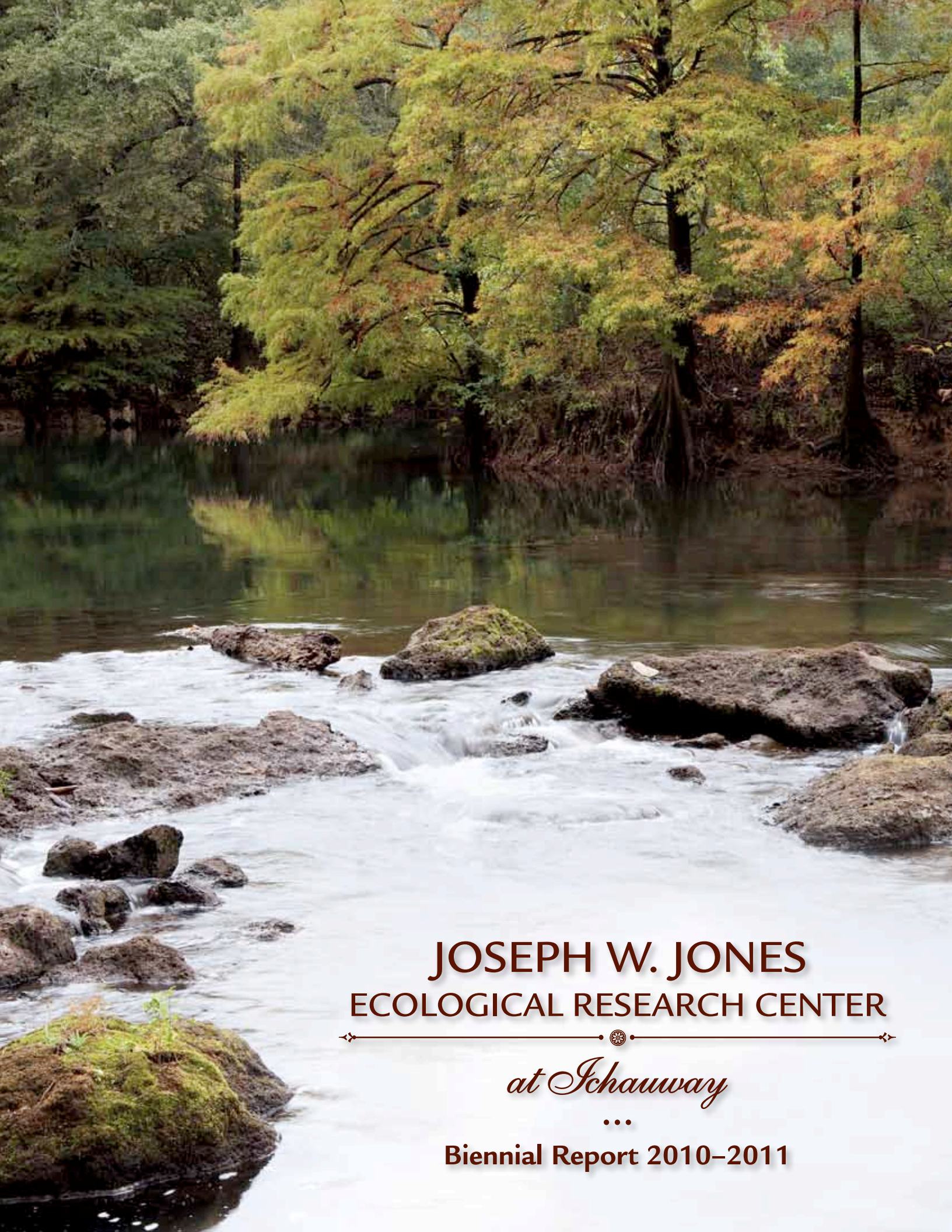

JOSEPH W. JONES
ECOLOGICAL RESEARCH CENTER

at Ichauway

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Biennial Report 2010–2011

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Mission and Values

The Joseph W. Jones Ecological Research Center at Ichauway seeks to understand, to demonstrate and to promote excellence in natural resource management and conservation on the landscape of the southeastern Coastal Plain of the United States.

The Jones Center was founded on a long-standing ethic of conserving land and water resources. Ichauway is maintained as the tangible expression of this natural resource management philosophy. Central to this philosophy is the conviction that management and research inform each other and are partners in their contribution to knowledge. One of the Center's most important products is people who combine a rigorous understanding of ecological principles with proficiency in natural resource management.

To understand the natural systems of the southeastern Coastal Plain, the Center assembles information from respected practitioners and the scientific literature and conducts targeted research to expand the knowledge of the field. Through a rigorous and creative research program, the Center aspires to improve management and stewardship of resources of the southeastern Coastal Plain and also to contribute to natural resource science at the national and international levels.

To demonstrate excellence in natural resource management, the Center manages Ichauway to protect and enhance the diversity of natural communities and their component species. The practical and economic aspects of proper stewardship are fundamental considerations of this work.

To promote excellence in natural resource management and conservation, the Center develops and conducts education and outreach programs for undergraduate and graduate students, interns, land owners and managers. The Center serves as a science-based resource for public officials, policymakers and the public.

From the Director

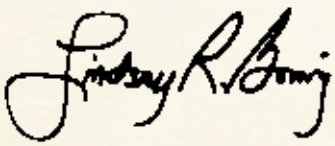
This report provides highlights of our activities from 2010–2011 and summarizes directions within our research, conservation and education programs. As a relatively small conservation and research center, we strategically direct our resources toward information needs for longleaf pine forests, associated wildlife and regional water resources in the Flint River watershed. Many of our key program elements address the interactions of natural resource management and land use with climatic variation.

