hundreds of slides, enabling students to view and read text on slides after listening to scripts narrated by me. These tasks consumed months of work; however, the course is now archived, and updating and revision will be manageable annual tasks.

The course is split into nine modules: History of Waterfowl Conservation, Waterfowl Morphology and Identification, Habitat Use and Selection, Evolutionary Ecology Related to Waterfowl, Annual-Cycle Ecology and Management (Fall/Winter, Spring Migration, Reproduction, Post-breeding/Molting), Adaptive Harvest Management (by Dr. Beth Ross, USGS, South Carolina Cooperative Fish and Wildlife Research Unit, Clemson University), and Waterfowl Diseases. Each module also includes readings on current research and issues related to waterfowl ecology and conservation, class discussions, and quizzes/exams. Students are evaluated via module quizzes, a group oral presentation, a waterfowl identification exam, and mid-term and final exams. To earn graduate credit in the course, each graduate student writes a scientifically based article on a recent topic approved by Dr. Kaminski. They are required to write their article following the style and format of *The Journal of Wildlife Management*. Dr. Kaminski critically reviews the students' submission and levies a letter grade, but no percentage of graduate students' course grade depends on this assignment, as it is a requirement only to earn graduate credit in the course. Graduate students also are required to be discussion leaders for groups of undergraduate students in the course. We also are exploring ways to provide You Tube video-audio field trips to important waterfowl and wetlands conservation areas across North America by collaborating with colleagues at other universities also teaching waterfowl ecology and management with field labs.

The course was assessed each semester by surveys returned by enrolled students. This evaluation included three surveys given pre-, mid-, and post-course completion and a pre- and post-course knowledge assessment test. A trial survey was given to students in the initial course offering in 2017, and the final Clemson Institutional Review Board approved surveys and assessments were given in falls 2018-2019. Surveys asked basic demographics (e.g., undergrad/grad student), asked students to rate components of the course in terms of their effectiveness in helping them learn, compare their learning experiences in the online waterfowl course to previous in-person and online courses (e.g., quality/quantity of learning, interaction with peers, interaction with instructors), and assess their experience with various wildlife technical skills and outdoor recreational activities. Surveys were administered via Qualtrics, and respondents were anonymous.

From 2017-2019, 139 students enrolled and completed the course (86 undergraduate and 54 graduate students). The course's first offering in fall 2017 had an enrollment of 25 students (11 undergraduate and 14 graduate students). The second offering of the course in fall 2018 had an enrollment of 58 students (35 undergraduate and 23 graduate students). This was a 136% increase in enrollment from the initial course offering. The third offering of the course in fall 2019 maintained enrollment numbers from the previous year, with 56 students (39 undergraduate and 17 graduate students). In fall 2020, 56 students enrolled in the course (40 undergraduate and 16 graduate students), indicating sustained interest and popularity of the course. All undergraduates were students enrolled in B.S. majors of Clemson University, whereas graduate students primarily were working professionals not living on campus. Graduate students were from Arizona, California, Colorado, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maine, Minnesota, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, Washington, and Washington DC. All students in 2017-2019 passed the course, with a total of 87 A's, 41 B's, 10 C's and one D across all years. Given current enrollment (~50 students) and tuition (~$600/credit), this 3-credit course is generating over $90,000 annually.

The pre-course knowledge assessment test administered to students enrolled in falls 2018 and 2019 combined resulted in a 96.5% response rate (n = 114). The post-course knowledge assessment test response rate was 94.7% (n = 114). A paired t-test of individual students' pre- and post-course knowledge gain revealed nearly a two-fold (1.57-1.83 times) increase after the course by undergraduate (pre-test $\bar{x}$ = 39.2%, SE = 0.159; post-course test $\bar{x}$ = 61.5%, SE = 0.189; t_{68} = -10.66, $P < 0.0001$) and graduate students(pre-test $\bar{x}$ = 40.7%, SE = 0.255; post-test $\bar{x}$ = 74.6%, SE = 0.271; t_{38} = -10.58, $P < 0.0001$).

Response rate to the fall 2018 pre-course survey was 59.3% (n = 59) for undergraduates and graduate students combined (i.e., 56% and 65% for undergraduates and graduates, respectively). However, I invoked an extra credit incentive (i.e., a dropped discussion grade) after the 2018 pre-course survey to increase response rate. The fall 2018 mid-course survey had a combined student response rate of 98.3% (57/58), with 97.1% (34/35) of undergraduates and 100% (23/23) of graduate students responding. The extra credit incentive did increase response rate for undergraduate (t_{34} = 2.083, P = 0.045) but not graduate students (t_{22} = 1.354, P = 0.189), and was utilized the following year to maintain higher response rates. The fall 2018 post-course survey had a response rate of 86.2% (50/58), with 80.0% (28/35) of undergraduate and 95.7% (22/23) of graduate students responding. The fall 2019 pre-course survey, with same incentive activated, had a response rate of 100% (57/57). The fall 2019 mid-course survey had a 92.8% (52/56) response rate, with 89.7% (35/39) of undergraduate and 100% (17/17) of graduate students responding. The fall 2019 post-course survey had an 85.7% (48/56) response rate, with 79.5% (31/39) of undergraduate and 100% (17/17) of graduate students responding.

Both undergraduate and graduate students enrolled in the waterfowl ecology and management course had little or no experience with many wildlife technical skills or other outdoor activities. No wildlife technical skill listed on the survey had an average Likert score of ≥3 for both undergraduates and graduates (i.e., 3 = students had frequent experience with the skill). Some outdoor activities did score an average of ≥3 for both undergraduates and graduates; these included hiking, walking, camping, wildlife watching, and fishing. Students enrolled in the waterfowl course did have frequent experience in the outdoors but generally were not partaking in consumptive uses of natural resources. Students indicated they had at least tried waterfowl and other hunting once or twice but did not engage frequently. Graduate students had scores slightly greater than undergraduate students on

all skills, although a statistical difference only was observed for about a third of the 34 skills/activities surveyed.

Students were asked to compare the quality and quantity of interaction between themselves and with their instructors in the online waterfowl course, other previous online courses, and in-person courses. Generally, there were no statistical differences between students' perceptions of other online courses and the waterfowl course, as well as face to face courses. However, two categories within this question did show a significant difference between other online courses and the waterfowl course. The quality of interaction with the instructor significantly increased from the start of the semester to its end, indicating instructors were effectively and increasingly engaging students during the semester. However, familiarity with computer technology (i.e. Canvas learning management system) showed a significant decrease between the start and the end of the semester, as technological complexity increased.

Significant differences were observed between undergraduate and graduate students within most questioned categories. Graduate students reported almost all pedagogical components of the course were more effective in helping them learn than did undergraduates, with the exception of exams that revealed no detectable differences between student classes. Furthermore, graduate students perceived increased amount of interaction among their peers, the quantity of their learning experience, motivation to participate in class activities, and increased familiarity with computer technology.

Future course improvements included the addition of You Tube outdoor labs. We'll use Go Pro cameras to record segments of labs in different waterfowl environments. We'll also use Remote Proctor to deter possible cheating in the course. We also are exploring making this course available to students not enrolled in either Clemson's B.S. or Master's program. Finally, Dr. Kaminski is conversing with personnel of Ducks Unlimited-Mexico, who have expressed their desire for us to offer the online waterfowl course in Spanish for their employees and university students in Mexico.

In addition to working on the course, I have collaborated with Drs. Shari Rodriguez (Clemson University) and Kaminski on a survey administered to attendees of the 6th, 7th, and 8th North American Duck Symposium (2013, 2016, and 2019, respectively). The survey was designed to profile socio-demographics and professional characteristics of attendees to determine critical credentials and experiences that promote one becoming a waterfowl and wetlands professional. Response rate to the survey was 52.7% (364/690), indicating a slight majority of the attendees provided input. Professional individuals represented 83.7% of the respondents (309/364), while student attendee responses were meager (15.1%, 55/364). Academic courses that ranked "important" or "extremely important" for acquiring employment in the waterfowl profession included biology, ecology, statistics/modeling, and writing. Technical skills ranked "important" or "extremely important" for acquiring employment in the waterfowl profession included science aptitude, computer competence, waterfowl identification, wildlife and plant identification, scientific writing, and oral communication.

