

CLEMSON  
UNIVERSITY  
JAMES C. KENNEDY  
WATERFOWL &  
WETLANDS  
CONSERVATION  
CENTER  
2017  
*annual report*



Lead in Science and  
Education to Conserve  
South Atlantic  
Wetland Ecosystems

# FROM THE DIRECTOR

## Causes to Cheer for Champions and Conservation

How many states can cheer because their public universities won multiple NCAA national championships in a single year? I recall the University of Florida's Gators winning football and basketball national titles in 2006-2007. Of course, the other state on my radar screen now is our home of South Carolina. Coastal Carolina University won the national championship in baseball in 2016, Clemson University won the national championship in football in 2017, and the University of South Carolina beat Mississippi State University (of which I'm a MSU Emeritus Professor) for the national women's basketball title. Three coveted titles in a single year by universities of a single state. Hail Chanticleers, Tigers, Gamecocks, and I'd be remiss to exclude the MSU Lady Bulldogs!

South Carolina also can cheer for its vast accomplishments in habitat conservation. For example, over 2.4 million acres of federal and state-owned conservation lands exist in South Carolina. Moreover, over 200,000 acres of privately owned habitats have been protected in perpetuity by conservation easements in coastal South Carolina alone. Together, that's over 13% of the land base of South Carolina. Indeed, the land-conservation ethic is deeply rooted in South Carolina and its people.

This rich legacy in conservation benefits the roles of the James C. Kennedy Waterfowl and Wetlands Conservation Center of Clemson University. With the help of our partners, we are striving to be a champion in research, education, and outreach to conserve wetland ecosystems in South Carolina and regionally. Clearly, application of science, coupled with hands-on experience, will result in effective conservation and educate students, professionals, and the public.

Singling out students, we could not accomplish the mission of the Kennedy Center without dedicated and bright undergraduate and graduate students affiliated with the Center and its sister organizations in research, education, and outreach, The Nemours and Yawkey Wildlife Foundations. You will read about the Kennedy-Nemours students and their research engagements in this annual report, and we welcome your input on their investigations and other topics you deem needing research. They are committed to learning and working in and out of the classroom, enabling them to emerge as the next generation of professionals studying and stewarding waterfowl, wetlands, and other natural resources. No professional reward is greater for me than to witness our students transform into natural resource professional colleagues and champion waterfowl and wetland conservation across the flyways.

Moreover, our research and outreach would not occur without the fiscal and in-kind support from our current sponsors and the numerous public and private landowners who generously allow us to use their properties for research, field trips, demonstration, and workshops. We are indebted to our partners and the trust they place in us to be their research and outreach "arms."

All people associated with Clemson's Kennedy Center and the waterfowl-wetlands community sincerely thank Mr. Jim Kennedy, a true champion of conservation for waterfowl and wetlands in North America.

Mr. Kennedy's generosity established in perpetuity Clemson's Kennedy Center in Waterfowl and Wetlands Conservation and three other university-based waterfowl and wetlands programs at Mississippi State University, University of Wisconsin-Stevens Point (co-created with David



F. Grohne), and Colorado State University. We privileged individuals associated with these endowed programs all pledge to be champions for waterfowl and wetlands science and conservation and hope our collective efforts and accomplishments are models to help sustain existing and create new university centers of excellence for waterfowl and wetlands in the Joint Venture Regions of The North American Waterfowl Management Plan. Working together insightfully and collegially, I'm confident we will fulfill Mr. Kennedy's anticipation, *"With these gifts, I hope to ensure future generations have waterfowl and wetlands to enjoy, and we continue to produce young people with passion to study and steward these important natural resources."*

Best and healthful wishes to our sponsors, partners, colleagues, and friends across the flyways.

Richard M. Kaminski, Ph.D.  
 Director, James C. Kennedy Waterfowl and Wetlands Conservation Center  
 Belle W. Baruch Institute of Coastal Ecology and Forest Science  
 Clemson University



**Thank you to our sponsors:**



Tom Yawkey Wildlife Center and Foundation



# TEACHING

Dr. Kaminski again enjoyed teaching Waterfowl Ecology and Management on campus weekly during fall semester 2016. Fifteen students completed the course, including three graduate students; all students earned an A or B grade. Lauren Senn, a Ph.D. student enrolled in the course and studying with Dr. Kaminski, is assisting him in transforming the waterfowl course from face-to-face, on campus to on-line delivery. Because Lauren aspires to be a university educator, her dissertation topics will entail content development and refreshment, pre- and post-online student assessments, and online marketing of the waterfowl course and perhaps another Department of Forestry and Environmental Conservation (FEC) online course.

To our knowledge, the Clemson University waterfowl course will be the first online version of such a course worldwide. It is intended to serve a valuable educational niche for students at universities not offering a waterfowl course, as well as graduate students enrolling in Clemson's new online Master's degree in Wildlife and Fisheries Biology that will be launched by FEC in fall 2017. This degree program was developed especially to

service natural resources professionals who cannot matriculate to the Clemson campus for a M.S. degree program.

The online version of the waterfowl course will be a split-level course available for enrollment by undergraduate and graduate students and will be an elective course for the new online Master's degree. Prospective students interested in enrolling in the course or matriculating to the degree program may contact Dr. Thea Hagan, FEC Online Program Director, [shotali@clemson.edu](mailto:shotali@clemson.edu). An example syllabus for the waterfowl course is appended below.

Besides weekly classroom instruction, students in the waterfowl course attended an October 2016 field trip to the Santee Delta Basin near Georgetown, SC. They visited and learned waterfowl and wetlands management from biologists at Annandale Plantation (Bill Mace and Phil Wilkinson), Belle W. Baruch Institute of Coastal Ecology and Forest Science (Bob Perry, Rick Kaminski, Molly Kneece, Michael Prevost, Phil Wilkinson, and R. Kenny Williams), and Rochelle Plantation (Michael Prevost). We sincerely thank plantation owners,





Dan Ray (Annandale) and Pierre Manigault (Rochelle), for providing access to their properties for student and visitor field trips.

Following a BBQ one night during the 2016 fall field trip, the students were treated to a panel discussion by the “Voices of the Santee Delta.” The “Voices” are sage waterfowl and wetland biologists, Bill Mace, Bob Perry, Michael Prevost, Phil Wilkinson, and R. Kenny Williams, who gave a historical chronicle of their professional lives and evolution of wildlife conservation in the Santee Delta from the 1930s-1960s to the present. Additionally, the “Voices” provided valuable insights to the students on strategies for professional and personal success after graduation. The “Voices” presentation was videoed by Clemson Online to preserve it in perpetuity. After the presentation is edited, it will be posted on the Kennedy Center website ([www.clemson.edu/kennedycenter/](http://www.clemson.edu/kennedycenter/)).

In addition to the waterfowl course, Dr. Kaminski and Nick Masto, a Clemson Kennedy Center-Nemours Wildlife Foundation M.S. graduate student, taught and coordinated a Clemson Creative Inquiry (CI) course on and off campus during academic year 2016-2017. The CI at Clemson University provides undergraduate students with research and outreach experiences by working side-by-side with faculty and graduate students. Besides acquiring hands-on professional experience, the students earn 1-3 academic credits based on their available time to contribute to the CI experience. Will Gallman and Taylor Byars, two undergraduate students who excelled as volunteer CI students during academic year 2015-2016, were each awarded a James C. Kennedy Undergraduate Student

Scholarship for their dedication and contributions. Dr. Kaminski’s intention is to seek volunteer CI students and then reward those who excel with a scholarship. The scholarship significantly defrays the students’ tuition and helps promote their leadership skills in recruiting and mentoring new CI students.

Throughout the academic year, CI Students attended regular meetings on campus both semesters, chaired by Nick Masto, to discuss waterfowl and wetlands research current topics, often gleaned from the Dr. Alan Afton’s email list serve provided through Louisiana State University. Dr. Afton has retired but graciously maintains the list serve for waterfowl and wetlands students, professionals, and enthusiasts worldwide. All Kennedy Center CI students and those enrolled in the waterfowl course are required to be members of Dr. Afton’s list serve—a most valuable current-issues blog and employment source for waterfowl and wetlands “people”. Readers of this annual report who are interested in becoming a member of Dr. Afton’s list serve may email him ([aafton@lsu.edu](mailto:aafton@lsu.edu)) and request membership FREE OF CHARGE for invaluable information. THANK YOU, Dr. Afton for your continued provision and management of the list serve.

