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Project B1.2 Land Use History of Longleaf Pine Ecosystems: Case Studies in the Retention and Management of Forested Lands

Josh McDaniel
Assistant Professor
Auburn University
School of Forestry & Wildlife Sciences
Auburn, AL 36849
(334) 844-1078
mcdanjm@auburn.edu

John McGuire
Outreach Coordinator
The Longleaf Alliance
(334) 844-1032
mcguijo@auburn.edu

Dean Gjerstad
Professor
Auburn University
School of Forestry & Wildlife Sciences
(334) 844-1020
gjersdh@auburn.edu

Rhett Johnson
Director
Solon Dixon Forestry Education Center
(334) 222-7779
Johnson@forestry.auburn.edu

John Schelhas
Research Forester
USDA Forest Service, Southern
Research Station
(334) 727-8131
jschelhas@fs.fed.us

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Abstract

Using a combination of ethnographic and historical ecology research, this project examines the history and current state of longleaf pine forest management on private lands in the southeastern US. Longleaf ecosystems are considered among the most threatened in North America with as little as 2% of their historical coverage remaining. These forests represent regional centers of biodiversity containing upwards of 40 species of vascular plants/m². While longleaf forests have been shaped over time by cultural practices, such as Native American uses of fire and European agriculture; the more recent conversion to loblolly pine (*Pinus taeda*) and slash pine (*Pinus elliottii*) has dramatically increased the loss of longleaf forests. Interviews with landowners, land managers, and other stakeholders are used to provide qualitative explanations of land use decision making. The research focuses on factors that have led to the retention of longleaf forests in specific locales – The Carolina sandhills, Southwest Georgia, and the Mobile-Conecuh River watersheds of South Alabama.

Using interviews with thirty-two landowners and stakeholders in the longleaf research, education and extension community, and analysis of historical aerial photos from the 1930s to the present, the project uses case studies to: (1) describe the history of longleaf pine management on private lands in the three study areas, (2) describes the cultural and economic factors that have led to the retention of longleaf pine on private lands, (3) develops a typology of longleaf ownership based on these factors, and (4) discusses the biodiversity implications of forest management under these ownership types.

A number of major events and forestry trends severely impacted longleaf forests in the 20th century, including: the “cut out and get out” period of intensive logging, fire suppression, and the growth of short-rotation, plantation forestry. However, we found through the case studies that these trends or periods affected the study areas differently. In the three study areas, private landowners were able to maintain longleaf forest management across generations. This persistence is related to common characteristics found among these families – similar origins as homesteaders, strong knowledge of forests and the forest industry, a pragmatic, conservation ethic, and long-term approaches to land management.

The case studies are used to develop a typology of longleaf ownership based on management objectives and history. We divide the owners into two types – the more pragmatic, utilitarian owners who are primarily interested in the financial returns from their land, and the owners who are more interested in the conservation, aesthetics, and recreational value of longleaf forests. Under the more utilitarian-oriented ownerships there is concern regarding the impact of harvesting and site prep on native groundcover and non-game wildlife habitat. The case studies also illustrate that many of these landowners are also actively managing to keep endangered species off their property. With the second type of landowner, the main biodiversity concerns pertain to the long-term sustainability of their efforts through generational transfer. Estate taxes and less conservation-minded heirs can undo decades of work in building a healthy forest. The project identifies the cultural and political factors that should be the basis for the development of policy instruments and incentives dedicated to the recovery and management of longleaf throughout its original range.

Introduction

The original range of longleaf pine (*Pinus palustris*) ecosystems extended from southern Virginia to central Florida then west to Texas. The total aerial coverage of longleaf pine forests at the time of European settlement has been estimated at approximately 60% of upland forest area in the coastal plains. Today, longleaf ecosystems are considered among the most threatened in North America with as little as 2% of its historical coverage remaining. A recent study found only 5,095 hectares of remaining old-growth longleaf pine acreage, and these forests were divided among 15 stands (Vaner and Kush 2004).

While a large proportion of longleaf forests are maintained on public lands, the majority exist on non-industrial private forest (NIPF) lands (Outcalt and Sheffield 1996; see Appendix D). In an effort to identify properties for purchase and easements, The Nature Conservancy identified all longleaf properties on the coastal plain of Georgia over 500 acres. They found 62 private longleaf forests. These properties totaled 136,563 acres and averaged 2,200 acres each (Unpublished data, The Nature Conservancy). While the overall acreage is not large compared to other forest types, these forests were relatively concentrated in Southwest Georgia, one of the study areas for the project presented here. So, while longleaf forests have declined dramatically, they have managed to hang on in substantial acreages in specific locations. We hope that the analysis of the role of longleaf forests on private lands in these areas will provide insight into expanding and maintaining longleaf forests elsewhere in its range.

