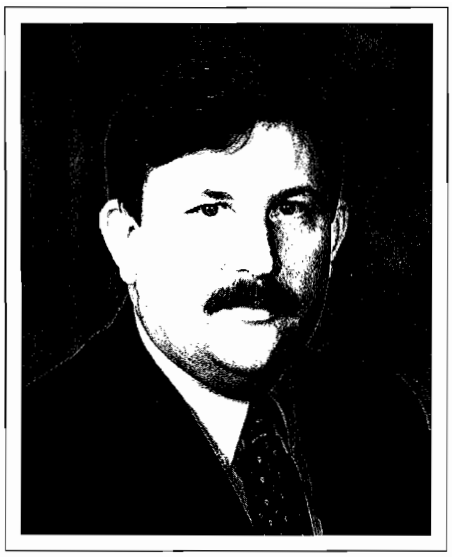
ALABAMA'S TREASURED FORESTS

FALL 1999

SPECIAL LONGLEAF ISSUE



STATE FORESTER'S MESSAGE

By TIMOTHY C. BOYCE, State Forester

Conventional wisdom reminds us to remember the past or we are doomed to repeat it. However, we must also remember the past to ensure that our strengths and successes are not forgotten or neglected. The longleaf pine (*Pinus palustris*) was once our dominant pine. In the true sense, it built the southern region of the United States. Our homes, our barns, our fences, our bridges, our stores, our towns, our wagons—all were built from strong yellow longleaf pine. Our home fires were started with the "fat lighter" of the resin soaked longleaf pine. Today, this stately, magnificent, fine textured and almost disease and insect resistant species finds itself toppled from its throne of dominance.

Many learned landowners have come to realize what we have forgotten about Alabama's state tree and have started to replant this remarkable species. The Longleaf Alliance has also been formed to promote and provide research about the species. The Alliance, located at the Solon Dixon Forestry Education Center in Andalusia, Alabama, has been a champion for the species across the region. Their goal is to bring back the longleaf pine as a dominant species in the Southland. If you have questions or need technical assistance in growing longleaf pine, the Alliance would be a good place to start.

This quarterly issue of *Alabama's TREASURED Forests* magazine is dedicated to our state tree in hopes that you, the reader, will join the growing number of landowners who are planting and growing longleaf pine.

Sincerely,

Timothy C. Boyce
State Forester

ALABAMA'S TREASURED FORESTS

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Volume XVIII, No. 4 **FALL 1999**

DEPARTMENTS

COVER: This issue of *Alabama's TREASURED Forests* is dedicated to the longleaf pine (*Pinus palustris*), Alabama's state tree. Photo by Kim Gilliland.

