MISSISSIPPI STATE UNIVERSITY

JAMES C. KENNEDY

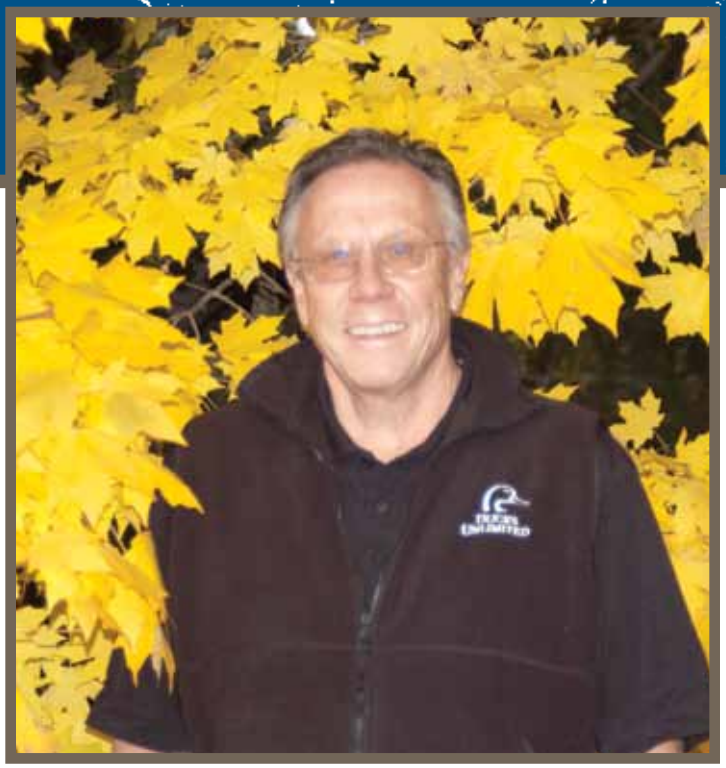
Endowed Chair in Waterfowl and Wetlands Conservation

Department of Wildlife, Fisheries, & Aquaculture
College of Forest Resources
Forest and Wildlife Research Center
Mississippi State University

Annual Report 2012

FROM THE CHAIR

Rick Kaminski



The fall 2012 semester at Mississippi State University is nearing its terminus, and millions of waterfowl in North America are migrating toward their winter destinations in the Mississippi Delta and other southern latitudes. A most colorful array of fall foliage adorns hardwood forests in Mississippi and elsewhere near the Mississippi River, where summer and fall precipitation and early frosts have roused vivid colors in the forest canopies and understories. Interspersed among lowland forests are moist-soil wetlands, showing like "golden meadows," where waterfowl will gorge on seeds, tubers, and aquatic invertebrates following flooding of these basins. A memorable day was November 12, as many Mississippians witnessed passages of arctic geese, mallards, pintails, and other waterfowl into the Mississippi Delta. The waterfowl hunting season began November 23 in Mississippi, and we hail, "We are ready!"

Despite approach of the hunting season, we continue working daily and diligently to prepare for hosting the 6th North American Duck Symposium and Workshop (NADS 6), "Ecology and Conservation of North American Waterfowl (ECNAW)." The MSU College of Forest Resources and the Forest and Wildlife Research Center will host this grand event from 27-31 January 2013 at The Peabody Hotel in Memphis, Tennessee. Co-chairs are J. Brian Davis and yours truly of the College and MSU's Department of Wildlife, Fisheries, and Aquaculture. I devoted a significant part of this year preparing for the symposium. Davis, several graduate students, and staff members also have spent countless hours to ensure utmost success of the symposium. I am most grateful to Mr. James C. Kennedy for his generosity in establishing the James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation and George Hopper, Dean and Director of the College of Forest Resources and Forest and Wildlife Research Center. These gentlemen have enabled my focused engagement in preparing for and convening this international symposium.

The symposium is a joint meeting of the North American Duck Symposium Inc., North American Arctic Goose Conference, and International Sea Duck Conference. The Board of Directors of NADS Inc. decided at NADS 5 (Toronto, Ontario, 2009) that a joint meeting of all waterfowl family members (ducks, geese, and swans) was necessary instead of only ducks. An all-waterfowl symposium has not occurred in North America since a 1987 conference in Winnipeg, Manitoba, Canada from which was published the seminal treatise, "Ecology and Management of Breeding Waterfowl." Our accumulated understanding of the ecology of waterfowl throughout their annual cycle and range demanded synthesis and forward thinking to guide future research and conservation. Moreover, much of the recent North American leadership of waterfowl science and conservation has retired

or will be doing so soon. Thus, NADS 6/ECNAW will be a timely venue to garner their wisdom and promote the talented younger generation who will lead science and conservation for waterfowl and wetlands into the 21st century.

We anticipate NADS 6/ECNAW will be among the largest (over 400 attendees) and most comprehensive waterfowl symposia ever convened in North America, and will attract waterfowl and wetlands professionals and enthusiasts from around the globe. A stellar group of 19 scientists and managers, representing public agencies, universities, Ducks Unlimited Inc., Delta Waterfowl Foundation, and European waterfowl research institutes, are guiding and planning NADS 6/ ECNAW. This diversity of experts will descend on Memphis, ultimately to impact future science and conservation of waterfowl in North America and the northern hemisphere.

Indeed, this symposium will synthesize and communicate critically important topics for waterfowl research, habitat and population management and conservation, and hunting for the next decades. We plan to document seminal information from the symposium in a special issue of a worldwide on-line journal. These legacy manuscripts of integrated science, management, and conservation will foster sustaining viable populations of harvested waterfowl and conserve declining species. Plenary, contributed, special, and workshop sessions, plus field trips to Mississippi and Arkansas are being planned. Please visit and view the details on the symposium website (www.northamericanducksymposium.org). The 2013 Kennedy Chair annual report will summarize significant outcomes of NADS 6/ ECNAW. We hope you attend this premier waterfowl symposium. Until then, we're excited about continuing our work for the success of NADS 6/ECNAW and the myriad of teaching, research, and outreach in waterfowl and wetlands that we do year-round through Mississippi State University. Please peruse this annual report and learn the discoveries our graduate students are making to gain science-based knowledge to guide waterfowl and wetlands conservation in the 21st century.

