Managing the Forest and the Trees

This guide is intended for the private owners of moderate-sized, existing stands of longleaf pine who want to manage their woodlands profitably while also maintaining the natural integrity of the ecosystem. A forest ecosystem is more than trees. It includes all of the plants and animals, as well as the natural processes that shape and maintain the forest. This guide provides information on successful ways to manage a longleaf pine forest. It covers the entire range of longleaf pine in the Southeast, focusing on four regional landscapes and a variety of management objectives, challenges and successes. Among the many benefits of growing longleaf pine are timber and pine-straw production, enhanced wildlife habitat and hunting, conservation of native species, increased woodland beauty and an understanding of the historic role longleaf plays in Southern heritage. All of them are discussed in this booklet.

One hundred and fifty years ago, most owners of woodlands within 200 miles of the Atlantic or Gulf shoreline from North Carolina to east Texas, enjoyed these benefits. Today it is difficult to envision a forest system so vast that it was considered inexhaustible. Longleaf forests described as "park-like" by early explorers and settlers were part of what appeared to be a simple ecosystem, but it was, in fact, quite complex. It was the most extensive forest ecosystem in North America dominated by a single species, and perhaps the most economically valuable one. Longleaf pine was the forest that built the South.

What destroyed the virgin forest was its commercial exploitation by people with little understanding of or regard for regeneration. R. W. Wells, North Carolina's first ecologist, summed up the situation eloquently in 1932: "It has been rooted out by hogs, mutilated by turpentine, cut down in lumbering or burned up through negligence."

The biological importance of the total forest system went largely unnoticed and rarely commented upon for the next 60 years. But as ecologists began to evaluate the rarity of southeastern habitats and the species they support, they began to understand the importance of this now fragmented ecosystem. Within the past two decades, zoologists, botanists and ecologists have studied the phenomenal biological diversity of longleaf-dominated habitats. A clearer picture has emerged of the significance of this forest system that extends from the savannas of the outer Coastal Plain to the more recently studied mountain longleaf stands in Alabama. The restoration and management of the remaining longleaf-dominated habitats are now conservation goals of The Nature Conservancy and many agencies and organizations such as the Longleaf Alliance, U.S. Forest Service, Department of Defense and various state programs.

Today less than 2.9 million acres of longleaf—only 3 percent of the original forest—remain of the nearly 90 million acres that existed when Europeans first settled the region. Federal and state agencies together own about 31 percent of the forests, but more than 51 percent is controlled by private landowners. The remainder is owned by the forest industry.

With assistance from the Longleaf Alliance and the Southern Group of State Foresters, The Nature Conservancy has produced this booklet for private landowners who plan to obtain income from forest products. Longleaf pine forests can be managed to maintain their natural integrity while providing a host of benefits—timber, pine straw, wildlife, hunting and aesthetic values. Ecologically based forest management by the private landowner is crucial to the future of longleaf ecosystems and the biodiversity they support. As well as being ecologically important, longleaf is a superior commodity tree and an important renewable timber type.
Contents

2 The Forest Is More Than the Trees
The longleaf pine ecosystem, the role of fire, and the four basic landscape types

10 Conservation Management of Longleaf Pine
Answering questions and debunking myths

18 Six Case Histories
Landowners talk about how they manage longleaf

30 Lessons of Longleaf Pine Managers
Characteristics of productive longleaf pine forests, how growers achieve and maintain them, and what goes into management plans

33 Where to Get Help
Sources of technical information, assistance with developing management plans and cost-sharing, and other financial assistance

36 Where to See Longleaf Pine
From Virginia to Texas, where to see management and restoration in progress

37 Protect Yourself and Your Forest
Questions to Ask Foresters Before Hiring Them

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The Forest Is More Than the Trees

Longleaf pine forests once stretched from southeastern Virginia to eastern Texas, covering more than 90-million acres. You could find them at sea level, within a few feet of the Atlantic Ocean or the Gulf of Mexico, and you could also find them on mountain ridges at 2,000 feet in northeastern Alabama, more than 200 miles inland. Over this vast region, longleaf pine with its many associated plants and animals formed numerous distinctive communities. It thrived on many soil types. It towered 120 feet on loams yet grew well on deep and nearly sterile sands.

Yet whether in east Texas, the panhandle of Florida or the mountains of Alabama, minimally disturbed high quality longleaf pine forests all share several fundamental characteristics:

- A forest canopy dominated by longleaf pine, although the density of pines may vary.
- A minimal midstory of small trees and shrubs above a well-developed low ground layer.
- A high diversity of plant life in the ground layer. Longleaf habitats have been recently described as among the richest in plant species in the world. Up to 50 species have been observed per square meter, and 140 species per 1,000 square meters. An estimated 900 plant species are confined (endemic) to the longleaf pine ecosystem. Twenty-six plant species and seven wildlife species native to these systems are currently considered to be federally threatened or endangered.
- A high percentage of grasses, legumes (peas and beans) and sunflower family species in the ground layer (important for many animal species because of the hard seeds and browse they consistently produce).
- Wildlife species dependent upon open pine forests—for example, bobwhite quail, Bachman’s sparrows, fox squirrels and pine snakes. Of the 290 species of reptiles and amphibians native to the Southeast, 170 of them (74 amphibians and 96 reptiles) are found within the longleaf ecosystem. There are 86 characteristic bird species and 36 mammal species. It is notable that 69 percent of the mammals forage primarily on the ground as do 36 percent of the birds.
- Age structures in natural stands that range from even-aged to all-aged, from similar-sized trees to many different sizes.
- Mature trees frequently found clumped together rather than evenly spaced.
- Regeneration occurring in open patches away from overstory trees.
- Frequent surface fires recurring at varying but frequent intervals, mostly during the growing season.

The Importance of Fire

Of all these characteristics, it was fire that enabled longleaf to dominate such an extensive portion of the Southeast and fostered the ecosystem’s diversity of plants and soil types and under widely differing moisture conditions.
and animals. During frequent spring and summer storms characteristic of the southeastern climate, trees struck by lightning transferred fire to the flammable ground cover of grasses and pine needles. Yet just days after a growing season fire, the blackened landscape was replaced by green as thousands of specially adapted plants leapt into the sunshine from the scorched earth. Most living things in native longleaf pine forests and woodlands are able to escape or tolerate a fire, and many of them can live nowhere else. Rather than destroying the sun-loving ground layer plants of this ecosystem, burning stimulates them by reducing hardwood trees and shrubs that otherwise would shade them, by scarifying seeds and thus helping them germinate, and, for many species, by triggering flowering and fruiting.

Unlike other southern pines, almost all stages of the longleaf life cycle tolerate the high temperatures associated with burning. This indicates that the ecosystem evolved with frequent fire, as does the tree's production of flammable needles throughout the year. Before the southern landscape was fragmented by fields and road systems, a single lightning strike could ignite a fire that traveled for miles across the landscape, occasionally moving down slopes into wetter savannas and stream corridors. There is no question that fire created and maintained the longleaf ecosystem.

The frequency of such fires depended on many factors, including local climate, topography, soil type, vegetation and moisture. A dry sand ridge with limited fuel from widely scattered pines and a discontinuous grass cover burned much less frequently than sites with more fertile, moist soils and a high density of pines and continuous grass cover. Flatwoods savannas, for example, burned every two to three years while sandhills forests may have burned only every decade. The average frequency of fire throughout the longleaf range was probably about three to six years.

Southeastern Indians observed the effects of lightning-set fires on the landscape and purposely burned the woods to drive game species, provide fresh forage, clear fields for cultivation, protect their settlements from wildfires and eliminate enemy cover. Taking their lead from the Native Americans, early settlers also burned the forests. Yet in the early 20th century, fire was considered harmful to forest systems and was suppressed. The longleaf forest ecosystem suffered as a result. When fire is taken out of the system, individual species are stressed and the diversity of the whole system drops dramatically. "Taking fire out of the longleaf forest is like taking rain out of the rainforest," said wildlife biologist Larry Landers in 1992.

Types of Longleaf
No other forest in America has changed more radically in the last 100 years than the upland pine forests of the Southeast, so today's ecologists and foresters are hard pressed to reconstruct a complete picture of the living forest. Our best evidence of what these forests looked like comes from the reports of early travelers and naturalists. Some early travelers referred to the monotonous, seemingly endless forests of almost pure pine they passed through as "barrens." In other accounts, the word "savanna" was used to describe forests of widely spaced trees and tall grasses that had a park-like aspect, whether they were located on the dry ridges of the sandhills, or on wet flats in the outer Coastal Plain. More accurate are early descriptions of majestic stands of tall, straight-trunked trees, sometimes densely concentrated, other times more widely scattered with dense patches of seedlings shooting upward in the sunny spots where a few old trees had died. Long, scenic vistas through these forests were typical and with few midstory hardwood trees travel by horseback and wagon was made easy. Longleaf is seldom killed by fire, insects or disease and will continue growing until it is 300 to 400 years old, unless struck by lightning or blown over by tornado or hurricane-force winds. As high winds remove the overstory trees by felling them or snapping off the crowns, seedlings and saplings grow up in the gaps left behind. Such impacts, on large and small scales, are the means by which new stands originated without the hand of man.

Today, scattered patches of longleaf pine forests have persisted on fewer than 2.9 million acres, less than 3 percent of the presettlement range. These forests may be classed in several ways, depending on the landscapes in which they are found: sandhills, flatwoods and savanna-rolling hills, and mountain. The major differences among them are summarized in the table on page 6. The names of the four landscape types are derived from a combination of the physiographic province in which they occur and the relative amount of soil moisture available.
LONGLEAF’S VAST DOMAIN

Longleaf pine once stretched over 15,000 square miles of the Southeast. In parts of that broad region it was the dominant tree, but in others it appeared with other pines and hardwoods.

Native Range of Longleaf Pine

1. Gulf Coast Prairies and Marshes
2. Piney Woods
3. Upper West Gulf Coastal Plain
4. Mississippi Alluvial Plain
5. Coastal Plain Rolling Hills
6. Interior Uplands
7. Piedmont
8. Fall-line Sandhills
9. Atlantic Coastal Flatlands
10. Gulf Coastal Flatlands

The Forest Is More Than the Trees
Transitional Forests

- Longleaf Pine Dominated Forests
- Forests of Longleaf with Other Pines
- Slash Pine Forests with Longleaf Pine

Dominant Grasses

Within the Longleaf Pine Range
- Bluestems and other grasses dominate the ground cover
- Approximate range of wiregrass. Bluestems may or may not be present
This illustration depicts some of the characteristic plant associations in the Sandhills. The most easily recognized longleaf landscape is probably the sandhills type with its white sand and scrub oaks. Such habitats composed perhaps no more than 12 percent of the original longleaf ecosystem, but today these forests constitute some of the largest remaining acreages. That's because throughout the South, most longleaf stands on fertile, loamy soils were cleared and cultivated first, leaving the deep, droughty, infertile sands to be cultivated last or not at all. On these low-fertility sites, species diversity is low and there is a sparse ground cover. Longleaf out-competes other pine species here. Several military installations are now the stewards of expansive acreages of the distinctive sandhills landscape type.