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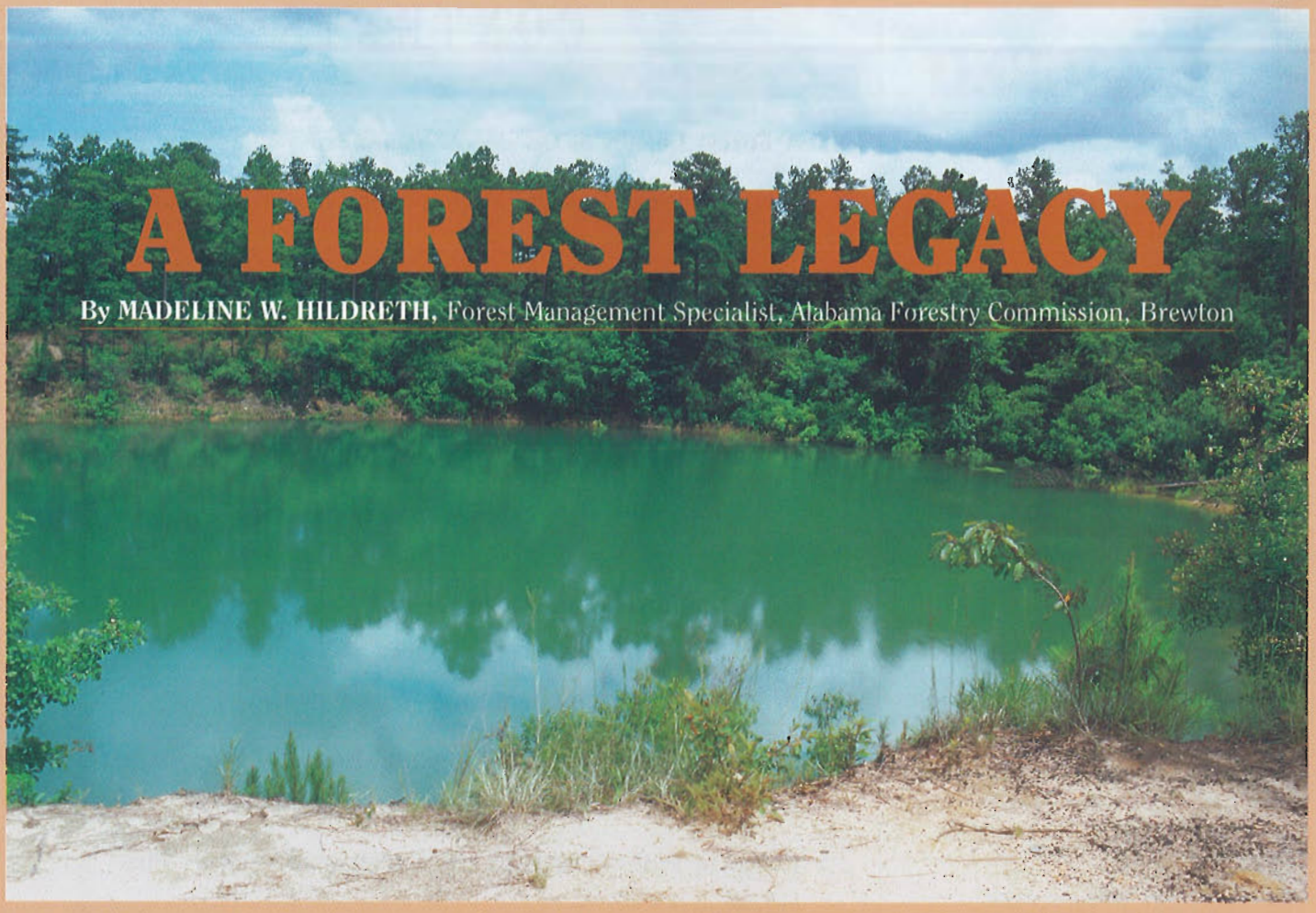
A FOREST LEGACY

By MADELINE W. HILDRETH, Forest Management Specialist, Alabama Forestry Commission, Brewton



The sinkhole is one of many scenic areas on the property.

What do Thailand's Minister of Interior, wildflower enthusiasts, scientists studying biting flies, Swedish foresters, Auburn students, elementary school teachers and the state forester have in common? They have all been guests at the Solon Dixon Forestry Center. The educational center is in Covington County near the small south Alabama community of Dixie. Because there are no interstates, movie theaters or shopping malls for miles, visitors are forced to acknowledge the enormity of nature. This 5,350-acre facility is the perfect place for a variety of people to learn, research, study and commune with nature.

The Dixon Dream

The Center is the brainchild of the late Solon Dixon. The Dixon family has been in the forestry business since the 1800s. At one point, Solon and his brother, Charles, ran five sawmills and a plywood mill. When the property was later divided, Solon was determined to create an educational facility centered around the family's old home place.

Mr. Dixon had a compelling interest in natural resources. Although trained as an engineer, he spent most of his life in Covington County making a living from timber. He had a special love for the area—its history, the wildlife, timber resources and especially the unique places on the family property.

According to his wife, Martha, Mr. Dixon knew his dream of an educational facility would become a reality. When faced with obstacles, he was often told the task was impossible. Solon would refute this, saying, "No, it is not impossible; it'll just take a little longer." He was not alone in making the dream a reality. Solon had the ideas, but oftentimes Mrs. Dixon found the way for them to be implemented. She worked beside him endlessly during the planning and creation of the center. Although not involved in the day-to-day operations of the center, Mrs. Dixon still maintains close ties to the staff and visits occasionally.

Solon Dixon's vision and determination paid off. Working closely with Dr. Emmett Thompson, then dean of Auburn University's School of Forestry, plans were made for the dedication of the educational and research facility. In 1979 construction began on the facilities. The following summer Auburn's forestry students attended the first summer camp at the Dixon Center.

The Solon Dixon Center is certified as a Demonstration TREASURE Forest.

The Staff

Rhett Johnson was the first employee of the Center in 1979. His background as a forester and wildlife biologist made him

the perfect choice as the Center's director. Rhett and his wife, Kathy, live on the property. Also on site is the residence of the assistant director, Dale Pancake, and his family. Pancake joined the Center in 1985.