Lastly, I have collaborated with Drs. Kaminski, Rodrigues, and Chris Williams (University of Delaware) on a survey to determine waterfowl professionals' perceptions of graduate students' scientific publishing performance, incentives and barriers to publishing, and students' perceived importance to publish. Surveys were sent via Qualtrics to participants of the 6th and 7th North American Duck Symposia. A separate student survey was sent to those who indicated they were students at the time of the 7th symposium. Response rate for professionals was 42.0% (197/469) and 44.9% (44/98) for students, indicating we did not attain a majority response but derived useful important information, nevertheless. For professionals, the most common role served for graduate students was as a graduate committee member (34.5%), followed by non-faculty advisor/mentor (33.6%). The most common job held by respondents working with graduate students was a government employee (44.8%), followed by university faculty (28.6%), and non-governmental organization employee (17.1%). Professional respondents spent an average of 12.9 years (SD = 9.6, n = 108) working with graduate students and worked with an average of ~15 students during their current or past career (SD = 19.9, n = 107). Thirty-five percent of student respondents indicated they had published one or more peer-reviewed articles from their Master's thesis, 23.5% had published from their Ph.D. dissertation, and 41.2% had not published, suggesting these students exhibited a relatively low rate of publication of their research. Respondents published on average 1.72 (SD = 1.07, n = 18) articles from their Master's thesis and 2.08 (SD = 1.44, n = 12) articles from their dissertation.

Both students (70.0%, *n* = 40) and professionals (75.3%, *n* = 97) believed publishing was very important but responding students have not followed through to publish.

Results revealed that Master's students took about 6-12 months to prepare and submit their first manuscript, while Ph.D. students took 6 months. Based on Dr. Kaminski's experience working with graduate students who publish, 2-3 years elapse from the time of students' graduation and journal publication of a manuscript(s). Nearly 70% (*n* = 88) of professionals indicated they were frustrated motivating their Master's students to publish, and half (*n* = 60) indicated they were frustrated motivating their Ph.D. students to publish. Professionals considered lack of time during and outside work hours and lack of job incentives as the top barriers to graduate student publication rate. Students most frequently indicated lack of time during and outside of work hours as major barriers to publication. The three most frequently utilized or experienced strategies to facilitate student publication by both professionals and students were congenial encouragement on a regular basis, the offer to defray journal page charges, and professionals playing a major role in drafting and editing manuscripts. When asked to rank which of these strategies were most effective in motivating publication, 78.6% (*n* = 28) of students ranked "providing congenial encouragement" most effective, while 59.7% (*n* = 72) of professionals ranked "played a major role in drafting and editing" as most effective. Implications from this study include a need for better communication between professionals and graduate students on the expectations of the student to publish before or at time of matriculation.

RESEARCH ABSTRACT

NEST-BOX, MICROHABITAT, AND MICROBIAL INFLUENCES ON WOOD DUCK PRODUCTION AND RECRUITMENT IN GEORGIA AND FLORIDA

Jacob A. Shurba
M.S. Student, James C. Kennedy Waterfowl & Wetlands Conservation Center, Clemson University

The wood duck (*Aix sponsa*) is a significantly harvested duck species that provisions ecosystem services and economic values. The species was nearly extirpated by the early 20th century due to extensive market hunting and loss of forested habitats, wherein the species innately nests in natural tree cavities. With continuing loss of lowland forests and associated natural cavities, nest boxes have been used to supplement availability of suitable cavities and help wood duck populations recover and be sustained as legal game-ducks in North America. However, recent analyses of a long-term data set on box-nesting wood ducks at the Savanna River Ecology Laboratory near Aiken, South Carolina suggested their recruitment (i.e., annual return and nesting by yearling females produced in boxes) would not sustain itself without immigration of hens produced in boxes or natural cavities from other sites.

An important factor that influences wood duck recruitment is selection of nest boxes by hens. Despite this importance, little research has been done to determine how microhabitat and box characteristics influence wood duck recruitment. Additionally, as boxes are used multiple times by same or different hens in a year, the potential for a build-up of bacteria, parasites, and other pathogens increases. Numerous different species of bacteria and fungi have the potential to invade eggshells, infect the embryo, and ultimately negatively impact hatching success.

We are testing hypotheses related to dimensional features of nest boxes, associated microhabitat, and microbial communities and comparing our results to previous studies (e.g., Walls et al. 2012, *The Condor*; Croft et al. 2020, *Wildlife Society Bulletin*). Preliminary predictions include that recruitment rates to boxes in my Georgia and Florida study sites will be similar to previously reported results (~5%; Hepp et al. 2020; *Journal of Wildlife Management*), and Florida nest boxes will have higher microbe counts and more diverse communities than Georgia, given Florida is farther south with a longer breeding and growing season than Georgia. Finally, nest boxes containing odorous cedar wood shavings compared to boxes with unscented aspen shavings will have a decreased microbial environment. In 2021, we will compare microbial communities and egg hatching success among boxes with odorous and non-odorous shavings, plus a control with no wood shavings, similar to females nesting in natural cavities.

In Florida, 131 (92%) of the 142 boxes were used by nesting ducks, with 244 nesting attempts made by either wood ducks or black-bellied whistling ducks (*Dendrocygna autumnalis*). Of these nest attempts, 40% were successful with most failed nests due to predation from unknown predators. We web-tagged 567 wood duck ducklings that successfully exited the boxes in Florida. We took sterile microbial samples of eggs from 95 boxes, which will be analyzed for microbes in fall 2020.

In Georgia, 76 (62%) of 122 boxes were used by nesting ducks, with 104 nesting attempts by wood ducks or hooded mergansers (*Lophodytes cucullatus*). Of these nest attempts, 35% were successful, with failed nests occurring from unknown predators. We web-tagged 351 wood duck ducklings that successfully exited boxes in Georgia. Finally, we collected microbial samples from 72 boxes. Preliminary microbial testing indicated that Florida does contain larger

and more diverse microbial communities than Georgia.

I will use simple correlation analysis to determine which habitat, box dimensional, and microbial explanatory variables are independent of each other and then investigate if independent variables explain variation in nest fates and recruitment (e.g., used and successful, used but unsuccessful, depredated by snakes or other predators, used and recruit attracted, etc.), using multinomial regression analysis.. I will repeat this study in 2021, analyze data, write my thesis and graduate in May 2022.

RESEARCH ABSTRACT

MANAGEMENT STRATEGIES TO INCREASE RECRUITMENT OF BOX-NESTING WOOD DUCKS IN SOUTH CAROLINA AND NORTH CAROLINA

Emily M. Miller, M.S. student,
James C. Kennedy Waterfowl & Wetlands Conservation Center
Clemson University

Wood ducks (*Aix sponsa*) have experienced one of the most significant population recoveries among North American waterfowl. Due to excessive harvest especially by market hunters and loss of habitat, wood duck populations declined through the early 20th century. With enactment of the Migratory Bird Treaty Act (MBTA) in 1918, the wood duck was the only duck targeted for protection and subsequently their populations recovered, and the species now is one of the most frequently harvested species in eastern North America. In addition to protection provided by the MBTA, introduction of wood duck nest boxes also likely influenced the species recovery to supplement availability of natural cavities for nesting. However, few studies have examined nest-box and habitat characteristics that contribute to use of boxes, nest success, and recruitment. I define recruitment as the rate (%) at which nesting females and their yearling daughters return to boxes and nest. Recruitment is a vital rate of population dynamics, which must be estimated to discern if box-nesting populations can sustain themselves without immigration of females from outside box-nesting populations and if box-nesting programs are cost-justified relative to recruitment rates. Additionally, if wood duck nest boxes are not maintained, they deteriorate, and vegetation can surround the box decreasing visibility and use by hens. Also, encroaching vegetation can increase the probability of predator access, reducing the possible contribution of boxes to wood duck production and recruitment.