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**LONGLEAF PINE LANDSCAPE TYPES AND THEIR FEATURES**

<table>
<thead>
<tr>
<th>HABITAT FEATURE</th>
<th>SANDHILLS</th>
<th>FLATWOODS &amp; SAVANNA</th>
<th>ROLLING HILLS</th>
<th>MOUNTAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Density &amp; Stature</td>
<td>low</td>
<td>low to very high</td>
<td>medium to very high</td>
<td>medium to high</td>
</tr>
<tr>
<td></td>
<td>short</td>
<td>medium to very tall</td>
<td>short</td>
<td>short to medium</td>
</tr>
<tr>
<td>Soils &amp; Moisture</td>
<td>deep fluvisol &amp; eolian sands, associated with rivers &amp; shore lines; well to excessively well drained</td>
<td>acidic, mineral soils with clay layer near surface; silt loams; mesic to hydric</td>
<td>clay loams &amp; sandy loams; less surface sand and increased clay in upper horizons; well drained to poorly drained</td>
<td>acidic and rocky; well drained to excessively well drained</td>
</tr>
<tr>
<td>Topography</td>
<td>hills, ridges</td>
<td>flat; very gently undulating, pimple mounds in the west</td>
<td>hills &amp; high terraces; rolling</td>
<td>ridges &amp; upper slopes</td>
</tr>
<tr>
<td>Ground Cover</td>
<td>low diversity of species but many are specialized: sparse to continuous; mainly wiregrass in the East; deep-rooted perennials</td>
<td>high diversity of species; dense, continuous; abundant legumes &amp; grasses; sedges &amp; special wetland plants</td>
<td>high diversity of species; continuous; abundant legumes &amp; grasses, especially numerous bluestems</td>
<td>low diversity of species; patchy, low shrubs; bluestems are characteristic grasses, but not dominant</td>
</tr>
<tr>
<td>Diagnostic Species</td>
<td>turkey oak, blue jack oak &amp; other scrub oaks</td>
<td>many orchids &amp; insectivorous plants; numerous evergreen shrubs</td>
<td>Southern red oak, post oak, dogwood, hickory, yaupon, wax myrtle</td>
<td>blackjack oak &amp; rock chestnut oak</td>
</tr>
<tr>
<td>Rare Species</td>
<td>Red-cockaded woodpecker, indigo snake, gopher tortoise, Pixie moss, hairy rattlesnake, Texas trailing phlox</td>
<td>Red-cockaded woodpecker, Henslow's sparrow, Roughleaf loosestrife, Cooley's meadow rue, American chestnut, Canby's drooping</td>
<td>Red-cockaded woodpecker, gopher tortoise, Louisiana &amp; black pine snake, Michaux's sumac, coca orchid</td>
<td>Red-cockaded woodpecker, Cumberland azalea</td>
</tr>
<tr>
<td>Fire Frequency</td>
<td>3 - 10 years</td>
<td>2 - 5 years</td>
<td>2 - 3 years</td>
<td>1 - 5 years</td>
</tr>
<tr>
<td>Province/Region</td>
<td>Fall-Line Sandhills, Atlantic &amp; Gulf Coastal Flatlands, Pinney Woods, Coastal Plain Rolling Hills</td>
<td>Atlantic &amp; Gulf Coastal Plain Rolling Hills</td>
<td>Coastal Plain Rolling Hills, Pinney Woods, Atlantic &amp; Gulf Coastal Flatlands, Piedmont</td>
<td>Interior Uplands, Piedmont</td>
</tr>
</tbody>
</table>

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**SANDHILLS LONGLEAF**

The wettest sites of the flatwoods and savanna habitat type were largely spared from cultivation until the mid-1970s when serious efforts were made to expand agricultural fields into marginally productive sites. Insectivorous plants such as pitcher plants, sundews and the Venus's-flytrap are savanna species along with rare species such as roughleaf loosestrife and Godfrey's butterwort. Recognition of the high number of herbaceous species in savannas first called attention to the impressive diversity of longleaf forests. If not frequently burned, grassy savannas are quickly taken over by evergreen shrubs. Flatwoods and savanna habitat may have constituted nearly 40 percent of the original longleaf landscape.
Bachman's sparrow • American kastrel • Loggerhead shrike • Common nighthawk • Screech owl • Wild turkey • Bobwhite quail • Red-cockaded woodpecker • Gopher tortoise • Carolina crawfish frog • Saint Francis' satyr • Sandhills chub • Pine-woods darter • Northern pine snake • Eastern coral snake • Fox squirrel • Pocket gopher

Bachman's sparrow • Brown-headed nuthatch • Blue jay • Red-cockaded woodpecker • Pine warbler • Yellow-rumped warbler • Meadowlark • Eastern wood pewee • Great horned owl • Flatwoods salamander • Pine barrens treefrog • Diamondback rattlesnake • Eastern king snake • Black bear • Fox squirrel • Marsh rabbit • Cotton rat • Bobcat • White-tailed deer
ROLLING HILLS LONGLEAF
Longleaf forests of the rolling hills habitat of the interior Gulf Coastal Plain in Alabama, Mississippi, and Louisiana continue to produce some of the highest quality longleaf timber. Four national forests in the Gulf region have substantial acreages of longleaf in rolling hills habitat. Similar forests are now largely gone in the Atlantic states. Moisture availability on the characteristic loamy sands and sandy loams is relatively high and constant and produces large trees and also a dense ground cover dominated by bluestem grasses. Evergreen shrubs including gallberry, yaupon, wax myrtle and numerous blueberries and huckleberries are more prominent in this mesic habitat than scrub oaks and can easily dominate the understory. Rolling hills and flatwoods habitats were burned regularly to “green up” forage for thousands of cattle that roamed freely through the southern forests. These forests—generally densely stocked—may have constituted more than 30 percent of the presettlement landscape.

MOUNTAIN LONGLEAF
Longleaf also grows well on the mountainous landscape of the Interior Uplands and the Piedmont of northeast Alabama and adjacent Georgia in a rocky landscape distinct from those of the Coastal Plain. In presettlement times these upland forests may have composed about 18 percent of the longleaf landscape. Of the four longleaf landscape types, the mountain type is the least known and appreciated. It occasionally forms pure stands, characteristically on southern and western slopes. It is more commonly found mixed with Virginia, shortleaf and loblolly pine. Blackjack oak is common and white, red, post and rock chestnut oaks are typical associates. The ground cover, particularly when burning is infrequent, is made up of low-growing blueberries and huckleberries (heaths) with many perennial herbaceous plants. The few and generally scattered grasses are mainly bluestems.

A MOST DIVERSE ECOSYSTEM
Distinctions between these four categories (and between most of the habitats within them) are determined by available moisture, which is largely a product of soil type, topography and exposure. Within each of these landscape types numerous variations occur. For instance, the rolling hills of the Piney Woods of east Texas are much like the rolling hills forests in southern Georgia; however, they also support species such as Texas stinging nettle which are not known farther east. Similarly, the ranges of several characteristic species of eastern longleaf forests—toothache grass, pinewoods hibiscus, smooth meadow beauty and slash pine—do not naturally extend to Texas. Flatwoods and savannas in central Florida and coastal Georgia usually have a lot of saw palmetto, a species that barely reaches the flatwoods and savannas of South Carolina and Louisiana. Many people consider wiregrass synonymous with longleaf forests because of its high visibility over thousands of longleaf acres. However, neither wiregrass species, *Aristida stricta* or *A. beyrichiana*, is present in over half of the longleaf range (see map on page 5). Beyond the distribution of wiregrass, and often mixed with it, are several species of bluestems (*Andropogon* and *Schizachyrium* species) as well as three-awns, paspalums, dropseeds, muhly grasses, panic grasses and skeleton grasses. Perennial bunch grasses like wiregrass and bluestems predominate on sites that frequently burn, whether in the sandhills or flatwoods.

While ecologists continue to discover and assemble pieces of the longleaf ecosystem puzzle, landowners can harvest an array of valuable products through the years without harming a healthy forest. What’s needed is an understanding of the basic forces that created the longleaf ecosystem (fire, weather, soil types/moisture and fuel), and techniques that mimic natural processes during harvesting and regeneration.
Conservation Management of Longleaf Pine

WHAT ARE THE BEST METHODS OF HARVESTING AND REGENERATING NATURAL LONG-LEAF STANDS? Both even-aged and uneven-aged management methods work with longleaf. Each can simulate the processes that maintain longleaf naturally. Deciding which one to use requires a look at the current condition of trees in a stand, including their stocking, age and distribution. Indeed, one may use different management approaches in different stands on a single property depending on their soil type, topography, storm damage, burning history and logging history. For more on even-aged and uneven-aged management methods, see pages 14 and 16.

HOW CAN I ELIMINATE HARDWOODS AND SHRUBS THAT ARE CHOKING MY PINE FOREST? An aggressive burning program consisting of several closely spaced fires will reduce hardwoods and encourage the growth of grasses and other herbaceous plants. If litter and fuel have built up, one or more dormant-season (winter) burns to reduce the fuel load are usually best, followed by a series of growing-season burns the next few cycles. Dormant-season burns will reduce the height of hardwoods but not their number. Indeed, they encourage sprouting and can increase shrubs and bracken fern over time.

Hardwoods too large to be killed by fire can be mechanically removed for firewood, pulpwood or saw timber and the tops scattered widely to burn in the next series of prescribed fires. Non-merchantable hardwoods can be girdled and left in place for wildlife habitat. However, it is best not to use heavy mechanized equipment to push over and pile debris because it disturbs the soil, damages the ground cover and can damage the bases of remaining pines. Valuable fuel and nutrients are also wasted.

Drum chopping with a single, lightweight (approximately 1.5 ton) drum chopper is another technique that can control shrubs and hardwood seedlings, but care must be taken to minimize soil disturbance. Use it where evergreen shrubs are dense, such as in flatwoods habitats, but avoid using it when the soil is wet or in habitats such as savannas with a grass and herbaceous ground cover. Without a cushion of shrubs, drum chopping can disturb the soil and damage the ground cover, interfering with the growth of desirable species such as grasses that help carry fire. Soil disturbances also reduce cover and food needed by wildlife, increase the potential for surface erosion and invite colonization by less desirable weedy plants and invasive exotics.

A variety of selective herbicides is now available that, when judiciously used, can quickly remove dense hardwood growth. Stem injections and spot or basal applications are preferable to a broadcast application throughout a stand. This will minimize the impact of the herbicide on the ground cover, hardwoods and shrubs that do not com-

Hundreds of young longleaf pine trees grow in a gap in the forest canopy.
pete with pines and are important to wildlife. (See Longleaf Alliance publications # 61, 62, ARN-829, and ARN-846.)

Though effective in reducing competition, herbicides and mechanical techniques are typically much more expensive than regular prescribed burning. Repeated use of both of these methods is not recommended.

WHEN I WANT TO BURN MY FOREST, WHO WILL ACTUALLY DO THE BURNING AND WHAT ARE THE LIABILITY ISSUES? Fire is a dangerous tool, but with proper training, a landowner or land manager can do the burning. Or, the landowner can contract with a qualified forestry consultant or the state’s county forestry agency to perform the burn. Each of these alternatives requires the development of a burn plan to reduce liability problems and ensure desired results. (See “Lessons of Longleaf Pine Managers” on pages 30-32 for information to include in a prescribed burning plan.)

The regulations governing prescribed burning differ from state to state. State forestry agencies are responsible for controlling wild fires as well as issuing the required burning authorization needed for a legal prescribed fire. Become familiar with your state’s forestry agency and meet with your county forester. They are there to assist you.