According to Johnson, the Center's success is a credit to the loyal staff, most of whom have been with the Center for many years; there is very little turnover. The staff does an outstanding job of managing the Center's many resources, but the most important aspect of their job is creating a comfortable atmosphere for visitors. The pride they have for the Center and their ability to make anyone, from students to dignitaries, feel at home is a testament that this is more than a job. Working at the Dixon Center is a way of life. In addition to Johnson and Pancake there are six other fulltime staff members. Teresa Cannon is the Center's secretary; Mark Hainds serves as outreach coordinator for the Longleaf Alliance; and David Padgett, Davey Sightler, Larry Stallings and Luke Vincent conduct forest research and management activities at the Center.

Forest Management

Mr. Dixon's commitment to the history and natural resource management encompassed TREASURE Forest ideals. The Center was first certified as a TREASURE Forest in 1991. Because of a change in the program's rules, it was recently recertified as a Demonstration TREASURE Forest.

Water bars and turnouts help keep the sandy roads from washing.

Mr. Dixon insisted from the beginning that the facility be self-supporting. This far-sighted provision encouraged the Center to be managed similar to private land, with some exceptions. The Dixon Center pays no taxes and it can borrow no money. As a result, large purchases are difficult and require years of planning.

The management objectives were set according to Mr. Dixon's priorities. In addition to managing its natural resources wisely and economically to provide income for the Center, other objectives are considered. Quality natural resource education, providing natural resource research, information and technology are all important considerations in the Center's management.

Pine stands of all ages are part of forest management at the Dixon Center.

Auburn University School of Forestry students practice surveying skills.

Timber and wildlife are the primary objectives, although one-quarter of the area was set aside because of natural uniqueness or significance in teaching and research. For example, a mature river bottom could be managed for timber, but it is used for teaching instead, since the variety of species makes the area especially useful in tree identification courses. The Center's diverse natural resources offer opportunities for different management schemes. Maintaining the timber diversity and the healthy wildlife population it supports is at the core of the Center's management.

When Rhett Johnson began working at the Dixon Center, most of the area had no deliberate management. Prescribed burning was the first tool to be implemented, and it continues to play a significant role in both timber and wildlife management. For several years, selective cuts were made in other areas to provide income to reforest cutover stands. After a few years, all the forested acres were in production, and the center became self-supporting. Sustained yield management—balancing growth and harvest—allows the Center to plan harvests and budget effectively. Since the Center is dependent upon income from the land, it takes advantage of all the resources. Income from hunting leases, agriculture and the periodic sale of pine straw is as important as a timber sale.

Numerous research studies are ongoing.

Hurricane Opal

Even the most meticulous plans can be destroyed. Fifteen years of planning and careful management was undone in two hours in October 1995 when Hurricane Opal dealt a devastating blow. Roads were blocked, stands of timber were destroyed and all the careful economic planning for the future was erased. Though the staff was frustrated at the unpredictable turn of events, they moved forward. Most of the damaged timber was salvaged, but the Center received less than half the market value.

Although Hurricane Opal was terribly destructive, there were a few bright spots. Restoration of longleaf pine was accelerated

because of the necessary replanting. A pecan orchard once served as a source of income, but was extremely difficult to manage. Hurricane Opal quickly took care of that problem! Although marketing limby, damaged pecan trees was troublesome, the area is now planted in longleaf pine.

The Dixon Center Staff: front row, l-r: Dale Pancake, Larry Stallings, Davey Sightler, Teresa Cannon and Rhett Johnson; back row, l-r: Luke Vincent and Mark Hainds; not pictured: David Padgett.

Research

A variety of research projects are ongoing. The Dixon Center staff conducts nearly one-third of the research efforts. Half of the research projects are cooperative efforts with Auburn University. Most of the research is applied, specific and intensive. Forestry research has centered around herbicide use, regeneration, fertilization and longleaf pine. Research on forest management's impact on the ecosystem is extensive. The impact of fire on the ecosystem is just one of the studies being conducted. Wildlife is important to the Center and often a focus of research. Indigo snakes, gopher tortoises, songbirds, white-tailed deer and gray squirrels have all been studied at the Dixon Center.

The research impacts the management of the Center's land. Areas for research studies must be carefully managed and maintained. Prescribed burning rotations are varied for research purposes, and a variety of site preparation and regeneration methods are used to accommodate research.