Additionally, the CI students assisted Nick Masto in processing hundreds of submersed aquatic vegetation (SAV) samples that he collected in summer 2016. One of Nick’s research projects is evaluating accuracy and precision of using a rake sampler to collect widgeongrass and other SAV species. The



SAV is important forage for ducks and coots; thus, we are interested in estimating biomass of SAV to determine metabolizable energy of the plants by ducks and carrying capacity of wetlands managed for SAV for wintering waterbirds in coastal South Carolina.



Still another project by the CI students was checking and maintaining 60 wood duck nest boxes at DeBordieu Colony, Georgetown, SC in springs 2016 and 2017, as part of a contract with the Colony. M.S. Nemours Wildlife Foundation and Kennedy Center graduate student, Gillie Croft, is conducting the first comprehensive survey of use and duck production from wood duck boxes across the entire coastal South Carolina, where public and private waterfowl conservation partners have erected thousands of nest structures. Gillie will incorporate nest-box data from DeBordieu Colony and provide an assessment of use and production of wood and other ducks from nest structures in this urban environment compared to his survey of nest boxes throughout natural wetlands in coastal South Carolina. Included in this report is a feature article by David Barron, a Kennedy Center undergraduate intern, who surveyed nest boxes at DeBordieu as an extracurricular project. The article reports preliminary data from David's and Gillie's nest box surveys.



If all these activities were not enough to keep the students busy, amidst class work and making good grades, they informed me there were dozens of wood duck boxes on impoundments located on Clemson's Experimental Forest adjacent to the main campus that needed monitoring and repair. They rallied a group of CI students and have since resurrected monitoring and maintenance of the wood duck boxes. One of the inspected nest boxes was not available for use by wood ducks, because it contained "layers" of wasp nests from previous years. The wasp nests were carefully removed so ducks could again use the box. The students will collect and analyze data from the campus nest box survey, seek comparative data from previous monitoring of the boxes, and prepare a poster for presentation at an upcoming wildlife management venue.

Similar to the fall waterfowl course, CI students also had a spring break field trip to the ACE and Santee Delta Basins. During spring field trip 2016, students erected 28 Hen Houses (HHs), donated in collaboration by Delta Waterfowl Foundation, the Flyway Foundation, and SC Waterfowl Association, in hopes of use of HHs by nesting female mottled ducks, because Clay Shipes' and Molly Kneece's M.S. research evidenced low nesting success (~12%) on natural sites by female mottled ducks in the ACE Basin. Clay and Molly were supported by Nemours Wildlife Foundation and graduated from Mississippi State University. Clay and Molly are wildlife/waterfowl biologists for Texas Parks and Wildlife and South Carolina Department of Natural Resources (SC DNR), respectively.

Now, let's return to the mottled duck HH story. Only one of the 28 HHs was used by a wood duck and none was used by mottled ducks in 2016. During the spring 2017 field trip, the students removed all HHs, many of which were destroyed by Hurricane Matthew in October 2016. In February 2017, the students also placed two HHs in Bridge Pond in DeBordieu Colony, near Georgetown, SC, where several mottled duck pairs were observed over successive days before erecting the HHs. At this juncture, "stay tuned," as we evaluate potential use of HHs by mottled ducks at DeBordieu Colony.

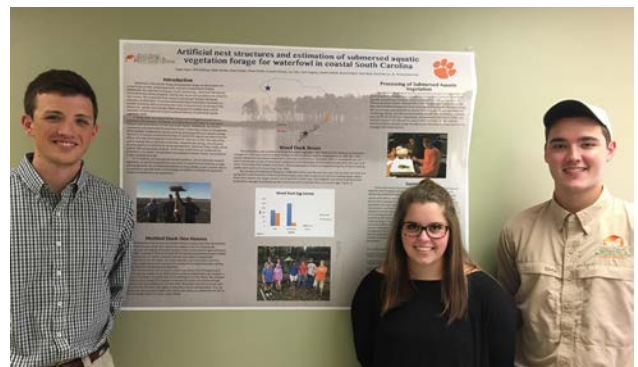


Additionally, during the spring 2017 field trip, the students were treated to a trailer-trip around Nemours Wildlife Foundation grounds, guided by Nemours Biologist Beau Bauer, to observe the diversity of habitats, upland and wetland management practices, and wildlife extant at Nemours. Yet another treat for the students was an oyster roast and seminars by Nemours graduate students at the Nemours Spring Friends Event. A great time was had by all attendees of the Nemours Friends Event.

We thank Daniel Barrineau, SC DNR wildlife biologist, who hosted an informative field trip of Bear Island Wildlife Management Area in the ACE Basin. There, Daniel explained construction and operation of water-management structures, termed “trunks,” and seasonal hydrological management of old ricefield impoundments wherein literally

thousands of spring migrating shorebirds, waders, and waterfowl were observed on mudflats in drawdown impoundments.

Finally, the CI students developed a poster depicting their research activities and presented it at the Clemson University Focus on Creative Inquiry symposium. The title of the students’ poster is: “Artificial nest structures and estimation of submersed aquatic vegetation forage for waterfowl in coastal South Carolina.” We look forward to another great year of waterfowl and wetlands knowledge gained through collaborative efforts among our students, faculty, staff, and our partners.



## EXAMPLE COURSE SYLLABUS: WATERFOWL ECOLOGY AND MANAGEMENT

**Instructor of record:** Dr. Richard M. Kaminski, Director, James C. Kennedy Waterfowl & Wetlands Conservation Center, Belle W. Baruch Institute of Coastal Ecology and Forest Science of Clemson University, P.O. Box 596, Georgetown, SC 29442; rmkamin@clemson.edu; (843) 344-2811.

**Course Description:** Waterfowl Ecology and Management: 3 semester hours. (Prerequisite: junior/senior standing or graduate student; all students should have prior course work in ecology). Annual ecology of North American waterfowl, habitat and population ecology and management, waterfowl and plant identification, waterfowl harvest management, waterfowl diseases, discussion of current waterfowl and wetland issues, and critical review of contemporary and classic literature.

**Lecture:** Three, 50-minute lectures weekly or equivalent for online delivery.

### General Objectives:

1. To acquire knowledge of the history of waterfowl and wetland conservation from the Migratory Bird Treaty (1916) to the present.
2. To acquire knowledge of the annual and evolutionary ecology and habitat selection of North American waterfowl.
3. To acquire knowledge in habitat management and conservation that helps fulfill the annual life-cycle needs of North American waterfowl.
4. To acquire knowledge in taxonomy, identification, sexing and aging, plumage, and morphology of North American waterfowl.
5. To be exposed to managed waterfowl habitats on public and private lands.
6. To learn identification and management of plant and invertebrate foods of waterfowl.
7. To discuss and critique contemporary and classic literature and issues important to waterfowl and wetland ecology and conservation.
8. To gain knowledge of major waterfowl diseases and management strategies to alleviate them.
9. To become familiar with population and habitat monitoring and management methods (e.g., North American Waterfowl Management Plan, Adaptive Harvest Management).
10. To discuss emerging and current issues influencing waterfowl science and management.

**Grading:** Undergraduate students will be evaluated in 4 general areas: (1) Waterfowl i.d. etc. test (20%), (2) Exam 1 (30%), (3) Final Exam 2 (40%), and in-class participation and attendance (10%). Graduate students will be evaluated in 5 general areas: (1) Waterfowl i.d. etc. test (20%), (2) Exam 1 (20%), (3) Final Exam (30%), (4) Research proposal/scientific manuscript; topic approved by instructor (20%), and (5) in class participation and attendance (10%). Learning objective for graduate students will be design and writing of a research proposal in the form of a scientific manuscript, adhering to the format of The Journal of Wildlife Management.

(1) A = > 90%, (2) B = 80-89%, (3) C = 70-79%, (4) D = 60-69%, and (5) F = <59%. If a student is on the borderline between 2 grades (e.g., <2% of the next higher grade), I will award the student the greater grade, if the person has exhibited excellent attendance and has contributed regularly to class discussion.





**Required text:** Baldassarre, G. A., and E. G. Bolen. 2006. *Waterfowl ecology and management*, 2nd edition. Krieger Publishing Company, Malabar, Florida. 567pp.

**Required Enrollment:** Please request enrollment in Dr. Alan Afton's waterfowl and wetlands list serve by emailing Dr. Afton (aafon@lsu.edu), informing him you are enrolled in the waterfowl ecology and management course at Clemson, and respectfully request enrollment in his list serve. The list serve is a valuable source of information on current issues and employment opportunities in waterfowl and wetlands science and conservation. As current issues emerge in blog on the list serve, we will be discussing these in class. Dr. Afton is expecting your email requests for membership in the list serve. If by chance, you already are a member of Dr. Afton's list serve, there is no need to request enrollment again.