Respectfully,

Richard M. Kaminski, Ph.D.
Professor of Wildlife Ecology and Management
James C. Kennedy Endowed Chair in Waterfowl and Wetlands Conservation
Fellow, The Wildlife Society

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James C. Kennedy and wife Sarah

Chairman, Cox Enterprises Inc.

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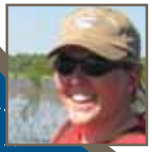

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FEATURE

Winter ecology of female mallards in the South Mississippi Delta

By: Joseph D. Lancaster, M.S. student

The mallard is arguably the most recognized and abundant duck species in North America. During fall and winter, the Mississippi Alluvial Valley (MAV) may support over 40 percent of the Mississippi Flyway mallard population. The region is attractive to mallards and other waterfowl because of its climate and diverse habitat resources, including bottomland hardwood forests, harvested agricultural crops, seasonal emergent wetlands, rivers and permanent wetlands, and aquaculture ponds.

Understanding the interrelationship of waterfowl habitat use, survival, and ultimately their reproduction is central to management of any waterfowl species. Also, knowing how mallards partition use of habitats within seasonal home ranges is fundamental to understanding their winter and annual ecology. Recent research in Louisiana and Arkansas documented that mallards occupied bottomland hardwood forests 50-80 percent during winter. Forested wetlands are important habitats for wintering mallards despite significant loss of these ecosystems in the MAV. The MAV in Mississippi provides important wintering habitat for mallards but contemporary research on bottomland hardwood use by mallards has not been conducted in the state.

Research on habitat selection by wintering mallards in North America has been difficult to quantify. Additionally, habitat-related survival estimates have not been estimated, but are critical to understanding the drivers of mallard population dynamics. To begin addressing these important issues, 126 female mallards were captured and equipped with very high frequency (VHF) radio transmitters at three south Mississippi Delta wildlife management areas in winters 2010–2012. Nearly 5,000 locations of radio-equipped birds were located and data on daily habitat use, survival and mortality was acquired. Through modern statistical modeling methods, biological and environmental factors were examined to possibly explain variation in the birds' winter survival and habitat use. These factors included daily diurnal habitat use, time of winter relative to hunting season, age, and body condition at time of capture and radiomarking, and year.

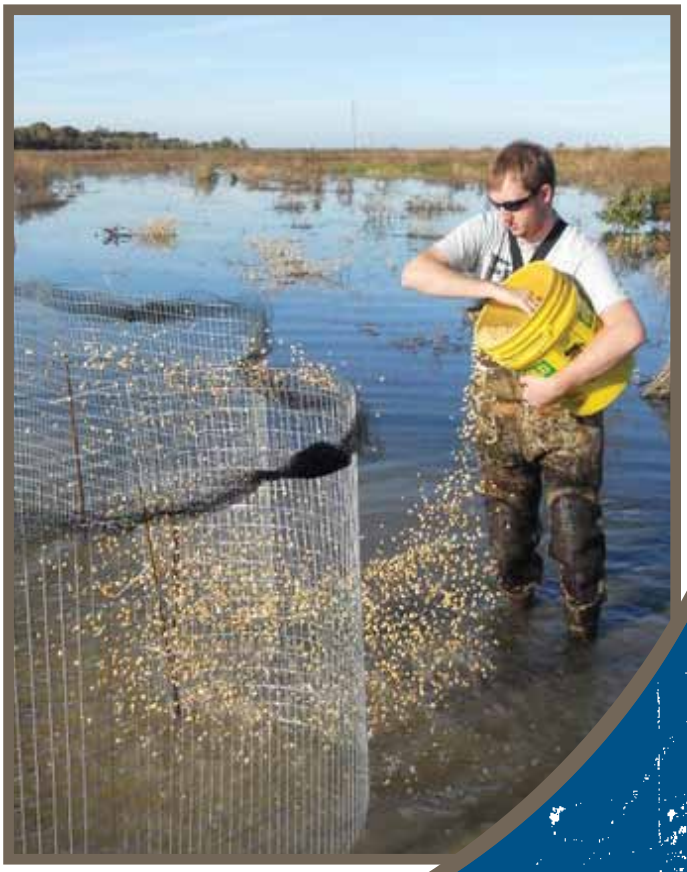
Daily locations of each female were used to calculate a home range to determine four primary habitat types: flooded agriculture, moist-soil wetlands, flooded forest and scrub-shrub, and permanent water. In an earlier study, these habitats comprised a complex of wetlands in the Mississippi Delta that was associated with the greatest abundance of mallards and other dabbling ducks. Additionally, the area of different wetlands in mallard home ranges was estimated using sophisticated satellite imagery. Using data

on available wetlands and those used by mallards, the birds' habitat preferences were determined and compared between birds that survive winter and presumably migrate north and those that are harvested or die of natural causes.

Daily survival rates of mallards varied among habitats, between juvenile and adult females, and relative to body condition at time of capture. The greatest daily survival occurred in moist-soil habitats (100%), followed by agriculture (99.96%), forested (99.78%), and permanent water (97.72%). Overall, winter survival was 76 percent. This was similar to a 1980s study in the Mississippi Delta which found winter survival at 82 percent. Females in better condition when marked had greater survival than less fit individuals, and juvenile females survived better than older birds. This latter discovery may be an artifact of disproportionately more young birds being radio-marked during 2011, a year of excellent mallard production on the breeding grounds and a mild 2011-2012 winter.

Similar to previous research in the MAV, the greatest day-time use by radio-marked females was found in forested habitats. Of all the habitats studied, flooded forest, moist-soil, and agricultural were preferred over permanent open-water wetlands. Forested habitats were most preferred, but there was no detectable preference between moist-soil and agricultural habitats. Also, habitat selection did not vary by year, age of female, capture site, or body condition at capture. Day-time use of habitats is critical to understand, however, because it occurs simultaneously with hunting and other human-related activities, further investigations must be made on nocturnal preference of habitats.

Given the decline of bottomland hardwood forests in the MAV, flooded moist-soil and agricultural land resources provide important resources to wintering mallards and other waterfowl. Water availability, along with diversity and configuration of habitats on the landscape at local and large spatial scales, should be managed to promote mallard abundance, survival, and preparedness for spring migration. The challenge in managing these habitats is to understand the spatial distribution of habitats that form the "ideal habitat complex" and how use of different wetlands through time and space influence the birds' ability to survive winter, migrate, and reproduce. To address these challenges, this study will be continued across the entire Mississippi Delta during winters 2013–2015.



What's swimming in the water around my waders?