Research projects on longleaf management have provided opportunities for contact with scientists and managers with vast knowledge on the subject. So much of the information was unwritten and there was no formal way to share this important knowledge. Realizing the importance of coordinating the information and recognizing the dwindling acres of longleaf, a grass roots initiative was begun and the Longleaf Alliance was formed. The Dixon center serves as headquarters for the Longleaf Alliance. This organization is dedicated to the retention and restoration of longleaf pine, once dominant in the Southern ecosystem.

Education

The Dixon Center plays a vital role in Auburn University's School of Forestry and Wildlife Science. Each Auburn forestry student spends one summer term taking basic field forestry courses. This intensive training is an introduction to more advanced forestry courses at Auburn. Other short courses and field exercises are held at the Center during their junior and senior years. Beginning in 2000, wildlife students will also spend a summer at the Center.

The Center has served other students at Auburn as well. Entomology, fisheries, horticulture, agronomy and the School of Architecture have also been to the remote location for special classes. Other schools have also taken advantage of the excellent facilities and natural resources including Iowa State University and the University of Wisconsin.

Natural Resources

A short ride or walk through the extensive road or trail system introduces the observer to the Center's amazing natural diversity. Upland and bottomland hardwoods as well as mixed stands are represented on the property. Five different Southern pines occur naturally on the site. Dry, sandy ridges are located near cypress bottoms. The wildlife populations supported by such diversity are thriving. White-tailed deer, wild turkey, squirrels, quail and songbirds are abundant. The variety of songbirds found on the property has made birding a popular activity; a guide has been published for observers.

Because of the diverse habitats, small plants and wildflowers are abundant. Wild ginger and ferns are nestled along the banks of the spring; sensitive plant is tucked near a sandy path; fields of wild lilies provide a scenic backdrop for spring turkey hunters.

There are many unique areas on the property. The limestone sinkhole, an amazing shade of blue-green, is eye-catching because of its natural beauty. A natural phenomenon occurs occasionally when the sinkhole, like a giant drain, empties. Perhaps the most beautiful site on the property is the spring. Surrounded by huge ferns, this area offers a cool retreat. Looking closely, one can spot an amazing variety of plants not found anywhere else in the area.

The Dixon Legacy

Though Mr. Dixon died in 1987, his philosophy lives on in the Dixon Center. While opportunity for continued growth exists, a conscious decision has been made to get better, if possible, but not bigger. The Center will focus on its main objectives: sound management of natural resources and natural resource education.

Solon and Martha Dixon

Solon and Martha Dixon gave of their time, money and talents, but perhaps their most important gift was a vision for the future. Anyone visiting the Dixon Center, even for a short time, is forced to appreciate the area's beauty and abundant natural resources. Future generations will continue to visit the Solon Dixon Forestry Center. Each will take home a little of the Dixon philosophy. Martha and Solon Dixon not only a realized dream, they created a legacy.

Longleaf Pine: Natural Regeneration and Management

By **WILLIAM D. BOYER,** Retired Emeritus Scientist, USDA Forest Service, Southern Research Station, Auburn University

Longleaf pine has long been recognized as a high-quality timber tree providing a number of valuable products. It is a versatile species with characteristics allowing the use of several silvicultural options. Both natural and artificial regeneration of longleaf pine are now practical management options. Natural regeneration is a low-cost alternative whenever sufficient seed trees are present. If not, then longleaf can be restored through planting. Risks of planting failure have been greatly reduced through use of container stock, especially on adverse sites. Longleaf's reputation as a slow grower may be more myth than reality. On many former longleaf sites, the growth of longleaf may equal or exceed that of loblolly or slash pine. This article reviews the important attributes of longleaf pine and options for management of this species.

The Tree

Longleaf pine is a long-lived tree, capable of reaching ages close to 500 years, although this is rarely attained due to the many natural hazards ranging from lightning strikes to tropical storms. Longleaf pine is a very intolerant pioneer species, but generally lacks the characteristics of such species. It is a poor seed producer. The seeding range is relatively short. Seedlings, once established, may remain in the stemless grass stage for years before beginning height growth. Despite these competitive drawbacks, longleaf pine has maintained itself in place for thousands of years. To do so, the species had to become naturally established in sufficient numbers and, despite its slow early growth, manage to overcome many aggressive competitors.