For my thesis, I will examine multiple habitat and box variables in addition to predator deterrent management strategies to determine their influence on selection and use of boxes, nest success, and recruitment of hen wood ducks using nest boxes at Lake Moultrie, South Carolina (n =181) and Mattamuskeet and Roanoke River National Wildlife Refuges in North Carolina (n =124). Management techniques being evaluated include removing emergent and woody vegetation within a two-meter radius around the nest boxes to deter rat snake (*Pantherophis alleghaniensis*) access to boxes and their depredation of eggs, deployment of new boxes away from those possibly disturbed by passing boats, sealing gaps between predator guards and posts, and deployment of woodpecker (Picidae) and snake deterrents. Woodpecker deterrents included a raptor decoy placed atop nest boxes with previous woodpecker egg depredation and that contained incubating hens at the time of deployment; snake deterrents included commercially available granules placed in a cotton sock and attached underneath boxes to avoid dilution from rain.

To determine recruitment rates, nesting hens are leg banded with standard USGS leg bands, and ducklings are web tagged with 1-mm self-piercing aluminum tags. Rat snakes found in boxes are tagged with a single glass passive integrated transponder (PIT) tag, each with a unique identification code. Use of PIT tags will enable us to estimate access to boxes and egg predation by individual snakes, dispersal and survival rates of these snakes, and population size of snakes able to access boxes.

Combined for South Carolina and North Carolina in 2020, a total of 233 hens were banded (three missing one leg from unknown depredation) and 1,942 ducklings were web-tagged. Ninety-eight percent (n =181) and 86% (n = 124) of boxes were used in 2020 by wood ducks in South Carolina and North Carolina, respectively. Forty-five rat snakes were captured

and PIT tagged in South Carolina, with 46% being recaptured ≥ 1 times. For both states, there were 456 wood duck nest attempts, 58% of which were successful, 15% were abandoned, 17% depredated by snakes, 5% depredated by woodpeckers, and the remaining 5% of nest fates were unknown or nests active when monitoring ceased in mid-July 2020. At Lake Moultrie in South Carolina, 12 yearling nesting hens, double web-tagged (i.e., one tag in webbing of each foot) as ducklings during our pilot study in 2019, were recaptured in 2020, yielding a yearling return rate of ~5% (*n* = 252 female ducklings that exited a nest box). Of the 12 yearling hens, 10 retained both tags and 2 retained one tag, indicating no complete tag loss. Additionally, 70 adult hens leg banded in 2019 were recaptured in 2020, yielding a return rate of 48% (*n* = 145). Combined adult and yearling hen return was 20% (*n* = 397). I'll be developing and assessing statistical models to determine what variables and management strategies positively influence box use, nest success, and recruitment, as well as estimate recruitment rate to determine if it is adequate to sustain the box-nesting populations in my study sites.

RESEARCH ABSTRACT

MANAGED WETLAND ECOSYSTEM SERVICES

Dr. Tom O'Halloran,
Clemson's Baruch Institute of Coastal Ecology and Forest Science

Managed wetlands, also sometimes called "duck ponds" in Lowcountry South Carolina, are extremely valuable for providing waterfowl habitat, and a new study in cooperation with the Kennedy Center will examine some of the other ecosystem services provided by these wetlands. Ecosystem services are the benefits humans obtain from ecosystems' natural functioning. Of the many types of ecosystem services, a few examples include habitat provisioning, water purification and reserving, and reducing greenhouse gasses from entering the atmosphere. The latter is the main subject of interest of the new study, because wetlands can be "sources or sinks" of some types of greenhouse gasses. However, many questions remain about the magnitude or dynamics of these emissions.

In March 2020, Dr. Tom O'Halloran, Assistant Professor at the Baruch Institute, and his research team constructed an environmental sensor tower next to wetland impoundments managed for ducks at Annandale Plantation in the Santee River Basin south of Georgetown, South Carolina (see picture). The instruments continuously measure a suite of meteorological and water quality variables, as well as the exchange of carbon dioxide and methane between the wetland and the atmosphere. Weather conditions and plant phenology vary seasonally, while water levels and salinity vary due to weather and management strategies; these variables are measured too. The instruments detect changes in ecosystem photosynthesis, respiration, and methane production caused by this environmental variability. With this information, greenhouse gas budgets can be quantified and compared against the value of other ecosystem services. The potential to reduce greenhouse gas emissions and enhance carbon sequestration by slightly altering management practices also will be examined. The scientists hope to discover balanced best management practices for ducks and the environment.

The pilot study is being funded through an Equipment Grant and Graduate Research Assistantship from the College of Agriculture, Forestry and Life Sciences at Clemson University. The Kennedy Center will help fund the graduate student research assistantship in years 3 and 4 of the study. Funding is currently being sought to expand the study to tidally influenced control sites without active human management to compare services between managed and not managed sites. Drs. O'Halloran and Kaminski are grateful to Mr. Dan Ray, owner of Annandale Plantation and Mr. Bill Mace, Wetlands Manager, for hosting and facilitating the research.

A webcam documents plant phenology and wildlife near the tower, and posts images every 30 minutes here: https://phenocam.sr.unh.edu/webcam/sites/brackishimpoundment/

Panoramic view of the eddy covariance flux tower and a managed waterfowl wetland.

RESEARCH ABSTRACT

WOOD DUCK USE OF AND PRODUCTION IN ARTIFICIAL NEST BOXES IN THE CLEMSON UNIVERSITY EXPERIMENTAL FOREST: AN UNDERGRADUATE RESEARCH PROJECT

Stephanie Braswell, Jonathan Mackey, Jeffrey Mitchum, Frederick James, Richard Coen, Jason Andrews, Lucas Downs, Cole Shealy, Clyde Zoubian, David Singletary, Nathaniel Schmidt, Caroline Sharpe, Amanda Taylor, Jordan McCall, Granger Rabon, Jessica Eidson, Marcus Dudley, Chandler Gray, Emily Miller, Jacob Shurba, Nicholas Masto, Magdalyn Husser and Dr. Rick Kaminski

Department of Forestry and Environmental Conservation
James C. Kennedy Waterfowl & Wetlands Conservation Center

Clemson University offers Creative Inquiry (CI) courses for undergraduate students to acquire research experiences assisting graduate students and faculty. The CI students, guided by former M.S. student Nicholas Masto and Dr. Kaminski, repaired and monitored wood duck (*Aix sponsa*) nest boxes in Clemson University Experimental Forest (CUEF) during springs 2018-March 2020, when COVID 19 forced closure of the university and temporary discontinuance of the research project. The students will inspect the boxes to determine duckling production when they return to campus for fall semester 2020.

Evaluating wood duck use of and reproduction in artificial nest boxes was identified in 2018 as a research priority by partners of the mid- and south Atlantic region of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan. A recent study in South Carolina evaluated wood duck use and production across coastal South Carolina (Croft 2018, Thesis, Clemson University).

Our CI team monitored 47 wood duck boxes in CUEF (30,351 ha) in the Piedmont Region of South Carolina during 2018-2020. Our objectives were to: 1) establish a protocol for monitoring and maintaining nest boxes in the CUEF for future undergraduate researchers, 2) determine nest box use (presence of ≥1 egg) and number (*n*) of ducklings that hatched and exited boxes (indexed by *n* egg-shell membranes), 3) identify variables that predicted probability of use of nest boxes by wood ducks, and 4) compare results between piedmont and coastal regions after project termination.

We monitored nest boxes biweekly from January–May 2018-2019 and January–March 2020. Our study area included two distinct areas of the CUEF including the North (n = 19 boxes) and South (n = 28) Forests and an impoundment within CUEF. We measured box volume, entrance diameter and direction (N, E, W, S), visual obstruction of boxes by vegetation, canopy cover, and distance to potential brood cover. We used a Fisher Exact Test to test frequency of box use by wood ducks among study sites in CUEF. We used logistic regression to estimate probability of wood duck use of boxes (1 = used, 0 = not used) relative to selected aforementioned variables measured for boxes. We excluded box volume and entrance diameter and shape from analyses, because boxes were standard dimensions and thus did not vary.