By: Justyn R. Foth, Ph.D. student

Ever wondered what those little "bugs" were swimming in the water while duck hunting? They are aquatic invertebrates. Aquatic invertebrates are a diverse group of bugs, crustaceans, insects, mollusks, among others that are part of aquatic food webs, along with microbes that decompose leaf and other organic matter. Aquatic invertebrates fall into four broad trophic categories: shredders, grazers, collectors, and predators. Shredders (midge larvae) process coarse and fine particulate organic matter, such as fallen leaf litter, to acquire nutrients from the associated microbial community. Grazers (snails) glean algae and phytoplankton from leaf, stem, and tree surfaces. Collectors (caddisfly larvae) process fine particulate matter from floating organic matter in the water. Finally, predators (dragonfly larvae) prey on other invertebrates. And where do waterfowl fit into this food web? They consume invertebrates as important sources of protein and other nutrients.

Aquatic invertebrates are an essential food source for different life stages of many wildlife species. They provide waterfowl with protein and calcium throughout the birds' annual cycle. Aquatic invertebrates diversify diets of wintering waterfowl which often are high in carbohydrates from acorns, other seeds and tubers, and grains. In bottomland hardwood forest wetlands, aquatic invertebrates and acorns fluctuate in abundance during winter, and ducks must "sample-forage" to find rich patches of these food resources.

Aquatic invertebrates also provide female ducks with protein and calcium to aid in feather growth during late winter-early spring and subsequent egg production. Most ducklings' diets primarily consist of aquatic invertebrates, which are easily digested and enable muscle and feather development—both of which are composed mostly of protein-based compounds.

Two main types of flooded hardwood bottomlands occur in the Southeast: naturally-flooded forests and greentree reservoirs (GTRs). Naturally-flooded forests occur from overbank flooding of rivers and local precipitation and run-off events. Frequency, extent, depth, and duration of flooding vary seasonally and annually. Most bottomland hardwood forests in the Mississippi Alluvial Valley (MAV) fall into this category. A GTR is a hardwood bottomland, part or all of which is surrounded by a levee containing a water control structure to manage flooding. The area surrounded by levees usually is dominated by red oak trees that produce acorns for wintering ducks. The GTRs generally are flooded artificially using pumped or gravity-fed water to attract ducks and provide opportunities for waterfowl hunting.

GTRs are typically flooded prior to the waterfowl hunting season and held at relatively stable depths and drained immediately following the hunting season. Additionally, GTRs are flooded to depths to allow hunters to boat to desired hunting areas. These practices are not necessarily beneficial for the forest, waterfowl, and invertebrate communities, because they are not natural. In nature, hydrology of lowland forests is dynamic, meaning frequency, extent, duration, and depth of flooding fluxes in time and space with natural rain and flood events.

Research across the MAV has shown that the taxonomic diversity of invertebrates was greatest in naturally-flooded hardwood bottomlands and in water depths ranging from 4 to 16 inches. This range of depths is consistent with depths in which mallards and other dabbling ducks were observed foraging in the MAV during winter. For example, research done in moist-soil wetlands in the MAV showed over 90 percent of dabbling ducks forage in less than 6 inches of water. Flooding GTRs shallowly and managing for dynamic natural hydrology likely benefits the invertebrate, waterfowl, and entire forest community.

Aquatic invertebrates are small and inconspicuous organisms in wetlands but are crucial to sustaining waterfowl populations and an integral ecological component of forested and other wetland systems. So this winter, when the ducks aren't flying, look into the water to see what may be swimming and feeding. Take a small fine-mesh net, sweep through the water and vegetation, and be amazed by the diversity of aquatic life living beneath the surface that may be eaten by a female duck and later converted into an egg on the breeding grounds.

FEATURE

Black duck declines in the volunteer state: Searching for answers in winter survival rates and habitat use

By: Kira Newcomb, M.S. student

The American black duck is a perennial favorite quarry of waterfowl hunters in the Mississippi and Atlantic Flyways. Between the 1950s and 1990s, black duck populations declined in North America, possibly due to changes in habitat quantity and quality from extensive deforestation, landscape conversion to agriculture, wetland loss, and other human-related causes. More recently, breeding and winter survey data indicate population stabilization in northeastern segments of the black duck range, while declines continue in western and central ranges. Approximately 30 percent of all black ducks winter in the interior habitats of the Mississippi Flyway, and these populations are undergoing the steepest declines. According to mid-winter survey data from the Mississippi Flyway, Tennessee has wintered the most black ducks in the flyway in 33 of the past 57 years, and the state supports an average of 35 percent of black ducks in the flyway.

Tennessee National Wildlife Refuge (TNWR) was established in 1945 as a waterfowl sanctuary in western Tennessee along the Tennessee River. The TNWR provides over 51,000 acres of agricultural, moist-soil, open-water, forested, and scrub-shrub habitats and supports over 150,000 total ducks each winter. TNWR provides critical habitat for black ducks in Tennessee, with at least 50 percent of all black ducks counted during the mid-winter survey being detected on the refuge. However, TNWR's weekly aerial surveys revealed declines in black ducks similar to those across the Mississippi Flyway. When initial surveys began at TNWR in 1964, approximately 20,000 black ducks were counted refuge-wide, whereas only 1,610 ducks were counted in 2012.

Wintering waterfowl have substantial energetic and other nutritional demands during winter, which must be satisfied with quality food to enable the birds' survival, establish and maintain pair bonds, and engage in other physiological and social activities. Factors that can influence survival of waterfowl in winter include age, body condition, disturbance (hunting, other human activities), and weather. Because of recorded declines in black duck use of TNWR, Mississippi State and University of Tennessee scientists have teamed with U.S. Fish and Wildlife Service biologists to investigate winter survival and habitat use of black ducks at TNWR.

In winters 2010–2012, scientists trapped and attached radio transmitters to 113 female black ducks on the Duck River Unit, the largest of TNWR's management units. Researchers monitored each duck's survival, movements, and habitat use during winter. Radio transmitters were

labeled with contact information so hunters could contact researchers if a radiomarked black duck was harvested.

After two years of study, 14 radio transmitters were recovered from dead black ducks, including five birds that were legally harvested by hunters. The other mortalities likely were due to avian predators (great horned owls, bald eagles) and other unidentified causes. Interestingly, an additional five black ducks were harvested in autumn 2011 from Ontario, Canada, and Michigan, but these birds were not included in survival estimates because their mortality occurred outside the winter study period.