WILL TRUNKS BLACKENED BY FIRE HURT THE VALUE OF TREES WHEN THEY ARE HARVESTED? Not normally. Problems occur only when old scars (today mainly caused during logging) are enlarged by burning, making the trunk vulnerable to decay and insects. Other problems can occur if the wood as well as the bark is charred. As the phrase at pulpwood mills goes, “Charred wood will turn the load around.”

Fire is more of a danger to the economic value of trees when it kills or harms the fine roots that are critical to the uptake of water. When fire has not occurred in many years, these hair-like roots can grow up into the duff layer (organic matter) that builds up around the bases of trees. High temperatures associated with fires can kill the roots and their loss can slow the tree’s growth. Under very dry conditions, a fire that burns deep accumulations of organic matter around the tree can actually kill it. Although the damage will not be immediately obvious, such trees may die within a year or so. This problem usually can be avoided by conducting the initial burns on a fire-suppressed stand during the dormant season and only when the soil is moist.

With appropriate training, landowners may conduct their own prescribed fires or they can rely on a forestry consultant or county forestry agent to do the burn.

hints for encouraging NATURAL regeneration

- First remove the badly formed, damaged and suppressed trees and most species other than longleaf, and retain older trees that consistently produce cones.
- Second, establish a regular burning program to make harvesting easier and make regeneration work.
Longleaf pine is hard to establish. Now that the specific planting requirements for seedlings are understood and high quality seedlings are available, success with both bare-rooted and containerized stock has greatly improved. Of course, failures are still common. Longleaf seedlings cannot be handled, stored or planted in the same way as other pine seedlings, and techniques developed specifically for longleaf must be used to maximize the chances of survival and good growth. (For details on longleaf seedlings and planting contact the Longleaf Alliance for publication #59 and "Keys to Successfully Planting Longleaf Pine.") Much of the suitable acreage within the native range of longleaf pine has been converted to other tree species or alternative land uses. In these instances, private landowners will have to rely on artificial regeneration methods, most often tree planting, to restore longleaf pine into the ecosystem.

If adequate numbers of cone-bearing trees are evenly distributed on a site, natural regeneration is a practical low-cost alternative to planting longleaf. Natural regeneration will work —after all, Nature has done it successfully over the millennia—but it can be a challenge because longleaf does not annually produce sufficient seeds to establish a new stand. Good seed years usually happen every five to seven years, but now and then several good years will occur in succession. As a general rule, keeping the larger and older trees will regenerate a stand more quickly because they consistently produce more cones and seeds. It takes more than two years for a cone to develop that will release seeds from late October through the middle of December.

The large, winged seeds germinate upon falling to earth and must make contact with mineral soil for rooting to take place. Burning in the nine months prior to seed fall is usually sufficient to reduce the duff or litter layer. It takes at least 750 cones well distributed within an acre to sufficiently regenerate a stand. If the shelterwood system is used, that works out to an average of 30 cones on each of 25 trees left uncut (see methods of regeneration described on pages 16-17).

Longleaf pine grows too slowly. Longleaf is only a slow starter, not a slow grower. It has its own distinctive seedling phase called the grass stage. Although the seedling may not look like it is growing, it is putting down a sturdy tap root beneath the surface that will reduce the risk of wind throw as the tree reaches its full height. The grass stage may last five to seven years or more. A lengthy grass stage is not likely where regular burning, mechanical removal or judicious application of target herbicides has controlled the competition.

Once out of the grass stage, sapling growth is rapid. On poor sites where longleaf, loblolly and slash are planted side-by-side, longleaf usually "catches up" within 12 to 15 years, and within 25 to 30 years on good sites. It frequently grows faster than other pines particularly on sites formerly occupied by longleaf. On the droughty, infertile soils of the sandhills, for example, longleaf consistently outgrows planted loblolly and slash pines.

The growth rate of wood volume is not the only or even the most important measure of the value of a forestry investment. More important...
is the growth rate in dollar value, for longleaf products the value is actually increasing at a faster rate than volume. Records kept over the past 20 years in the productive piney woods of Mississippi show sales containing mostly longleaf return 10 to 20 percent more than comparable sales of loblolly and slash in every year, in good markets and bad.

LONGLEAF PINE TAKES TOO LONG TO PRODUCE INCOME. Actually, growers can harvest valuable longleaf pine products at every stage, including the early stages. Broadly speaking, longleaf produces enough pine straw to rake beginning at 10 to 15 years of age, pulpwood by age 20, chip-'n'-saw logs at 30 years, and the higher-class products—saw timber, poles and plywood—by age 40 on better quality sites. Poles generally are worth 30 to 40 percent more than saw logs. On average sites, over 60 percent of the trees in a longleaf stand can make utility poles. On comparable sites, slash pine produces from 11 to 25 percent poles and loblolly pine between 3 and 8 percent.

In addition, the longleaf pine straw-based industry has blossomed in the past two decades and now can be a major source of a grower’s income. Used extensively as an attractive, long-lasting mulch, longleaf pine straw is now a multi-million dollar enterprise. Depending on the quality of the straw, a bale of straw can be sold for $0.75 to $1.50.

Of course, the removal of pine straw can harm the forest, and raking is best if conducted infrequently on a site. Pine straw serves the same functions in the forest as it does in the home landscape, and it fuels fires that keep hardwood competition to a minimum. Annual removal of straw prevents organic material from decomposing, reduces the fertility of the soil as well as its moisture-holding capacity and affects the ground cover, reducing wildlife food and cover. The methods needed to sustain a stand raked regularly for straw are still being developed. (For recommendations, see Longleaf Alliance publications # 51 and # 63 – 66 and “Lessons of Longleaf Pine Managers,” page 32.)

CLEARCUTTING A LONGLEAF PINE STAND AND REPLANTING WITH FASTER GROWING LOBLOLLY OR SLASH IS ECONOMICAL AND COST-EFFECTIVE. Whether clearcutting is economical and cost-effective depends on the kind of forest you start with and how fertile your land is. It also depends on whether you want to grow a crop of trees with a possible short-
Uneven-aged or all-aged timber management is inherently flexible. It allows most of the forest to be retained between harvests, which provides ecological stability and regular economic benefits. Other desirable ecological and economic benefits from uneven-or all-aged timber management include:

- A stable habitat for wildlife associated with longleaf pine forests
- Small openings in the canopy that mimic small-scale disturbances caused by wind or insects
- Minimal habitat fragmentation
- Minimal groundcover disturbance, if done carefully
- An even distribution of pine needles that make a significant contribution to the fuel base for effective burning
- A sustained flow of timber products

Even if your goals are short term, the cost of site preparation prior to planting cannot be ignored, and if competing hardwoods need to be controlled, the cost per acre can be substantial. Though success rates are high, they are not guaranteed. The first income from thinning the most productive loblolly pine plantations generally comes 12 to 18 years after establishment. A second thinning is usually possible about five to 10 years later, and the final harvest in another eight to 10 years, at age 25 to 35, followed by the expense of replanting a new stand. If the quality of the site is low, as it is on deep sands, the growth of loblolly or slash will be much slower than on more fertile sites, and the trees may never be very profitable.

Longleaf, on the other hand, is well adapted to infertile sand. On these sites, today's longleaf seedlings have greater long-term survival rates and consistently out-compete planted loblolly and slash pine. A recent analysis of sandhill sites in North Carolina predicts a very reasonable rate of return of 7.9 percent for longleaf planted on a tract with a site quality index of 45, and a rate of return of 9.4 percent for a site quality of 55. (Site quality index or site index is a relative measure of growing conditions based on the height in feet that the dominant trees reach at a specific age, in this instance 50 years. Rate of return includes planting and management costs without factoring in land costs, taxes, cost shares, hunting leases, etc.) These rates were calculated for revenues from the sale of wood only. Both rates are comparable with rates earned by most investments (even the stock market over the long term). With the potential income from pine straw sales, the return rate increases to 9.35 and 10.1 percent respectively.

Furthermore, a longleaf stand is much less likely to be attacked by southern pine beetles and Ips beetles, common pests of dense, southern pine stands. And longleaf, at any age, is more likely to survive a wild fire.

IF I GROW LONGLEAF, THE RED-COCKADED WOODPECKER OR GOPHER TORTOISE WILL INVADE MY PROPERTY. CURRENT LAWS PROTECTING THESE ENDANGERED SPECIES WILL PREVENT ME FROM DOING ANYTHING PROFITABLE WITH MY LAND. This is doubtful unless these species are present on nearby properties and your land has suitable habitat. Red-cockaded woodpeckers need older pines with red-heart disease for cavities and an open pine stand to feed in. Tortoises excavate extensive burrow systems in sands or sandy loams and feed in a ground cover rich in grasses and herbs.

A landowner can also derive relief from federal regulations governing the protection of an endangered species if he or she assists in its conservation. The Safe Harbor Program is a new approach by the U.S. Fish and Wildlife Service to demonstrate the flexibility of the Endangered Species Act in balancing species protection with the needs of landowners. Before this initiative, some concerned landowners felt that they had no alternative but to make management decisions that removed habitat on their property for protected species such as the red-cockaded woodpecker.

Under a Safe Harbor plan, a landowner is responsible only for a determined number of individuals of a listed species present at the time an agreement is signed. The landowner is under no obligation to protect habitat colonized by the species attracted to their land as a consequence of habitat maintenance or restoration. As long as the landowner carries out the agreed-upon habitat
management, they may develop, harvest trees or make any other lawful use of the property. The landowner is provided a "safe harbor" from future liability. The participating landowners will only be required to notify the Fish and Wildlife Service and to give the agency an opportunity to relocate species should the site be adversely affected by the planned action.

Under the agreement, participating landowners may sell their land and a buyer has exactly the same protection as the original owner, if he or she so desires. Also, no additional restrictions will be placed on the landowner or his/her neighbors. (Read how landowners David Goodyear, page 28, and Jim Morgan, page 20, are using the Safe Harbor Program.)

Limited cost-share funds for habitat improvements are available through the U.S. Fish and Wildlife Service's Partners for Wildlife Program and the U.S. Forest Service's Stewardship Incentive Program. See "Where to Get Help," page 33, for more information and addresses.

Summary: Why Longleaf Is Right for Many Timber Owners

1. Longleaf grows in a variety of soil and moisture conditions. Longleaf does well on flat, moist infertile sites of flatwoods and savanna habitats and on fertile, loamy rolling hills. It is a species that out-grows other pines on droughty, deep sands, and it competes successfully on more fertile sites if fire is regularly used as a management tool.

2. Longleaf pine forests make money. The best thing about longleaf pine is that it produces more valuable products than other southern pines. Straw, poles, piling, sawlogs, posts and pulpwood provide a nearly continuous source of income for the grower. Hunting leases or short-term fee hunting may be additional sources of annual income from regularly burned pine stands that support healthy populations of quail, turkey, deer and other game species. (See Longleaf Alliance publications # 20-23 and 55.)

3. Crowing longleaf is easier today than ever before. Dramatic results have occurred in the past decade from the improved quality of longleaf seedlings (both bare root and containerized), identification of specific storage requirements and careful attention to suitable planting times, generally mid-November through mid-February. (See "Where to Get Help," page 33 and the Longleaf Alliance's "Keys to Successfully Planting Longleaf Pine" and publications # 54 and 59.)