**Note:** *Students with disability needing accommodations should contact the Office of Student Disability Services in Suite 239, Academic Success Center, 864-656-6848.* This office will contact me to make student-specific arrangements.

**Academic and Professional Honesty:** As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating or stealing in any form." (<http://www.clemson.edu/academics/integrity>). **Note:** Consequences imposed on violators may include failing the course and even dismissal from the university.



# KENNEDY CENTER STUDENTS CONDUCT DEBORDIEU DUCK BOX SURVEYS

By: David Barron, Rick Kaminski, Molly Kneece, and Gillie Croft. Research affiliates of the Belle W. Baruch Institute of Coastal Ecology and Forest Sciences, James C. Kennedy Waterfowl and Wetlands Conservation Center, Clemson University; Nemours Wildlife Foundation; and South Carolina Department of Natural Resources

Note: Senior author and undergraduate student technician, David Barron, drafted this article for publication in the DeBordieu's Colony spring 2017 newsletter, *The Blue Heron*.

During spring 2016 semester, James C. Kennedy Waterfowl and Wetlands Center's Interns from Clemson University began a wood duck nest box

project at DeBordieu Colony near Georgetown, SC. DeBordieu has a breeding population of wood ducks that has been long supported by dedicated residents of the Colony.

You may have seen Clemson students in the Colony removing old nest materials from the boxes, repairing damaged ones, erecting additional new boxes, and pruning branches overhanging the boxes. Overhanging

branches were removed to deter snakes and squirrels from entering nest boxes and depredating eggs.

During summer 2016, David Barron, a Kennedy Center and Nemours Wildlife Foundation Undergraduate Intern, continued monitoring wood duck boxes at DeBordieu. David is a senior at Clemson majoring in Wildlife and Fisheries Biology. He is passionately interested in waterfowl ecology and management. David was assisted by Molly Kneece of the Kennedy Center and now a wildlife biologist for South Carolina Department of Natural Resources. Additionally, data collected by David will be used

by Gillie Croft, a current Master's student of Clemson University, who is conducting surveys of wood duck nest structures across coastal South Carolina.

The trio of biologists discovered that a few wood duck hens took advantage of warm weather and began nesting in January 2016. Usually, peak nesting by wood ducks in South Carolina is in March-April, as reflected by Gillie's 2016 survey of nest boxes across coastal South Carolina (see figure next page). In 2016 at DeBordieu, nesting occurred from January through August. That's a long reproductive season which may be consequence of repeated nesting (termed "re-nesting") by females, which lose their eggs or ducklings to predators, as well as multiple nesting and brooding by southern latitude wood ducks.

Before wildlife conservationists provided nest structures, wood ducks nested in natural tree cavities. Nest boxes, like those in DeBordieu, compensate for a lack of natural tree cavities, but Hurricane Matthew in October 2016 may have delimbed trees and could increase availability of natural cavities in South Carolina.

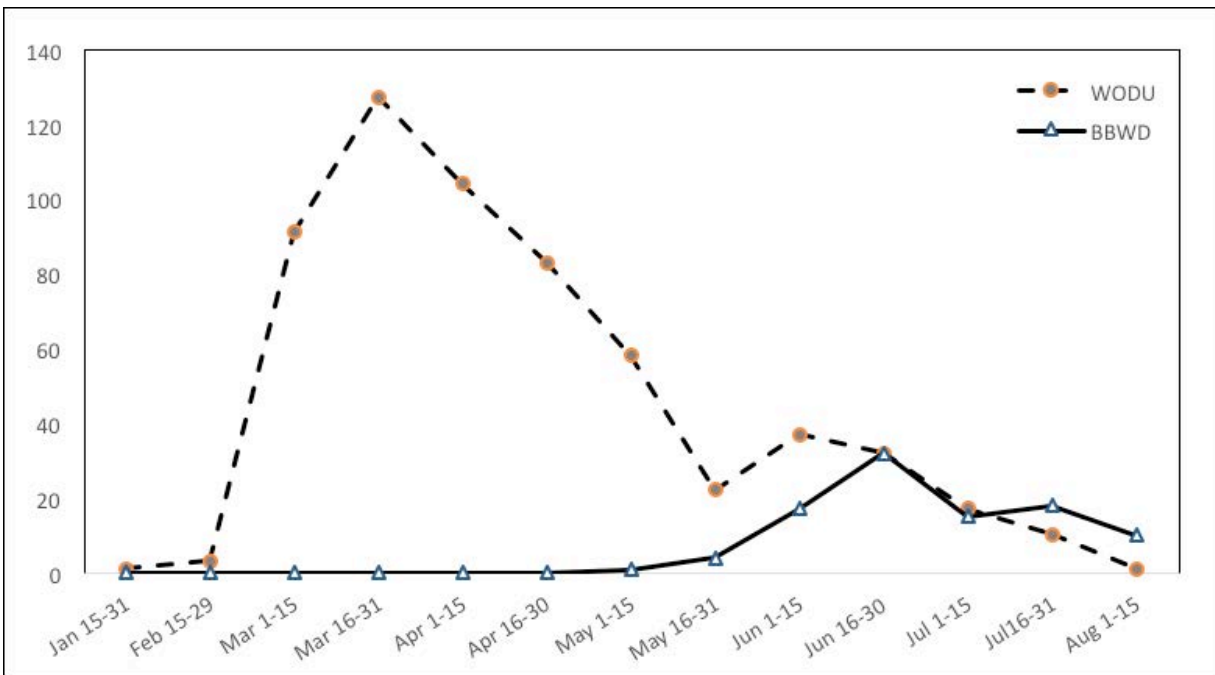
In February 2016, Kennedy Center Interns inspected and cleaned DeBordieu boxes of old nests and eggs and added new wood shavings as nesting substrates. Our previous research in Mississippi and Alabama and that of colleagues from Auburn University



Male (top) and female wood ducks using a wooden nest structure like those in DeBordieu Colony.



David Barron at a nest box in DeBordieu Colony.

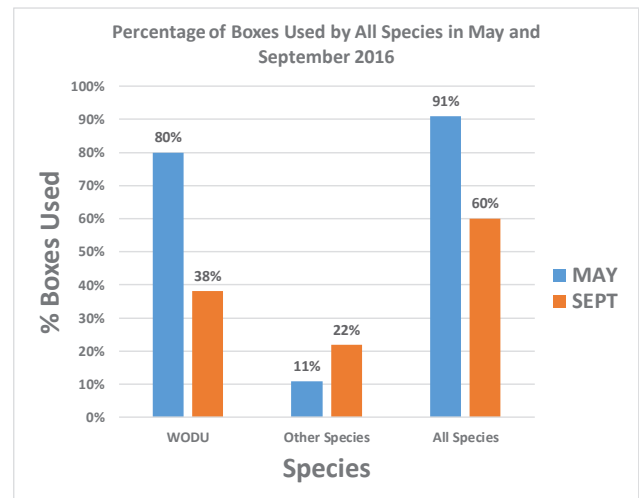


Number of active wood duck (WODU) and black-bellied whistling duck (BBWD) nests in >300 nest boxes inspected by Gillie Croft throughout coastal South Carolina, January-August 2016. Wood ducks nest significantly earlier than black-bellied whistling ducks suggesting little competition between the species for nest boxes currently.

revealed that cleaning boxes for southern-nesting wood ducks before the breeding season and after first hatches in late spring (i.e., May) increases hen use of boxes and duckling production. Moreover, our Mississippi research revealed that large boxes, like those deployed at DeBordieu, maximize wood duck use, production, and recruitment into the fall population instead of small boxes. We published these findings in *The Journal of Wildlife Management* in 2015.

DeBordieu currently has about 60 boxes. David counted numbers of eggs and egg-shell membranes in the boxes during his inspections. Each duckling leaves behind an egg-shell membrane. The membranes index the number of ducklings that actually left each box. In 2016, wood ducks nested at least once in 44 (80%) of the 55 inspected boxes. Similarly, Gillie found that wood and other ducks nested in about 75% of over 300 nest structures he inspected across coastal South Carolina. These rates of use demonstrate that most nest structures at DeBordieu and elsewhere were suitable for use by nesting ducks in 2016.

Boxes used at least once by wood ducks produced an average of about 10 ducklings per box. Additionally, one hooded merganser but no black-bellied whis-



tling ducks used DeBordieu boxes. Some boxes also were used by flying squirrels and song birds, such as bluebirds and great crested flycatchers.