While many of our long-term themes continue to develop from historical legacies of earlier programs, newer elements continue to grow such as research that links the ecological services of healthy forests, wetlands, rivers and wildlife to human health and well being. This includes research on the linkages between decreased ticks and prescribed burning, wetland conditions and mosquito populations, environmental flows and sustainability of river ecosystems and the values of longleaf pine ecosystems in the storage of carbon in biomass and soils. Prescribed fire continues to be a unifying theme for many of our research, education and conservation programs. These activities range from regional studies of fire-maintained habitat for wild turkey populations to outreach programs that increase society's awareness of the importance of prescribed fire at the national scale. Our staff effectively leverages our research resources with outside funding and over 40 collaborators and visiting scientists who expand and enhance our internal resources.

Our education and outreach contributions have greatly increased over the past two years. We have now graduated 79 M.S. and Ph.D. students through 2011 and continue to support 24 ongoing graduate students, collectively representing co-sponsorship with seven different universities. Our program provides these students with highly unique opportunities to conduct research in exciting field sites with excellent mentors and with great relevance to natural resource management, conservation and policy.

Outreach education programs and partnerships continue with historic partners such as the Georgia Department of Natural Resources, the Georgia Forestry Commission, the Longleaf Alliance and private landowners. However, we have expanded initiatives at the national scale by working collaboratively on projects such as the implementation of America's Longleaf Restoration Initiative, which includes many Federal, State and nongovernmental organization partners working together across the extensive range of longleaf pine. Other new partners and constituents include the National Wild Turkey Federation and the Apalachicola-Chattahoochee-Flint Stakeholders among others. Our programs are providing unique and new information transfer to practicing natural resource professionals with results that can facilitate implementation of integrated conservation practices across the region.

Over the past two years we have continued to have excellent long-term core support from the Robert W. Woodruff Foundation. We express our great appreciation for their financial support of programs and facilities, as well as for their visionary commitment of Ichauway's natural resources for conservation, research and educational demonstrations.



Dr. Lindsay R. Boring, Director

Highlights 2010–2011

- Approximately 1,360 natural resource professionals and university students participated in Jones Center education and outreach activities during 2010–2011 as part of 79 educational programs that included field tours, short courses, workshops and professional conferences. In addition, approximately 800 visitors from the region attended our 2011 Open House.

- Thirty-seven graduate students from seven cooperating universities conducted their research at Ichauway during 2010–2011 as part of our cooperative graduate student program. In addition, three individuals participated in the Center's conservation apprentice program during this time.

- The Center's wildlife program launched a new project to study the ecology of wild turkey in longleaf pine habitats. In 2010, the Center sponsored an outreach workshop to identify regional priorities for wild turkey research that included biologists and managers from across the Southeast. This workshop led to substantial external funding for a collaborative project that will include five graduate students through 2013.

- Center staff continued to provide leadership and support for regional and national collaborative conservation initiatives in prescribed fire outreach, range-wide longleaf pine restoration and water resource management in the Apalachicola-Chattahoochee-Flint river basins.

- The Center continued to broaden collaborative research partnerships. Ichauway was designated as a National Ecological Observatory Network site by the National Science Foundation-sponsored NEON program. Center staff hosted 10 visiting scientists from seven universities and agencies during summer residencies at Ichauway during 2010–2011 and collaborated with 37 other scientists and cooperators.

- The Center continued post-harvest data collection for the long-term ecological forestry research project. Ecological forestry outreach highlights in 2010–2011 include four ecological forestry workshops, publication of two books by the University of Georgia Press, publication of an economic analysis of the Center's demonstration area in a major forestry journal and numerous presentations at workshops and conferences.

- The Center was awarded $949,128 in new externally-funded research and outreach projects during 2010–2011. Eight externally-funded projects totaling $2,331,615 were continued from awards prior to 2010.

- Research staff published 27 articles in peer-reviewed journals in 2010 and 13 in 2011. Center staff also produced 11 technology transfer and other publications in 2010 and seven in 2011. There are an additional 15 "in press" publications for 2011.

Sampling for mosquito larvae in forested wetland.

Overview of Research, Education and Conservation Programs

The Joseph W. Jones Ecological Research Center at Ichauway is a research and conservation site of regional, national and international significance. Ichauway's 29,000 acres contain approximately 17,000 acres of rare, mature, longleaf pine woodlands, 3,000 acres of young restoration plantings of longleaf pine, innumerable depressional wetlands, 25 miles of rivers and streams and 3,000 acres of field habitat. This land base is complemented by 50,000 square feet of research and education facilities and a full time staff of 85.

Research

Our research programs focus on two broad themes: the ecology, restoration and management of the longleaf pine ecosystem; and water resources and aquatic ecosystems of the southeastern Coastal Plain. These areas of focus reflect the Center's location and the information needs of the region. Ichauway is situated in the heart of the historic range of longleaf pine. The longleaf pine ecosystem is one of the most biologically diverse systems in North America and, with less than 3% of the original extent remaining, increasingly a focus of conservation efforts. Southwest Georgia is also a hydrologically unique karst region that serves as the major recharge area for one of the most prolific and heavily-used aquifers on earth, the Upper Floridan aquifer. We balance basic research of these systems with applied work of interest to the natural resource management and conservation communities. Much of the Center's research is integrated under five long-term projects that incorporate various components of terrestrial, aquatic and wildlife research in an interdisciplinary approach.

Harvesting *Muhlenbergia* seeds for understory restoration.

Information generated from our research program is disseminated through peer-reviewed journal articles, technology transfer products, popular publications and by participation in local, regional, state and national scientific meetings. Our approach to research is based on cooperation between scientific staff and information users. Our work seeks to address relevant natural resource management questions so that policymakers and landowners can utilize science to support the development of sound resource management plans and policies.

Conservation

The Center's conservation program is charged with the stewardship and management of the Ichauway land base. It also serves as a technical information resource for the Center and as an example of sound resource management in the region.

Integration of research and natural resource management on Ichauway presents a unique opportunity for these programs to inform one another. Information from our research programs can be scaled up to an operational level for implementation and demonstration with these same management applications providing valuable feedback and generating additional questions for researchers.