4. Longleaf pine resists certain kinds of blights and other types of damage that kill other pines. Longleaf is a low-risk species to manage. It is resistant to more serious diseases and insect pests that afflict other southern pines, including fusiform rust, annosus root rot, pitch canker, southern pine beetle and tip moth. It is more resistant than slash pine to breakage from ice storms, and its deep taproot minimizes wind throw damage during hurricanes and storms. Plus, it is more likely to survive wild fires.
EVEN-AGED MANAGEMENT

Shelterwood and two-aged harvest systems are appropriate ways to harvest and regenerate existing even-aged stands. Generally, even-aged stands develop from one or several seed crops over a fairly short period of time as happened following blowdowns from hurricanes, straight-line winds and tornadoes. In the shelterwood approach, several thinnings are made at approximately 10-year intervals, depending on the density and age of the initial stand, to reduce the basal area (BA) and stimulate growth of the remaining trees. This would be followed in about five years by a "seed cut" that reduces the basal area to approximately 30-square feet per acre. The remaining evenly distributed mature trees—about 25 to 35 per acre are needed—produce the seeds that will regenerate the stand. When a sufficient number of seedlings—about 4,000 to 6,000 per acre—are in place, the overstory trees are removed.

A modification of this system is two-aged management in which only a portion of the overstory trees is removed after seedlings are established. Perhaps 10 to 15 trees may be retained per acre. This method is a good way for the landowner to maintain a forest with some mature trees. (As planted longleaf stands reach maturity, even-aged management guidelines can be employed to regenerate the stand naturally and avoid the expense of replanting.)

UNEVEN-AGED MANAGEMENT

Stands with three or more age classes are perfect for uneven-aged management, particularly if there are trees old enough to produce cones consistently. This method of all-age management represents the condition that developed over time in a natural longleaf pine forest, with the mature trees dying from lightning strikes, bug kills, fire and small-scale blowdowns, and with regular regeneration occurring in gaps created through time. Uneven-aged management assures that the stand always contains canopy-stature trees and produces periodic (every 8 to 10 years) income from timber products while providing for wildlife needs and maintaining biological diversity.

Once established, an uneven-aged stand will consist of trees of all ages. It can be maintained indefinitely with a 10-year or greater thinning cycle that reduces the BA to no less than 60-square feet per acre, depending on site quality and the owner's objectives. Two harvest methods work best under uneven-aged management—single-tree and small-group selection. With single-tree selection, damaged or poor quality trees throughout the stand are marked for harvest within two to three years while seedlings are still in a grass stage. (In two-aged management, some of the seed trees are retained.) A burning cycle is skipped so seedlings become well established and logging slash and litter decay.

TAKING A CUT

To illustrate the differences between even-aged and uneven-aged management, the following schematics depict what the same hypothetical stand would look like during and after three selective harvests. The one-third acre block is representative of a neglected longleaf dominated stand. Several other pine species are also present along with a few tree-size hardwoods. Although timber has been harvested several times in the past 50 years, the stand is adequately stocked with young and middle-aged longleaf with some mature and old trees but few longleaf seedlings and saplings.

First year: Under the shelterwood system, a preparatory cut harvests all non-longleaf pines unless they are needed to produce needles for burning. All hardwoods are harvested, girdled or poisoned.

10th year: The stand now has a basal area of about 60 to 70 square feet and has been burned two or three times to control hardwoods and shrubs. Evenly distributed seed trees (proven cone-producers) with a BA of about 30 square feet are retained; the others are harvested. Before an anticipated fall seed crop, a winter or spring burn exposes a mineral soil seedbed.

15th year: A dense carpet of seedlings has developed. The seed-trees are marked for harvest within two to three years while seedlings are still in a grass stage. (In two-aged management, some of the seed trees are retained.) A burning cycle is skipped so seedlings become well established and logging slash and litter decay.

22nd year: About 5 years after seed-tree harvest, most seedlings have initiated height growth. Regular burning continues. In 25 to 30 years, the even-aged stand can be thinned for pulpwood, posts, etc.
Legend

The trees marked with a red "X" are those that will be harvested in the next cutting/thinning cycle.

The different sized icons indicate different size trees.

- Smallest = 3-7" dbh
- Medium = 7-10" dbh
- Biggest = > 10" dbh

Small-Group Selection

1st year: With small-group selection, a cluster of hardwoods and pines of various species and sizes is marked for harvest to create a quarter to half an acre opening at least 115 feet wide where longleaf regeneration can be concentrated. Cone-producing longleaf are retained around the opening and the stand is burned several times during the decade.

10th year: A dense carpet of longleaf seedlings is established in the opening. One burning cycle is now skipped to protect seedlings. The surrounding trees that will suppress seedling growth are marked for harvest. A few hardwoods with wildlife value are retained.

20th year: Regular burning has resumed and continued. A group of trees is marked for harvest to create another opening. Seedlings in the opening created first are now saplings.

30th year: Mature trees are marked for harvest to minimize competition with nearby seedlings. Regular burning continues and saplings in the first opening have grown into the next size class. An all-aged longleaf stand is developing with groups of reproduction, younger saplings and middle-aged trees. In 10 years the stand can be thinned once again.

Single-tree Selection

1st year: In single-tree selection, individual trees are marked throughout the stand for removal. Those that are seriously suppressed, damaged, diseased, or of poor form are harvested first. Other pine species and less desirable hardwoods are removed, unless they are needed to produce fuel. A few hardwoods with wildlife or aesthetic value are retained and regular burning commences.

10th year: After several burns, small patches of seedlings are established in small gaps. Trees of various sizes throughout the stand are evaluated based on position in the canopy and the density of the stand, and they are marked for harvest.

20th year: The thinning and removal process continues, retaining the most desirable trees and removing others to release nearby seedlings and saplings. Burning continues.

30th year: Thinning throughout the stand continues and openings with regeneration are enlarged. Storm-damaged timber is also removed. The frequent-burning cycle continues. An all-aged longleaf stand is developing with groups of reproduction, younger saplings and middle-aged trees. In 10 years the stand can be thinned again.
A fascination with his family's history of turpentining, which began in the 1890s, stimulated Mayo Livingston's interest in longleaf. Following military service, he returned home in the 1950s with a degree in forestry and began managing this and other properties in southwest Georgia and adjacent Alabama and Florida. Turpentine production continued on his forest land until 1968. Today a long tradition of cattle grazing continues on a limited acreage of grassy ground cover maintained by a two-year burning cycle.

Livingston believes landowners need a frequent income flow from timberland. "You have to think in terms of cash generation," he says. "If we had gone in and clear-cut the whole place and had to wait 15 years before we had another forest, I don't think we could have kept the land because people normally are not going to wait that long for more income. Lack of income can make people give up on the land and sell."

Livingston's rule for successfully growing longleaf is the "3-P rule"—plans, patience and perspiration. Believing that a good plan is essential to a regular income flow, he updates the plan for his property and the timber inventory every 10 years. It is important to have a little diversity in his investments, he says. He harvests sawtimber, pulpwood, fence posts and pine straw, but his preferred target is the most valuable product—poles. He works to produce poles throughout several harvest cycles, removing everything that won't make poles or saw timber. "I'd like to cut poles forever," he says, and with prices at over $100 a pole that is understandable. "It takes 50 to 60 years to produce a good pole on land with a good site index of around 80." With the upper diameter limit for poles from 14 to 16 inches at the base, poles are harvested before they grow into sawlogs.

Through the years his management techniques have changed. At first Livingston used the "diameter limit" approach he had learned in forestry school, but he found it lacking as applied to longleaf. More recently he has been successfully using single-tree and group-selection...
harvesting methods with a 10-year cutting cycle. He is considering reducing the cycle to eight years, based on current stocking levels. He also uses shelterwood management in stands where the overstory is dense and of a uniform size or age, but he no longer uses a target residual basal area (BA) for thinnings, which he found misleading with longleaf rather than helpful in attaining his desire for in-stand variability. "With all ages, all densities, it is hard to aim at a uniform BA," he says. Livingston emphasizes that a good logging job is essential to protect reproduction if these selection systems are going to succeed (see "Good Logging," page 21).

Livingston aims at establishing natural regeneration in large, linear holes or gaps and "picks off" the surrounding overstory within 15 to 20 feet of the seedlings just as soon as a sufficient quantity and distribution of seedlings are established. As trees are removed over time, the patches of regeneration are connected. "Remember, longleaf has got to have light," he says. "You may need to react faster than a 10-year cycle dictates to help seedlings move out of the grass stage."

He doesn't manage all of his longleaf stands exactly the same way, although all are burned every two years, weather permitting. "See that tree right there, it could have been cut the last time," he says. "Sometimes you can look at them or sell them. I just wanted to look at that tree a bit longer." In his main quail-hunting woods the overstory is thinner to increase density and diversity of groundcover species. A quarter section (40 acres) with 120-year-old trees is set aside with no cutting for the time being but is burned every other year.

In addition to naturally regenerating stands, Livingston plants some acreage each year with either containerized or bare-root longleaf seedlings, after controlling potential hardwood and herbaceous competition with a combination of burning, cutting and herbicides. "A one-year-old seedling stand is just as important as a 70-year-old forest," he says. "You have got to have that first-year vision. You are really planting for the next generation."

"When I came home in 1954, one of the big mistakes I made was taking out all the oak trees. I either sold them, cut them for pulpwood or killed them, and that was a mistake. Quail love a diversity. So now we are trying to get some oaks to come back. So we're learning."

As Mayo Livingston has proved, landowners can target revenue from timber as the major management objective and yet maintain many of the attributes needed for a healthy longleaf ecosystem. Burn frequently, he says, and use the harvest and regeneration techniques that mimic natural processes.
WHEN JIM MORGAN WAS GROWING UP IN THE NORTH CAROLINA SANDHILLS, he considered it a boring place and couldn't wait to leave. Morgan left for Atlanta and stayed there for 15 years. But a funny thing happened when he returned. The place didn't seem as boring any more.

"I saw it was really special because this Sandhills ecosystem is such a rare thing, just a little strip of land coming out of Georgia and South Carolina, with the really white sand and that ecosystem of longleaf pine and wiregrass and reindeer moss, and this handful of animals adapted to it," he says.

Today he takes a special interest in the farm, and especially the longleaf pine component of the property. He has enrolled Morgan Farms in the Forest Stewardship Program, which helps landowners construct a long-term management plan for their forests with the aid of foresters, wildlife biologists and soil and water specialists (see "Where to Get Help," page 30).

"My Dad has a land grant that goes back to 1789," Morgan says. "There are some trees that survive from that period. We've cored a few that go back 200 years. It's just been part of the family tradition that you take care of the land and are a steward of the land.

Trees as young as 10 to 15 years old produce the best straw, Morgan says. What this means is that with the addition of pine straw to the economic equation, longleaf pine can produce a constant income stream throughout the life resources." He is happy to see that wildlife have begun to return because of the management plan that he has installed. He's found wild turkey, fox squirrels and several coveys of bobwhite quail on his land after years of absence.