The structure and expanse of longleaf forests have been shaped over time by anthropogenic disturbances, such as Native American uses of fire, naval shipbuilding, agriculture, the turpentine industry, and conversion to loblolly pine (*Pinus taeda*) and slash pine (*Pinus elliottii*). A successful effort to promote the expansion and sustainable management of longleaf ecosystems must be responsive to the regional cultural history and land use patterns that have shaped its current condition and structure. In addition, research and management efforts must take into account the complexity of local social, economic, and environmental conditions present throughout the longleaf range.

Longleaf pine forest owners have a multiplicity of objectives, constraints, and management capabilities. While most forest owners cite environmental and amenity-related objectives as paramount, most look to their forests for income generation at least once during their tenure. By looking at historical land use and management of longleaf forests we present case studies that demonstrate that private land owners can manage for multiple ecological and economic attributes and still maintain the structural integrity of the forest and its associated biodiversity.

Landowners harvest, clear, regenerate, exploit, or conserve the forest in response to continually changing social and economic stimuli. Property, income, and estate taxes enter significantly into the complicated decision calculus, as do income-generating opportunities from forest management and alternative land uses. Demographic shifts, economic cycles, and a host of other macro-level dynamics influence land use history

throughout the longleaf range, and thus influence the extent, condition, and likely future of the longleaf pine ecosystem. These fundamental social and economic data are essential to understanding ecosystem-social system dynamics, and therefore are critical to conserving the resource for its ecological value and as a foundation for sustainable economic development.

The case studies produced by the project characterize the primary ecological, economic, and social factors that have resulted in the retention of longleaf resources. The case studies also provide a basis for making recommendations regarding policies and incentives to promote conservation and expansion of longleaf forests. In terms of outreach and education, these case studies offer a context and framework for distributing information to landowners and land managers regarding effective management strategies.

Purpose

Social and economic considerations are recognized as among the most important drivers of forest and landscape change (Turner et al. 1995, Turner et al. 1996). Important social factors include a broad range of underlying driving forces and proximate factors that lead to changes in forest cover, structure, and biodiversity (Schelhas and Greenberg 1996). Certain broad social structures and policies set the context in which land owner decisions-making take place. Policies, markets for forest and agricultural products, and government technical and financial assistance programs all play a role. Population size, growth, and residence choices all matter, too, as do the many rural to urban linkages that take place through flows of people, products, and money. Within these contexts, land owners make certain decisions based on the short and long term economic returns they desire from and investments they make in their land, and their own socio-cultural values for land ownership and forest management. The various choices of individual private landowners produce forest patterns on their landholdings that aggregate up to larger, landscape level patterns (Gragson 1998). Historically, longleaf pine ecosystems have been influenced by reforestation choices and related industry and government programs, changes in agriculture, markets for forest products, knowledge and promotion of various management models, hunting, tourism, and ecosystem conservation (Rudel 2001).

The decisions of landowners change forest ecosystems, but the changes are not always immediate. Forest cover and other landscape characteristics at a particular time represent “layer upon layer of the legacies of former institutional arrangements” (Leach et al. 1999). Furthermore, some ecological responses to human action unfold slowly, as the effects from species loss or other changes cascade through an ecosystem (Schelhas and Greenberg 1996).

In recognition of these social and ecological interactions, we designed the project around four key questions:

- What is the history of longleaf pine forests on private lands within the three longleaf pine study areas?

- What cultural and economic factors have shaped the retention of longleaf pine ecosystems within the study areas?
- What would be a typology of current longleaf ecosystem ownerships, based on the identified factors?
- What are the biodiversity implications of forest management under these different ownership types?

Summary of Results

What is the history of longleaf pine forests on private lands within the three longleaf pine study areas?

The decline in acreage of longleaf pine forests was dramatic and steady through the twentieth century. In some portions of the range, especially in Virginia, Louisiana, and Texas, the decline of longleaf forests is almost complete. In most portions of the former range, intact longleaf forest ecosystems can only be found on public lands, and these small forests exist as islands in a sea of agriculture and loblolly and slash pine forests and plantations. As was mentioned in the introduction, there are dispersed concentrations of the forest where longleaf resources have maintained their importance economically and as reserves for biodiversity even on private landholdings. One of the primary objectives of this study was to describe the historical reasons why the longleaf pine forest has been retained where it survives on private lands. We focused on private lands because that is where the future of longleaf pine forests lie, and any expansion in the present forests will occur most dramatically on private holdings. We developed land use case studies of key longleaf pine ecosystems centered in each of the following regions: 1) the quail plantation region of Albany, GA to Tallahassee, FL; 2) the Conecuh and Mobile River watersheds in South Alabama, where longleaf stands are managed primarily for poles and timber; and 3) the Carolina Sandhills where longleaf is important for recreation and a well developed straw market. (see Appendix B)