The survival rate of female black ducks on TNWR was 89 percent in winter 2010–2011 and 85 percent in winter 2011–2012. Researchers did not detect any influence of age, hunting pressure, or weather on duck survival. However, they did find that body weight at time of capture influenced winter survival and it varied by year. Winter 2010–2011 was harsh with freezing temperatures and weekly snowfall, and survival rates declined as body weight at time of capture decreased below 2.6 pounds. In contrast, winter 2011–2012 was mild with record high temperatures and abundant rainfall, and survival rates gradually increased as body weight at time of capture decreased below 2.6 pounds. Perhaps 2.6 pounds is a possible threshold weight that influences female black duck survival differently in harsh and mild winters relative to food availability, metabolic rates, weather or other environmental stressors, or a combination of these and other factors influencing body maintenance and individual survival.

Researchers determined habitat use and movements by recording nearly 4,000 day and night locations of black ducks on and near TNWR. Preliminary analysis of these data indicate that daytime black duck habitat use was greatest in open-water areas, followed by moist-soil wetlands, forested and scrub-shrub wetlands, and agricultural lands. At night, habitat use was greatest in moist-soil wetlands, followed by forested and scrub-shrub wetlands, open-water, and agricultural lands. Black ducks may have used open-water areas during daylight to be vigilant from hunters and natural predators and "sun bathe" to conserve energy on clear days. Ducks may have used moist-soil and woody cover extensively at night to forage on seeds and aquatic invertebrates and to seek thermal or roost cover amid grassy and woody vegetation.

Winter survival of black ducks on TNWR remains high despite declines in winter and mid-continental populations. The fact that black ducks relied greatly on moist-soil wetlands is encouraging as refuge managers can readily provide these important natural wetlands. In addition to this study, ongoing and collaborative research with colleagues at University of Tennessee will further identify important patterns of habitat use by black ducks. This information will help guide management to benefit wintering black and other ducks at TNWR. Future research should investigate other factors contributing to black duck declines, such as a shift in the wintering range of the species due to climate change and causes of lower survival rates during the black duck's annual cycle.

ABSTRACTS

Native crayfish harvesting and alternative opportunities for landowners practicing moist-soil wetland management

By: Amy Spencer, Ph.D. candidate

Recent aquatic invertebrate studies in moist-soil wetlands suggest that populations of native crayfish, those not artificially stocked, may be of sufficient quantity to harvest sustainably for human consumption. To estimate the economic potential of crayfish harvests in managed moist-soil wetlands, crayfish yield was estimated from moist-soil wetlands on public and private lands in Arkansas, Louisiana, Mississippi, and Missouri in spring-summer 2009–2011. Typical crayfish harvest strategies practiced in commercial crayfish culturing in Louisiana rice fields were used.

Estimated costs associated with harvesting crayfish were then entered into the Mississippi State Budget Generator to create enterprise budgets under different harvest scenarios. Break-even selling prices necessary to recover direct expenses (fuel, bait, and labor) were also estimated.

Average daily yields of crayfish from moist-soil wetlands averaged 2.73 kg per hectare (n = 42, CV = 21%), three times less than the yield from high production rice-crayfish culture systems in Louisiana. Estimated cost associated with harvest of crayfish from moist-soil wetlands was $529 per hectare compared to $1,856 per hectare for commercial rice-crayfish harvesting. The estimated break-even selling price, however, for native crayfish harvested from moist-soil wetlands was $4.90 per kg ($2.23/lb) compared to $2.75 per kg ($1.25/lb) for rice-crayfish commercial production.

Estimates of break-even selling prices for crayfish harvested from moist-soil wetlands were greater than the commercial crop production of crayfish in Louisiana. However, in areas where crayfish markets are sparse, such as in the north Mississippi Alluvial Valley of Mississippi, Arkansas, Tennessee, Kentucky, and Missouri, landowners may realize economic potential from this fishery.

A consumer taste test of crayfish harvested from moist-soil wetlands and from commercial rice fields showed no statistical differences in panelists' ratings of the overall acceptability.

Harvesting crayfish from moist-soil wetlands may provide a small profit for landowners but will likely provide additional recreational opportunities and can serve as additional extension vehicles to encourage wetlands conservation throughout the MAV.

Estimating and modeling red oak acorn yield and abundance in the Mississippi Alluvial Valley

By: Jake Straub, Ph.D. (graduate, December 2012)

Red oak acorns are valuable forage for wildlife, especially mallards and wood ducks, wintering in the Lower Mississippi Alluvial Valley (MAV) and elsewhere in river bottom areas of southeastern United States. However, information is limited on red oak acorn production, particularly the amount, timing, and persistence of acorns during fall-winter. Conservation planners need precise estimates of acorn abundance and other forages to estimate foraging habitat needs of waterfowl during winter.

Recent research provided landscape-scale, multi-year estimates of red oak acorn yield and on-ground abundance in the MAV. Mean yield of acorns was 534 dry kg per hectare across all sites, years, and oak species. Yield varied more within years than when data were combined across years. Yield was not synchronized in any year among MAV sites. However, yield usually was synchronized among red oak species within sites suggesting local factors influenced acorn yield more than landscape-scale environmental factors. Among sites and years, on-ground acorn abundance generally was greatest in January (371 kg per hectare) and smallest in November (198 kg per hectare). In years with above-average yield, acorns persisted on the ground until February. For Nuttall oak, however, acorn persistence was generally continual during winter regardless of yield. Persistence of Nuttall oak acorns increased with yield, perhaps revealing an evolutionary pressure that encourages acorn production by this species. Red oak acorn abundance was positively related to the percentage of red oaks in the overstory, but this relationship differed in years of above- and below-average yield.

Conservation planners currently estimate 166 kg per hectare as a combined forage of red oak acorns, moist-soil seeds, and aquatic macro-invertebrates in bottomland hardwood forests with 100 percent red oak canopy. This value is based on an estimate of red oak acorn abundance from a long-term study conducted in a single study area in the Bootheel of Missouri in the northern MAV.

In this study, scientists sampled five sites throughout the MAV over three years. Results indicate the estimate should be increased to 247 kg of acorns per hectare of forest land with 100 percent red oak canopy. Because acorns persist through most winters and generally reach peak abundance in January, simultaneous with peak abundance of mallards and other ducks in the MAV, biologists and conservation planners may have underestimated the potential of bottomland hardwood forests to support ducks in mid-late winter. Future studies should be conducted because of the variable nature of acorn production within and among sites and years in the MAV.