The Center's conservation program incorporates a diverse range of activities into a management model that balances multiple values in the context of a deeply-rooted land ethic. Land management activities include an extensive prescribed fire program, conservation-based forest management and restoration of the longleaf pine ecosystem across the Ichauway landscape. Our wildlife program includes game management for species such as bobwhite quail and white-tailed deer as well as management and monitoring of nongame and endangered species characteristic of the longleaf pine ecosystem such as the red-cockaded woodpecker and gopher tortoise.

Education and Outreach

The results of our scientific studies, as well as information generated from our conservation and land management programs, are shared with a diverse constituency including natural resource management agencies, policymakers, private land owners, conservation groups and university classes. These audiences visit Ichauway for field tours, short courses and workshops, while Center staff also work collaboratively at other sites in Georgia and across the Coastal Plain of the southeastern U.S.

Our primary constituents are practicing professionals and those actively involved in making decisions that influence the management of natural resources. Our work with university students helps prepare the next generation of natural resource professionals. Through our outreach efforts, the Center influences conservation and management at both the state and national level.

Seventy-nine students from regional research universities have completed advanced degrees through our cooperative graduate education program and 24 students are actively pursuing degrees at this time. Key cooperating institutions include the University of Georgia, the University of Florida, Auburn University and seven other nationally-ranked programs. The development of well-trained professionals through our cooperative graduate program is one of the Center's most important contributions. It provides a unique legacy that continues to influence the management and conservation of natural resources through the course of these individuals' careers in conservation, research and education.

Long-Term Research Projects

Productivity, Biodiversity and Carbon Dynamics of Longleaf Forests

Principal Investigators: R. J. Mitchell, L. K. Kirkman and L. R. Boring
Lead Technicians: Jason McGee, Melanie Kaeser, Lisa Giencke and Scott Taylor

Since the Center's founding in the early 1990's, our research has maintained a strong focus on addressing information gaps in the basic ecology of longleaf pine. Our first long-term research effort, the Productivity and Biodiversity Project, has explored the basic ecology of longleaf pine forests, such as net primary productivity, patterns of plant species composition and nutrient cycling. Many of the studies associated with this project have included components that assessed both above-ground and below-ground cycling of carbon through the fire-maintained longleaf ecosystem.

Carbon, like currency in an economy, is a basic building block of ecological systems. Through photosynthesis, plants take carbon from the atmosphere and water from rainfall and soils, and produce carbohydrates and oxygen. Those carbohydrates are used to build leaves, stems and roots and to provide the energy to maintain life processes such as respiration. While ecologists have always been interested in patterns and controls of carbon dynamics and foresters have studied the productivity of forests, focus on the carbon cycle has increased dramatically in recent years in response to concerns about climate change. There is currently great interest in the ability of forests to capture and sequester carbon, particularly highly productive forests such as southeastern U.S. pine forests, as one strategy to reduce atmospheric carbon dioxide (CO_2).

However, protocols for assessing how much carbon is stored in forests are poorly developed, particularly for mature, multi-aged longleaf forests. Basic questions remain in our understanding of the carbon cycle and how management may influence carbon storage in both above- and below-ground pools. Multiple approaches are being used to study carbon dynamics, which build on the Center's long-term research into patterns, controls and gradients of productivity from wet to dry longleaf sites. In particular, our studies of below-ground ecosystem processes and carbon cycling are a unique contribution of the Jones Center. These data are combined with that of collaborators from the University of Edinburgh and the University of Alabama working on ecosystem-level measurements at Ichauway and then integrated into a newly developed carbon-fire process model.

The Soil-Plant-Atmosphere model has been adapted from African savannas to longleaf pine-grasslands. Over the last two years, scientists and graduate students have refined and validated the model by building an enormous dataset collected from three state-of-the-art eddy flux towers on Ichauway as well as empirical data from biological measurements. This research will help advance our ability to assess carbon stocks in forests beyond simple calculations of above-ground biomass.

Refinement of our understanding of how carbon cycles through forests will help provide the scientific basis for more informed decisions as policies for management of CO_2 are developed in the years ahead. Over the last two years, we have worked in partnership with the Pacific Forest Trust to apply accounting procedures from the Carbon Action Registry protocol used in California to our multi-aged longleaf stands in the Ichauway demonstration forest. This work combines the growth projections from our economic model with preliminary results from our carbon research to assess necessary adaptations for these accounting procedures should U.S. carbon markets develop in the future. While carbon policy in the U.S. has not developed to the degree it has globally, research such as this can help guide the future development of sound policy based in science.

Preparing cannon net for trapping wild turkeys.

Wildlife Research

Principal Investigators: L.M. Conner and L.L. Smith
Lead Technicians: Jessica Rutledge, Gail Morris and Jen Howze

Wildlife research at the Jones Center focuses on two general themes; predator-prey relationships and wildlife-habitat interactions. Within these areas of study, our scientists work on questions that further our understanding of the basic ecology of wildlife of the longleaf pine ecosystem as well as applied issues related to its conservation and management. While our wildlife research is conducted in all areas and habitats on Ichauway, much of our predation work over the last few years has focused on a manipulative experiment in which medium-sized mammalian predators were excluded from 100-acre fenced enclosures. Our wildlife habitat work seeks to better understand how wildlife responds to habitat structure in natural longleaf pine forests as well as responses to manipulation of that structure through management actions.

Results from the predator exclusion study continue to support our initial findings indicating that mammalian predators have relatively little impact on shrub-nesting birds. Rather, red imported fire ants are the most prevalent cause of mortality. Exclusion of mammalian predators did significantly improve nesting success of gopher tortoises, suggesting that predator control may be a viable option for management of this rare species. The results of this study have led us to expand our research on fire ant predation to explore population-level effects, particularly on herpetofauna and small mammals. For this work we will also explore how fire ants may indirectly impact native wildlife through behavioral adaptations.