In longleaf case studies in South Alabama and South Georgia, the majority of the families who now own older, larger stands of longleaf pine forests (meaning stands larger than 500 acres) acquired the largest portion of their land in roughly the same period. These families bought land in the 20s and 30s after the “cut out and get out period” when land was cheap. In the Carolina Sandhills, the forests were cut much sooner than Georgia and Alabama, with most of the “virgin timber” cut in the 1890s. Since the Sandhill lands have always been considered marginal for agriculture and timber production, land values remained low until recently, and as opposed to Alabama and Georgia, many of the Sandhills longleaf landowners interviewed for the case studies acquired their land more recently. In the Sandhills, longleaf forests have survived because the land, until recently, was not viewed as acceptable for growing anything else.

The history and management of longleaf pine forests in these areas took different trajectories that make the story in each area unique. An Alabama and Georgia , most of

these longleaf forest managing families acquired their land at the very time large changes were taking hold in forestry in the southeastern US. The virgin longleaf forests had been exhausted, and foresters were promoting the planting of faster-growing loblolly and slash pines in plantations. To protect these less fire resistant pines, there was a strong effort to end the tradition of woods burning that had helped maintain the longleaf forest's hold on the landscape. The fate of the longleaf forests throughout its range, and within the study areas, was largely determined by the landowners' acceptance of or resistance to the principle of fire suppression and the enthusiasm for short-rotation, plantation forestry.

While plantation forestry and fire suppression began to dominate forest management from the 1930s to the 1950s, their effect was not complete, especially in the three study areas. Traditions are hard to break, so woods burning continued. Burning accompanied the naval stores industry that continued into the 1960s in South Georgia and 1970s in south Alabama. Fire also was used to promote forage in many areas where people grazed cattle and other livestock in the forests, an important component of land management in all three areas, especially in the Carolinas, up to the 1960s. Many landowners included in the case studies spoke of a fire tradition in their families, with memories of woodburning going back for generations. Wildfires were also still common throughout the height of fire suppression, as fires from accidents, arson, and recreation were a regular occurrence in many rural areas. The regular and irregular prevalence of fire allowed the longleaf forests to regenerate in certain areas, despite attempts to exclude fire from the system. Other areas in which fire was eliminated or reduced quickly became overgrown with hardwoods and other pine species, and groundcover diversity likely declined.

The story of longleaf forests in the three areas begins to diverge in the 1950s. In the late 50s and early 60s the short-rotation plantation model was heavily promoted by the pulp and paper industry, and by foresters trained by regional universities across the longleaf range. In the Carolina Sandhills, early experiments with short-rotation, plantation forestry in the sandy soils were a complete failure, and this discouraged large scale conversion of the longleaf forests throughout the 1970s and 1980s. However, in other areas with more favorable soils, many landowners who had longleaf forests decided to convert. The families included in the case studies decided not to convert completely, on a large scale, or at all, for different reasons in each case, but according to some of the traditions, opportunities, and challenges specific to their areas.

We asked the present landowners why their families did not convert to the short-rotation, industrial forestry model, and also, why they thought that other families did. In South Alabama, most of the longleaf families had long connections with the timber industry and many of them had been and continue to be owners of sawmills. When they were presented with the short-rotation plantation model they said that it did not make economic sense to them. It required more capital inputs and produced a lower quality product. As one put it, it was "a matter of attitude and thinking." These families recognized that longleaf pine was a higher quality timber species and that it was always going to fetch higher prices. They also knew that it was best suited to the soils in South Alabama. While most of these families also decided to begin planting loblolly and slash pine on their property, they did not completely abandon longleaf pine. A few of the mills

in the area had specialized in processing longleaf poles and timber and that market has remained strong up to the present.

Most of the longleaf families interviewed for the case studies in Alabama and Georgia went to a selective harvesting system, and began planting loblolly and slash pine in the clearings. By the 1960s there was beginning to be widespread recognition of the benefits of controlled burns, and most of these families instituted burn programs that while were not specifically designed to promote longleaf ecosystem management, did allow for spots of regeneration to occur. Many of the present landowners described the period from the late 1950s to the late 1970s as an era of benign neglect. The effects of fire exclusion appear in the aerial photographs of the period with denser forests with a strong hardwood component. Even among the longleaf owning families, a great deal of slash and loblolly pine was planted. Burning occurred, but was highly irregular and inconsistent temporally and spatially. The result was that most of these landholdings had a growing percentage of slash and loblolly pine in their stands, and there was little regeneration of longleaf pine occurring, resulting in mature longleaf pine trees mixed in with growing percentage of hardwoods, and a resultant decline in groundcover diversity.