ABSTRACTS

Wintering waterfowl use of Mississippi's Delta National Forest

By: Thomas G. Peterson, M.S. student

Approximately 25 percent of the original 25 million acres of bottomland hardwood forests remain today in the Mississippi Alluvial Valley (MAV). Delta National Forest is located in the western Mississippi Delta and at 60,000 acres is the second largest public holding of contiguous bottomland hardwood forest in the MAV. Uniquely, it is the only bottomland hardwood forest managed by the U.S. Forest Service.

Historically, waterfowl management in the Delta National Forest has been mostly passive with few silvicultural or other practices employed for the benefit of waterfowl. Also, knowledge of waterfowl abundance and how birds use diverse hardwood bottomland communities in the Delta National Forest is virtually nonexistent. The U.S. Forest Service seeks a more thorough understanding of habitat use by ducks at the Delta National Forest and specific management practices that may enhance use of the forest by wintering waterfowl, given the variable annual yields and on-ground abundance of red oak acorns in this and other bottomland hardwood forests in the MAV.

A pilot study was initiated in winter 2011–2012 to determine species composition and relative abundance of waterfowl using the Delta National Forest. Using aerial imagery, 66 semi-permanent wetlands dispersed throughout the Delta National Forest were randomly selected for surveys of waterfowl. Four species of ducks were present in the surveys: mallards (*Anas platyrhynchos*), gadwall (*A. strepera*), wood duck (*Aix sponsa*), and hooded merganser (*Lophodytes cucullatus*). However, only wood ducks were observed consistently (77%) during surveys. Mallards, gadwall, and hooded mergansers were found in less than 10 percent of the surveys.

Survey methodology is being refined for winter 2012–2013. Scientists will survey the Delta National Forest wetlands from mid-November 2012–early March 2013 and repeat surveys on each of the 66 wetlands each week. Habitat composition within and around survey wetlands will be quantified. Through statistical modeling, the data will be used to determine if certain key habitat features are associated positively or negatively with waterfowl occurrence and abundance. Other factors—hunter disturbance, survey wetland distance to roads, water depth, and aquatic plant communities—will be investigated to determine influence on waterfowl use of wetlands.

Winter waterbird use and food resources of aquaculture facilities in Mississippi

By: James Feaga, M.S. student

The conversion of wetlands and hardwood bottomlands to aquaculture ponds in Mississippi in the 1970s provided alternate aquatic habitats for a variety of waterbirds. However, the aquaculture industry as a whole has declined causing many facilities to drain ponds and idle production. Nonetheless, vast acreage of aquaculture ponds remain in western and eastern Mississippi.

A study was initiated on 12 aquaculture facilities in the Mississippi portion of the Mississippi Alluvial Valley. The study is assessing winter waterbird abundance and species diversity in production and idled aquaculture ponds during winters of 2011–2013. The study also is comparing current winter waterbird use of aquaculture habitats with historical data collected in the early-mid 1980s,

estimate invertebrate abundance and diversity on production aquaculture ponds as a function of water depth, pH, and soil types, and estimate moist soil seed abundance and diversity on idled aquaculture ponds.

Production aquaculture sites exhibited less dynamic fluxes in bird abundance during winter than idled ponds, with peak abundance (33 birds per hectare) reached in mid-December 2011. Idled aquaculture sites exhibited similar peak abundance (35 birds per hectare) in mid-December 2011 and late-January 2012 (35 birds per hectare). Surface feeders (American coot, American wigeon, mallard, northern pintail, and northern shoveler) composed the greatest proportion of waterbirds in production and idled aquaculture sites. Diving feeders (bufflehead, canvasback, double-crested cormorant, ruddy duck, and hooded merganser) and wader/shoreline feeders (cattle egret, sandpipers, great blue heron, and great egret) composed greater proportions of waterbirds in production than idled aquaculture sites. Mean ducks and coots per hectare were significantly greater in winter 2011-2012 than in winters 1984-1986.

Differences in duck use of aquaculture ponds between the 1980s and current surveys may be related to the reduced area of available aquaculture production acreage. This reduction in wetland area may be concentrating birds on remaining aquaculture production habitat. Preliminary results indicate that production and idled ponds continue to provide wetlands for migrating and wintering ducks and other waterbirds.

ABSTRACTS

Waterbird use of Mississippi Alluvial Valley private lands enrolled in the Natural Resources Conservation Service's Migratory Bird Habitat Initiative

By: Matt Weegman, M.S. student

To mitigate biological and environmental impacts of the Deepwater Horizon oil spill in the Gulf of Mexico, the Natural Resources Conservation Service established and federally funded the Migratory Bird Habitat Initiative (MBHI). The MBHI allocated $40 million of funding in 2010 to create wetland habitat for waterbirds and wetland wildlife on private lands inland from the Gulf oil spill. Landowners received an incentive payment for managing private lands that NRCS deemed potentially beneficial to wintering and migrating waterbirds. Additionally, NRCS suggested and encouraged habitat enhancements for MBHI enrolled lands. Roughly 175,000 hectares of land were enrolled in the MBHI in Arkansas, Louisiana, Mississippi, and Missouri. These states make up a portion of the Mississippi Alluvial Valley (MAV), a historically significant region for millions of migrating and wintering waterfowl and other waterbirds in North America.

Waterbird surveys were conducted bimonthly in Mississippi and Louisiana during August 2011–April 2012. The surveys were randomly chosen for wetlands enrolled in the MBHI and passively- or non-managed wetlands enrolled in the Wetland Reserve Program. All shorebirds were counted during surveys and included *Charadiiformes*, wading birds (*Ciconiiformes*, *Pelicaniformes*), waterfowl (*Anseriformes*), and marsh birds (*Podicipediformes, Gruiformes*). In addition to waterbird surveys, soil-core samples were collected in October 2011 and March 2012 to estimate potentially available seed and tuber resources for waterfowl between fall and spring. A total of 400 samples were obtained from a subsample of 40 randomly selected wetlands (20 MBHI and 20 control wetlands).