Morgan's pinelands also shelter several colonies of red-cockaded woodpeckers, and unlike most people, he says, he's glad to see them. Many landowners feel that older growth, well-managed longleaf pine forests only encourage even more of these endangered species, placing burdensome restrictions on their rights to harvest trees, but Morgan has enrolled his land in the Safe Harbor Program. This federal program, administered by the U.S. Fish and Wildlife Service, offers participating landowners economic incentives to help protect endangered species (see page 14-15). By managing his forests in ways that protect the endangered red-cockaded woodpecker and encourage its habitat, Morgan feels secure that he will not be responsible for any additional birds found on his land after the date he signed the Safe Harbor agreement. "I think there are a lot of people confused about the red-cockaded woodpecker and the Safe Harbor Program," Morgan says. "It's a great program, but the average landowner still thinks of the birds as an 'infestation.'"

It has not been easy to be a good forest steward, especially in the Sandhills. "Sandhills soil is really an oxymoron," says Morgan. "It will grow longleaf pine trees—that's the crop that this sand is designed to grow. But you're beating your head against the wall to try to grow just about anything else except maybe tobacco."

Yet Morgan and his family have turned what seemed to have been a bad hand into a winner. He's looking to plant more acreage to the longleaf pine already growing on his property. The reason? Pine straw.

"When we made our management plan in 1994, it had not become as clear to us and perhaps to others the enormous cash value of straw," he says. "We had no idea how much money could be made by raking straw." In the 1990s, pine straw skyrocketed in value. In the Sandhills, an acre of trees can produce 65 to 80 bales of pine straw, worth about $75. In some cases, property owners have even doubled this return.

Pine straw adds a new economic dimension to growing longleaf.
of the stand, even from young trees in plantations. And if you add to that the value of the timber as it enters the sawtimber and pole stage, it's a money-making combination.

"We've never wanted to just maximize dollars," he points out. "We've always wanted to say, we have a beautiful resource here, let's find a way to balance the environment and wildlife and the business part of it. You've got to pay the taxes on the land each year so you have to find a way to make money."

Morgan tries not to put all his eggs in a single basket. He cuts some timber, and he still farms some of his acreage, although he is diverting more farmland into longleaf pine plantations. He prefers to rake the young stands more often and the older stands less often, because he knows the value of the needles as fuel for prescribed fires.

"If you read our management plan it basically just says 'Burn!'" he says. "So we burn everything in a regular planned three-year cycle." After adopting the plan, he and manager Dave Buhler set their prescribed fires mostly in winter to reduce the hardwoods that had grown up in thickets. But now they are doing growing-season burns.

"We think of growing-season burns as more natural—most of the fires happened because of lightning strikes, and that had to have been during the growing season," Morgan says. "We felt proud of the condition of our forest this year. We had two fires from campers who were camping on our property illegally, but the fires didn't do any damage at all. They just ran along the ground. Had that happened 10 years ago, we would have had major trouble."

Morgan cuts some timber from his property every year, usually through small-scale modified shelterwood cuts (two-aged management) in which some of the mature seed trees are retained and may be removed in 10 to 15 years. "When I first got here I didn't think I would cut anything. A consulting forester took me to another property. We walked all over and didn't see a single quail. Then he took me to a place where they had opened the forest up through a shelterwood cut and there was an explosion of quail."

He believes in forest diversity, and prefers having multi-aged stands of trees to single-age classes. Though his burning program and selective use of herbicides are thinning out the scrub oak thickets on the property, he doesn't want to get rid of all of them. With wildlife as one of his goals, he wants to keep some high quality mast-producing trees.

One of the motives that Morgan guards against is greed. "You can't be greedy," he says. "People sometimes want to get all the money and right now, but you can't do that. You really have to take a little off the table each year and continue to invest. You've got to keep burning and planting. It's sustainable over a long period of time. You know, it's a beautiful thing to walk up on a piece of property that is well managed and see and hear wildlife and know that you're still actually making money on the land."
INVESTMENT BROKER REX HINSHAW AND HIS WIFE BECKY OFTEN DRIVE TWO HOURS northeast of Houston into the Piney Woods south of Woodville to spend the weekend on the family farm. His father acquired the acreage, located near the western limit of the natural longleaf range on rolling hills landscape, between 1958 and 1962 as an investment and a place to hunt. Although the property had been burned for grazing cattle, the hardwood component was dense with southern red oak and patches of blackjack and bluejack or sandjack on more sandy sites. A program to remove the undesirable hardwood subcanopy beneath the mixed longleaf, loblolly and shortleaf stands was initiated immediately and a prescribed-burning program started.

Few private landowners in east Texas are growing longleaf today, although it was once common on drier sites. So why does Hinshaw grow longleaf?

"In a well-maintained stand you get a greater percentage of poles, and poles make you more money," he explains. In a recent sale, for example, Hinshaw made $70 per ton of poles compared to $50 per ton of sawlogs and $25 per ton of chip-'n'-saw. Longleaf's disease resistance is also an incentive. Southern pine beetle has been a major problem in loblolly and particularly shortleaf forests in east Texas. He cuts out shortleaf with a vengeance, he says, because of its susceptibility to the beetle. However he will maintain some mixed stands because "mixed stands aren't as likely to be wiped out by blights or viruses."

Hinshaw's forest consultant marks and oversees harvests, and he also handles prescribed burning. He advises, "The cost of a forester is worth it." From 25 to 30 percent of the property is thinned every eight to nine years, however, his plan is flexible and he can cut when prices are high and skip a cycle if they are low. "If there is a huge spike in timber prices we will increase the size of a normal sale, or if they are down, we can decrease a sale or skip a cycle. Uneven-aged (or all-aged) management allows you to do this," he says.

Both the longleaf-dominated and the mixed stands are managed for saw timber and poles with no designated rotation age. He favors longleaf in the mixed stands and intends to increase its proportion, while he harvests shortleaf heavily.

"We're moving mixed, 50-percent longleaf stands to 100-percent longleaf," Hinshaw says. "We're keeping pure stands pure and gradually letting them expand." Mixed stands with less longleaf will remain mixed with varying amounts of loblolly but less shortleaf. The burning frequency for all natural stands is the same. When loggers cut trees, they leave the tops in the forest rather than haul them to a central site to be limbed. The limbs are cut so that woody material is generally no more than waist high. This way, the logging slash is distributed throughout the stand and more quickly burned, leaving the woods unsightly for less time following a harvest.

The consulting forester employs group- and single-tree selection tech-
niques to maintain an all-aged forest. "I think the private landowner for the most part will get a lot more enjoyment out of the land and probably get a better return on his dollar with selective cutting," Hinshaw says. "And it will be a more valuable property for resale." As harvests of sawtimber and poles are marked, shortleaf pine is targeted and gaps created for regeneration. "Natural regeneration appeals to me because it is more aesthetically pleasing. I think if you ran the numbers on the investment of capital it is more efficient and you keep the look of a forest," he says.

Control of the understory continues to be a major management objective. The clay and clay loams of the property produce a characteristic hardwood and evergreen component of the rolling hills longleaf landscape type. Hinshaw treated several groves of blackjack oak with a chemical herbicide. However, he prefers burning to herbicide treatment, particularly for releasing longleaf regeneration. "Lighting a match is a lot cheaper, too," he notes.

When grazing ended on the property in the mid-1970s, yaupon holly began to spread aggressively under the pines, and Hinshaw is using fire to control it. He warns, 'Don't pause on the yaupon control because it will cost you a clear cut later on. If you don't stay on it and you get into a drought cycle, you won't be able to burn. You'll get behind and you can hardly catch up." Controlling competition saves water and nutrients for pines, and it minimizes timber losses to arson fires or from cigarettes thrown out truck windows.

Flanking the stream and creek system that flows through the property are extra wide streamside management zones that protect the watercourses and provide habitat diversity, particularly for the deer population. Having a healthy local deer heard is of major concern to Hinshaw, an avid deer hunter. On his own property he supplements the natural vegetation with several feeding stations but considers the variety of natural vegetation to be sufficient.

“You need to burn so deer will have something to eat besides yaupon,” he says. “I saw a covey of quail for the first time two years ago—I hadn't seen them in a long time.” He maintains a system of permanent fire breaks by disking and mowing, and he also disks retired logging decks to make a receptive seedbed. Such open, grassy strips and patches provide additional herbaceous forage.

As an absentee landowner, he sees several benefits in leasing a property such as his to a local hunt club to help care take of the property, reduce trespass and provide additional income to the landowner.

Given the property he and his family own, Hinshaw believes that uneven-aged or all-aged timber management is a sound investment. "We originally paid $150 per acre for the place in 1958 and we cut timber probably every eight to nine years on about 25 to 30 percent of the place. In net income, after forestry fees and such have been subtracted, we’re receiving (from each harvest) about as much as we paid for the place. So what you are looking at is a rate of return right at 8 percent. After taxes, you will be making maybe 7.8 percent. It is going to run in cycles, but if you run it over a long enough basis that is about what you’re going to get on your money.”
JOHN NORMAN HAS A PASSION FOR BURNING AND FOR BOBWHITE QUAIL. IN APRIL
and May, after quail season ends on his commercial shooting preserve in southwest Georgia, he is ready once again to burn his 700 acres of longleaf. It's an annual tradition here. His great-grandfather purchased this pine barrens property near the turn of the 20th century and worked the forest for turpentine, "burning off" the orchards every year in late fall and early winter after each tree was raked around to prevent the "cat-faces" from igniting. Cattle were also grazed in the forests under open range laws until 1942 and on some fenced tracts until 1960. Regular dormant-season burning kept the range green.

Today the product is quail. Frequent burning maintains the native ground cover that he believes is the key to maintaining high quality quail habitat as well as a high quality longleaf ecosystem. His property also supports a healthy gopher tortoise population that benefits from the abundant foods at ground level. There are pitcher plant seepages here and a distinctive and unusual geological formation called Altamaha Grit.

Norman has seen three fires ignited by lightning, and he says it isn't hard to imagine a lightning strike burning off the entire country around him. "This year it would have burned from here to Savannah," he says. He uses prescribed fire as a management tool to maintain a diverse, herbaceous ground cover dominated by grasses, legumes and sunflowers, along with numerous other species, beneath an open canopy of longleaf pines. The bare ground between clumps of bunch grasses are pathways that enable quail and other small animals to move beneath over-arching leaves and seed heads. The cover these grasses provide is far better than that offered by mat-forming grasses such as Bermuda grass. Grasses and grass-like plants (sedges and beak rushes) also provide seed and forage for wildlife, and help carry the frequent fires that shape the distinctive character of the longleaf ecosystem.

Planning is the key to prescribed fire. "Burning is the hardest job you do," he says. "You can set more fire in a few minutes than you can put out. Every fire has to be decided on what the conditions are right now, not on what you think it is going to be or on what the weatherman says. If you make decisions two weeks ahead on what you are going to do, you're always going to be in trouble.'

"Burning when it is too dry does a lot more damage to roots of plants," he adds. "You won't have too much trouble if the ground is damp." The abundance of fine grassy fuel produced by vigorous clumps of wiregrass make it possible to burn shortly after a rain. The presence of wiregrass makes burning easier. Old field land lacks the fine fuel provided by wiregrass and is much more difficult to burn, Norman observes. To maintain some cover for wildlife within a tract or unit to be burned he advises, "Just burn without trying to be too tidy about it. Let it finger around, hot sometimes, cool other times, a natural meandering fire." And if it is too wet? "A lot of years you quit burning because it just won't burn any more."

As a result of the long history of...
Flourishing ground cover rewards a frequent burning regime (above). Norman's land contains an unusual outcropping of Altamaha Grit (bottom), a type of sandstone.