In South Georgia, much of the private longleaf acreage that wasn't converted to short rotation forestry was being managing for quail, and so burning continued. As the 1980s began, the benefits of burning became more widely recognized and most of the lands started a regular burning program. In South Georgia, the longleaf pine landowners not only had to resist the temptation to convert to loblolly plantations, they also had to resist the incentives to convert land to agriculture. In the 1970s when capital intensive, center pivot irrigation agriculture and large fertilizer inputs became standard in the area, many forest lands were cut to provide space for large-scale agriculture, and also to finance the buying of equipment. Farmers had to incorporate center-pivot into their system or they couldn't get loans from the bank. It created a vicious cycle that led to the loss of many longleaf forests. In contrast to south Alabama, the longleaf landowners in south Georgia said that most landowners were farmers first, and beside the quail plantations, they did not view the forests as their primary economic priority. Forests were a bank for the farming operations that they drew upon when they needed it. When money was needed in lean years or to finance new equipment, forests were cleared. The cleared lands were either put into short-rotation plantations or were converted for agriculture.

The landowners who maintained longleaf management normally did so as a result of knowledge of the suitability of longleaf pine to local soils and conditions, and a familiarity and understanding of forest product markets. However, many other landowners did not know the forest or the industry well, and many of those chose to convert their lands to short-rotation plantation forestry. They were presented with a model that was backed up by "high-powered foresters and research" from the pulp/paper companies and by forestry consultants trained in southeastern forestry schools. Many just decided that "the paper companies and the foresters must know what they are talking about." This was compounded by the fact that many lands were overgrown with lower value pines and hardwoods or abandoned fields that had become overgrown due to fire suppression and exclusion. The industrial, plantation model of forestry suddenly made

those lands valuable through the pulp market. As one landowner described it, “It was an easy step to say ‘Hey, I can clear this land that is not producing timber well, make some cash up front, and plant it according to this model they have, that shows much quicker returns.’” The pulp/paper companies were providing assistance, seedlings, and firebreaks. It was an easy decision to make.

Many landowners implicated the southeastern forestry schools in this process as well. They said that the foresters coming out of forestry schools only know one model of forestry and that is the model promoted by the pulp and paper companies. They argued that pulp and paper companies have contributed a great deal of money to the southeastern forestry schools for research and education efforts, and the result is that these schools have produced foresters trained to work for the interest of the pulp and paper industry. When landowners have gone to foresters for advice on land management they have only been presented with one general model.

In the 1990s and early parts of the new century there has been renewed interest in longleaf pine for many reasons, but primarily due to its resistance to disease and insects, and its lack of vulnerability to market volatility. Many landowners in Georgia and Alabama have begun to question the land management models that were adopted in the 1970s, and many are taking another look at longleaf management. Georgia had the most land under the longleaf portion of the CRP program than any other state combined. The decline in the pulp market has spurred landowners to look for alternative models to forest management. In the Carolinas a strong and growing market for pine straw for garden mulch, and specifically longleaf pine straw, has increased interest in longleaf pine forest management, and many landowners are converting loblolly and slash pine plantations to longleaf plantations. The increase in education and outreach for longleaf management has also improved over the past decade. Where before, a landowner who wanted to manage for longleaf pine had to know what they were doing on their own. Now there are foresters, state agency foresters, and organizations like the Longleaf Alliance that provide assistance.

What cultural and economic factors have shaped the retention of longleaf pine ecosystems within the study areas?

In conducting the case studies, we wanted to know what it is about these families and landowners that has led to this persistence in managing longleaf? In many cases these families or individuals have gone against conventional wisdom, professional advice, and regional patterns for decades in their approaches to land management. We found a number of factors appeared to be common among long-term longleaf landowners and families, and also developed a classification of landowners based on those traits and management approaches. The common traits include:

- Homesteading and family origins
- Strong knowledge of forests and forest industries
- A pragmatic, conservation ethic
- Long-term vision, goals, and investment philosophy
- Strong individuals setting management course that has crossed generations

The majority of the families we interviewed came from similar origins. They were descended from homesteading families that had moved into the three study areas looking for land to farm. Most families traced their origins in the study areas back to the mid to late 1800s. They were farming families that eventually were pulled into forestry work as its importance grew in the South. Many of the families operated small sawmills or naval stores operations around the turn of the century, or worked for the large timber companies that moved across the South. A few of the families took over after the large companies moved out, setting up permanent milling operations that filled the void after the large operations moved on.