On average, about 10 and 8 wood duck ducklings departed used and all DeBordieu nest boxes combined in 2016, respectively. Gillie found in 2016 that about five wood duck ducklings departed, on average, from the over 300 nest boxes inspected across coastal South Carolina but only about 16% of these structures were used by female black-bellied whistling ducks, which departed with about three ducklings on average. Thus, black-bellied whistling

ducks are a pioneering duck species yet in coastal South Carolina.

Assuming the initial cost of a nesting structure, treated post, and predator shield at DeBordieu was \$50 and each cypress nest box may have a longevity of about 20 years, 9,600 ducklings may hatch and depart from the 60 DeBordieu boxes (i.e., 60 boxes x 8 ducklings departing, on average, from each box x 20 years = 9,600 ducklings). If initial estimated cost of 60 boxes was \$3,000 (i.e., \$50 per box x 60 boxes), this cost divided by total duckling production and departure over 20 years (i.e., 9,600 ducklings), estimated cost per duckling would be about 30 cents per bird. However, we need to know duckling survival rates after exodus from nest structures, so we can determine if current nest boxes are located properly within DeBordieu and positively impacting survival and recruitment of young into the fall population. Such data also would enable calculation of the average cost of each duckling recruited into the fall population.

DeBordieu’s conservation work certainly is providing wood ducks with much needed nesting



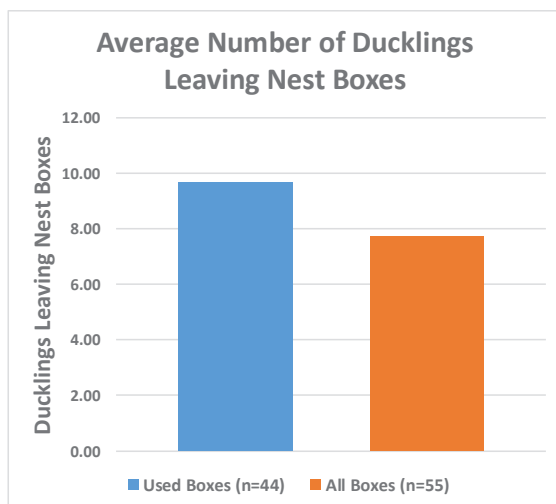
Pair of black-bellied whistling ducks on a nesting structure.

structures. However, it remains unknown how many ducklings survive and enter the fall, winter, and breeding populations. An accurate number of this recruitment would require further research by tracking hens and ducklings with radio transmitters or PIT tags to determine how many survive and eventually enter the breeding population. These data are critically needed to determine if the wood duck nest box program at DeBordieu Colony is worthwhile, or have these boxes created an “ecological trap” for ducklings because of depredation by various varmints.

Nest box surveys will continue in 2017 and 2018 at DeBordieu. Kennedy Center and Nemours Wildlife Foundation students cleaned nest boxes in February 2017 and placed red cedar shavings in the boxes. During spring break in March 2017, the students inspected all 60 boxes and discovered that 36% of them had active wood duck or hooded merganser (n = 1) nests in them. One clutch already had hatched; we estimated it was initiated sometime in early-mid February 2017.

DeBordieu boxes will be checked again in May, cleaned if they contained hatched or addled eggs, and then checked again in late summer or early fall to estimate 2017 duckling production from the boxes.

The Kennedy Center looks forward to serve as DeBordieu’s waterfowl and wetlands research “arm.” We are grateful to partner and serve DeBordieu Colony and assist with its wood duck nest box program.



Top left to right: Ryan Frazier, Dr. Kaminski, Caroline Sharpe, and Jess Eidson, checking DeBordieu nest boxes and a nesting female wood duck.



## RESEARCH ABSTRACT

**Beau Bauer, M.S. Student**

### **Influence of Wetland Management for Widgeongrass on Aquatic Invertebrate Communities in South Carolina Coastal Impoundments**

*Beau A. Bauer, M.S. student*

Widgeongrass (*Ruppia maritima*) management is practiced in impounded wetlands along the South Carolina coast in intertidal regions containing brackish water. Impoundments are managed for widgeongrass to provide foraging habitat for wintering waterfowl; however, these impoundments also provide critical habitat for a diversity of other waterbirds. Widgeongrass, other submersed aquatic vegetation (SAV), and their associated detritus also provide food and substrate for aquatic invertebrates that constitute essential, protein-rich food for ducks and other waterbirds. The influence of widgeongrass management on invertebrate community dynamics is poorly understood in these systems. Widgeongrass management involving a complete and prolonged water-level drawdown during spring-summer is potentially detrimental to aquatic invertebrate communities. I am conducting a study to investigate the influence of widgeongrass management on invertebrate community dynamics by comparing the effects between complete and partial water-level drawdown management regimes on invertebrate abundance and diversity in coastal South Carolina impounded wetlands. Results from this study will provide estimates of invertebrates, widgeongrass, and other SAV biomass that will be used to estimate carrying capacity of managed wetlands for waterfowl and other waterbirds. Field work for the 2016-

2017 period has been completed with samples collected during August 2016, November-December 2016, January-February 2017, and April 2017. Samples were obtained from three properties within the ACE Basin that invoke complete and partial drawdown widgeongrass management. Samples were collected from 20 impoundments and 3 un-impounded tidal marsh areas (control sites). Invertebrates have been processed and sorted from 629 sediment and SAV samples from the above periods. Project completion is slated for 2018.



**Gillie D. Croft, M.S. Student**

### **Waterfowl and other bird use and production from nest boxes and satellite tracking of black-bellied whistling ducks in coastal South Carolina**

*Gillie D. Croft, M.S. student*

In 2016, we initiated the first landscape-scale survey of nest-structure use and duckling production by wood ducks (*Aix sponsa*), black-bellied whistling ducks (*Dendrocygna autumnalis*), and hooded mergansers (*Lophodytes cucullatus*) across the ACE and Santee Delta Basins in coastal South Carolina. We are interested in black-bellied whistling ducks because of their increasing population size and range expansion in South Carolina and across southeastern United States. In 2016, three duck species used boxes disproportionately (wood ducks, 69%; black-bellied whistling ducks, 19%; hooded merganser, 0.3%; overall use, 75%). Furthermore, nest structures also were used by other birds, including Carolina wrens (*Thryothorus ludovicianus*, 12%), great-crested flycatchers (*Myiarchus crinitus*, 9%), eastern bluebirds (*Sialia sialis*, 7%), and eastern screech owls (*Megascops asio*, 1%). Nesting seasons for wood ducks and black-bellied whistling ducks coincided from May to August 2016. Wood ducks nested from January through August with peak nesting in March. Black-bellied whistling ducks began nesting in May and continued into September with peak nesting occurring in June. Thus, wood ducks and black-bellied whistling ducks currently do not appear to be competing for nest structures in coastal South Carolina. One hooded merganser nest was initiated in February. Wood ducks and black-bellied whistling ducks exhibited similar nest success; at least one duckling departed from approximately 61% of all nests. An estimated 1,522 wood duck,

359 whistling duck, and 12 hooded merganser ducklings exited nest structures based on egg-shell membranes recovered in structures. Most unsuccessful duck nests resulted from abandonment and predation by red-bellied woodpeckers (*Melanerpes carolinus*) and yellow rat snakes (*Elaphe obsoleta quadrivittata*). To begin understanding annual movement ecology, habitat use, and survival of black bellied whistling ducks, ten birds (7 females, 2 males, and 1 bird of unknown sex) were captured on the Combahee River and instrumented with implanted satellite transmitters in August 2016. As of April 2017, two transmitters were responding and will continue to be monitored. Preliminary results revealed that two black-bellied whistling ducks moved about 500 km from South Carolina to near Titusville, Florida, and eight birds remained in South Carolina. In summer 2017, ten additional transmitters will be deployed. Nest structures will continue to be monitored through summer 2017, with project completion in 2018.