Preliminary results from 2018-2019 revealed that nest boxes in the South Forest had greater use by wood ducks compared to those in the North Forest and the impoundment (P = 0.002) and thus the former boxes contained more eggs. However, boxes in the South Forest were parasitized most by dump nesting hens (i.e., they contained >12 eggs). Canopy cover was the only variable that predicted box use (P = 0.06), which

increased with lack of cover around boxes. We speculate that greater rates of use and dump nesting in boxes in the South Forest may be due to conspicuousness of these boxes, facilitating hens to find and use boxes. These boxes also occur in wetlands containing predatory fish and little emergent vegetative cover; thus, hatched wood ducks may be depredated and not recruited into the fall population. We will determine number of egg-shell membranes in boxes in fall 2020 to index duckling production.

Nest boxes in CUEF are managed under the auspices of the South Carolina Department of Natural Resources (SCDNR). The CI students will meet with SCDNR biologists in fall 2020 to communicate results of the study and make recommendations to relocate boxes to sites with suitable brood cover (i.e., wetlands with emergent or scrub-shrub shoreline cover; Davis et al. 2007, *Journal of Wildlife Management*) and present their results at Clemson University and other venues such as the annual meeting of Southeastern Section of The Wildlife Society.

OUTREACH AND COLLABORATION

SERVICE ACTIVITIES OF THE KENNEDY CENTER

The term Outreach means communicating research and other technical knowledge from various reputable sources to public and private stakeholders, similar to how Cooperative Extension Units are charged to do for land-grant universities and citizens of their state or nation. Land-grant universities also term outreach as Service and provide these to the public along with Teaching and Research. Clemson University is the land-grant university of South Carolina; hence, an obvious role of the Kennedy Center is and will continue to be sharing and outreaching technical information on ecology and management of waterfowl and wetlands. The following are outreach activities engaged in by the Kennedy Center during 2019-2020.

North American Waterfowl Professional Education Plan 2020

Conservation of waterfowl, wetlands, and all natural resources neither occurs effectively nor efficiently without human resources. Therefore, the North American Waterfowl Professional Education Plan (NAWPEP) and steering committee were established as a sub-unit of the North American Waterfowl Management Plan (NAWMP). The goal of NAWPEP is to: *Engage and assist universities/colleges and NAWMP partners with establishing, sustaining, and enhancing academic and experiential programs in waterfowl and wetlands science and management, in order that sufficient numbers of professionals with this expertise and representative of North America's human society are available to sustain professional capacity and excellence of future waterfowl science and management across the continent.*

Dr. Kaminski and an esteemed cadre of waterfowl and wetlands colleagues from the United States, Canada, and Mexico compose NAWPEP's steering committee (see below). Diane Eggeman coordinates the committee and is NAWPEP's liaison with NAWMP. The committee has drafted a strategic plan which was shared with NAWMP partners for their review in July 2020. Additionally, the steering committee surveyed current and retired waterfowl-wetlands professors in the USA and Canada to determine how many of their graduate students ultimately acquired employment in the arena of waterfowl or wetlands during the 1980-2020 period. Respondents indicated that, on average, <1 person per year graduated and obtained employment in the waterfowl/wetlands arena, suggesting very low availability of professionals for these positions in the future unless university-based waterfowl and wetlands programs increase in training capacity. Clearly, the need for NAWPEP is paramount. Inquiries and questions may be directed to Diane Eggeman at deggeman@ducks.org

Steering Committee

Michael G. Brasher
Waterfowl Scientist
Ducks Unlimited, Inc.
mbrasher@ducks.org

Eduardo Carrera
National Director and Chief Executive Officer
Ducks Unlimited de México
ecarrera@dumac.org

John Eadie
Professor and Dennis G. Raveling Chair in Waterfowl Biology
University of California-Davis
jmeadie@ucdavis.edu

Diane Eggeman
NAWMP Integration Coordinator
Ducks Unlimited, Inc.
deggeman@ducks.org

David Howerter
Chief Conservation Officer
Ducks Unlimited-Canada
d_howerter@ducks.ca

Richard M. Kaminski, Director
Clemson University's James C. Kennedy Waterfowl & Wetlands Conservation Center
rmkamin@clemson.edu

J. Drew Lanham
Alumni Distinguished Professor of Wildlife Ecology
Clemson University
lanhamj@clemson.edu

Tom Moorman
Chief Scientist
Ducks Unlimited, Inc.
tmoorman@ducks.org

Kevin M. Ringelman
Associate Professor
Louisiana State University
kevin.ringelman@gmail.com

Frank Rohwer
President
Delta Waterfowl Foundation
frohwer@deltawaterfowl.org

21st Century Waterfowl, Waterbird, and Wetland Science and Conservation: A Symposium

The Kennedy Center, Nemours Wildlife Foundation, and the South Carolina Department of Natural Resources organized and convened a day long special symposium at the 2019 annual conference of the Southeastern Fish and Wildlife Agencies (SEAFWA). It was titled 21st Century Waterfowl, Waterbird, and Wetland Science and Conservation. The symposium featured speakers from across the Southeast Region. The speakers and their topics are listed below.

Pictured is Paul Schmidt, long-time USFWS and DU employee and now conservation consultant for Nemours Wildfire Foundation. Paul delivered a wrap-up presentation at the symposium entitled, Waterfowl and Wetlands Research Priorities for the Mid-South Atlantic Flyway and Beyond. The Nemours Wildlife Foundation, the Kennedy Center, and partners from the Atlantic and Mississippi Flyways have identified waterfowl and wetlands priorities for the Southeast Region and have begun to address these important research needs. For example, an initial project in 2020 is a regional study of recruitment by box-nesting wood ducks and other cavity nesting ducks across 10 states. Paul and others plan to report on this large-scale study at the 2020 SEAFWA conference in Missouri.

Nesting Ecology and Population Genetics of American Black Ducks in Coastal North Carolina
Daniel Lawson, Christopher Williams - University of Delaware

Survival and Recovery of Mottled Ducks in Coastal South Carolina 2008-2018
Molly Kneece, SCDNR; Joseph Lancaster, INHS Forbes Biological Station; Brian Davis, Mississippi State; Dean Harrigal, SCDNR

Nesting Ecology of Mottled Ducks in Southwest Louisiana
Lizzi Bonczek, Louisiana State; Samantha Collins, Joseph Marty –Louisiana Department of Wildlife and Fisheries; Kevin Ringelman, Louisiana State University

Population Genetics and Hybridization Between Mottled Ducks and Mallards in South Carolina
Philip Lavretsky, University of Texas at El Paso; Richard Kaminski, Clemson University

Spatiotemporal Dynamics in Winter Harvest Distribution of Mallards Banded in Arkansas
Douglas Osborne, Lindsay Carlson - University of Arkansas-Monticello

Distribution Dynamics of Waterfowl
Michael Brasher, DU; Mickey Heitmeyer, Greenbrier Wetland Services; Tom Moorman, DU; Heath Hagy, USFWS; Dale Humburg, DU / Retired; Andrew Raedeke, Missouri Dept. of Conservation; Brian Davis, Mississippi State; Jamie Feddersen, TWRA; Dave Graber, Missouri Dept. of Conservation, Retired; Luke Naylor, Arkansas Game and Fish Commission; Douglas Osborne, University of Arkansas - Monticello; Larry Reynolds, Louisiana Dept. of Wildlife and Fisheries; Elisabeth Webb, USGS

Wood Duck and Black-Bellied Whistling Duck Box-Nesting Ecology in Coastal South Carolina
Gillie Croft, Nemours Wildlife Foundation; Richard Kaminski, Clemson University; Ernie Wiggers, Nemours Wildlife Foundation; Patrick Gerard, Clemson University

Regional Examination of the Contribution of Nest Boxes to Wood Duck Recruitment in the Southeast United States
Beau Bauer, Nemours Wildlife Foundation; Ernie Wiggers, Nemours Wildlife Foundation; Richard Kaminski, Clemson University; Gary Hepp, Auburn University; Paul Schmidt, Consulting for Conservation

True Metabolizable Energy of Native and Exotic Submersed Aquatic Vegetation for Ducks in the Southeast U.S.
Joseph Lancaster, Margaret Gross, Sarah McClain – Forbes Biological Station; Stephen Rockwood, Florida Fish and Wildlife Conservation Commission; Nick Masto, Clemson University; Michael Netherland, University of Florida; Heath Hagy, USFWS