Because of this background, these families had intimate knowledge of the woods and the forest products industry, they appreciated the value of land, and they took advantage of the depressed prices for land after it was cut over and the great depression set in. They understood milling and the differences in quality and markets for different species, and this led in most cases to an emphasis on the management of longleaf. In all of these areas there was a strong burning tradition for cattle, naval stores, and hunting, and most of these families proudly carried on that tradition despite the calls for suppression. Many of the families said that their families maintained longleaf on their land because it was the right species for the soils and the site. When everyone else began clearing their longleaf and planting loblolly and slash, they continued working for regeneration of longleaf because they knew it was the best for their land.

The intimate knowledge of the forests and forestry led to a pragmatic, conservation ethic among most of these families. They viewed the land from a utilitarian standpoint, but they also looked at land management as a long-term endeavor. Many of these families are very wealthy now, but the persons who put the land together and built the investment struggled. The benefits are being harvested today from work and struggle that began in some cases 70-80 years ago. The long-term vision has carried over to today, and most of these families recognize the strength of this long-term approach versus other models of land management that generate short term benefits, but not sustained output over decades and generations. Most said that the real key to their success with longleaf is the tradition of patience that was established early on and passed down.

In many cases a strong individual within the family established the longleaf tradition and the long-term vision, and made sure that tradition stuck either through legend or legal safeguards. Many of these persons, while not around anymore, still strongly influence decisions regarding land use. Families included in the case studies said that they are constantly thinking about how some of those individuals would have approached management today. Respecting the original vision for the land is an important consideration in many cases.

What would be a typology of current longleaf ecosystem ownerships, based on the identified factors?

We found that longleaf landowners fall into two different categories – the more pragmatic, utilitarian owners who in the final analysis are mainly interested in the economic returns from their land, and the owners who are more interested in the conservation, aesthetics, and recreational value of longleaf forests. These two groups are obviously not mutually exclusive, and most longleaf landowners would consider themselves a combination of the two, but their management actions usually place them in one of these camps.

The first type is made up of landowners who manage longleaf because of the superior forest products it provides. The landowners that we interviewed who fall into this more economically-oriented approach to longleaf management, truly felt that their forests could compete as a financial investment with any other forestry model in the Southeast. Multi-objective landowners manage for a range of equally important income sources – hunting leases (deer, turkey in Alabama and the Carolina Sandhills or quail plantations in Georgia), saw timber and utility pole production in all three study areas, pine straw in the Carolinas and Georgia, and even seeds of native plants (which is beginning to develop a substantial market in all three areas).

There are also landowners who manage primarily for single commodities – in South Alabama there was a strong market for poles provided by a local mill, and many longleaf landowners were primarily interested in managing for sawtimber and poles. In the Carolinas, there were many longleaf landowners who managed specifically for pine straw. Pine straw is also harvested in Georgia, but to a lesser degree, and is not harvested at all in South Alabama. Pine straw is a new market, so it does not explain the survival of longleaf in the area, but it has been a motivating factor for landowners to maintain longleaf in that area over the past 25 years.

Many of the properties had been put together by families who originally had very utilitarian perspectives on the land. Through a couple of generations, however, descendants have moved off the land, and many have become successful in other pursuits. They still manage the land, but it is not their primary income source anymore. Many of these landowners now manage it for personal recreation and from a conservation ethic. These owners and managers work to enhance wildlife habitat, promoting rare and endangered species, and generally build healthy longleaf forests with less need or interest in economic returns.

Under this second category of ownership also falls many of what we call the new landowners. The recent forest owners are the retired professionals who are moving to rural areas and buying 50 – 100 acres of forest land. Many of these landowners manage the land as a hobby and are more interested in aesthetics and conservation than maximizing income from the land. These new landowners are very interested in longleaf restoration and are investing substantial sums to restore longleaf ecosystems to varying degrees on their properties.

What are the biodiversity implications of forest management under these different ownership types?

This brings us to the biodiversity implications for management under these different ownership types, and we think that each of these different management approaches raises particular questions. Under the more economically oriented ownerships there is concern regarding the impact of harvesting and site preparation on more intensively managed, planted, or shorter rotation stands. Many of these landowners do not value groundcover diversity and are not managing for non-game, wildlife habitat. While these landowners may be managing longleaf pine trees, they are not managing longleaf pine forests. These owners would need strong financial incentives for reducing biodiversity impacts and for enhancing non-timber and non-game wildlife attributes of existing forests. These owners would likely be open to cost-share programs for native groundcover restoration in longleaf forests, and tax incentives for maintenance of high-biodiversity value forests.