## RESEARCH ABSTRACT

### Molly R. Kneece, Research Specialist

#### Aerial Line-Transect Surveys for Waterbirds Take Flight in South Carolina

*Molly Kneece, South Carolina Department of Natural Resources; Richard M. Kaminski, Kennedy Center; Beth E. Ross, U.S. Geological Survey (USGS), South Carolina Cooperative Fish and Wildlife Research Unit; Aaron T. Pearse, USGS, Northern Prairie Wildlife Research Center; and Nicholas M. Masto, M.S. Student, Clemson University*

Surveys from aircraft enable biologists to estimate wildlife abundance, relate wildlife presence, absence, and abundance to local and landscape habitat features, and use resulting information to guide conservation planning and research. Reliable probability based, line-transect surveys of wintering waterfowl have been successfully used and adopted by Mississippi, Arkansas, Louisiana, and Missouri since the mid-2000s. During fall 2016, biologists of Clemson University’s James C. Kennedy Waterfowl and Wetlands Conservation Center and the South Carolina Department of Natural Resources initiated aerial line-transect surveys to estimate abundances and spatial distributions of waterfowl and other waterbirds, making South Carolina the first state in the Atlantic Flyway to use such methodologies inland of the Atlantic Ocean. Molly Kneece served as survey biologist for five flights, conducted monthly from November 2016-March 2017. Flights were conducted using a fixed-winged aircraft flying at about 60 meters above ground level, which required a low-altitude waiver from the Federal Aviation Administration (FAA). The FAA permits surveys at  $\geq 150$  m, but test flights revealed that most waterbirds could neither be detected nor identified at those altitudes. Each survey took approximately 28 hours to complete and was conducted over four consecutive days, when weather conditions allowed. Only partial



surveys were completed in December 2016 and January 2017 due to inclement weather and aircraft mechanical issues, respectively. Currently, we are refining survey regions within the state and transects to omit large areas of upland forest lacking wetlands and forested wetlands with dense canopies and understory precluding detection and reliable estimation of waterbirds. These revisions will increase efficiency and effectiveness of the survey. A summary of 2016-2017 surveys will be available in summer 2017. Beginning fall 2017, M.S. student, Nick Masto, will serve as a second survey biologist on the project. The addition of Nick to the project will allow us to evaluate a double-observer survey technique as a means to adjust waterfowl counts for

incomplete detection by a single observer. Double-observer surveys are typically used where birds are distributed at low densities and in areas inaccessible to ground surveys, such as in South Carolina tidal wetlands. Surveys will resume in September 2017 and be conducted monthly November 2017-March 2018. We are grateful for support of and cooperation with this project from Delta Waterfowl Foundation,

Ducks Unlimited, Inc., Mississippi Department of Wildlife, Fisheries, and Parks, Nemours Wildlife Foundation, USGS Northern Prairie Wildlife Research Center, USGS South Carolina Cooperative Fish and Wildlife Research Unit, South Carolina Department of Natural Resources, South Carolina Waterfowl Association, the U.S. Fish and Wildlife Service, and Seven Rivers Aviation, Georgetown, SC.





### Nick Masto, M.S. Student

#### Evaluation of a rake-collection method to estimate biomass of submersed aquatic vegetation in managed tidal impoundments in coastal South Carolina

*Nicholas M. Masto, M.S. student*

Managers of impounded brackish wetlands in coastal South Carolina manipulate water depth, hydroperiod, and salinity to promote growth of widgeongrass (*Ruppia maritima*) and other submersed aquatic vegetation (SAV) as forage for ducks and other waterbirds. Researchers need efficient and cost-effective methods to estimate SAV biomass and carrying capacity of these wetlands for wintering waterfowl, as an integral part of habitat-conservation initiatives of the North American Waterfowl Management Plan in the Atlantic Coast Joint Venture region. Garden rakes are commonly employed to harvest and estimate SAV biomass; however, accuracy and precision of this method have not been evaluated for estimating biomass of SAV in managed coastal impoundments in South Carolina or elsewhere. Thus, I am evaluating use of a rake for estimating total and species-specific, above- and below-ground biomass of SAV within five impoundments at Bear Island Wildlife Management Area in the ACE Basin of South Carolina. Within each impoundment in July 2016, I collected 10 spatially random samples of SAV using a rake rotated in a circular motion and lifted upward from within a 0.2-m<sup>2</sup> plastic quadrat and hand harvested any residual above- and below-ground vegetation from within the quadrat (i.e., rake + hand harvest = total biomass). Clemson University undergraduates and I have been processing samples during fall 2016 and spring 2017 semesters as part of an undergraduate research project. Separately, I will regress dry mass of species-specific and total biomass of SAV on

(1) dry mass of rake-collected SAV species, (2) total rake-collected SAV biomass, (3) water depth at sample sites, (4) an index of soil penetrability at sample sites, and (5) sample impoundment as a random offset variable accounting for any among-impoundment variation. I will evaluate different multiple regression models to determine which yield the most precise prediction of species specific and total SAV biomass. I also made an oral presentation on this research at the Graduate Student Arts and Science Research Symposium, College of William and Mary in Virginia and will prepare a manuscript for publication in a scientific journal.



### Lauren Senn, Ph.D. Student

#### Development, assessment, and marketing of an on-line university course in waterfowl ecology and management

*Lauren Senn, Ph.D. student*

To our knowledge, no university currently offers an on-line course in waterfowl ecology and management; however, such a course is needed especially by wildlife students and working professionals unable to matriculate on a campus where this type of course is offered. As part of my dissertation research, I will be converting Dr. Rick Kaminski's Waterfowl Ecology and Management course from traditional lecture and laboratory to on-line presentation and evaluating the transition and marketing processes. This course will be offered as an elective as part of Clemson University's new Wildlife and Fisheries on-line Master's degree in Wildlife and Fisheries Biology. This conversion process involves 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. The on-line course also will include video interviews with

Dr. Kaminski and other professionals, as well as video of waterfowl management techniques being applied in the field to provide students and viewers with a near "hands-on" experience. The course will be split into modules, including history of waterfowl management, waterfowl identification and morphology, habitat use and selection, evolutionary ecology, annual cycle ecology and habitat management, the North American Waterfowl Management Plan, adaptive harvest management (by Dr. Beth Ross, USGS Cooperative Fish and Wildlife Research Unit, Clemson University), waterfowl diseases and their management, and emerging contemporary issues. Students will be evaluated via module quizzes, a waterfowl identification exam, and midterm and final exams. The course will be assessed by evaluations by each enrolled student. Results of these surveys will be compared to student feedback from the fall 2016 in-person traditional lecture version of the course to enhance future offerings of the on-line version. In addition to course development, modifications based on student feedback, and marketing to prospective students, my dissertation research will include implementation and video documentation of field practices which demonstrate waterfowl habitat management and restoration in South Carolina. These videos and audio will be shared on-line with other waterfowl educators, biologists, and professionals in an attempt to develop a repository of habitat ecology and management practices that can be viewed worldwide by waterfowl students and





professionals. In addition to my dissertation work, I will conduct a survey of current and prospective waterfowl hunters in South Carolina to understand their attitudes toward

waterfowl hunting, with a goal of increasing waterfowl hunter recruitment and retention within the state.

*Dense mat of widgeongrass causing calm water in the background as opposed to waves in foreground where widgeongrass was absent.*



## INTER-UNIVERSITY COLLABORATION AND INTERACTIONS

Collaborative teaching, research, and outreach with colleagues and students of other universities with a waterfowl and wetlands program is a continuing ambition of the Kennedy Center. Such collaboration provides diverse educational opportunities for interacting students and faculty and yields collective benefits to engaging participants and institutions. Indeed, we learn and prosper by inter-institutional and colleague collaboration and interaction.

Dr. Kaminski continues to collaborate with Dr. Brian Davis of the James C. Kennedy Endowed Program in Waterfowl and Wetlands Conservation and other faculty at Mississippi State University (MSU), where Dr. Kaminski is an Emeritus Professor in the Department of Wildlife, Fisheries, and Aquaculture after retiring from MSU in 2015. During 2016-2017, Dr. Kaminski, Dr. Davis, and their former and current MSU students worked to co-author several journal publications and make presentations at regional, national, and international conferences (see Presentations and Publications section of this report). Dr. Kaminski also served as a graduate committee member or co-major professor to MSU students, Justyn Foth, Joe Marty, and Joe Landcaster.

Justyn received his Ph.D. in December 2016 after studying shorebird movements, community ecology, and isotope signatures of the birds' blood and feathers during their summer-fall migration between the Lower Mississippi Alluvial Valley (MAV) and Alabama, Louisiana, and Mississippi Gulf Coasts. A major goal of the study was to determine shorebird use of Migratory Bird Habitat Initiative (MBHI) wetlands provided through USDA Natural Resources Conservation Service on the

mainland, away from areas potentially impacted by the Deepwater Water Horizon Gulf Oil Spill. Dr. Foth currently is employed as Waterfowl and Gamebird Biologist for the Delaware Division of Fish and Wildlife.