Results indicate that wetlands enrolled in the MBHI were used by three times more waterfowl and other waterbirds than nearby passively managed or unmanaged wetlands. Because dabbling ducks made up most of waterbirds, they influenced the results. No other significant effects were detected in the analyses. Management through the MBHI program significantly increased dabbling duck and other waterbird use of wetlands during winter in the MAV of Mississippi and Louisiana. However, this and an earlier study in the same region revealed that waterfowl and other waterbirds also made important use of passively and unmanaged wetlands, suggesting a diversity of wetlands within habitat complexes are important to migrating and wintering waterbirds in the MAV.

Shorebird and other waterbird use of wetlands and aquaculture ponds in the Mississippi Alluvial Valley and Gulf Coast regions

By: Justyn R. Foth, Ph.D. student

Before the 20th century, most of the Mississippi Alluvial Valley (MAV) was covered by bottomland hardwood forests. A majority of this region has since been converted to agriculture, aquaculture, urbanization, or other land uses. Historically, shorebirds likely migrated over the MAV to the Gulf Coast or used riverine wetlands or exposed mudflats and sandbars. Very little is currently known about shorebird use of modern-day MAV habitats.

This study will estimate species composition and relative abundance of migrating shorebirds, waterfowl, and other waterbirds in aquaculture ponds and associated wetlands in the MAV and Gulf Coast regions from July-October, a primary migration period for shorebirds. The Natural Resources Conservation Service provided funds through the Migratory Bird Habitat Initiative (MBHI) to producers who no longer used their catfish ponds for aquaculture production. The federal support enabled landowners to flood, mow, disk and otherwise manage idled catfish ponds and thus create freshwater mudflats and shallow wetlands for shore- and other birds inland from the Gulf Deep Water Horizon oil spill. The MBHI was an attempt to "short-stop" birds north of the Gulf and possibly oil-fouled coastal wetlands.

The study will also estimate invertebrate food resources for shorebirds in the MAV, use stable isotope (hydrogen, carbon, nitrogen) analysis of tissues of live-captured shorebirds and soil to determine possible migratory connectivity among MAV and Gulf Coast habitats, and assess migratory connectivity and stopover wetland use from stable isotope analysis of biological material (feather, blood, tissue) and soil across the MAV. The data will allow scientists to evaluate possible accumulation of hydrocarbon material in shorebird tissue possibly from the Deep Water Horizon oil spill.

Shorebird and other surveys began in summer-fall 2011 and will continue through 2013. Current data indicate that ponds enrolled in and managed through the MBHI had a mean bird use of 43 birds per hectare. This abundance is substantially greater than that on other aquacultural facilities which averaged less than one bird per hectare. Results from years two and three will further refine the value shallowly flooded wetlands provide shorebirds and assist the NRCS and other conservation agencies in guiding shorebird habitat conservation efforts in the MAV and along the Gulf Coast.

ABSTRACTS

Waterfowl foods and waterbird abundance in the Gulf Coast rice lands of Louisiana and Texas

By: Joseph Marty, M.S. student

Flooded rice fields are important habitats for waterfowl and waterbirds in the southern United States, California, and worldwide. In the Texas Mid-Coast and Louisiana Chenier Plain, over 413,797 acres of rice are cultivated annually. Millions of waterbirds use these regions for foraging and fulfilling other habitat needs. A study was initiated to estimate and compare waste-rice and moist-soil seed abundance among rice production systems, geographic regions, and time periods relevant to waterfowl conservation planning and implementation of the North American Waterfowl Management Plan. Scientists will also estimate waterbird abundance during autumn-winter on rice fields in the Gulf Coastal Prairies of Louisiana and Texas.

Nearly 6,000 soil cores from active and idle rice fields in the Texas Mid-Coast and Louisiana Chenier Plain were collected during falls-winters 2010–2012. Preliminary results suggest a 36 percent increase in residual rice and natural seed abundance in rice fields between first harvest in August and second harvest (ratoon crop) in November. In the Louisiana Chenier Plain, a 44 percent increase in waste seed abundance was detected between first and ratoon harvests. In comparison, a 19 percent decrease occurred during the same time period in the Texas Mid-Coast. In the Louisiana Chenier Plain, greatest abundance of waste seed (457 lb [dry] per acre) occurred in fields with a harvested ratoon crop in November, whereas greatest abundance of waste seed (397 lb/ac) in the Texas Mid-Coast occurred in idle rice fields with standing natural vegetation in November. In contrast, only 69 pounds per acre of waste rice were estimated in harvested rice fields in the Mississippi Alluvial Valley (MAV) in November in the early 2000s. However, the autumn growing season is too short in the MAV to support a second ratoon crop. The ratoon crop in the rice prairie region provides bountiful waste rice for wintering waterfowl unlike the MAV. Scientists will continue sampling to more precisely estimate abundance of waste grain and natural seeds in harvested and idle rice fields.

Waterbirds in fields under different management practices were also surveyed. Approximately 68 species of waterbirds were observed in Louisiana and Texas rice fields. About 12 waterbirds per flooded acre of rice fields were detected while only 9 waterbirds per acre were found in flooded idle rice fields. However, less than 1 percent of all waterbirds were observed in dry fields.

Waterbirds and their food resources in Gulf Coastal Prairie rice lands

By: David Fishman, Ph. D. Student

The collapse of the Deepwater Horizon oil rig triggered the establishment of the Migratory Bird Habitat Initiative (MBHI) with a primary goal of mitigating loss of habitat for migratory birds in the Gulf by providing inland habitats. Similar to the Farm Bill conservation programs, NRCS's MBHI provided financial incentives to landowners to implement various management practices to create wetlands in eight states and make associated foods available in mainland habitats away from sites impacted by the spill. Most practices involved flooding sites to various water depths at specified times during the migratory season, thus providing critical wetlands for countless shore and other waterbirds.

Rice agriculture constitutes an important component of the landscape in the Gulf Coastal Prairies of Louisiana and Texas. The preexisting water-management infrastructure associated with rice production makes these systems important potential habitats for conservation practices of the MBHI. Consequently, over 600,000 acres of rice lands were enrolled in Louisiana alone. Furthermore, unlike rice agriculture in more northern rice-growing states, producers in Louisiana and Texas often idle rice fields after a year of production to conserve soil and water. These fallow fields typically evolve naturally into diverse grass-sedge communities and provide important natural wetlands when flooded.

One component of this research is to determine the linkage of MBHI management practices in Louisiana and Texas rice fields to avian use and associated potential foods. Based on current surveys, a major factor determining bird use of rice fields is the presence of water. The mean number of birds observed in flooded fields was almost 17-fold that of dry fields. While no major differences in the numbers of birds using active and idle rice fields were detected, there is compelling initial evidence suggesting the two types of fields support different avian communities. For example, flooded rice-production fields tend to be used by ducks, geese, and waders; whereas, temporarily idled and flooded fields with sparse vegetation attract a variety of shorebirds, waders, and raptors.