Many of these landowners are also actively managing to keep endangered species off their property. The fear of endangered species was much more prevalent in South Alabama than in either Georgia or the Carolinas. Alabama does not participate in the US Fish and Wildlife Service Safe Harbor program, which provides a mechanism for maintaining habitat for the federally endangered red cockaded woodpecker while guaranteeing landowners use rights of their property. The Safe Harbor program is used by many landowners in the Carolinas and Georgia and was viewed by many as a positive response to many of the negative incentives for endangered species management for private landowners. However, the growth of colonies of red cockaded woodpeckers in the Conecuh National Forest in South Alabama has caused many neighboring longleaf landowners to alter their management to prevent the establishment of colonies on their land. The introduction of the Safe Harbor program in this area could help in the expansion of red cockaded woodpecker colonies onto private lands.

With the second type – the more conservation/recreation-oriented landowners, the main concerns, in terms of biodiversity, are in the long-term sustainability of their efforts. Longleaf forests grow on a time scale that does not fit with human time scales. Many of these landowners have invested a great deal of time, energy, and money in managing and restoring longleaf forests, and they are worried about what will happen when they die. Estate taxes and less conservation minded heirs can undo decades of work in building a healthy forest.

One of the biggest threats to the forests under the second type of ownership is development pressure. Development pressure is increasing land values and pressures to show economic return. Many of these lands have been passed down through the generations and are now managed by multiple family members under a variety of arrangements. It almost always takes consensus on management to keep these forests intact. When development pressures build that consensus is much more difficult to maintain. Conservation easements are promoted as a way to protect these landholdings, and those efforts should be expanded.

Approach

The project began with a summary of existing literature on biodiversity and human action in longleaf ecosystems. The literature review focused on existing research regarding the connections between management approaches and ecological and economic outcomes. The literature review set the stage for the fieldwork aspects of the project. First, we contacted longleaf forest researchers, State and federal regulatory agencies, and longleaf education/outreach organizations regarding potential properties for longleaf land use history case studies. We also interviewed stakeholders regarding related longleaf issues including the management of longleaf on public lands, the impact of the Endangered Species Act on longleaf ownership, the effect of the Conservation Reserve Program – longleaf component on longleaf planting, the declining pulpwood market, and efforts to promote restoration on private lands. We interviewed a total of fourteen stakeholders from USDA Forest Service, US Fish and Wildlife Service, Florida Division of Forestry, Clemson University Cooperative Extension Service, The Longleaf Alliance, Joseph E. Jones Ecological Research Center, Solon Dixon Forestry Education Center, The Nature Conservancy, and the Red Hills Conservation Program.

Next, we contacted identified landowners and conducted land use history case studies of privately held forests in the three study areas. Combining the literature review with the stakeholder interviews and land use history case studies we are developing a suite of strategies for promoting and managing longleaf pine forests on different ownership types and under different social conditions and management objectives. We will disseminate research results to project partners and the community of interest for longleaf forests over the next year through conference presentations, published academic and extension materials, and Longleaf Landowner Workshop planned for November, 2004. We discuss the dissemination of results in detail in the appendices.

Longleaf Land Use History Case Studies. Consultations and interviews with longleaf stakeholders led to the identification of landowners who represented a range of size, history, and management objectives in each of the three study areas. We contacted these landowners and arranged for interviews and field visits. In the South Alabama study area, we developed five case studies, involving nine landowners and managers. In South Georgia, we also developed five case studies based on interviews with five landowners, and in the Carolina Sandhills we built two case studies and interviewed four landowners.

Each case study involved a comprehensive accounting and analysis of past land use activities, and the social and economic forces that have been and continue to be relevant to the current condition and future management of each forest. Interviews were structured to improve understanding of how land owners and land/resource managers have historically responded to specific constraints, opportunities, and incentives. The interviews focused on ownership history, legal arrangements for generational transfer, past and present objectives, goals, and values related to the forests; and principle management constraints, motivations, and incentives. Most interviews were conducted within the context of a visit to the landowner's or manager's forest. We asked the landowner to give us a tour of their property focusing on areas that represented important sites for biodiversity, innovative approaches to management, interesting management histories, efforts at restoration, problem areas, or just any place they would like to show us.

For many of the properties we acquired a series of aerial photos going back to the 1930s that demonstrate the changing management on the longleaf properties and the surrounding properties which may or may not have remained in longleaf as the 20th century progressed. The aerial photos are presented in the case studies to highlight the landscape level impact of changing forest/land management trends and the effects of certain policies such as the Conservation Reserve Program and the Endangered Species Act on specific properties and landscapes.