Longleaf pine has always been recognized as a high-quality timber tree providing a wide range of products: logs, poles, piling, posts, peelers for plywood, and pulpwood. It usually has a higher specific gravity than other southern pines and thus produces more dry weight per unit of volume. On average sites, 30 to 80 percent of the trees will make poles, which are more valuable than sawlogs.

Longleaf pine has many attributes that allow a variety of management options. In addition to its commercial quality and versatility, longleaf, once established, is a low risk species to manage. It is resistant to fire and the more serious diseases and insect pests that afflict other Southern pines, including fusiform rust, annosus root rot, phytophthora, pitch canker, southern pine beetle, and tipmoth. The species develops a massive taproot that, in mature trees, may reach a depth of 8 to 12 feet or more, reducing the risk of windthrow.

Natural Regeneration

Successful natural regeneration of longleaf pine will depend on one of the occasional good seed years. Longleaf cone crops are highly variable from year-to-year, and from place-to-place. In most years, the cone crop will do little more than supply the many animals that feed on these large, nutritious seeds. In poor seed years there are not only fewer cones per tree, but also fewer sound seeds per cone. Given a receptive seedbed, 360 cones per acre are needed, on average, just to obtain the first seedling. A minimum of 750 cones per acre is usually needed to provide for acceptable regeneration. Given 25 residual seed trees per acre in a shelterwood stand, it takes an average of 30 cones per tree to reach this minimum. Cone crops of this size or larger are uncommon throughout much of the longleaf region, and are erratic in their occurrence. The large "masting events," indicated by an average of 150 or more cones per mature tree, are extremely rare. Two have occurred in the central Gulf Coast longleaf belt in the last 50 years: 1947 and 1996. In most years, cone crops will average less than 10 cones per mature seed tree.

Natural regeneration is a practical low-cost alternative given an adequate number and distribution of seed-bearing trees. It should not be difficult under these conditions, since nature has managed to do so over the millennia. Some of the observed examples of successful regeneration in nature seemed to resemble a shelterwood method and led to the hypothesis that this approach could be the most appropriate for longleaf pine. This has since proven to be the case. The shelterwood method of natural regeneration is highly flexible and can be adapted to a variety of site conditions and management objectives.

To ensure success, the manager needs to see that all biological requirements for natural regeneration are met in a timely manner. These include:

- An adequate seed supply.
- Pre-establishment competition control.
- A well-prepared seedbed.
- Post-establishment competition control.
- Control of brown-spot needle blight.

Except for seed supply, all these requirements can be met through timely use of prescribed fire.

Given a mature, managed stand of longleaf pine periodically thinned to medium densities, the regeneration process begins about five years before the planned harvest date. At that time, a seed cut creates a shelterwood stand with a residual density of 25 to 30 square feet

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One-year-old seedlings following heavy seed crop.

Longleaf Pine: Natural Regeneration and Management

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of basal area per acre of well-distributed, high-quality dominant trees, preferably those with a history of cone production. Cone production on a per-acre basis peaks at stand densities of 30 to 40 square feet, but the lower end is preferred because logging-related seedling mortality increases with increasing density of the overstory removed. At a stand density of 30 square feet or less, logging related seedling mortality should remain below 50 percent. In addition to maximizing seed supply, this density produces enough needle litter to fuel the fires that can limit hardwood encroachment and prepare an adequate seedbed when needed. During the wait for a good seed crop, high-quality volume growth is added to residual trees. Although the seed cut may reduce stand density by half, volume growth is reduced only about one-third as the dominant trees take advantage of released growing space.

Within a regeneration area, advance warning of an upcoming good cone crop is obtained through annual checks of flowers and conelets on sample trees. Binocular counts are made in the springtime, when both flowers and conelets are most visible. Flower counts are relatively unreliable predictors of cone crop size, due to uncertain and often heavy flower losses. These counts do reliably predict cone crop failures, and reveal any possibilities of a good cone crop. Counts of the green conelets are good predictors of cone crop size for the coming fall, although only a limited time remains to accomplish any needed competition control and seedbed preparation.

The regeneration goal is 6,000 or more seedlings per acre at least one year old before the parent overstory is removed. This number allows for logging losses of up to half the stand. It leaves enough survivors that the superior, fast-growing, brown-spot resistant fraction of the stand will provide 300 to 600 high quality trees per acre for the next generation. This number of one-year-old seedlings is flexible and may be adjusted to meet local conditions. A smaller number of established seedlings might suffice, especially if logging mortality can be reduced through careful supervision.