Joe Marty also completed his doctorate, graduating in May 2017. Dr. Marty's dissertation provided estimates of waste rice, natural seeds, and wetland birds in Gulf Coast Prairie ricelands in Louisiana and Texas. Waste rice (i.e., seeds escaping mechanical harvest) and natural seeds are important forage for waterfowl, and estimates of their abundance enable biologists and managers to determine the foraging habitat carrying capacity of working and idled ricelands for wintering waterfowl. The Gulf Coast Joint Venture of the North American Waterfowl Management Plan require these and energetics data to determine the landscape's capacity to support desired population levels of waterfowl. Dr. Marty also conducted surveys of waterfowl and other wetland birds using ricelands managed with financial assistance from the aforementioned MBHI program and from private riceland





owners. Dr. Marty is now employed as Biologist Supervisor and Research Coordinator for the Louisiana Department of Wildlife and Fisheries at the Rockefeller Wildlife Refuge.

Joe Landcaster is a Ph.D. candidate in the final year of his doctoral program. In April 2017, Joe's graduate committee unanimously passed him on his comprehensive qualifying written and oral exams. Joe is busy drafting his dissertation on movements, survival, and habitat use of radiomarked female mallards in the Mississippi MAV. Joe is working as a Research Scientist at the Frank C. Bellrose Memorial Laboratory of the Illinois Natural History Survey in Havana, IL. Joe intends to defend his dissertation and graduate in 2018.

The Kennedy Center, Clemson's Department of Forestry and Environmental Conservation (FEC), and FEC's Natural Resources Graduate Student Association hosted Dr. John Eadie, Professor, Chairperson, and the Dennis G. Raveling Endowed Chair in Waterfowl Biology of the University of California-Davis. Dr. Eadie delivered two eloquent, informing seminars during his visit, one on the Clemson campus concerning his wood duck breeding ecology research and a second seminar at the Baruch Institute on moist-soil wetland ecology and management and agent-based modeling strategies for conservation of rice- and other wetlands for migrating and wintering northern pintail and other waterfowl in California's Central Valley. We are grateful to Dan Ray, owner of Annandale Plantation, who hosted Drs. Eadie and Kaminski on a duck hunt, guided by manager Bill "Cap'n" Mace, during the final weekend of the hunting season. As the picture indicates, the hunt was successful for all participants in the hunt. Drs. Eadie and Kaminski are discussing undergraduate and graduate student exchanges between UC-Davis and Clemson, so the students can gain valuable research and management experiences in the Pacific and Atlantic Flyways.

Dr. Kaminski also is collaborating with Dr. Phil Lavretsky of the University of Texas-El

Paso. Dr. Lavretsky is a renowned waterfowl geneticist, who is investigating genetics of North American ducks, including mottled ducks which occur in South Carolina and along the Gulf Coast. Dr. Lavretsky needs increased samples of mottled ducks from South Carolina. Thus, Dr. Kaminski and fellow biologists collected hunter harvested mottled ducks and shipped them to Dr. Lavretsky for DNA analyses. This project will continue to determine to what extent, if any, wild and released mallards are interbreeding with mottled ducks.

A final inter-university interaction was Dr. Kaminski's invitation from Dr. Jacob Straub of the University of Wisconsin-Stevens Point (UWSP) to deliver a keynote address at the James C. Kennedy and David F. Grohne Endowed Chair in Waterfowl and Wetlands Conservation in the College of Natural Resources (CNR) of UWSP in March 2017. Dr. Straub is the new Kennedy-Grohne Chair at UWSP. He earned his B.S. from UWSP, a M.S. from The Ohio State University, and a Ph.D. from Mississippi State University under Dr. Kaminski's direction. After graduating from MSU, Dr. Straub and his wife, Rachel, were faculty members at State University of New York-Plattsburgh before returning to UWSP, where both are employed now in the CNR and enjoying raising their son, Oliver.



Dr. Kaminski's seminar rounded out a series of presentations in the CNR during February-March 2017: "Waterfowl and Wetlands Colloquium Series: Ducks, Habitat, and People." Dr. Kaminski's seminar was titled, "One Hundred Years of Waterfowl Conservation: The Migratory Bird Treaty (1916) through the North American Waterfowl Management Plan." In a post-colloquial email, Dr. Straub stated, "Thank you to those who attended the Wisconsin Center for Wildlife's Waterfowl and Wetlands Speaker Series that culminated last week with a keynote presentation by CNR alumnus (class of 1972), Dr. Rick Kaminski. From my perspective, the seminars were a success. I particularly appreciated the excitement and willingness of all speakers to make time for student 'meet-and-greets'. I have received positive feedback from

the speakers, our students, and public alike." It was an honor to return to my alma mater and exude pride in the new Kennedy-Grohne Chair and Dr. Straub's leadership of the program. Indeed, I am most grateful for witnessing my former students and son, Matt, in important ecological and conservation roles in the USA and Canada.

Below are pictures (*at left*) of Dr. Straub and me and (*at right*) Dr. Lyle Nauman (*right*) and Dr. Charlie White (*left*). Drs. Nauman and White were my advisors and mentors, when I was an undergraduate at UWSP. Drs. Nauman and White attended my seminar and joined us later that night at the UWSP Ducks Unlimited's Student Chapter Banquet. Thank you Jake for inviting Loretta and me to Point; Charlie and Lyle, thank you for your guidance and support over the decades, which I know you will impart to Jake too.





# OUTREACH

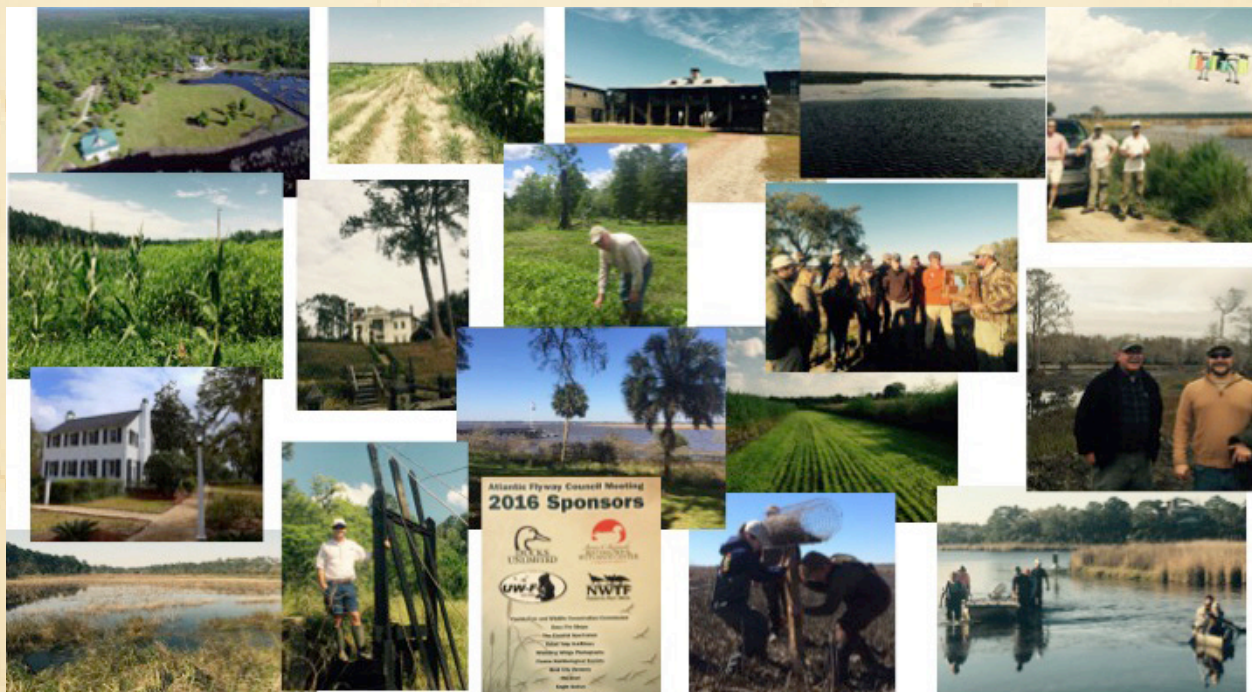
The major outreach activity in inaugural year 2015 of the Kennedy Center was the Waterfowl and Wetland Wildlife Management Workshop convened at the Baruch Institute in October 2015. This workshop focused on ecology and management of tidally influenced impounded fresh, brackish, and saline wetlands in coastal South Carolina. Over 60 people attended the workshop, primarily public and private land biologists, managers, and owners, plus Clemson students enrolled in the waterfowl ecology and management class taught by Dr. Kaminski.