Deliverables

Deliverables can be divided into three categories: academic peer-reviewed publications, extension/outreach publications, and conference presentations. All three will be developed simultaneously. The research will be presented in a two peer-reviewed publications that will emphasize respectively: (1) the land use history case studies and the characteristics of long-term, multi-generation longleaf managing families, and (2) the biodiversity implications of forest management under these different private ownership types (see Appendix C).

The outputs of this research will be of great practical interest and value, and we are making it available to forestry and conservation professionals and landowners in several ways. First, we are summarizing longleaf social and ecological history to promote interest and knowledge in longleaf pine. We are also developing guidelines for management of longleaf pine and associated biodiversity for specific social and ownership contexts (properties managed for biodiversity/conservation, timber, hunting, and/or non-timber forest products). Guidelines will be published in extension outlets to be used by landowners, forestry consultants, and extensions agents to help landowners meet their management objectives in biodiversity rich longleaf pine systems. This information will be made available through Powerpoint presentations, extension pamphlets, and articles in landowner and other forest practitioner publications.

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Appendix A - List of Contacts & Collaborators

The following persons were contacted during the course of the project. This list includes landowners included in the case studies, representatives of stakeholder organizations, and project collaborators. A few of landowners interviewed for the case studies asked to participate anonymously and their names and contact information have not been included.

Jim Bates - Biologist

US Fish & Wildlife Service
Ecological Services Field Office
P.O. Box 52560
Ft. Benning, GA 31995-2560
(706) 544-6422
jim_bates@fws.gov

Victor Beadles – President

Beadles Lumber Company
P.O. Box 3457
Moultrie, GA
(229) 985-6996
vbeadles@surfsouth.com

Alex Boldog - Forester

Conecuh National Forest/ Conecuh Ranger District
Rt. 5 Box 157
Andalusia, AL 36420
(334) 222-2555

Vanessa Casanova – Research Assistant

Auburn University
School of Forestry & Wildlife Sciences
Auburn, AL 36849
(334) 844-1062
fullevc@auburn.edu

Becky Estes – Research Assistant

Auburn University
School of Forestry & Wildlife Sciences
Auburn, AL 36849
(334) 844-1062
estesbl@auburn.edu

Bobby Franklin – Area Extension Agent
Clemson University Cooperative Extension Service
P.O. Drawer 1086
Walterboro, SC 29488
(843) 549-2595
rmfrnkl@clermson.edu

Rick Gooch
Regional Safe Harbor Coordinator
U.S. Fish and Wildlife Service
1875 Century Boulevard, Suite 200
Atlanta, GA 30345
(404) 679-7124

Mark Hains - Research Coordinator
Solon Dixon Forestry Education Center
Route 7, Box 131
Andalusia, AL 36420
(334) 222-7779
hains@alaweb.com

Keville Larson
Larson & McGowin, Inc
PO Box 2143
Mobile, Alabama 36603
(251) 438-4581
jlittle@larsonmccgowin.com

Kevin McIntyre – Education Coordinator
Joseph W. Jones Ecological Research Center at Ichauway
Route 2, Box 2324 Newton, GA 39870
(229) 734-4706
kevin.mcintyre@jonesctr.org

Paul Padgett – General Manager
TR Miller, Inc.
P. O. Box 708
Brewton, AL 36427
(251) 867-4331

John Norman
Quailridge Plantation
PO Box 155
Norman Park, GA 31771
(912) 985-5011

Tim Pittman

Florida Division of Forestry - Andrews Nursery
P.O. Drawer 849
Chiefland, FL 32644
(352) 493-6096
pittmat@doac.state.fl.us