Development and Assessment of an Online University Course in Waterfowl Ecology and Management
Lauren Hernandez-Rubio Senn, Richard M. Kaminski, Shari L. Rodriguez, Althea H. Hagan, Daniel R. Hitchcock, William H. Conner – Clemson University

Evaluation of Aerial Surveys to Monitor Waterbird Populations in South Carolina
Nick Masto, Richard Kaminski – Clemson University; Molly Kneece, SC DNR; Patrick Gerard, Kyle Barrett – Clemson University; Beth Ross, USGS; Clemson University

Integrating Counts from Aerial and Ground Surveys to Estimate Densities of Waterfowl
Beth Ross, USGS, South Carolina CRU; Nicholas Masto, Richard Kaminski – Clemson University; Jamie Dozier, Mark McAlister, Joseph Woods - Tom Yawkey Wildlife Research Center, SC DNR

Distribution and Ecology of Eastern Black Rails in South Carolina
Christy Hand, SC Department of Natural Resources

The Atlantic Coast Joint Venture's Flagship Initiative: Conserving Coastal Marshes for American Black Duck, Saltmarsh Sparrow, and Black Rail
Craig Watson, Aimee Weldon - U.S. Fish & Wildlife Service

Framing the 2018 NAWMP Update and Plan Committee Priorities
R. Joseph Benedict, Jr., Tennessee Wildlife Resources Agency; Jerome B. Ford, USFWS; Karla Guyn, Ducks Unlimited Canada; Silke Neve, Canadian Wildlife Service; Dean Smith, AFWA–NAWMP Director/ Wildlife Liaison

Fall Migration Ecology of Shore- and Other Waterbirds and Conservation Implications in the Mississippi Alluvial Valley and Gulf Coast Regions
Justyn Foth, Delaware Division of Fish & Wildlife; Richard Kaminski, Clemson University; Francisco Vilella, U.S.G.S Mississippi Co-op Fish and Wildlife Research Unit

The Efficacy of Marsh Terraces for Enhancing and Restoring Gulf Coastal Wetlands
Brian Davis, Madelyn (Madie) McFarland, Medhi Armandei, Joseph French, Anna Linhoss, Robert Moorhead, Raul Osorio, Adam Skarke, Mark Woodrey - Mississippi State University; Michael Brasher, Ducks Unlimited

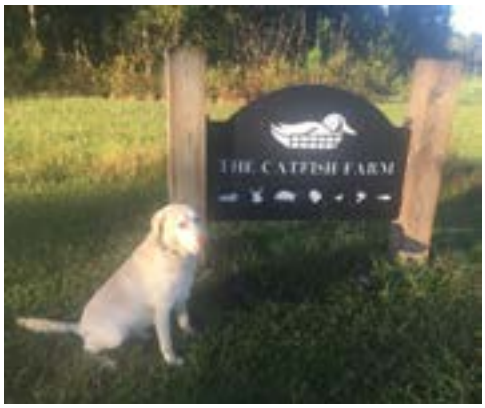
DU's Southeastern Conservation Initiatives: Partnerships Throughout the South
Jamie Radar and Todd Merendino, Ducks Unlimited

Ecosystem Services of Managed and Non-managed Historic Rice Fields: A Research Strategy for Atlantic Coastal Wetlands Conservation
Tom O'Halloran, Richard Kaminski - Clemson University

Waterfowl and Wetlands Research Priorities for the Mid-South Atlantic Flyway and Beyond
Paul Schmidt, Consulting for Conservation; Ernie Wiggers, Nemours Wildlife Foundation; Richard Kaminski, Clemson University

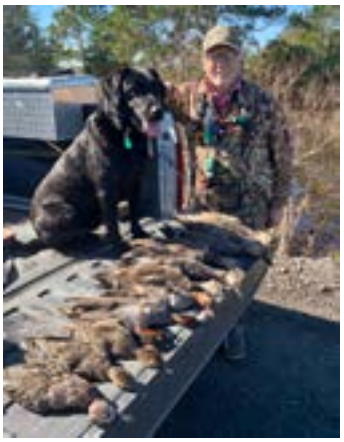
Recruiting and Retaining Waterfowl Hunters

The Kennedy Center had hoped to partner with Delta Waterfowl to sponsor a waterfowl hunt for Clemson University students enrolled in a course entitled Wildlife Hunting and Conservation, taught by Mr. Rick Willey, Coach of Clemson University's shotgun and skeet shooting team. Dr. Kaminski also lectured in Rick's course on the history of waterfowl management in North America and waterfowl hunting strategies and cuisine recipes. Most students enrolled in the course had never hunted previously; thus, it was a great opportunity to recruit these conservationists. Mr. Joseph Richardson, Columbia, SC, graciously offered to host the waterfowl hunt at his lodge and property, The Catfish Farm. However, the week before the planned event, the ducks decided to leave the Catfish Farm so the hunt was canceled but will convene in 2021, assuming the ducks facilitate.



Mr. Dan Ray, Kennedy Center friend and sponsor, hosted two waterfowl hunts for youth after the close of the regular hunting season at his Annandale Plantation south of Georgetown, SC. Thank you Dan for providing outstanding waterfowl habitat and helping recruit the next generation of waterfowl hunting conservationists. Above is a collage of happy hunters from the Annandale event. Especially note Smith Ragsdale, III, with his first ever harvested duck—a female green-winged teal.

Additionally, my son, Matt, escorted his daughter, Madison, on a youth hunt in California. Madi enjoys these events with her dad despite some reluctance to leave a warm bed in the wee hours of the morning.



There also were several opportunities to ensure retention of senior waterfowl conservationists with pleasurable and successful hunts hosted by Nemours Wildlife Foundation and Rochelle Plantation. We thank Beau Bauer (left) of Nemours Foundation and Michael Prevost (center) of Rochelle Plantation for guiding these hunts.

And, of course, we wish Mr. Kennedy (right) continued good health to enable his conservation efforts and waterfowl hunting with his family and guests at his waterfowl mecca, York Woods in Mississippi.

Habitat Management

Dr. Kaminski and students engage in a number of site visits annually to friends and sponsors of the Kennedy Center. During these visits, we prescribe habitat management to restore and improve the habitat for waterfowl and other wildlife. Below is a collage of pictures taken during site visits in 2019 and 2020.

Ratoon heirloom Charleston Gold rice being restored after a century of cessation at Mr. Don Quattlebaum's (left) White House Plantation, Georgetown, SC. Note wood storks and egrets using these historic rice fields constructed by enslaved peoples and cultivated from early 1700s until early 1900s.

Mr. Dan Ray, owner of Annandale Plantation, and his manager, Mr. Bill Mace, also are attempting to grow rice and chufa sedge this year in their upland fields. Bill (right) stands alongside of a rice field growing vigorously with frequent June and July rains. Bill and Dr. Kaminski discussed harvesting or mowing the first crop of rice to avoid blackbird depredation and then allowing a ratoon crop to grow during the remainder of late summer-fall for wintering ducks. Ratooning is the same practice that is applied at White House Plantation owned by Mr. Don Quattlebaum.



Prescribed burning of invasive giant cutgrass (aka white marsh) to restore a historic rice field to suitable waterfowl habitat at Oatland Plantation owned by Pawleys Island mayor, Mr. Brian Keith. Subsequent aerial helicopter application of herbicide to the giant cutgrass before prescribed burning of the dead vegetation and overseeding of the impoundment with millet.

Assisting the Coen family with management of historic rice fields at their Halidon Hill Plantation. Former students, Richard Coen (left) and Castles Leland, in front of a rice field impoundment colonized by a pad plant named watershield, the seeds and tubers of which are favored food of ringnecked ducks. Far left is a dewatered impoundment that will be managed as a moist-soil wetland.



Beaver dam demolition and drawdown for planned moist-soil management in historic beaver pond and brush clearing to open overgrown wetlands at Nesmith Plantation owned by Dr. Ben Cameransi.