So as not to be redundant with delivery of workshops, we have decided to conduct workshops around the state in key regions attracting waterfowl and other waterbirds. We did not conduct a workshop in 2016 but are planning to convene one in fall 2017 to address waterfowl habitat management in the Midlands of South Carolina. We will announce this workshop when further planning is underway in summer 2017.

Outreach during 2016-2017 consisted primarily of Dr. Kaminski and students making invited site visits to public and private waterfowl management lands in coastal South Carolina and the Midlands. Managers and landowners tour us around their

managed lands, explain their management regimes, successes, and failures, and then we address schemes that hopefully will enhance the habitat to meet biological needs of waterfowl and other waterbirds and promote waterfowl hunting and viewing. Dr. Kaminski also was invited to the Atlantic Flyway Technical Section and Council meeting in Jacksonville, Florida in October 2016 to make an address on teaching, research, and outreach missions of the Kennedy Center. The Kennedy Center also was a key sponsor of the meeting.

Below is a collage of pictures taken during waterfowl and wetland management site visits and meetings across South Carolina during 2016-2017. We are grateful for invitations to visit, make recommendations, and publicize the Kennedy Center's activities and roles. An important goal of the Kennedy Center is to provide outreach in waterfowl and other wetland wildlife habitat management. Therefore, we are delighted to share our knowledge and assist the public and private sector with their habitat management needs. Please feel free to contact Dr. Kaminski via email ([rmkamin@clemson.edu](mailto:rmkamin@clemson.edu)) or phone (843-344-2811) to request a site visit or conference.



# AWARDS AND REWARDS

We are pleased to announce receipt of fellowships and awards by Kennedy Center-Nemours students and placement of students in summer internships or seasonal work where they will gain invaluable professional experience to augment their academics. We are grateful for support of these students toward completion of their degrees and acquisition of professional experience.

- **Beau Bauer**, current M.S. student researching aquatic invertebrate communities in managed impoundments in coastal South Carolina. Nemours Wildlife Foundation, the Kennedy Center, and Clemson's Department of Forestry and Environmental Conservation provide support for Beau's assistantship, research, tuition, and technical assistance.
- **Gillie Croft**, current M.S. student, researching duck and other bird use and production from nest structures across coastal South Carolina. Gillie is likewise supported as Beau Bauer.
- **Nick Masto**, M.S. student, Kennedy Center Master's level fellowship, coupled with research sponsorship by Nemours Wildlife Foundation, SC DNR, Delta Waterfowl Foundation, SC Waterfowl Association, and U.S. Fish and Wildlife Service for his research with Molly Kneece (SC DNR) to conduct aerial line-transect surveys of waterbirds.
- **Lauren Senn**, Ph.D. student, Kennedy Center Ph.D. student fellowship. Lauren is working with Dr. Kaminski to transform the waterfowl ecology and management from face-to-face to online delivery.
- **Taylor Byars**, Kennedy Center Undergraduate Research Technician and Scholarship Recipient.
- **Charles "Will" Gallman**, Kennedy Center Undergraduate Research Technician and Scholarship Recipient and the 2017 Outstanding Senior in Wildlife and Fisheries Biology. Will is pictured at right with his award for Outstanding Senior with Dr. Greg Yarrow, Chair, Department of Forestry and Environmental Conservation.







## Clemson Creative Inquiry (CI), Kennedy Center, and Nemours Wildlife Foundation Undergraduate Interns

Clemson University, Kennedy Center, and Nemours Wildlife Foundation co-sponsor and support undergraduate students who serve as technicians to graduate students and faculty and thereby gain valuable hands-on professional experience while pursuing their B.S. degrees through the Departments of Forestry and Environmental Conservation and Biological Sciences. Here is a picture of the 2016-2017 CI students enjoying a well-deserved dinner at a Beaufort, SC restaurant, following a grueling day afield during their spring break field trip to the ACE Basin.



# Kennedy Interns, Summer Internships/Employment

Congratulations to 2016-2017 Kennedy Center-Nemours Wildlife Foundation Interns, all of whom have acquired professional, paid work experience or a M.S. graduate assistantship.

## David Barron

- Senior, Wildlife Fisheries Biology (WFB) major
- Summer classes at Clemson and monitor wood duck boxes on campus and at DeBordieu Colony

## Adam Brown

- Senior and graduated, WFB major, Forestry (FOR) minor
- South Carolina Waterfowl Association's Camp Woodie

## Taylor Byars

- Senior and graduated, WFB major
- California Waterfowl Association Technician

## Sean Byrd

- Senior WFB major
- Clemson UPIC hydrology and fisheries intern at DeBordieu Colony for Drs. Dan Hitchcock, Bo Song, and Jack Whetstone and assisting Nick Masto

## Jess Eidson

- Sophomore, FOR major
- Summer classes at Clemson University and monitor wood duck boxes on campus

## Ryan Frazier

- Junior, Agricultural Mechanization and Business major
- Seasonal U.S. Forest Service forestry technician in the Shoshone National Forest, Wyoming

## Will Gallman

- Senior and graduated, WFB major
- M.S. graduate student and research assistantship, South Dakota State University; Brookings, SC; Supervisor: Dr. Josh Stafford

## Ethan Hinkle

- Senior, Biological Sciences major, minor in Microbiology
- Accepted position with Tyson Foods

## Zachary Hughes

- Junior, WFB major
- Internship with South Carolina Department of Natural and Marine Resources, Charleston

## Robert "Castles" Leland

- Sophomore, WFB major
- Wildlife summer intern at Nemours Wildlife Foundation, Yemassee, South Carolina

## Caroline Sharpe

- Freshman, WFB major
- Internship at Savannah River site electroshocking fish as part of a state-wide environmental assessment

## Ian Talty

- Sophomore, WFB major
- Summer technician at South Carolina Botanical Gardens, summer classes, monitoring nest boxes in Clemson Experimental Forest, and continuing service in the National Guard

## KENNEDY CENTER ADVISORY COUNCIL AND ACKNOWLEDGEMENTS



The advisory council of Clemson University's James C. Kennedy Waterfowl and Wetlands Conservation Center met for its second annual meeting July 14-15, 2016 at Clemson's Belle W. Baruch Institute of Coastal Ecology and Forest Science near Georgetown, SC. The council advises Drs. Kaminski, Van Bloem, and Yarrow and graduate students on programmatic activities and needs for advancement in teaching, research, and outreach through the Kennedy Center.

Board members represent public and private-sector wildlife professionals. Nearly 25 board members and Center graduate students attended the meeting, which included a Thursday night reception and Friday morning technical session. Matt Kaminski, Regional Biologist

for Ducks Unlimited, Inc. in California, and his wife Molly, a certified chef, hosted and prepared for the reception a scrumptious array of cuisine including wild duck lettuce cups and a spicy Lowcountry shrimp boil. An article highlighting the 2016 advisory council meeting is at: <http://newsstand.clemson.edu/kennedy-waterfowl-and-wetlands-center-convenes-advisory-board-meeting/>



We sincerely thank the board members of the Kennedy Center listed below and their affiliations for their guidance and especially for financial support of the Center's research and outreach programs.

- **Jason Ayers**, South Carolina Coastal Program Coordinator, U.S. Fish and Wildlife Service;
- **Breck Carmichael**, Special Assistant to the Director, South Carolina Department of Natural Resources (SCDNR);
- **Jim Clark**, manager, Weehaw Plantation;
- **Jamie Dozier**, Project Leader, Tom Yawkey Wildlife Center, SCDNR;
- **Travis H. Folk**, woodland and wildlife consultant, Folk Land Management, Inc., Green Pond, SC;
- **Dean Harrigal**, Waterfowl Biologist, SCDNR;
- **Gary Hepp**, Emeritus Professor, Waterfowl Ecology, Auburn University
- **Jason Hewett**, Manager, Clarendon Farms;
- **Craig R. LeSchack**; Director, Conservation Programs – Southeast; Ducks Unlimited; Southern Region; South Atlantic Field Office;
- **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;
- **Sharon Richardson** and **Heather VanTassel**, South Carolina Audubon Society;
- **Buford Mabry**, Delta Waterfowl Foundation;
- **Michael Prevost**, wildlife biologist and land manager, White Oak Forestry and Rochelle Plantation;
- **Derrell Shipes**, Chief-Statewide Programs, Research & Surveys Wildlife Section, SCDNR;
- **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 and chair of Clemson's Department of Forestry and Environmental Conservation

Last but never least, I acknowledge and sincerely thank my loving wife and partner for life, Loretta, for all she has done and continues to do for our family, students, and me, which have enabled my contributions to waterfowl and wetlands conservation through the decades. Thank you Mama Duck!