Flourishing ground cover rewards a frequent burning regime (above). Norman's land contains an unusual outcropping of Altamaha Grit (bottom), a type of sandstone.
IN MOUNTAINOUS CHEROKEE COUNTY, ALA., KATHERINE EDDINS AND HER SISTER

Ellen Eddins Beidler have invested in an unusual project—restoring several hundred acres of mountain longleaf pine, the least well known of the four longleaf landscape types. Like other ridges and mountains in north-central Alabama and adjacent Georgia, much of Weisner Mountain (with a crest elevation of 1,894 feet) was covered with pure and mixed longleaf pine stands with an open understory, good habitat for red-cockaded woodpeckers that lived in the now inactive colonies. After 1900, following extensive harvests of the longleaf and decades of fire suppression, thousands of acres of thick, unmerchantable scrub blackjack, chestnut and post oak grew up.

Given the condition of the timber resource when it was acquired in 1998, why did the Eddins sisters invest in longleaf? “This is the native tree on the mountain,” Katherine Eddins says. “It makes sense ecologically and financially to restore it. I can stand on top of the mountain and imagine nice maturing longleaf spilling down the sides, their needles shining in the sun. Everyone loves to see a healthy stand of native trees maturing.” She adds. “Our goal is not to maximize timber production and income. When we bought this land, the merchantable timber was negligible. So, profit will come in the form of increased property and wildlife values as a result of restoring a good stand of timber.”

A graduate of the Auburn School of Forestry and a certified forester, Katherine Eddins has developed a detailed management plan that addresses natural and artificial methods of re-establishing longleaf, with an emphasis on the re-introduction of fire through regular prescribed burning. Although the soil on the steep slopes is sandy, rocky and fairly dry, the growing conditions are good and Eddins has concluded that the site is capable of supporting a reforestation effort. On the steeper slopes the soil has never been cultivated, and there has been no stress from harvest in nearly 100 years. Using management techniques that minimize soil disturbance is a major objective.

Another of the Eddins’ objectives is to cooperate with neighbors to reintroduce fire to their properties. This will reduce the number of fire breaks located along property boundaries on the steep slopes, increasing longleaf across the mountain and minimizing soil disturbance. On the sisters’ property, where fire has been excluded for decades, a series of dormant-season burns is reducing heavy fuel layers before burning during the growing season can be introduced.

Natural regeneration will come from pockets of relict trees, after a combination of prescribed fire and herbicide applications reduce the hardwood midstory and create a receptive seedbed. In areas lacking longleaf, containerized mountain longleaf seedlings are being planted using locally grown material from locally collected seed, which is particularly important in this distinctive landscape type.

“We do not want a monoculture,” Eddins states, “so, we have planted longleaf on a wide spacing, and on about a third of the property we are shooting for a mixed longleaf, oak and hickory stand. A 40-acre tract covered with a dense continuous cover of scrubby oaks and other hardwoods was treated with the herbicides Accord and Chopper applied aerially in September 1999, burned the following November, then hand-planting a few days later while stumps were still smoldering. Seedling survival was exceptional after 10 months of especially dry weather.

Once longleaf seedlings are established, prescribed burning every three to five years at different times during the growing season will maintain the stands in an open condition. As the natural and planted stands mature, an uneven-aged management model, either group or single-tree selection, will be used for harvesting and regeneration. The sisters are realistic in their expectations. “There is a little timber on the eastern side of our property that might bring a little income, but I doubt it,” says Eddins. “When we bought land, we had no expectation to harvest and make back some of the purchase price. I do not anticipate harvesting timber anytime in the next 20 years. Depending on how things go, we might get a thinning sometime within the next 15 or so, but we’ll wait and see.”

“We won’t plant anything but trees and one or two food plots for wildlife,” she adds. “Most of the ground has never been subjected to a plow so we hope the native plants will work their way back in with a good fire regime.
We already have seen an explosion of native honeysuckle, sedges and grasses. There is a remarkable lack of non-native species on the mountain.”

Following herbicide release and burning the previous November, little bluestem and partridge pea now cover the lower elevations of the 40 acres that were treated. Many other grasses, legumes and sunflower relatives have also appeared on slopes that were for decades heavily shaded by extensive colonies of low-growing blueberries and huckleberries. The propagules (seeds, roots, bulbs, rhizomes, etc.) of herbaceous plants have persisted and are now flourishing after the overhead competition was removed.

What advice does Eddins have for other landowners interested in restoring longleaf on sites with more hardwoods than pines? “Herbicide is expensive and adds to the cost of the investment; try to use it sparingly and work with the longleaf you already have and with fire,” she says. “However, it is important to control competition to get your longleaf out of the grass stage, so make sure you use enough fire and/or herbicide to do so.”

By following the plan and with cooperation from mother nature in providing ample seed, by the end of 2001 the Eddins sisters will have restored longleaf pine to 450 acres of the property. Financial assistance for some of these efforts has come from three programs—Partners in Wildlife (administered through the Longleaf Alliance), the Forestry Incentive Program and the Alabama Cost Share Program (both administered through the Natural Resources Conservation Service). (For more information on these programs, see “Where to Get Help” on page 33.)

As a part of their long-term plan, the sisters hope to acquire additional acreage that would connect with mountain longleaf pine stands on the Talladega National Forest to the south. “Although we have no plans to sell, we do enjoy the fact that our asset is being improved,” says Eddins. “The land will continue to increase in value as stands grow. People would rather have an already established, nice-looking longleaf pine stand 20 years old than a mountain with nonmerchantable, thick ugly brush on it.”
MONEY HILL has been in DAVID GOODYEAR'S family since 1905 when his grand-father and family acquired it as part of the extensive long-leaf acreage owned by the Great Southern Lumber Company. At that time, a considerable amount of longleaf existed in St. Tammany and the adjacent parishes. Today, this region of southeast Louisiana has less than 2 percent of the acreage in longleaf present a century ago. Money Hill Plantation supports longleaf stands on rolling hills and in wet flatwoods and connects two preserves owned by The Nature Conservancy, Abita Creek Flatwoods and Talacheek Pine Wetlands, the latter of which was bought from the Goodyear family at a price below market value.

"The property has been through every contortion you can imagine," explains David Goodyear. Money Hill has supported turpentine and tung oil orchards, timber and cattle production, a popular recreational campground and later a hunting preserve. Seventy years ago the central part of the property was a tung tree orchard; today it is a golf course and residential community, surrounded to the south and east by maturing stands of natural longleaf pine. These now dense stands grew from the few seed trees that remained when the "virgin" forests were harvested. Cattle grazed these cut-over woods and pastures until 1955. Thus the lands received little attention other than regular burning. When the density of trees increased sufficiently through natural regeneration, poles were selectively cut. Since they continue to be the most valuable longleaf product, poles will be periodically harvested using a single-tree selection method. Selective harvests coupled with regular burning will be used to regenerate the stands.

Goodyear favors longleaf basically for two reasons— aesthetics and a high percentage of poles. "Longleaf is better looking and more impressive," he says. "I just think it is prettier. The pine cones are bigger, the needles are a darker green plus they are so straight, and when you get them growing together they look so much better than a bunch of slash (pine)." Scenic open stands of maturing longleaf add ambiance to the development.

Goodyear has observed that the longleaf on his property is more resistant to insect damage than the planted and natural slash pine surrounding the golf course which has suffered from Ips beetles this dry summer. "I've driven through these woods in the last month a lot and I've seen very few (longleaf) trees that are dead and the ones that are usually were hit by lightning."

Although slash pine is a natural component of the wet flatwoods and savannas of the region, it is "off site" on the well-drained portions of the property. Slash pine may be cut with future harvest cycles, unless it is needed to provide fuel for burning or to restore the desired natural density in the longleaf-dominated flatwoods and savanna habitats. In some upland longleaf-dominated stands, Goodyear is currently removing off-site slash and loblolly pine as part of the restoration program as well as to generate income. The harvest is in part a salvage operation to remove slash pine killed by an Ips beetle infestation triggered by drought. The gaps created will provide openings for longleaf regeneration, increasing the number of age classes in the generally even-aged stands. Care is being taken to leave enough pines to provide needles as fuel for future prescribed burns.

Goodyear and his crew try to burn annually in the dormant season but in 2000 it was too dry. Through the years he has kept maps of the areas and dates of successful burns. He is considering growing-season burns at the encouragement of The Nature Conservancy, and joint burns are planned where Money Hill adjoins the two preserves. A permanent firebreak system is disked before fire season.

The value of regular burning was clearly demonstrated last summer, Goodyear reports. "We had a wildfire back here in the middle of the summer. An arsonist actually set it on the hottest day of the summer and it didn't hurt the first tree." Residents of the golf community will be provided educational material concerning the ecological desirability of burning as well the value of fuel reduction in the vicinity of their homes.

The Louisiana Department of Wildlife and Fisheries has long been aware of the wildlife value of the property. While leased to a hunting club for many years, it was the only place in the region where white-tailed does could be taken throughout the season, not just on "doe days."

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profile

Owner: David Goodyear and Family (Money Hill Plantation)
Location: St. Tammany Parish, La.
Longleaf Resource: 2,000 acres of natural longleaf in mixed and pure stands
Management Objectives:
- Develop a rural golf and residential community with surrounding nature preserves
- Maintain and restore natural longleaf for aesthetics and income
- Cooperate with The Nature Conservancy and The U. S. Fish and Wildlife Service's Safe Harbor Program for federally protected species

key words

aesthetics
wildlife and endangered species
poles
Decades of nearly annual burning have maintained a diverse ground cover that provides ample food within reach of deer as well as the open understory needed by the vigorous fox squirrel population.

Prescribed burning in pine stands benefits deer by increasing browse yields and improving nutrition and palatability of understory plants as well as maintaining sufficient cover along drains and creeks. Two American bald eagles were seen this summer near the lake. Goodyear plans to erect a tower for nesting if the 100-foot-tall longleaf around the lake do not suit the eagles. He leaves dead trees to become snags even on the golf course, unless they are a hazard. They will benefit woodpeckers as well as other birds and cavity-nesting mammals.

The Goodyear family is managing not only for what is currently on their property but also for species that may find their way to the extensive maturing longleaf stands. By participating in the federal Safe Harbor Program, Money Hill is assured by the Fish and Wildlife Service that they will not be penalized or limited in their management options if federally protected species move on to their property or if those present increase in number. A Safe Harbor agreement is currently being developed with the assistance of The Nature Conservancy for the red-cockaded woodpecker and gopher tortoise. Intensive surveys facilitated by the Conservancy have determined that there are currently no red-cockaded woodpeckers on the property, but the surveys located some additional burrows of the gopher tortoise, a federally protected species west of Mobile, Ala.

This regularly burned Louisiana savanna reveals the open look of classic longleaf forests, along with a thriving assortment of wildflowers.
Lessons of Longleaf Pine Managers

Each of the landowners profiled in the last chapter is growing longleaf under different soil, moisture, climatic and topographic conditions, but they are using similar management techniques to achieve similar forests. They are demonstrating that well-managed longleaf pine forests generate a satisfactory income while providing suitable habitat for the living things making up the forest ecosystem.

Ground cover dominated by grasses and herbs. Landowners have found that a ground cover of native species is essential to maintain the longleaf ecosystem. The use of frequent growing-season fires stimulates the flowering and fruiting of native grass and wildflower species. (See Eddins, Norman.)