In July 2019, Dr. Kaminski advised staff of Tennessee Wildlife Resources Agency and members of the Davey Crockett Hunting Club along the Obion River in northwestern Tennessee on management of the club's croplands, moist-soil wetlands, and green-tree reservoir for wintering waterfowl. The club lies adjacent to TWRA's Hop-In Wildlife Refuge, providing abundant food and sanctuary for wintering ducks and sandhill cranes.

Dr. Kaminski advised Mr. Brinkley Melvin, owner of Heron Bay Lodge and Lands, and his manager, Jake Hodges, on waterfowl habitat and wood duck management options on Mr. Melvin's properties adjoining and near Mattamuskeet National Wildlife Refuge in North Carolina. Heron Bay already is superbly managed by Mr. Hodges but every little enhancement helps the waterfowl and the hunters.

Dr. Kaminski was a guest of South Carolina Waterfowl Association's annual Night before Waterfowl Season, where he represented and remarked about roles of the Kennedy Center. Pictured are attendees and the SCWA event and SCWA President, Mr. David Wielicki, as they viewed thousands of ring-necked and other ducks using several of SCWA's managed wet croplands in November 2019.

Dr. Kaminski stands overlooking his primary study area at the famed Delta Marsh in Manitoba, where he conducted his doctoral research during the 1970s through the Delta Waterfowl and Wetlands Research Station, Michigan State University, and Ducks Unlimited-Canada. During the 1970s, Kaminski's study area was primarily a wetland meadow of white-top rivergrass used by abundant breeding dabbling ducks. Now, the area is covered largely by cattail and phragmites. Dr. Kaminski gave a historical account of this area and Delta Marsh to visitors of the Delta Station in August 2019 before the 8th North American Duck Symposium in Winnipeg, Manitoba, Canada. Dr. Kaminski dreams of restoring his former study area to a productive waterfowl habitat and hunting area.

Dr. Kaminski enjoys receiving updates of habitat management from his son, Matt, and grandaughter, Madi, in California. Matt's an excellent manager, so Grandpa can't add much be he tries. Here is a Madi in June 2020 standing amidst a stand of volunteer Golden Millet planted in 2019 that has restored itself. Despite thousands of ducks used this millet field during winter 2019-2020, they apparently didn't deplete and seed bank. The 2020 volunteer crop is evidence.

Assisting Louisiana Department of Wildlife and Fisheries (LDWF), South Carolina Department of Natural Resources (SC DNR), and Local Citizen Groups

Rockefellar Wildlife Refuge

Kennedy Center graduate students and interns traveled to Rockefeller Wildlife Refuge in Grand Chenier, LA for a spring break field trip in the south Mississippi Flyway. Although our trip was abbreviated due to COVID 19 and the group was forced to return to campus, the students ably assisted LDWF staff with banding a couple hundred black-bellied whistling ducks at and near the Refuge. The students also drew blood samples from the birds and installed about 150 PIT tags to uniquely identify each captured bird for further research. The PIT tags function like a chip placed in pets and which can be read with electronic devices to determine return rates by ducks to nest boxes. The students were hosted by Dr. Joe Marty a former student of Drs. Davis and Kaminski at Mississippi State and his wife Deanna and son, Noel. The Marty's treated Clemson Team Duck to a crawfish boil, Cajun style. The students learned the meaning of and exclaimed, "Aaaeeeeeeeeeeh!"

Lake Moultrie, South Carolina
The SC DNR manages about 170 nest boxes for wood ducks around Lake Moultrie near Bonneau, SC. The boxes are being monitored by M.S. student Emily Miller and technicians, Jake Merrendino and Samantha Fishman, as part of a regional study of female wood duck return and recruitment from nest boxes at Lake Moultie and sites in Maryland, Delaware, North Carolina, Georgia, Florida, Louisiana, Mississippi, and Wisconsin. Part of Emily's study is to evaluate if vegetation removal around nest boxes will deter rat snakes from entering the boxes, consuming eggs, and strangling nesting hens. Snake depredation is a major factor contributing to wood duck nest loss at Lake Moultrie, which ultimately reduces recruitment of wood ducks. Here are Emily and Jason Andrews removing cypress branches and trees from around nest boxes in October 2019. The spring 2020 view illustrates how vegetation clearing results distances the box from vegetation that otherwise would allow snakes to access the box.



Local Citizen Groups
Dr. Kaminski and Kennedy Center students assist local citizen groups with varied waterfowl and wetlands issues. For example, Dr. Kaminski is advising a senior citizen group who have placed wood duck boxes on ponds in their community of Pawleys Island Plantation. Dr. Kaminski hopes to conduct a study of wood duck recruitment from nest boxes in urban environments compared to adjacent natural swamplands at Hobcaw Barony. Two stories about this project were published; one in the Coastal Observer newspaper and another in the Debordieu Colony's newsletter.

Conservation Fellowship
Outreach and fellowship are inseparable elements of connectivity for conservationists and other professionals. Dr. Kaminski helped organize a secret retirement event for his colleague and friend, Dr. Jim Sedinger, who retired after spending long segments of his career at the University of Alaska-Fairbanks and University of Neveda-Reno. Dr. Sedinger is a world renown arctic goose and other waterfowl expert. Dr. Kaminski worked closely with Dr. Sedinger's son, Dr. Ben Sedinger, in organizing the event which convened at the 8th North American Duck Symposium in Winnipeg, Manitoba, Canada in August 2019. Pictured are Dr. Sedinger's former students, colleagues, and friends at the recognition event.

Student Teaching Outreach
The Baruch Institute of Coastal Ecology and Forest Science and Kennedy Center regularly host Clemson and other students on environmental field trips to Hobcaw Barony. Pictured below is Dr. Stefanie Whitmire lecturing on forested wetland systems ecology to Dr. Yarrow's students in his course, Applied Wildlife Habitat Management. The students also were exposed to Fairfield Village at Hobcaw Barony. The Village was one of a number of slave communities that are preserved for cultural and historical instruction. The students are pictured on the porch of one of the slave houses from the 1800s.

The Baruch Institute hosted an open house for Clemson Extension, administrators, and other colleagues at which students made oral presentations and interacted at posters. Two of the guests included Vice President Dr. George Askew and Dean Dr. Keith Belli (top left picture of 2 gentleman). Another annual event for fellowship is the annual Thanksgiving sharing. Both Clemson and University of South Carolina Baruch Institutes conjoined for the Thanksgiving feast in the Clemson multi-purpose room. Finally, Georgetownian, Mr. Jim Hills, annually invites about 200 conservationists to celebrate in wildlife hunting and harvesting by hosting an outdoor event featuring wild game and seafood at his Ingleside Plantation.

In August 2020, Dr. Kaminski returned to the Davey Crockett Duck Club in Tennessee to follow-up on waterfowl habitat prescriptions recommended in 2019 for the Club's green-tree reservoir, corn fields, and moist-soil wetlands and to introduce his former graduate student, Nick Masto, to the Club's board of directors. Nick (far left) is a Ph.D. student now at Tennessee Tech with two other graduate students studying wintering and spring migrational ecology of mallards marked with GPS transmitters in western Tennessee. The Club agreed to allow the students to capture mallards on the Club's property in October-November before the waterfowl hunting season in order to mark and monitor mallards from before, through, and after the hunting season. Below are pictures of the Davey Crockett Club board members, the students, and Dr. Kaminski (middle) in front of one of 14 duck blinds on the several thousand acre Club along the Obion River near Reelfoot Lake. Additionally, the board and Dr. Kaminski (right) are pictured in newly enlarged duck hole in the cypress swamp seeded with Japanese millet, which will provide a shallow (~12-18 inches) secluded hole in the swamp for wintering mallards and a hunters' haven. The brown, newly mulched hole also is planted in millet and will produce seed for mallards this winter.

Dr. Kaminski also met with members of Hearts Desire hunting club in western Tennessee. The Davey Crockett Club recommended Dr. Kaminski to Hearts Desire Club. Below are members and the manager of Hearts Desire Club, who Dr. Kaminski advised on ways to improve their bottomland moist-soil and hardwood tracts. Both Hearts Desire and Davey Crockett Clubs are monetary sponsors of the Kennedy Center in exchange for Dr. Kaminski's gratis consultation.