In an initial study of white-tailed deer, our results suggested that coyotes were directly impacting recruitment through predation of fawns. Thus, we are continuing our work on coyote-deer interactions with more detailed research on coyote predation of white-tailed deer fawns. Long-term monitoring data suggest that coyotes may also be having an indirect impact on our white-tailed deer population by altering their behavior. A designed experiment will allow us to learn more about the impacts of coyotes on deer behavior, such as feeding patterns, and subsequent implications for habitat structure and quality.

A new initiative of the Center's wildlife research program is our wild turkey project that began in 2010. Many information gaps remain in our knowledge of how wild turkey utilize longleaf pine forests, their population dynamics in these systems and how they respond to seasonal and spatial aspects of prescribed fire. This effort is a partnership between the Jones Center, the University of Georgia, the Georgia Department of Natural Resources and the National Wild Turkey Federation and will have five graduate students working at two sites including Ichauway. The unhunted turkey population at Ichauway offers a unique opportunity to examine how this bird uses longleaf pine habitats in the absence of behavioral changes from hunting pressure.

An emerging species of emphasis for nongame wildlife research has been the gopher tortoise, which is now a candidate species for Federal listing under the Endangered Species Act. Wildlife ecologists at the Center have refined techniques and developed protocols to more accurately estimate populations of gopher tortoises, which are often elusive and difficult to survey with precision. A new grant in 2011 allowed us to expand our partnership with the Georgia Department of Natural Resources by conducting surveys on private lands under conservation easement. Center staff and graduate students are involved in this new initiative. Together, these efforts will lead to a better understanding of population dynamics, carrying capacity, habitat management and, ultimately, improved conservation of this iconic species of the longleaf pine ecosystem.

The Center continues to focus its wildlife research on issues of relevance to the wildlife management and conservation community while exploring fundamental scientific questions that advance our understanding of how longleaf pine ecosystems and wildlife populations interact. These programs highlight the value of Ichauway as a long-term study site to continue to build robust datasets over time for both game and nongame species of interest.

Wetlands Research

Principal Investigators: L.K. Kirkman, S.W. Golladay, D.W. Hicks and L.L. Smith
Lead Technicians: Melanie Kaeser, Lisa Giencke, Nathalie Smith, Brian Clayton and Jen Howze

Isolated wetlands of the southeastern Coastal Plain are widely recognized for their conservation values, such as biological diversity and wildlife habitat. Perhaps less well-known are the important ecosystem services that intact natural wetlands provide, such as water storage and control of diseases spread by insects. The Center's long-term research on wetlands seeks to broaden knowledge of these ecosystems, assess their status across the landscape and deepen our understanding of their contributions to ecosystem services and human health. This line of inquiry has historical connections to Ichauway that date back to the tenure of the Emory Field Station (1939–1958) when Robert W. Woodruff sponsored research and public health outreach to eradicate malaria in southwestern Georgia.

Healthy isolated wetlands support unique communities of plants and animals adapted to cycles of flooding and dry-down largely driven by rainfall. The biological significance of isolated wetlands is much greater than their size would indicate; while wetlands comprise less than 5% of Ichauway's acreage, they harbor almost 30% of the plant species found on the property and provide habitat for

many rare and protected plants and animals. Across the southeastern Coastal Plain, however, ongoing human development, agricultural conversion and altered hydrology are causing the cumulative loss or significant alteration of isolated wetlands. A deeper understanding of these ecosystems is needed to address wetland policy, management and restoration issues. The relatively undisturbed reference wetlands found on Ichauway offer a unique opportunity to gain that understanding.

Graduate students and Center staff are currently engaged in several wetland studies. An analysis of isolated wetlands in the Dougherty Plain evaluated land use and land cover changes over the last 40 years and developed remote assessment methods to identify the location and condition of wetlands to better monitor their status. Another project continues the tradition established by the Emory Field Station, documenting mosquito communities in natural wetlands of Ichauway as a baseline for future comparative studies in disturbed wetlands. A manipulative experiment is examining changes in hydrology in an isolated wetland after removal of invasive hardwoods. Site-wide monitoring of wetland hydrology continues to add to our long-term dataset.

One conservation value of isolated wetlands is the habitat they provide for wildlife species of concern, especially amphibians. Research that began in 2010 is exploring a range of issues associated with the population genetics of amphibians. Because of these wetlands' isolation, amphibians that inhabit them form distinct populations that interact with one another through periodic migration between wetlands. This research will further understanding of how these animals interact by looking at habitat barriers to their movement and comparisons of species that vary in their mobility. Another project is comparing amphibian communities in high-quality natural wetlands with those of degraded wetlands in agricultural fields. This work will help inform restoration practices to provide greater habitat benefits for amphibians.

The natural wetlands found on Ichauway provide a rich research opportunity just as they did 70 years ago when scientists from the Emory Field Station began to study the ecology of these complex systems. The Jones Center's work builds on this tradition as we continue to refine our understanding of how to manage, restore and conserve these unique ecosystems.

Ecological Forestry Research

Principal Investigators: R.J. Mitchell, S.B. Jack, L.K. Kirkman, R.K. McIntyre, L.L. Smith and L.M. Conner
Lead Technicians: Jason McGee, Noah Jansen, Melanie Kaeser, Lisa Giencke, Jen Howze, Jessica Rutledge and Gail Morris

Ecological forestry is an approach to forest management that uses natural disturbances and ecological processes as a guide to silvicultural prescriptions and forest structure. Exemplified in the longleaf pine ecosystem by the Stoddard-Neel approach to forest management, the goal of this project is to deepen the scientific understanding of mechanisms upon which the practical application of ecological forestry is based. The Center has been a leader in advocating for the broader utilization of the ecological forestry concept where applicable through an integrated program of research, management and outreach.

Our long-term ecological forestry project has three focal areas: 1) how natural disturbances in longleaf pine ecosystems shape forest structure and how managed disturbances, such as harvest, compare to those patterns; 2) the relationships between overstory structure, prescribed fire and forest demographics; and 3) recovery of the system, particularly understory communities, after disturbance. Treatments will compare control (no cut), single-tree selection and gap-based approaches to harvest. Research results during the next few years will help refine understanding of the critical issues and questions related to sustainable management of longleaf pine ecosystems.