Few other pine species present. Landowners eliminate other pine species unless they are needed to produce fuel for fires. (See Hinshaw, Eddins, Goodyear.)

Spacing between trees is variable, with some clumps of similar-aged trees. Some growers favor harvest and regeneration techniques that achieve an irregular spacing of trees reflecting the way a natural stand develops. (See Livingston, Norman.)

Enough cone-producing trees to produce abundant seeds for regeneration. Successful growers of longleaf pine favor natural regeneration, and they always consider harvest techniques that leave a generous number of cone producers on the site to establish the next generation. (See Eddins, Hinshaw, Morgan.)

Scattered dead trees or snags including coarse woody debris on the ground. Landowners choose to leave lightning-struck pines and other dead trees, unless they are a hazard to roads or electric lines.

In summary, there are really just five fundamental principles for managing natural longleaf forests successfully:
1. Burn regularly and frequently
2. Avoid soil disturbance
3. Protect the native ground cover
4. Leave a sufficient number of trees for reseeding and for fuel
5. Use natural regeneration methods that mimic natural processes

These trees provide foraging and nesting habitat for many wildlife species, including bluebirds, numerous woodpeckers, nuthatches and flying squirrels. Numerous ground-dwelling reptiles, amphibians and some small mammals benefit from course woody debris on the ground. (See Eddins, Goodyear, Norman.)

Few invasive exotic species, plant or animal. These longleaf growers do not introduce exotic species—plant or animal—and eliminate species that have invaded to encourage species native to the ecosystem. (See Norman, Eddins.)

Minimal soil disturbance other than by wind-thrown trees or animal excavations. Landowners try to avoid disturbing the soil as much as possible. Rather than plowing new firebreaks each time they burn, they employ existing roads, property lines, fields and wetlands as permanent fire breaks. They reuse wildlife food plots. (See Norman, Goodyear, Livingston, Eddins.)
Most successful growers of longleaf pine also have a long-term management plan. If landowners need assistance in developing a plan, they can contract with a forest consultant or professional forester (see pages 33-35). Landowners must work closely with the forester to assure that their objectives are clearly understood and addressed.

The plan should contain maps and identify management units using as many existing features as possible—natural and manmade features as sensitive sites (cemeteries, old house sites, wet areas, rare animal or plant habitats) to prevent damage during logging and burning; and problem areas (heavily eroded sites, dumps, etc.). The plan should also describe the current condition of wooded stands, project a schedule of management actions and needs, and provide a schedule of anticipated income and expense events. Each management plan should include specifications in the following areas:

**Harvest and regeneration**
- select a harvest method—shelterwood, group- or single-tree selection—appropriate to the condition of a particular stand
- plan for natural regeneration
- remove the longleaf with the poorest form first, retain the best (usually older) trees for seed production or with significant wildlife or aesthetic value
- remove undesirable hardwoods and other pine species (unless needed for fuel) as soon as possible

**Prescribed burning**
- plan to keep heavy equipment on roads and trails to minimize soil compaction, rutting and scraping, damage to tree trunks, saplings and ground cover
- establish permanent loading decks (with preference for sites of prior disturbance) to be used during each harvest to minimize compaction and soil disturbance
- use tree length harvest so that limbing gates will not be needed
- locate and protect groups of seedlings and saplings from damage during harvest

Lessons of Longleaf Pine Managers 31
such as ponds, lakes and creeks
create burn units as large as necessary to meet management objectives
reduce high fuel levels by a series of dormant-season burns, particularly if burning has been infrequent
use a series of growing-season burns to reduce existing hard-wood competition
periodically burn during the growing season and vary the time of year of burns to stimulate different groundcover species
burn to prepare seed bed prior to autumn seed fall when a good seed year is expected
interrupt burning schedule to allow new seedlings to become established
leave a few unburned areas in a stand to provide patches of low cover for wildlife
identify and map injured trees that could ignite during burning (burn or rake around them to reduce fuel and hazard potential before burning the entire tract or burn unit)
avoid burning large piles of logging slash that can damage adjacent healthy trees and sterilize soil due to intense heat
be aware of snags located on property boundaries that can ignite and become a hazard

WILDLIFE ENHANCEMENT
keep selected trees valuable to wildlife and thin dense stands so that sufficient sunlight reaches the ground for vegetation to grow
maintain an open canopy rather than a dense stand
provide low escape cover in burning units by leaving some areas unburned
burn regularly to stimulate flowering and fruiting of the ground cover species that are prime wildlife foods
retain a few hardwoods (e.g., black gum and dogwood) and scattered patches of fire-tolerant oaks (e.g., southern red oak and blackjack oak) that consistently produce fruit or acorns
burn into drains and floodplains so that these travel corridors are accessible and forage is at a usable height
use permanent locations for food plots, preferably on previously disturbed sites
use established loading decks as foraging areas or food plots

PINE STRAW RAKING
identify specific sites with the greatest potential for straw production, avoiding high quality wildlife habitat, special plant habitats, wetlands, etc.
develop a three- to four-year schedule of rake, rest, burn, rake, to minimize impacts to tree growth, ground cover and wildlife habitat
divide the acreage into several units and harvest from only a single unit each year
leave enough fuel to burn regularly
avoid raking on slopes, erodible surfaces and other sensitive sites
don’t rake during drought periods
if raking in plantations, consider a fertilization program; however, fertilization of natural stands will diminish the diversity of the ground cover
hand raking affects the forest less than mechanical methods
maintain a dense, grassy ground cover to keep fallen needles off the ground, making it easier to bale the clean straw.
Where to Get Help

THE LONGLEAF ALLIANCE
Route 7, Box 131
Andalusia, AL 36420
334-222-7779
www.forestry.auburn.edu/la/

JOSEPH W. JONES ECOLOGICAL CENTER
Educational Coordinator
Route Box 232
Newton, Georgia 31770
912-734-4706
www.jonesctr.org

TALL TIMBERS RESEARCH STATION
13093 Henry Beadle Drive
Tallahassee, FL 32312
850-893-4153
www.talltimbers.org

SAFE HARBOR PROGRAM
The Safe Harbor Program provides incentives for landowners to preserve federally protected species habitat. It encourages voluntary habitat restoration or enhancement by relieving the landowner from any additional responsibility under the Endangered Species Act beyond that which exists at the time he or she enters into the agreement. Limited cost-share funds for habitat improvements are available through U.S. Fish and Wildlife Service and U.S. Forest Service Programs.

Ralph Costa
U.S. Fish and Wildlife Service
Clemson Field Office
Department of Forest Resources
261 Lehotsky Hall
Clemson, SC 29634
864-656-2432

Lee Andrews
U.S. Fish and Wildlife Service, Region 4
1875 Century Boulevard, Suite 200
Atlanta, GA 30345
404-679-7217
Lee_Andrews@fws.gov

CONSERVATION RESERVE PROGRAM
The Conservation Reserve Program is an environmental-improvement program that includes financial incentives to landowners for planting and maintaining trees on des-
Where to Get Help

Don Tonczak
U.S. Forest Service Cooperative Forestry
1720 Peachtree Road, NW
Atlanta, GA 30367
404-347-4177

STATE FORESTRY COST-SHARE PROGRAMS

Alabama Agricultural and Conservation Development Commission Program: The Alabama Agricultural and Conservation Development Commission Program provides 60 percent cost-sharing for forestry practices that include tree planting, site preparation for natural and artificial regeneration, and timber stand improvement.

The North Carolina Forest Development Program (FDP): FDP is a reforestation cost-sharing program administered by the N.C. Division of Forest Resources. Reforestation cost-share payments cover 50 to 75 percent of the total cost of implementing one or more forestry practices, not to exceed a maximum limit. Eligible landowners can receive up to $5,000 of FDP per year.

Ronnie Myers
Mississippi Forestry Commission
301 North Lamar Street, Suite 300
Jackson, MS 39201
601-359-1886
rmyers@mfc.state.ms.us

The North Carolina Forest Development Program (FDP): FDP is a reforestation cost-sharing program administered by the N.C. Division of Forest Resources. Under FDP, a landowner is partially reimbursed for the costs of site preparation, seedling purchases, tree planting, release of desirable seedlings from competing vegetation or any other work needed to establish a new forest. To qualify for this assistance, the landowner must have a forest management plan approved by the division.

FDP currently reimburses up to 40 percent of the actual cost per acre or 40 percent of the prevailing rate for management practices in that region, whichever is less. FDP cost share rates increase to 60 percent for the planting of longleaf pine, hardwood or wetland species.

Merk Megalos
North Carolina Division of Forest Resources
Post Office Box 27687
Raleigh, NC 27626-0581
919-733-2162, ext 254
megalos@mail.de.state.nc.us

South Carolina’s Forest Renewal Program (FRP): Landowners can receive cost sharing to reforest cutover land, plant open land or improve woodlands. The amount of money a landowner would receive is based on approximately 40 percent of the statewide average cost of a particular practice. The Forest Renewal Program is administered by the Forestry Commission and funded mostly by a tax on roundwood processed by forest industry in the state. The remainder (20 percent) is funded by state appropriations.

Ron Ferguson
South Carolina Forestry Commission
Post Office Box 21707
Columbia, SC 29223
803-896-8800
scf@forestry.state.sc.us

STATE COOPERATIVE EXTENSION SERVICE

Extension offices provide a variety of educational programming designed to help landowners meet their management objectives. These programs include short courses, workshops, and useful up-to-date written materials. Assistance in preparing a land management plan may also be available.

Ken McNabb
Auburn University
School of Forestry
108 M. White Smith Hall
Auburn, AL 36849-5418
334-844-1044
mcnabb@forestry.auburn.edu

Alan Long
University of Florida
Post Office Box 110410
Gainesville, FL 32611-0410
352-846-0891
ail@gnv.ifas.ufl.edu

Michael Dunn
Extension Natural Resources
115 School of Forestry, Wildlife and Fisheries Bldg.
Louisiana State University
Baton Rouge, LA 70803
225-388-2373
mdunn@sgctr.lsu.edu

Glenn Hughes
Mississippi State Extension Service
17 J. M. Tatum Industrial Drive
Hattiesburg, MS 39401-8000
601-545-4455
ghughes@ext.msstate.edu

Rich Hamilton
College Of Forest Resources
N.C. State University
Box 8003
Raleigh, NC 27695-5636
919-515-5636
hamilton@cfr.cfr.ncsu.edu

Lufkin, TX 75902-0310
409-639-8180
carraway@lcc.net

Burl Carraway
Texas Forestry Service
Post Office Box 310
Lufkin, TX 75902-0310
409-639-8180
carraway@lcc.net

TEXAS REFORESTATION FOUNDATION (TRF): TRF, which is supported entirely by voluntary contributions from forest industries, helps non-industrial landowners pay up to 50 percent of the cost of work such as site preparation, planting trees and timber stand improvement. The program is administered by the Texas Forest Service.
FORESTRY TAXATION BENEFITS
Private landowners should be aware that the Federal tax code and several State tax codes provide incentives for reforestation activities.