Reach out and share your waterfowl conservation knowledge with whoever hasn't yet been so touched to help grow the flock!

STUDENT AWARDS

We are pleased to announce fellowships, assistantships, and scholarships received by Kennedy Center-Nemours Wildlife Foundation undergraduate and graduate students during 2019-2020.

Lauren Rubio-Hernandez Senn, Kennedy Center, Ph.D. Candidate Fellow. Lauren is in her fourth and final year of her doctoral degree program. One topic of Lauren's dissertation is the three-year evaluation of the online course, Waterfowl Ecology and Management. Additionally, Lauren conducted two other studies to identify (1) academic and experiential credentials of professional waterfowl and wetlands ecologists and managers and (2) strategies to motivate graduate students to publish research from their thesis or dissertation in scientific journals.

Emily Miller is a Kennedy Center and Nemours Wildlife Foundation M.S. Student Fellow. Emily is a second year M.S. student and member of Team Wood Duck conducting research on recruitment by box-nesting female wood ducks in South Carolina and North Carolina.

Jacob Shurba is a Kennedy Center, Nemours Wildlife Foundation, and South Carolina Department of Natural Resources Graduate Research Assistant. Jacob also is a member of Team Wood Duck conducting research on box-nesting wood ducks in Georgia and Florida. He too is researching recruitment of hen wood ducks and effects of nest-box microbial communities on wood duck egg hatching success.

Stephanie Braswell is a senior undergraduate student majoring in Wildlife and Fisheries and minoring in Forestry. Stephanie is a second-year recipient of the Kennedy Center undergraduate scholarship for her academic achievements and campus leadership of the Kennedy Center undergraduate interns and creative inquiry students in 2019 and 2020. She also was honored by receiving the Steven L. Potts Award from the Department of Forestry and Environmental Conservation for academic and other excellence.

Magdalyn Husser is a undergraduate student majoring in Wildlife and Fisheries. She is a new member of Team Duck and first-year recipient of a Kennedy Center undergraduate scholarship for academic excellence and exemplary contributions to Team Duck and its graduate students.


Rubio-Hernandez Senn


Miller


Shurba


Braswell


Husser

KENNEDY CENTER ADVISORY COUNCIL AND ACKNOWLEDGEMENTS

We sincerely thank the advisory council members of the James C. Kennedy Waterfowl and Wetlands Conservation Center. The members represent partners from academia, agencies, and the private sector. They advise, facilitate, and support teaching, research, and outreach activities of the Kennedy Center. We anticipate meeting in summer 2021 after a successor to Dr. Kaminski is hired. Details will be forthcoming.

- **Jason Ayers,** South Carolina Coastal Program Coordinator, U.S. Fish and Wildlife Service
- **Billy Dukes,** Chief of Wildlife, South Carolina Department of Natural Resources (SCDNR)
- **Jim Clark,** Plantation and Land Manager
- **Jamie Dozier,** Project Leader, Tom Yawkey Wildlife Center, SCDNR
- **Travis H. Folk,** woodland and wildlife consultant, Folk Land Management, Inc., Green Pond, SC
- **Jason Hewett,** Manager, Clarendon Farms
- **Beth Ross,** Assistant Leader, South Carolina Cooperative Fish & Wildlife Research Unit, Clemson University
- **Thomas Rainwater,** Wildlife Research Scientist, Yawkey Wildlife Foundation and Belle W. Baruch Institute of Coastal Ecology and Forest Science
- **Buford Mabry,** Delta Waterfowl Foundation
- **Bill Mace,** Manager, Annandale Plantation
- **Robert Perry,** Palmetto Natural Resources Management, LLC
- **Michael Prevost,** wildlife biologist and land manager, White Oak Forestry and Rochelle Plantation
- **Ducks Unlimited,** Inc. Southern Regional Office
- **Skip Van Bloem,** Director, Baruch Institute of Coastal Ecology and Forest Science
- **Craig Watson,** South Atlantic Coordinator, U.S. Fish and Wildlife Service, Charleston Ecological Services Field Office
- **David Wielicki,** Executive Director, South Carolina Waterfowl Association
- **Ernie Wiggers,** CEO Nemours Wildlife Foundation
- **R. Kenneth Williams,** Owner, Williams Land Management Company
- **Greg Yarrow,** Professor, Clemson's Department of Forestry and Environmental Conservation

Publications (*n* =13)

Bauer, B. A., R. M. Kaminski, J. D. Lanham, P. D. Gerard, and E. P. Wiggers. 2020. Hydrological management for submersed aquatic vegetation in South Carolina coastal impoundments. Wildlife Society Bulletin 44:570-584.

Bradley, S. 2020. Clemson researchers collaborating on ground-breaking duck study. Clemson University: https://newsstand.clemson.edu/mediarelations/clemson-researchers-collaborating-on-groundbreaking-duck-study/

Croft, G. D., R. M. Kaminski, E. P. Wiggers, P. D. Gerard, and G. R. Yarrow. 2020. Nest-box use by wood ducks and black-bellied whistling ducks in coastal South Carolina. Wildlife Society Bulletin, in press.

Kaminski, R.M. 2020. Duck boxes protect wood ducks from ground predators. Debordieu Colony, Blue Heron Newsletter.

Lavretsky, P., E. Duenez, M. Kneece, and R. M. Kaminski. 2020. Conservation genetics of a translocated population of mottled ducks and Anas allies in South Carolina. Journal of Wildlife Management, in review.

Marty, J. R., J. B. Davis, R. M. Kaminski, M. G. Brasher, and S. A. Rush. 2020. Gulf Coast Riceland seed biomass estimates for waterfowl habitat conservation. Journal of Wildlife Management: https://doi.org/10.1002/jwmg.21924

Masto, N. M., B. A. Bauer, R. M. Kaminski, C. Sharpe, R. C. Leland, E. P. Wiggers, and P. D. Gerard. 2020. Rake sampling to estimate biomass of submersed aquatic vegetation in coastal wetlands. Wetlands: https://doi.org/10.1007/s13157-020-01296-3

Masto, N. M., R. M. Kaminski, P. D. Gerard, B. E. Ross, M. R. Kneece, K. Barrett, and G. Wilkerson. 2020. Aerial strip-transect surveys: Indexing autumn–winter waterbird abundance and distribution in South Carolina. Journal of Southeastern Fish and Wildlife Agencies, in press

Monroe, K. C., J. B. Davis, A. P. Monroe, R. M. Kaminski, M. J. Gray, and D. L. Evans. 2020. Winter habitat selection by a declining American black duck population. Wildlife Society Bulletin, in press.

Schmidt, N., R. Leland, N. Masto, and R. Kaminski. 2019. Clemson Tigers' Waterfowl and Wetlands Spring Migration. Spring Newsletter, Southeastern Section of The Wildlife Society.

Shurba, J., E. Miller, R. Kaminski, and Clemson Creative Inquiry Students. 2020. COVID-19 Didn't Break Our Spring Break. The Wildlife Society Southeastern Section Newsletter, September 2020 62:10-12.

Sokoloski, C. 2020. Do wood ducks come home to roost? Study will find out. Coastal Observer 13 February 2020, pages 1 and 3.

Vilella, F. J., J.A. Cruz-Burgos, R.M. Kaminski, H.R. Murkin, J.B. Davis, S.L. Weitzel, and F. Vizcarra. 2020. Avian community responses to management of vegetation and water levels in restored wetlands at the Humacao Nature Reserve, Puerto Rico. Caribbean Naturalist 72:1-21.

Oral and Poster Presentations (*n* = 32)

Miller, R., and J. Shurba. Wood duck nest box studies in Florida, Georgia, North Carolina, and South Carolina: Recruitment while combating microbes and snakes. Ducks Unlimited Podcasts.

Shurba, J. et al. 2020. Regional examination of the contribution of nest boxes to wood duck recruitment in the Southeastern United States. South Carolina Chapter of The Wildlife Society, Annual Meeting, 13 October 2020.