Since the 2009 experimental harvest, activity has concentrated on post-treatment data collection from control, single-tree and group selection plots. Initial measurements have been made on impacts and recovery from the actual harvests, such as soil compaction and ground cover disturbance and recovery. Data have also begun to be collected on longer-term responses to harvest such as experimentally planted seedlings and natural regeneration. Scientists and technicians have given several presentations on the experimental design and preliminary results of this project at national meetings.

Ecological forestry is a significant component of the Center's education and outreach program. Four ecological forestry training sessions were held at Ichauway during 2010–2011 and the basic concepts and philosophy of ecological forestry are presented to all groups that come to the Center to learn about how we manage longleaf pine on Ichauway. We also transfer information through outreach publications; Center staff published an economic model of the Ichauway demonstration forest and Center-sponsored projects resulted in the publication of two books related to ecological forestry with the University of Georgia Press.

The Center is recognized as a leader in research and development for restoration of the longleaf pine ecosystem. During 2010–2011, the Center hosted three groundcover identification and restoration workshops for Federal and State resource management agencies. We also continue our work on conversion of offsite pine plantations to mature, longleaf pine-grasslands. Three younger planted stands of slash pine were marked for harvest in the first phase of a gradual conversion to longleaf pine and pretreatment measurements were taken on groundcover conditions to prepare for the second harvest in our 80-year-old planted slash pine at the Center entrance. Longleaf restoration is a featured topic for many educational programs at the Center and staff made several presentations on restoration at Ichauway at national and regional conferences in 2010–2011.

Ichauway's extraordinary natural longleaf pine and wiregrass stands, as well as the varying stages of longleaf restoration sites, provide both a living laboratory and an outstanding demonstration site for those interested in this ecosystem. As interest in longleaf conservation and restoration grows across the Southeast, our efforts and land base put us in a unique position to contribute new information to refine management and conservation of the longleaf ecosystem.

Flint River Basin Research

Principal Investigators: S.W. Golladay and D.W. Hicks
Lead Technicians: Nathalie Smith and Brian Clayton

During 2010–2011, a significant part of the Flint River Basin research at the Jones Center focused on water quality monitoring and studies throughout the southern part of the Apalachicola-Chattahoochee-Flint (ACF) Basin. In January 2010, the U.S. Environmental Protection Agency issued proposed nutrient water quality standards for lakes and flowing waters in Florida. In response, the Florida Department of Environmental Protection developed nutrient criteria for lakes, streams and springs in the western Florida Panhandle area, which includes the ACF drainages.

The Chattahoochee and Flint Rivers and the groundwater-fed stream, Spring Creek, merge to form Lake Seminole, a 37,000 acre Federal reservoir in Georgia's southwestern corner. The lake's outflow to the Apalachicola River is important to Florida because it influences the water quality and quantity that support a diversity of freshwater and estuarine life in Apalachicola Bay, which is critical to the region's economically significant seafood industry.

Altered hydrology, intensive agricultural production, population growth and associated urban and suburban development all increase runoff and result in nutrient impacts. In southwestern Georgia, the intensive agricultural land use can increase nonpoint-source levels of nutrients in waterways and negatively impact aquatic plants and animals, as well as interfere with designated uses of the water in downstream areas.

Jones Center staff and students have been conducting monitoring and research to advance our understanding of nutrient concentrations in the Flint River, the Chattahoochee River and tributary streams and springs for nearly 10 years. Reservoirs play a crucial role in storing and removing nutrients that enter the watersheds from many sources. The Center initiated studies on Lake Seminole in 2008 to provide new information about how differences in water quality reflect patterns of urban and rural land use that are characteristic of different parts of the ACF Basin. Of the many constituents deposited in reservoirs, nitrogen and phosphorus have long been the two components of greatest concern due to their abundance and roles in excessive plant and phytoplankton growth. Lake Seminole appears to play an important role in mitigating a substantial amount of nutrient pollution before the temporarily-stored water flows into Florida and the Apalachicola Bay system. Lake Seminole accumulates nitrogen and phosphorus during the summer months in aquatic plants, primarily in the abundant hydrilla found in the lake. During the winter months when hydrilla dies back, some of the stored nutrients are released into the lake water, which may influence downstream water quality. Our studies have shown that the quality of the water flowing from Lake Seminole meets the proposed Florida nutrient criteria during both the summer and winter months even though inflow to the lake system often exceeds the criteria.