Contacts: Larry Bishop
USDA Forest Service
1720 Peachtree Rd., Room 850
Atlanta, GA 30309
404-347-2067
lbishop@fs.fed.us

FOR PROFESSIONAL ASSISTANCE IN DEVELOPING A LAND PLAN
American Association of Consulting Foresters of America, Inc. ACF professionals serve private landowners, banks and others in capacities such as appraisals, forestland purchases, environmental impact studies, timber volume estimates and forest management. An ACF forester must have a forestry degree from an approved university, at least five years experience and meet continuing education credits every two years. To receive a current list of ACF members in your area contact:

The Association of Consulting Foresters of America, Inc.
732 North Washington Street
Alexandria, VA 22314
703-548-0999
director@acf-foresters.com

FURTHER READING
A detailed bibliography of longleaf pine material can be found at the following web site: http://www.forestry.auburn.edu/la/biblio.htm

THE NATURE CONSERVANCY
Field Offices

ALABAMA
2821-C 2nd Avenue S.
Birmingham, AL 35233
205-251-1155

FLORIDA
222 S. Westmonte Drive, Suite 300
Altamonte Springs, FL 32774-4269
407-682-3664

GEORGIA
1330 West Peachtree Street, Suite 410
Atlanta, GA 30309
404-873-7979

LOUISIANA
Post Office Box 4125
Baton Rouge, LA 70821
225-338-1040

MISSISSIPPI
6400 Lakeover Road, Suite C
Jackson, MS 39213
601-713-3355

NORTH CAROLINA
4011 University Drive, Suite 201
Durham, NC 27636
901-403-8558

SOUTH CAROLINA
Post Office Box 5475
Columbia, SC 29250
803-254-9049

TEXAS
Post Office Box 1444
San Antonio, TX 78295-1440
210-224-8774

Piney Woods Region Office
Post Office Box 909
Silsbee, TX 77656-0909
409-387-0445

VIRGINIA
490 Westfield Road
Charlottesville, VA 22901
804-295-6106

NATURAL HERITAGE OFFICES
State Offices

ALABAMA
Alabama Natural Heritage Program
Huntington College, Massey Hall
1500 East Fairview Avenue
Montgomery, AL 36106
334-834-4519

FLORIDA
Florida Natural Areas Inventory
1018 Thomasville Road, Suite 200-C
Tallahassee, FL 32303-6237
850-224-8207

GEORGIA
Georgia Natural Heritage Program
2117 US HWY 278 SE
Social Circle, GA 30025
770-918-6411

LOUISIANA
Louisiana Natural Heritage Program
Department of Wildlife and Fisheries
P. O. Box 98000
Baton Rouge, LA 70898
225-765-2821

MISSISSIPPI
Mississippi Museum of Natural Science
2148 Riverside Drive
Jackson, MS 39202-1353
601-354-7303

NORTH CAROLINA
North Carolina Natural Heritage Program
MSC 1615
Raleigh, NC 27699-1615
919-733-4181

SOUTH CAROLINA
South Carolina Heritage Trust
P. O. Box 167
Columbia, SC 29202
803-734-3894

VIRGINIA
Virginia Natural Heritage Program
217 Governor Street
Richmond, VA 23219
804-786-7951
Where to See Longleaf Pine

Examples of well managed and restored longleaf pine stands can be found on other sites including state parks (particularly in Florida), nature preserves, tracts owned by local land trusts and scout and church camps.

**Virginia**
Zuni Pine Barrens – Isle of Wight Co., an Old Dominion University and Virginia Nature Conservancy preserve. Northernmost remnant of longleaf pine sandhills habitat, restoration in progress.

**North Carolina**
Weyerhaeuser Cool Springs Preserve – Craven Co. Sandhills longleaf.
Croatan National Forest – Carteret, Craven and Jones counties. Flatwoods and savanna longleaf, sandhills longleaf on ridges.
Camp Lejeune Marine Base – Onslow Co. Sandhills, flatwoods and savanna and rolling hills longleaf.
Bladen Lakes State Forest – Bladen Co. Sandhills longleaf and flatwoods.
Holly Shelter Game Land – Pender Co. Flatwoods and savanna longleaf and sandhills longleaf on ridges.
Green Swamp, a North Carolina Nature Conservancy Preserve – Brunswick Co. Flatwoods and savanna longleaf.
Weymouth Woods State Natural Area – Moore Co. Sandhills longleaf and old-growth stand on the Boyd Tract.
Sandhills Game Land – Scotland and Richmond counties. Sandhills and rolling hills longleaf stands.

**South Carolina**
Fort Jackson Military Reservation – Richland Co. Sandhills longleaf.
Harbison State Forest – Richland Co. Sandhills longleaf.
Francis Marion National Forest – Berkeley and Charleston counties. Flatwoods and savanna longleaf.
Webb Wildlife Center – Hampton Co. Flatwoods longleaf.
Hitchcock Woods – Aiken Co. Sandhills longleaf.

**Georgia**
Fort Stewart Military Reservation – Liberty and Bryan counties. Sandhills and flatwoods longleaf.
Okefenokee Swamp National Wildlife Refuge – Charlton and Ware counties. Flatwoods and savanna longleaf, turpentine production demonstration.
Fort Benning Military Reservation – Chattahoochee and Muscogee counties. Sandhills longleaf.

**Florida**
Ocala National Forest – Marion, Putnam and Volusia counties. Flatwoods and savanna longleaf.
Apalachee National Forest – Leon, Liberty, Franklin, and Wakulla counties. Flatwoods and savannas, rolling hills and, on ridges, sandhills longleaf forests.
Tall Timbers Research Station – Leon Co. Rolling hills longleaf, restoration in progress.
The Apalachicola Bluffs and Ravines Preserve. Flatwoods and savanna longleaf.
Eglin Air Force Base – Okalosa, Santa Rosa and Walton counties. Sandhills and flatwoods and savanna longleaf.

**Louisiana**
The Nature Conservancy, St. Tammany Parish – Lake Ramsay, Abita Creek and Talshee preserves. Flatwoods and savanna longleaf, restoration in progress.
Kisatchie National Forest – Grant, Natchitoches, Rapides, Vernon and Winn parishes. Rolling hills and flatwoods and savanna longleaf.
Alexander State Forest – Rapides Parish. Rolling hills longleaf.
The Nature Conservancy, Southwest Louisiana Persimmon Gully and C.C. Road Preserves. Rolling hills and flatwoods, restoration in progress.

**Texas**
Sabine National Forest – Shelby, Sabine, and San Augustine counties. Rolling hills longleaf.
Angelina National Forest – Angelina, San Augustine, and Nacogdoches counties. Rolling hills longleaf.
Big Thicket National Preserve – Tyler Co. Rolling hills and flatwoods and savanna longleaf.
Roy E. Larson Sandylands Sanctuary, a Texas Nature Conservancy Preserve – Hardin Co. Sandhills longleaf restoration project underway.
Protect Yourself and Your Forest

Always have a timber sale contract that addresses three factors, not just payment:

Liability. Logging can be essentially a destructive and dangerous activity. The landowner/seller must be sure that he or she is adequately protected from liability as a result of this activity on their property. The seller should be provided with evidence of adequate liability insurance covering the purchaser’s operations.

Payment. The type of sale, lump-sum or pay-as-cut, should be specified. Method and schedule of payment should be stated including payment to the consultant if one is handling the sale. Payment should be made promptly and, if a pay-as-cut sale, be based on documentation of what products are cut (pine sawtimber, poles, chip-n-saw and pulpwood, hardwood sawtimber and pulpwood, etc.).

The type of harvest should be clearly stated—e.g., clearcut or thinning as marked—and the contract should have initiation and expiration dates. If cutting is completed prior to the expiration date, require the purchaser to release the sale so that other management activities can be resumed.

Damage. The condition of the residual timber and land when the contract is completed will determine the future quality of the stand. The buyer will not commit “waste” upon the residual timber in the stand or that surrounding the sale. The trees to be harvested must be clearly marked on the bole and at the base; and only those trees should be removed. The seller must retain the right to halt the operation should conditions become too wet or if other damaging practices are observed.

Damage to residual tree roots, bases, boles and crowns should be minimal and within reasonable limits. Areas of desirable natural regeneration and young trees should be identified with flagging or paint and protected. A protection clause indicating restitution for damage to unmarked, salable trees within and surrounding the sale area may be included.

Other features of a timber sale contract:

A contract should include a description of the sale. Clearly mark the sale boundaries both on the ground and on a map or aerial photo. Identify fences, roads, bridges, culverts, wetlands, watercourses and associated stream-side management zones (SMZs), slopes and other sensitive features such as rare and unusual plant or animal habitats, that you do not want disturbed. When possible, include enough land so that a buffer exists between the area to be avoided and the harvest operation. Such areas should be clearly and generously marked with sufficient paint and/or flagging.

A contract should stipulate reasonable restrictions. For example, minimize log landing areas and use previously used or disturbed sites when possible. Roads, trails and firebreaks should not be used as skid or drag trails; such trails should be dispersed through the sale area to minimize damage to the soil and vegetation. In a thinning sale, trees should be topped and limbs trimmed flush in the woods rather than pulling the whole tree to the loading area where the limbs and tops are removed. No limbs, tops or butts should be left within 6 feet of the base of a living tree. Stumps should be less than 6 inches above ground level. The purchaser is responsible for preventing woods fires during the logging operation and for collecting all types of litter brought to the site during the operation.

Pre-sale or Preliminary Conference

The seller or his or her agent should review the contract and specifications with the forester handling the sale and the person responsible for the logging operation. It is important to meet on the site before the contract is finalized to discuss access, roads to be used, types of equipment, sensitive areas, etc.

Longleaf Alliance publication # ANR-560 provides more information on timber sales and contracts.

To determine if a forester can do what you need done, ask:

- Do you have experience with longleaf pine?
- Do you have experience using natural regeneration systems?
- Do you have experience integrating wildlife management with timber production?
- Do you have experience with prescribed burning?
- Can you burn my property for me?
- Does your liability insurance cover burning and can you produce a certificate?
"Longleaf is better looking, more impressive. I just think it is prettier. The pine cones are bigger, the needles are a darker green plus they are so straight, and when you get them growing together they look so much better than a bunch of slash (pine)."

—David Goodyear, St. Tammany Parish, Louisiana

"Selective harvest used to be more difficult than it is now. The equipment they have now is just made for selective harvest. It just walks up there and picks out a tree and lays it down. You can do whatever you want to do with that equipment. Really we are more concerned about finding the right people to do the logging than about what trees are left."

—John Norman, Colquitt Co., Georgia

"Our goal is not to maximize timber production and income. When we bought this land, the merchantable timber was negligible. So, profit will come in the form of increased property and wildlife values as a result of restoring a good stand of timber."

—Katherine Eddins, Cherokee Co., Alabama

"A one-year-old seedling stand is just as important as a 70-year-old forest. You have got to have that first-year vision."

—Mayo Livingston, Decatur Co., Georgia

"In net income, after forestry fees and such have been subtracted, we’re receiving about as much as we paid for the place. So what you are looking at is a rate of return right at 8 percent. After taxes, you will be making maybe 7.8 percent."

—Rex Hinshaw, Tyler Co., Texas

"People sometimes want to get all the money and right now, but you can't do that. You really have to take a little off the table each year and continue to invest. You got to keep burning and keep planting. It’s sustainable over a long period of time. You know, it’s a beautiful thing to walk up on a piece of property that is well managed and see and hear wildlife and know that you’re still actually making money on the land."

—Jim Morgan, Scotland Co., North Carolina