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## Scientific and Popular Articles (*n* = 10)

- Monroe, K.C., J.B. Davis, R.M. Kaminski, M.J. Gray, A.P. Monroe, and D.L. Evans. 2017. Winter, diel habitat selection by female American black ducks in Tennessee. *Journal of Wildlife Management*. Submitted and in review.
- Tapp, J.L, M.W. Weegman, E.B. Webb, R.M. Kaminski, and J.B. Davis. 2017. Waterbird communities and seed biomass in managed and reference restored wetlands in the Mississippi Alluvial Valley. *Restoration Ecology*. In final review.
- Foth, J.R., R.M. Kaminski, J.B. Davis, J.N. Straub, and T.D. Leininger. 2017. Aquatic invertebrate community composition, diversity, and biomass from sweep-net samples in non-impounded bottomland hardwood forests and greentree reservoirs. *Journal of the Southeastern Fish and Wildlife Association*. Submitted and in review.
- Marty, J.R., J.B. Davis, M.G. Brasher, R.M. Kaminski, and E.L. Brinkman. 2017. Density of lead and nontoxic shotshell pellets in Gulf Coast prairie ricelands. *Journal of Fish and Wildlife Management* 8:1-8.
- Davis, J.B., F. J. Vilella, J. D. Lancaster, M. Lopez-Flores, R. M. Kaminski, and J.A. Cruz-Burgos. 2017. White-cheeked pintail duckling and brood survival across wetland types at Humacao Nature Reserve, Puerto Rico. *The Condor* 119:308-320.
- Barron, D., R. Kaminski, M. Kneece, and G. Croft. 2017. Kennedy Center researchers conduct duck nest box survey. *The Blue Heron, DeBordieu Colony Special Issue*, February 2017.
- Kneece, M. R., and R. M. Kaminski. 2016. "Waterfowl Surveys Begin in South Carolina." *Ducks Unlimited Magazine*. November/December 2016, pp. 24b.
- Kneece, M. R., and R. M. Kaminski. 2016. Inlet covered in waterfowl counts. *SouthStrandNews.Com*, 11 August 2016. Page 6A.
- Veit, J, M. R. Kneece, and R. M. Kaminski. 2016. Clemson researchers begin aerial counts of waterfowl and waterbirds. [http://newsstand.clemson.edu/mediarelations/clemson-researchers-begin-aerial-counts-of-waterfowl-and-waterbirds/?utm\\_source=feed](http://newsstand.clemson.edu/mediarelations/clemson-researchers-begin-aerial-counts-of-waterfowl-and-waterbirds/?utm_source=feed)
- Kaminski, R. M., M. R. Kneece, and J. Veit. 2016. Kennedy Waterfowl and Wetlands Center convenes advisory board meeting. <http://newsstand.clemson.edu/kennedy-waterfowl-and-wetlands-center-convenes-advisory-board-meeting/>
- Kira C. Newcomb, K. C., J. B. Davis, R. M. Kaminski, and M. J. Gray. 2016. Winter survival of female American Black Ducks in Tennessee, USA. *The Condor* 118:33-45.

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## Presentations ( $n = 25$ )

- Kaminski, R.M. 2017. Roles of the James C. Kennedy Waterfowl and Wetlands Conservation Center. Invited presentation to the Georgetown County Soil and Water Conservation District. Georgetown, SC, 19 June 2017.
- Kaminski, R. M. 2017. Roles of the James C. Kennedy Waterfowl and Wetlands Conservation Center. Invited seminar to Georgetown, SC Rotary Club, 16 May 2017.
- Kneece, M. R. and R. M. Kaminski. 2017. Aerial Surveys for Waterfowl and Waterbirds Take Flight! Invited Seminar to Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC, 15 May 2017.
- Clemson's Kennedy Center Creative Inquiry Students. 2017. Artificial nest structures and estimation of submersed aquatic vegetation forage for waterfowl in coastal South Carolina. Poster presented at Clemson University Focus on Creative Inquiry, Clemson University campus, April 2017.
- Masto, N. M. 2017. Wetland conservation for people and waterfowl with emphasis on forested wetlands. Invited presentation to Clemson undergraduate students in Wetland Wildlife Biology, Clemson University, 14 April 2017.
- Kaminski, R. M. 2017. 100 years of waterfowl conservation: The Migratory Bird Treaty through The North American Waterfowl Management Plan. Invited keynote address, James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation Colloquium, University of Wisconsin-Stevens Point, 30 March 2017.
- Masto, N. 2017. Biomass and diversity of submersed aquatic vegetation in managed South Carolina coastal wetlands. Invited presentation at Graduate Student Arts and Science Research Symposium, College of William and Mary, Williamsburg, VA, 24 March 2017.
- Kaminski, R. M. 2017. Wetland ecology and management: Focus on lowland forested systems and green-tree reservoirs. Invited presentation to Clemson graduate students in Forested Wetlands Ecology, Belle W. Baruch Institute of Coastal Ecology and Forest Science, 22 March 2017.
- Davis, J. B., R. M. Kaminski, F. J. Vilella, P. J. Barbour, and E. Webb. 2017. Evaluations of USDA NRCS's Migratory Bird Habitat Initiative following the Gulf Oil Spill. Gulf of Mexico Oil Spill and Ecosystem Science Conference, New Orleans, LA, 5 February 2017.
- Perry, R., D. Harrigal, R. Kaminski, et al. 2016. Management of South Atlantic Coastal Impoundments for Waterbirds. Invited presentation, Symposium: Conservation and Management of Tidal Wetlands for Fish and Wildlife in the Face of Changing Environmental Conditions, Southeastern Fish and Wildlife Agencies Annual Conference, Baton Rouge, LA. 18 October 2016
- Kaminski, R. M. 2016. Teaching, research, and outreach functions of the James C. Kennedy Waterfowl and Wetlands Conservation Center. Invited presentation to the Atlantic Flyway Technical Section, Jacksonville, Florida, 3 October 2016.



- Barron, D., M. Kneece, G. Croft, and R. M. Kaminski. 2016. Wood duck and other avian use of and production in nest structures at DeBordieu Colony, Georgetown, SC. Invited undergraduate intern poster presentation, Belle W. Baruch Institute of Coastal Ecology and Forest Science, 30 September 2016.
- Kaminski, R. M., and M. R. Kneece. 2016. The inaugural year of the Kennedy Waterfowl and Wetlands Center. Clemson University and South Carolina Department of Natural Resources Annual Coordinating Meeting, Clemson University, 8 September 2016.
- Kneece, M. R. and R. M. Kaminski. 2016. The inaugural year of the Kennedy Waterfowl and Wetlands Center. South Carolina Plantation Managers Association Meeting, Baruch Institute, 18 August 2016.
- Kneece, M. R. and R. M. Kaminski. 2016. Aerial line-transect surveys for waterfowl and waterbirds in South Carolina. South Carolina Plantation Managers Association Meeting, Baruch Institute, 18 August 2016.
- Kneece, M. R. 2016. Aerial Line-transect Surveys for Waterfowl and Waterbirds in South Carolina. South Carolina Department of Natural Resources Wildlife and Freshwater Fisheries Advisory Committee Meeting, West Columbia, SC, 9 August 2016.
- Kneece, M. R. and R. M. Kaminski. 2016. Aerial Line-Transect Surveys for Estimating Abundances of Waterbirds in South Carolina. South Carolina Bird Conservation Meeting, Columbia, SC, 4 August 2016.
- Kneece, M. R. 2016. Mottled Ducks in South Carolina: How much do we really know? South Carolina Bird Conservation Meeting, Columbia, SC, 4 August 2016
- Croft, G., D. Harrigal, R. Kaminski, E. Wiggers, P. Gerard, and G. Yarrow. 2016. Movements, habitat use and nest box use by black-bellied whistling and other ducks in coastal South Carolina. Bird Conservation Coordinating Meeting, Columbia, SC, 4 August 2016.
- Davis, J.B., R. M. Kaminski, F. Vilella, and L. Webb. 2016. Aspects of an Evaluation of USDA/NRCS's Migratory Bird Habitat Initiative, After the 2010 Gulf Oil Spill. American Society of Agricultural and Biological Engineers International Annual Meeting, Orlando, FL, July 2016.
- Bauer, B. A. 2016. Aquatic invertebrate communities in managed impounded wetlands in the ACE Basin. Presentation to Kennedy Center Advisory Committee, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC, 15 July 2016
- Croft, G. D. 2016. Blackbellied and other duck use of artificial nest structures in the Santee Delta and ACE Basin. Presentation to Kennedy Center Advisory Committee, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC, 15 July 2016.

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