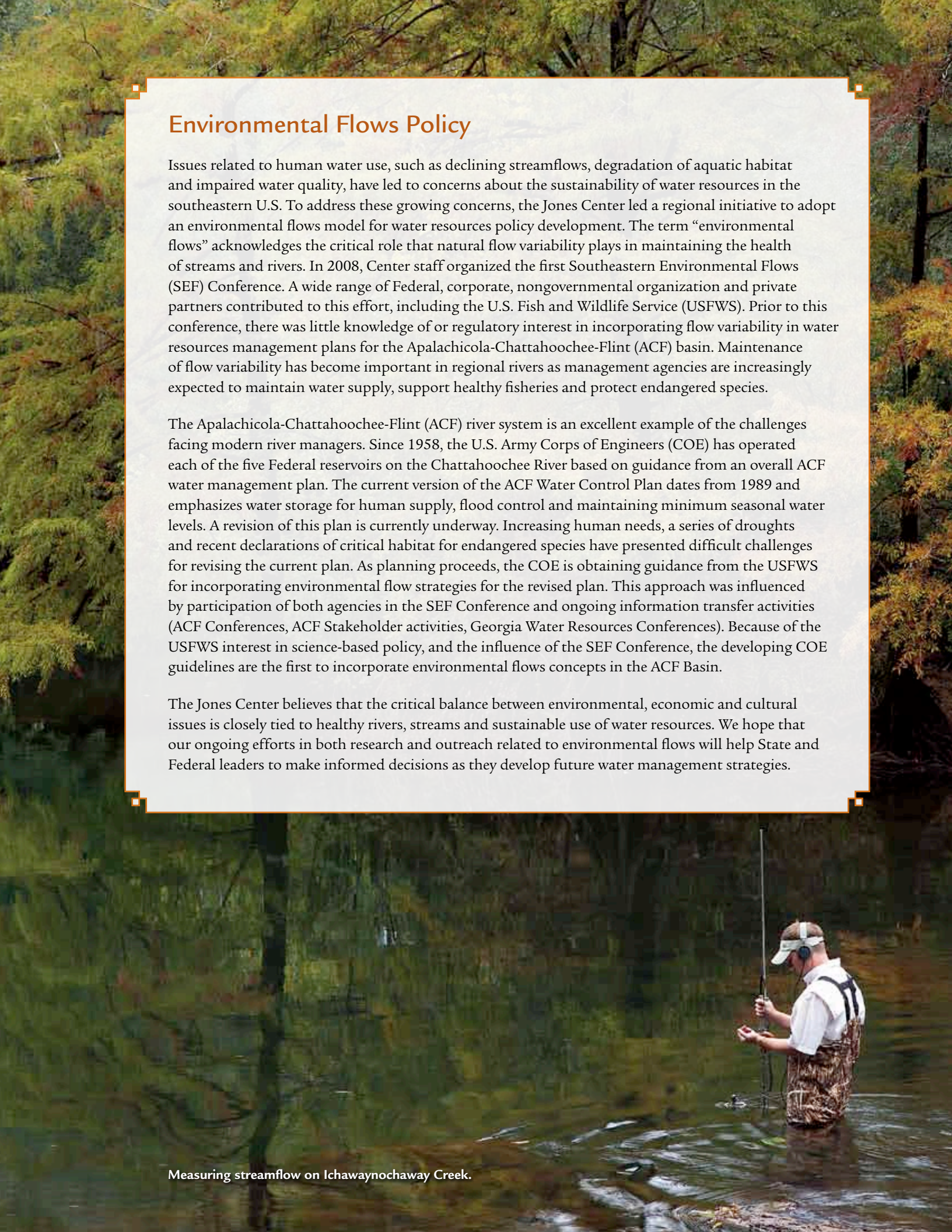
Through our efforts, we now better understand the consequences of human development and land use on the quality of our water resources and associated ecosystems of this region. Our current work integrates new and ongoing studies that will evaluate threats to the health of aquatic systems.

Environmental Flows Policy

Issues related to human water use, such as declining streamflows, degradation of aquatic habitat and impaired water quality, have led to concerns about the sustainability of water resources in the southeastern U.S. To address these growing concerns, the Jones Center led a regional initiative to adopt an environmental flows model for water resources policy development. The term "environmental flows" acknowledges the critical role that natural flow variability plays in maintaining the health of streams and rivers. In 2008, Center staff organized the first Southeastern Environmental Flows (SEF) Conference. A wide range of Federal, corporate, nongovernmental organization and private partners contributed to this effort, including the U.S. Fish and Wildlife Service (USFWS). Prior to this conference, there was little knowledge of or regulatory interest in incorporating flow variability in water resources management plans for the Apalachicola-Chattahoochee-Flint (ACF) basin. Maintenance of flow variability has become important in regional rivers as management agencies are increasingly expected to maintain water supply, support healthy fisheries and protect endangered species.

The Apalachicola-Chattahoochee-Flint (ACF) river system is an excellent example of the challenges facing modern river managers. Since 1958, the U.S. Army Corps of Engineers (COE) has operated each of the five Federal reservoirs on the Chattahoochee River based on guidance from an overall ACF water management plan. The current version of the ACF Water Control Plan dates from 1989 and emphasizes water storage for human supply, flood control and maintaining minimum seasonal water levels. A revision of this plan is currently underway. Increasing human needs, a series of droughts and recent declarations of critical habitat for endangered species have presented difficult challenges for revising the current plan. As planning proceeds, the COE is obtaining guidance from the USFWS for incorporating environmental flow strategies for the revised plan. This approach was influenced by participation of both agencies in the SEF Conference and ongoing information transfer activities (ACF Conferences, ACF Stakeholder activities, Georgia Water Resources Conferences). Because of the USFWS interest in science-based policy, and the influence of the SEF Conference, the developing COE guidelines are the first to incorporate environmental flows concepts in the ACF Basin.

The Jones Center believes that the critical balance between environmental, economic and cultural issues is closely tied to healthy rivers, streams and sustainable use of water resources. We hope that our ongoing efforts in both research and outreach related to environmental flows will help State and Federal leaders to make informed decisions as they develop future water management strategies.



Measuring streamflow on Ichawaynochaway Creek.

Sampling for ticks

Environmental and Human Health

The link between environmental health and human health is an emerging area of research that is generating interest around the world. It is based on the recognition that healthy and diverse ecological systems generate resources of value for humans, for example, clean air and water. Several projects at the Jones Center are working in this area with particular focus on the role of healthy ecosystems in reducing the spread of infectious diseases. These studies continue the legacy of the Emory Field Station, which from 1939–1958 sought to understand the causes of malaria and eradicate it in the region. Current projects are built upon collaboration between the Center and cooperators such as the Southeastern Cooperative Wildlife Disease Study program, the Centers for Disease Control, the Odum School of Ecology and the Warnell School of Forest and Natural Resources at the University of Georgia.

One of these projects is exploring the relationship between prescribed fire, tick populations and the potential spread of tick-borne diseases. Diseases carried by ticks occurring in southwestern Georgia include Ehrlichiosis, Spotted-fever Rickettsiosis, Rocky Mountain Spotted Fever and Lyme Disease. The project has demonstrated significantly lower abundance of ticks, as well as altered community composition of ticks, in forests that are managed with frequent prescribed fire. While the benefits from prescribed fire for healthy wildlife populations are well known, this research provides a unique insight into the role that prescribed fire can play in human health as well. This project won the 2011 Most Outstanding Paper award at the Georgia Chapter of the Wildlife Society's Graduate Student Symposium.