Kaminski, R. M. 2020. The North American Waterfowl Professional Education Plan for the 21st century. Annual meeting of the South Carolina Chapter of The Wildlife Society, October 2020.

Bauer, B. A., et al. 2020. Regional contribution of nest boxes to recruitment of wood ducks in the Mid- and South Atlantic states. Poster, Southeastern Fish and Wildlife Agencies Annual Meeting, Springfield, Missouri (virtual), 13 October 2020.

Kaminski, R. M. and NAWPEP team. 2020. The North American Waterfowl Professional Education Plan: A strategy to sustain university-based waterfowl and wetlands education. Association of Fish and Wildlife Agencies Annual Meeting, 10 September 2020.

Miller, E., J. Shurba, J. Merendino, B. Bauer, R. Kaminski, E. Wiggers, B. E. Ross, K. Barrett, and P. Schmidt. 2020. Contribution of nest boxes to wood duck recruitment in the Southeastern & Mid-Atlantic states. Clemson University, Baruch Institute. 13 July 2020.

Bauer, B., R. Kaminski, P. Gerard, J. D. Lanham, and E. Wiggers. 2020. Hydrological management for submersed aquatic vegetation and invertebrates in South Carolina. ACE Basin Research Symposium, Edisto Island, SC, March 4, 2020.

Senn, L. H.-R., R.M. Kaminski, C.K. Williams, and S.L. Rodriguez. 2020. Waterfowl professionals' and students' perceptions of graduate student publication practices. Presented at Hobcaw Research Symposium 2020, Georgetown, SC, Feb 7th.

Miller, E., B. A. Bauer, R. M. Kaminski, E. P. Wiggers, G. R. Hepp, and P. Schmidt. 2019. Regional examination of the contribution of nest boxes to wood duck recruitment in the southeastern United States: Pilot study and regional plan. Symposium: 21st Century Waterfowl, Waterbird, and Wetland Science and Conservation in Southeastern U.S. SEAFWA Conference, Hilton Head Island, SC, 29 October 2019.

Croft, G. C., R. M. Kaminski, E. W. Wiggers, P. D. Gerard, and G. K. Yarrow. 2019. Nest box use by wood ducks and black-bellied whistling ducks across coastal South Carolina. Symposium: 21st Century Waterfowl, Waterbird, and Wetland Science and Conservation in Southeastern U.S. SEAFWA Conference, Hilton Head Island, SC, 29 October 2019.

Senn, L.H., R.M. Kaminski, S. Rodriguez, A. Hagan, D. Hitchcock, and W. Conner. 2019. Development and assessment of an online university course in waterfowl ecology and management. Symposium: 21st Century Waterfowl, Waterbird, and Wetland Science and Conservation in Southeastern U.S. SEAFWA Conference, Hilton Head Island, SC, 29 October 2019.

Shurba, J. A., E. Miller, M. J. Merendino, B. A. Bauer, R. M. Kaminski, B. E. Ross, and E. Wiggers. 2019. Mississippi and Atlantic Flyway study of box-nesting wood duck recruitment 2019 pilot study at Lake Moultrie, South Carolina. SEAFWA Conference, Hilton Head Island, SC, 29 October 2019.

Masto, N. M., R. M, Kaminski, B. E. Ross, K. Barrett, P. Gerard. 2019. Evaluation of aerial surveys to estimate abundance and distribution of waterbird populations in South Carolina. Invited presentation. Symposium: 21st Century Waterfowl, Waterbird, and Wetland Science and Conservation in Southeastern U.S. SEAFWA Conference, Hilton Head Island, SC, 29 October 2019.

Senn, L. H.-R., R.M. Kaminski, C.K. Williams, and S.L. Rodriguez. 2019. Professionals' and students' perceptions of graduate student publication practices. The South Carolina Chapter of The Wildlife Society Annual Meeting, Columbia, SC, 16 October 2019.

Bauer, B. A., R. M. Kaminski, P. D. Gerard, J. D. Lanham, and E. P. Wiggers. 2019. Effects of hydrological management for submersed aquatic vegetation and invertebrates in South Carolina coastal impoundments. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Bauer, B., E. Wiggers, R. Kaminski, G. Hepp, and P. Schmidt. 2019. Contribution of nest boxes to wood duck recruitment in the Southeast and Mid-Atlantic states. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Croft, G.D., R.M. Kaminski, E.P. Wiggers, and P.D. Gerard. 2019. Box-nesting ecology of wood duck and black-bellied whistling duck in South Carolina. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Croft, G.D., R.M. Kaminski, E.P. Wiggers, and P.D. Gerard. 2019. Nest-box selection by wood ducks and black-bellied whistling ducks across coastal South Carolina. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Eadie, J-Mc., K.M. Ringelman, D. N. Koons, and R.M. Kaminski. 2019. Who's minding the marsh? Participants, Professionals and Partners in the 21st Century. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Ringelman, K.M. Price, E.E., Dugger, D.B. L.H. Senn, and R.M. Kaminski. 2019. Education and training of future waterfowl professionals. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Marty, J., J.B. Davis, M. Brasher, R.M. Kaminski, S. Rush. 2019. Autumn–winter rice and natural seed abundance: Biomass estimates for avian habitat conservation in Gulf Coast prairie croplands. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

K. Guyn, M.G. Anderson, T. Moorman, R.M. Kaminski, and C.W. Williams. 2019. WHO WILL MIND THE MARSH 2.0: Can partnerships help preserve the future for professional waterfowl/wetland education? 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Masto, N.M., R. M. Kaminski, B. E. Ross, M. R. Kneece, P. Gerard, and K. Barrett. 2019. Aerial transect surveys for monitoring fall–winter waterfowl abundance and distribution in South Carolina. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Masto, N.M., R. M. Kaminski, B. E. Ross3, M. R. Kneece, P. Gerard, and K. Barrett. 2019. Modeling double-observer aerial count data to estimate detection, abundance, and habitat relationships of waterfowl wintering in South Carolina. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

J.D. Lanham, C.W. Williams, R.M. Kaminski, and K. Adams. 2019. Who will mind the marsh? Welcoming and diversifying new participants in waterfowl and wetlands conservation. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Sharpe, C., J. Eidson, C. Leland, T. Turner, S. Braswell, C. Watson, J. Tolson1, R. Coen, N. M. Masto, T. Byars, C. Gallman, B. Bauer, and R. M. Kaminski. 2019. A rake sampling method to estimate biomass of submersed aquatic vegetation for waterfowl in managed South Carolina and other applicable wetlands. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

O'Halloran, T., M. Motallebi, and R.M. Kaminski. 2019. Beyond waterfowl habitat: Valuing multiple ecosystem services in managed wetlands to inform conservation. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Senn, L.H., R.M. Kaminski, S. Rodriguez, A. Hagan, D. Hitchcock, and W. Conner. 2019. Development and assessment of an online university course in waterfowl ecology and management. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Senn, L.H., R.M. Kaminski, C.K. Williams, and S. L. Rodriguez. 2019. Professionals' and students' perceptions of graduate student publication practices. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Lancaster, J.D., J.B. Davis, R.M. Kaminski, and G.M. Street. 2019. Habitat use by female mallards during and after waterfowl hunting seasons in Mississippi. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada, August 2019.

Ross, B. E., N. M. Masto, R. M. Kaminski, J. Dozier, M. McAlister, and J. Woods. 2019. Integrating counts from aerial and ground surveys to estimate densities of waterfowl. 8th North American Duck Symposium, Winnipeg, Manitoba, Canada. August 2019.

Sharpe, C., R. Leland, T. Turner, T. Byars, C. Gallman, A. Brown, J. Eidson, C. Ferrah, S. Braswell, C. Watson, N. M. Masto, B. Bauer, and R. Kaminski. 2019. Garden-rake sampling to estimate biomass of submersed aquatic vegetation in South Carolina managed coastal wetlands. Poster. 2019 Southeast Association of Fish and Wildlife Agencies annual conference, Hilton Head, SC.

Design by Charlene P. Mayfield
Clemson University, PSA Publications

James C. Kennedy
WATERFOWL & WETLANDS CENTER
CLEMSON UNIVERSITY