This research has demonstrated waste rice and natural seeds in these systems are abundant and several times greater, on average, than amounts found in harvested rice fields in the Lower Mississippi Alluvial Valley.

Annual ecology of mottled ducks in coastal South Carolina

By: James C. Shipes, M.S. student

Mottled ducks are close relatives of mallards but are historically endemic to coastal and some interior regions of Florida, Alabama, Mississippi, Louisiana, Texas, and Mexico. Mottled ducks in Louisiana were captured and released on several state and privately owned lands in coastal South Carolina in the late 1970's. It is believed that mottled duck populations in South Carolina have increased since the initial release as birds are now frequently observed in many coastal wetlands. Despite apparent increases and the birds' popularity with hunters, little is known about ecology and habitat use of mottled ducks in South Carolina. This study will determine winter movements and habitat use of radio-marked mottled ducks in the Ashepoo, Combahee, and Edisto Rivers (ACE) Basin; determine social indices of breeding mottled ducks; estimate survival; determine movements and habitat use of female mottled ducks during nesting and brood-rearing; and develop baseline habitat management recommendations to benefit mottled ducks wintering and breeding in coastal South Carolina.

In August 2010 and 2011, 106 molting female Mottled ducks were captured and radio-marked near Yemassee, South Carolina. Aerial reconnaissance was used to monitor and study movements and macro-habitat use by birds from fall-winter. Radio-marked females were also tracked intensively during the breeding season to study their nesting ecology. Unfortunately, significant transmitter failure or perhaps unidentified predation of females in winter 2010-2011 greatly reduced the sample of radio-marked birds. In 2012, there were 9 radio-marked mottled ducks remaining in the study area during the breeding season. A search for possible nests revealed 42 nests of unmarked females with an apparent nest success of 29 percent. Mean clutch size was 8.4 eggs. In 2012, nests of three radio-marked females were found but two nests were lost to predators and one was abandoned. Seven radio-marked females died in 2012 and apparent annual survival of females was 81 percent.

Data on winter movements and habitat use of radio-marked females is currently being analyzed. This research is an important predecessor to a second study that will focus on brood ecology beginning spring 2013. Together, these studies will be important for mottled duck conservation and management in South Carolina.

Ecology of mottled duck broods in Coastal South Carolina

By: Molly Kneece, M.S. student

The mottled duck (*Anas fulvigula*) is a close relative of the mallard (*Anas platyrhynchos*) and endemic to parts of Mexico, Texas, Louisiana, Alabama, and Florida. In the early 1970s, free-ranging mottled ducks were transported from Louisiana and released on wetlands in coastal South Carolina. Since their introduction, mottled duck populations have increased in South Carolina. Several studies of mottled ducks have been conducted in Florida, Louisiana, and Texas during the 2000s, but little is known about mottled duck ecology and management in South Carolina. This study is the second of two consecutive research projects that are investigating the seasonal ecology of mottled ducks in South Carolina.

The first and ongoing study between the Nemours Wildlife Foundation, the South Carolina Department of Natural Resources, and Mississippi State University is examining nesting biology of mottled ducks in the Ashepoo, Combahee, and Edisto Rivers (ACE) Basin in South Carolina. This study will expand the effort and focus on survival, movements, and habitat use of mottled duck broods on public and private lands in the ACE Basin. During fall 2012, 72 female mottled ducks were captured and instrumented with surgically implanted intra-abdominal radio transmitters. Radio-marked females will be located during winter-spring to examine movements and habitat use. During nesting and brood rearing, radiomarked females and broods will be tracked to examine habitat use and estimate duckling and brood survival. Additional transmitters will be attached to mottled ducks in 2013-2014 to enable a second year of brood monitoring.

The results of this project have important conservation and management implications. Mottled duck broods have been observed using wetlands with salinity concentrations greater than 12 parts per thousand. However, previous research on captive mottled duck ducklings has found these salinity levels lethal. Confirmation of mottled duck broods using high saline wetlands would have implications throughout the species' range. Use of saline wetlands by mottled ducks may require birds to find and use freshwater wetlands to neutralize bodily salt loads. Freshwater wetlands may be a key habitat component of mottled ducks in the ACE Basin, and conservation and management of freshwater wetlands may become a focused action by management partners.

PUBLICATIONS

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AWARDS

James Feaga

Second-Place Student Poster, Mississippi Chapter of The Wildlife Society for Feaga, J.S., F. Vilella, B. Davis, R.M. Kaminski. 2012. Winter waterbird use and food resources of aquaculture facilities in Mississippi. Mississippi Chapter of The Wildlife Society Annual Meeting, Ocean Springs, MS.

Justyn Foth

James C. Kennedy Endowed Scholarship in Waterfowl and Wetlands Conservation

Mississippi Wildlife, Fisheries, and Parks Foundation Scholarship

Third-Place Student Poster, Mississippi Chapter of The Wildlife Society for Foth, J.R., F.J.Vilella. 2012. Shorebird use of wetlands and aquaculture ponds in the Mississippi Alluvial Valley and Gulf Coast region. Annual meeting of the Mississippi Chapter of The Wildlife Society, Ocean Springs, MS.

Thomas A. Plein Foundation Scholarship in the College of Forest Resources

Richard M. Kaminski

Outstanding Peer-reviewed Publication Award, Mississippi Chapter of The Wildlife Society for Pearse, A.T., R.M. Kaminski, K.J. Reinecke, S.J. Dinsmore. 2012. Local and landscape associations between wintering dabbling ducks and wetland complexes in Mississippi. Wetlands 32:859-869.

Joe Lancaster

James C. Kennedy Endowed Scholarship in Waterfowl and Wetlands Conservation

Best Student Poster, Mississippi Chapter of The Wildlife Society for Lancaster, J.D., J.B. Davis, R.M. Kaminski, A.D. Afton, E.J. Penny. 2012. Survival and habitat use of radio-marked female mallards in the Mississippi Delta. Mississippi Chapter of The Wildlife Society Annual Meeting, Ocean Springs, MS.