While malaria has been largely eliminated from the southeastern U.S., other mosquito-borne diseases have emerged as health concerns including West Nile Virus, Eastern Equine Encephalitis and St. Louis Encephalitis. Larger towns and cities in Georgia often have mosquito monitoring and control programs, while rural areas often lack these resources. Thus, little is known about mosquitoes and potential mosquito borne illnesses in rural Georgia. Recent studies at Ichauway have documented the presence of at least 35 species of adult mosquitoes. While seasonally abundant, mosquitoes at Ichauway have a low viral prevalence. Low virus presence has been attributed to wildlife diversity which reduces the likelihood of disease transmission between mosquitoes and a wildlife or human host. Ongoing research is studying how agriculture and other forms of rural land use affect the success of mosquito breeding. Ultimately, the results of mosquito research can contribute to land management practices that reduce nuisance mosquito populations and the risk of mosquito borne illness.

Installing cavity box for red-cockaded woodpeckers.

Conservation

A long tradition of excellence in land management, started by Robert Woodruff and continued over many decades, has produced the unique and valuable landscape found at Ichauway. The longleaf pine forest on Ichauway is one of the finest examples of this rare forest type in existence today, and the Center continues the tradition of conservation in a dynamic setting where resource management and science are integrated and collaborative. The Jones Center's conservation staff is responsible for the day-to-day natural resource management on Ichauway.

The Conservation professional staff includes resource managers, wildlife biologists and foresters. This group conducts programs in forest management, silviculture and restoration; management of game species such as bobwhite quail and white-tailed deer; conservation of endangered, threatened and special-concern species such as red-cockaded woodpeckers and gopher tortoises; long-term habitat monitoring; and control of invasive, non-native plant and animal species. Their work includes many ongoing activities, such as using prescribed fire as a management tool as well as practices to restore or improve forest or wildlife habitat based on sound science. Significant effort is also spent in support of the Center's research and education programs.

Highlights of activities over the last two years include the following:

- Prescribed fire is the most essential tool for management of the longleaf pine ecosystem. In 2010, Center staff burned approximately 12,700 acres, and in 2011 approximately 12,300 acres were burned for management, research and education objectives, despite the extended drought conditions occurring in these years. The Center's conservation staff maintains an exemplary prescribed fire program that simultaneously sustains the longleaf ecosystem and minimizes wildfire danger, and the long history of prescribed fire on Ichauway demonstrates the critical role of fire in maintaining the values of longleaf forests.

- Significant efforts were continued to control exotic species on Ichauway. A major program to control feral hogs has evolved in recent years, and efforts increased over the last two years as the population on adjacent properties grew rapidly and more hogs moved onto Ichauway. Several methods (e.g., trapping) have been utilized to remove hogs from the property, with the most effective being the use of dog teams to track and immobilize hogs. Using these methods, about 60 hogs were removed from Ichauway in 2010–2011. While we will never be able to completely keep feral hogs off the property, with dedicated effort we are able to keep the population at relatively low levels.

- Longleaf restoration activities continued across Ichauway. While much of Ichauway offers some of the best remaining examples of the longleaf pine ecosystem left today, some areas of the property have been altered by past land use activities and restoration to a pine-grassland ecosystem on these sites is a primary objective for management. The Center continues to remove hardwood trees that have encroached on upland areas and around depressional wetlands. In 2010, these harvest activities were focused in the Turkey Woods area of the property, removing offsite hardwoods primarily on bluffs and terraces along the creek road and north of the skeet range. In 2011, we took advantage of the drought conditions to remove hardwoods that had encroached into the edges of grass-dominated depression wetlands on the George Place. Other restoration activities practiced include selective herbicide application, planting longleaf seedlings and re-establishing native groundcover.

- The Center continues to conduct forest management in the natural and plantation forest areas using an adaptation of the Stoddard-Neel system of selection harvest, with two timber sales occurring in late 2011. In addition, conservation staff continues to salvage dead and downed trees that present a hazard near roads and buildings or will cause significant smoke issues during prescribed fire operations. This salvaged timber is milled with a portable saw mill and is used extensively for on-site building projects and repair. The Ichauway forest demonstrates that conservation-based management of longleaf pine can produce economic benefits while maintaining ecological values.

Education

The Center's education and outreach program focuses on natural resource professionals and university students enrolled in natural resource programs. These audiences represent the best opportunity for application of new information and best practices generated from the Center's work. 2010–2011 was a very active period for the Center's education program, with over 1360 visitors attending 79 events such as short courses, workshops and field tours. Additionally, Center staff members are actively engaged in collaborative partnerships outside of Ichauway. Our graduate education and conservation apprentice programs continue to produce highly-skilled young professionals who carry the Ichauway legacy through their careers in natural resource management and conservation.

The Center continues to promote the concept of ecological forestry to agencies, organizations and individuals interested in managing forests for multiple uses, including timber production, while maintaining conservation values. In early 2010, the Center sponsored a book signing for Mr. Leon Neel's memoir *The Art of Managing Longleaf*. This was a celebratory capstone for the Center's work to document the Stoddard-Neel approach to forest management and was attended by almost 200 people. A second book from this project, *Conserving Southern Longleaf*, was published by the University of Georgia Press in 2011. It examines the life of Herbert Stoddard and the development of his conservation-based approach to land management. Another significant milestone in this area was the publication of an economic model of Ichauway's demonstration forest in the Journal of Forestry. Interest in restoration of the longleaf pine ecosystem continues to grow across the region. Center staff continued to serve in a leadership role in the development of the Longleaf Partnership Council, a collaborative partnership of Federal and State natural resource agencies, nongovernmental conservation organizations and the private sector focused on the implementation of the rangewide conservation plan for longleaf pine, America's Longleaf Restoration Initiative.