Bob Pasquill – Forest Archaeologist/Forest Historian

USDA Forest Service
2946 Chestnut Street
Montgomery, AL 36107
(334) 241-8125

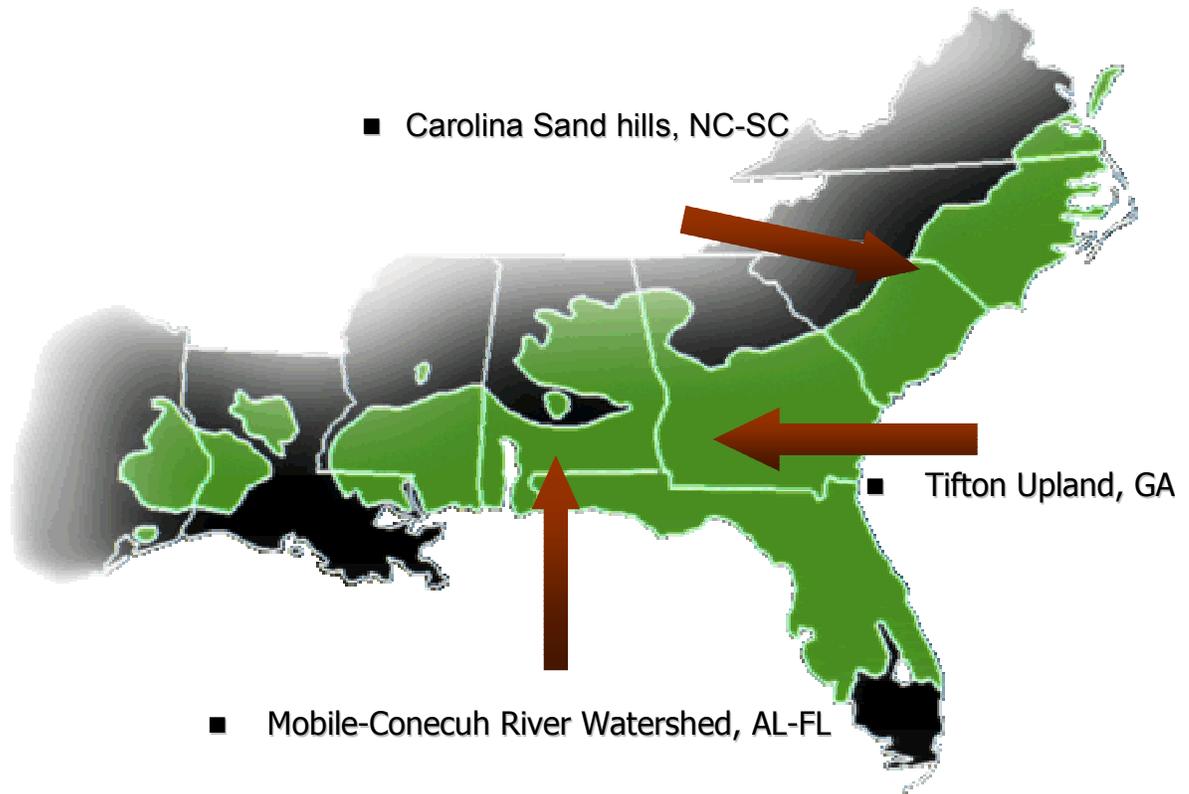
Andrew Predmore – Research Assistant

Auburn University
School of Forestry & Wildlife Sciences
Auburn, AL 36849
(334) 844-1062
predmsa@auburn.edu

Debbie Russell – NEPA/GIS Coordinator

Conecuh National Forest/ Conecuh Ranger District
Rt. 5 Box 157
Andalusia, AL 36420
334-222-2555

Appendix B - Map of Focus Areas for Land Use History Case Studies



The Green area indicates the historical range of longleaf pine forests.

Appendix C - List of Future Publications

Academic Publications

We anticipate at least two peer-reviewed academic publications resulting from the longleaf case study research. We are currently preparing both of these manuscripts. The first will focus on the characteristics of long-term longleaf landholding families and the second will emphasize the biodiversity implications of forest management under different ownership types (history, objectives, and approaches).

(1) Land Use History of Longleaf Pine Ecosystems: Case Studies in the Retention and Management of Forested Lands. In prep. To be submitted to **Society and Natural Resources**.

(2) Biodiversity and Longleaf Pine Forest Management: Implications of Private Ownership Types. In prep. To be submitted to **Forest Ecology and Management** or **Conservation Biology**.

Extension products

Working through the Longleaf Alliance and the Alabama Cooperative Extension System, we will develop extension publication focused on the social and ecological history of longleaf forests to promote interest and knowledge in longleaf pine. We will also develop some guidelines for management of longleaf pine and associated biodiversity for specific social and ownership objectives. This information will be made available through Powerpoint presentations, extension pamphlets, and articles in landowner and other forest practitioner publications, and as a webpage on the Longleaf Alliance website.

Appendix D – Area of longleaf pine forests by State and ownership

State	Total Acreage	NIPF	Public	Industry
Georgia	520,200	416,700	58,800	44,700
Florida	740,500	266,500	401,500	72,500
Alabama	535,100	240,800	104,000	190,300
South Carolina	369,000	238,300	115,300	15,400
Mississippi	255,300	137,200	100,900	17,200
North Carolina	255,500	127,100	108,100	20,300
Louisiana	232,900	83,800	73,600	75,500
Texas	45,000	11,100	11,100	22,800
Total	2,953,500	1,521,500	973,300	458,700

From: Outcalt and Sheffield 1996