Joe Marty

2012 Wisconsin Waterfowl Hunters' Conference Scholarship

First-place oral presentation winner, Louisiana Association of Professional Biologists/ The Wildlife Society Louisiana Chapter Symposium for Marty J.R., J.B. Davis, R.M. Kaminski, M.G. Brasher, G. Wang. 2012. Waste rice, moist-soil seed, and waterbird abundance in rice production systems in Louisiana and Texas.

Kira Newcomb

James C. Kennedy Endowed Scholarship in Waterfowl and Wetlands Conservation

PRESENTATIONS

Alford, A.B. R. Kröger, R.M. Kaminski. 2012. Nutrient characteristics of moist-soil wetlands in agricultural landscapes. Oral presentation, Mississippi Water Resources Conference. Jackson, MS.

Davis, J.B. 2012. Waterfowl and wetlands conservation. Oral Presentation, Society of American Foresters meeting, Lake Tiak O'Khata. Louisville, MS.

Davis, J.B., R.M. Kaminski. 2012. North American Duck Symposium and Workshop. Invited Presentation, The Waterfowl Working Group, Association of Fish and Wildlife Agencies meeting. Hilton Head, SC.

Davis, J.B. 2012. Overview of MSU-WFA waterfowl and wetlands research program. Presentation to visiting students of Wetlands Ecology and Management (WFS 340), Department of Forestry, Wildlife and Fisheries, University of Tennessee. Knoxville, TN.

Davis, J.B., J. Lancaster. 2012. Habitat selection, wildlife management area use, and survival of radio-marked mallards in the Mississippi Delta. Invited presentation, the Mississippi Department of Wildlife, Fisheries & Parks Commission meeting. Jackson, MS.

Feaga, J.S., F. Vilella, J.B. Davis, R.M. Kaminski. 2012. Winter waterbird use and food resources of aquaculture facilities in Mississippi. Mississippi Chapter of The Wildlife Society Annual Meeting. Ocean Springs, MS.

Foth, J.R., F.J.Vilella. 2012. Shorebird use of wetlands and aquaculture ponds in the Mississippi Alluvial Valley and Gulf Coast region. Mississippi Chapter of The Wildlife Society. Ocean Springs MS.

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Foth, J.R., F.J. Vilella. 2012. Shorebird use of wetlands and aquaculture ponds in the Mississippi Alluvial Valley and Gulf Coast region. 5th North American Ornithological Conference. Vancouver, British Columbia.

Hagy, H.M., R. Smith, J. Stafford, A. Yetter, C. Whelen, C. Hine, M. Horath, R.M. Kaminski, K. Reinecke. 2012. Foraging thresholds for accurately estimating carrying capacity for non-breeding waterfowl. Long Point Partners Research Forum. Turkey, Point Ontario, Canada.

Kaminski, R.M. 2012. Farming for crops and ducks in the Mississippi Delta. Waterfowl and Wetlands Committee of Delta Wildlife. Stoneville, MS.

Kaminski, R.M. 2012. The Mississippi Alluvial Valley: It's conservation for migrating and wintering waterfowl. Invited presentation to University of Tennessee-Knoxville wildlife students. Mississippi State University, MS.

Kaminski, R.M., J.B. Davis. 2012. 6th North American Duck Symposium, Ecology and Conservation of North American Waterfowl. Invited presentation to waterfowl conservation sponsors and partners, Memphis Country Club. Memphis, TN.

Kaminski, R.M., et al. 2012. Ecological assessment of NRCS's Migratory Bird Habitat Initiative (MBHI). Invited special session presentation, The Wildlife Society Annual Meeting. Portland, OR.

Lancaster J.D., J.B. Davis, R.M. Kaminski, A.D. Afton, E.J. Penny. 2012. Mississippi Mallards. Mississippi 75th Anniversary Ducks Unlimited Convention. Natchez, MS.

Lancaster J.D., J.B. Davis, R.M. Kaminski, A.D. Afton, E.J. Penny. 2012. WMA use, habitat use and survival of radio-marked mallards in the Mississippi Delta. Mississippi Department of Wildlife, Fisheries, and Parks Annual Research Summit. Mississippi State, MS.

Lancaster, J.D., J.B. Davis, R.M. Kaminski, A.D. Afton, E.J. Penny. 2012. Survival and habitat use of radio-marked female mallards in the Mississippi Delta. Mississippi Chapter of The Wildlife Society Annual Meeting. Ocean Springs, MS.

Marty J.R., J.B. Davis, R.M. Kaminski, M.G. Brasher, G. Wang. 2012. Waste rice, moist-soil seed, and waterbird abundance in rice production systems in Louisiana and Texas. Louisiana Association of Professional Biologists/The Wildlife Society Louisiana Chapter Symposium. Lafayette, LA.

Marty J.R., J.B. Davis, R.M. Kaminski, M.G. Brasher, G. Wang. 2012. Waste rice, moist-soil seed, and waterbird abundance in rice production systems in Louisiana and Texas. Poster Presentation. Mississippi Chapter of The Wildlife Society Annual Meeting. Ocean Springs, MS.

Marty J.R., J.B. Davis, R.M. Kaminski, M.G. Brasher, G. Wang. 2012. Wintering waterfowl in Louisiana and Texas. Wisconsin Waterfowl Hunters' Conference. Wausau, WI.

Newcomb, K.C., J.B. Davis, M.J. Gray, R.M. Kaminski. 2012. Survival and habitat use of female American black ducks in western Tennessee. Poster presentation. Mississippi Chapter of The Wildlife Society Annual Meeting. Ocean Springs, MS.

Sloan, J.E., J.A. Hatten, R.M. Kaminski, A.W. Ezell, J.N. Straub. 2012. Relationship of hydrological and soil conditions to red oak acorn production in bottomland hardwood forests in the lower Mississippi Alluvial Valley and Interior Flatwoods. Poster presentation. Southern Hardwood Forest Research Group Meeting. Stoneville, MS.

Sloan, J.E., J.A. Hatten, R.M. Kaminski, A.W. Ezell, J.N. Straub. 2012. Relationship of hydrological conditions to red oak acorn production in the Mississippi Alluvial Valley and Interior Flatwoods. Poster presentation. Mississippi Water Resources Conference. Jackson, MS.

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Straub, J.N., R.M. Kaminski, A.W. Ezell, T. Leininger. 2012. Red oak acorn production, insect predation, and survival in hardwood bottomlands at Delta National Forest, MS. The 59th Southern Hardwood Forest Research Group annual meeting. Stoneville, MS

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