Sampling longleaf pine cones to determine seed viability.

The exemplary management and restoration program on the Ichauway land base is truly one of the Center's most valuable assets for education. During 2010–2011, several in-depth workshops for natural resource professionals were held at Ichauway, including two ecological forestry workshops for southeastern Army installation personnel working with red-cockaded woodpeckers, two ecological forestry workshops for the U.S. Fish and Wildlife Service Region 4 biologists, refuge managers and ecological services personnel, and two groundcover identification and restoration workshops for the Natural Resources Conservation Service, with a third workshop targeting state agency personnel. The Center also hosted a large forestry group as part of the silviculture instructor's tour of the national 2010 Society of American Foresters Conference.

Prescribed fire continues to be a focal point of the Center's education and outreach program. As co-founders of both the Georgia Prescribed Fire Council and the national-level Coalition of Prescribed Fire Councils, Center staff continue to serve in leadership roles in these organizations. Onsite short courses provide hands-on training in prescribed fire for Jones Center personnel and university students through our employee prescribed fire course and our "Maymester" prescribed fire course offered through the University of Georgia. The Center also represents the private sector prescribed fire community with the National Wildfire Coordinating Group, a working group of Federal agency fire management leaders.

The unique wildlife of the longleaf pine ecosystem is a primary area of interest for university classes. Several visiting classes tour Ichauway annually, such as the University of Georgia's mammalogy and herpetology classes. The Center also sponsors two week-long university "Maymester" courses focused on wildlife: *Field Methods in Wildlife Management and Research* and *Coastal Plain Ecosystems: Ecology and Conservation Management*. In 2010, we sponsored a workshop that brought together biologists and managers from across the Southeast to develop research priorities for wild turkey. This led to a major new initiative within wildlife research examining wild turkey use of longleaf pine habitats, with five graduate students pursuing their degrees on this project.

The Center's aquatic program also has a strong education and outreach component. This group sponsored the third biennial Lower Apalachicola-Chattahoochee-Flint (ACF) research conference, held at the Bainbridge College Kirbo Conference Center. Our annual freshwater mussel identification and conservation workshop continues to be popular with both agency personnel and private environmental consultants. Another annual event with a strong water resources component is the southwestern Georgia module of the Institute for Georgia Environmental Leadership. This program brings together leaders from the business and natural resource sectors to learn about environmental issues at a statewide level. The Center is playing a leadership role in the ACF Stakeholders group, a grassroots effort to find stakeholder-driven solutions to ACF water issues. The group's mission is to achieve equitable water-sharing solutions among stakeholders that balance economic, ecological and social values, while ensuring sustainability for current and future generations.

As the Center's research programs mature, opportunities for meaningful outreach and education programs continue to grow. These programs help facilitate the application of new information generated from the Center's research and conservation programs. The application of our research to real world issues demonstrates the positive impact of the Center's programs on the land and water resources of the Southeast.

Externally Funded Research 2010–2011

Conner, L.M. Development, validation and refinement of habitat suitability models for selected wildlife species on Fort Bragg. U.S. Army Corps of Engineers (University of Georgia). 2007–2010. $25,000.

Conner, L.M. Breeding bird response to longleaf pine restoration. National Wild Turkey Federation. 2011–2013. $36,000.

Conner, L.M. Effects of hunting on gobbling chronology of wild turkeys. National Wild Turkey Federation. 2011–2012. $10,000.

Conner, L.M., R. J. Warren. White-tailed deer behavioral response to predation risk in southwestern Georgia. Georgia Department of Natural Resources. 2011–2013. $241,000.

Conner, L.M., R. J. Warren. Effects of removing novel stimuli of coyote captures. Berryman Institute. 2010. $10,000.

Conner, L.M., R. J. Warren. Prescribed fire and wild turkey ecology: grappling with growing season burns. Georgia Department of Natural Resources. 2010–2011. $531,000.

Hicks, D.W. Grand Bay-Banks Lake long-term wetland evaluation. U.S. Army-Moody AFB. 2009–2013. $104,644.

Kirkman, L.K., L.M. Conner, R.K. McIntyre. Longleaf pine understory restoration III. National Fish and Wildlife Foundation. 2007–2012. $196,500.

Kirkman, L.K., R.K. McIntyre. Enhancing longleaf ecosystem understory. National Fish and Wildlife Foundation. 2007–2012. $82,000.

McIntyre, R.K., S.B. Jack. Collaborative management and restoration of longleaf pine in lowcountry South Carolina. The Nature Conservancy-South Carolina. 2009–2011. $49,255.

Mitchell, R.J. Does increased precipitation alter belowground allocation and carbon storage by fine roots and mycorrhiza fungi in pine savannas? National Institute for Climatic Change Research (Duke University). 2008–2011. $375,000.

Mitchell, R.J., J.K. Hiers. In situ measures of fire-atmospheric dynamics: implications for PM 2.5 production and dispersion. Environmental Protection Agency. 2008–2010. $70,000.

Mitchell, R.J., L.K. Kirkman, L.M. Conner, L.L. Smith. Developing dynamic reference models and a decision support framework for southeastern ecosystems: an integrated approach. Strategic Environmental Research and Development Program. 2009–2014. $1,351,138.

Mitchell R.J., L.R. Boring. Working forests in a changing climate: creating a pilot forestry offset process for frequently burned longleaf pine in Georgia. R. Howard Dobbs, Jr. Foundation. 2009–2010. $8,500.

Smith, L.L. Proposal to conduct gopher tortoise surveys at Ft. Gordon, Georgia. The Nature Conservancy. 2009–2010. $55,578.

Stober, J.M. Bill Terrell Avian Conservation Grant. Georgia Ornithological Society. 2009–2010. $14,000.

Graphic design by Lenz | Decatur, Georgia.
Photography by Richard T. Bryant.
Special thanks to Jessica McCorvey.
Published November 2011

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Biennial Report 2010–2011

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