Once a regeneration survey indicates adequate seedling stocking, the overstory can be removed. Longleaf seedlings can survive for years under a parent overstory provided they are not burned before reaching a fire-resistant size. Thus, overstory removal can be scheduled to meet management needs or market conditions. However, the overstory should be cut before many of the best seedlings begin height growth. Stemless grass-stage seedlings are less likely to suffer serious damage from logging, but when they do, are more likely to sprout. Burning should be delayed until at least two years after overstory removal. This allows time for logging slash and accumulated litter to decay and for suppressed seedlings to respond to release.

A number of successful tests and applications of the shelterwood method described above indicate that longleaf pine stands can be regenerated naturally at low cost and with a high probability of success provided necessary cultural treatments are properly timed and executed.

Management

A principal management goal should be the use of silvicultural methods that

Development of multi-age longleaf pine stand under parent overstory.

can sustain longleaf pine ecosystems in perpetuity. They will incorporate natural regeneration and will likely simulate, in a systematic way, some of the events and processes that maintained longleaf ecosystems in nature. Management, however, can exercise positive control of the processes rather than merely responding to the impact of chance events.

Longleaf pine forests can be maintained with any one or more of three basic management systems or their variants. The three systems are: 1) even-aged management, 2) two-aged stand management (the irregular shelterwood), and 3) uneven-aged management. Each of these can simulate the processes that maintained longleaf pine in the past. While much is known about even-aged management of longleaf pine, relatively little is known about the long-term consequences of alternatives to traditional even-aged management or their adaptability to differing site conditions. Limited tests suggest that, at least on average sites, management of two-aged stands and selection management are both viable alternatives for longleaf pine.

Even-aged management—Even-aged stands are initiated by natural regeneration from one or several seed crops that occur within a short span of time. The parent overstory is removed only after an adequate seedling stand is established.

Variants include:

1. Rotation age
2. Thinning regimes.

This method represents the catastrophic stand replacement event that often led to the even-aged stands found in nature. Cutting replaces the blowdown that often followed severe tropical storms. Ultimately, most coastal plain forests will experience such an event, certainly within the potential lifespan of a longleaf forest. Risks from tropical storms increase with rotation length and proximity to the coast. Management hopes to ensure that the stand replacement event (overstory removal) occurs only after adequate regeneration is present. This may or may not occur in nature, and possibly not even under management.

Two-aged stand management—A mature stand is reduced to a shelterwood density after which seedlings from one or more good seed crops are established. All or part of the parent overstory is retained through all or part of the next rotation.

Principal variants are:

1. Maintain two-aged stand through rotation. Dominant ingrowth fills canopy gaps; thinning from below removes intermediate/suppressed trees, plus some dominant/codominant trees as needed to maintain desired stand density. At the selected rotation age, the process is repeated. Area control is preserved. Within the above, variants include:
   a) Density of residuals retained.
   b) Length of time residuals retained.
   c) Rotation length.
   d) Thinning regimes.
2. Maintain the reverse-J diameter class distribution (more small trees and fewer large trees) resulting from retention of overstory trees. This is a fast way to reach an uneven-aged stand structure. Selection management is imposed, leading ultimately to an uneven-aged condition which is maintained indefinitely.

Once the uneven-aged structure is established, variants will be the same as those listed below. Two-aged stand management represents the situation in which a partial stand is left after a catastrophic event and regeneration is present on the forest floor. It is most likely to occur where good seed crops are infrequent and regeneration from the first big crop preempts the site, maintaining essentially a two-aged stand.

Uneven-aged management—Forest stands are comprised of three or more age classes. Conditions are established to promote periodic recruitment of regeneration in order to develop and retain a full range of age classes within the management unit. Once established, it can be maintained indefinitely in absence of a major catastrophic event.

Variants include:

1. Single tree selection.
2. Group selection. Group size and shape a variable.
3. Any one of several methods of regulation.

This method represents the condition that develops over time with normal attrition, mainly through lightning strikes, bug-kills, fire, and limited blowdowns. This is combined with regularly recurring recruitment and retention of regeneration in newly created gaps.

Summary

The management systems outlined above illustrate systematic ways to perpetuate longleaf pine forests, including their diverse associated fire-dependent communities, using processes that maintained these systems in nature. The adaptability of longleaf pine to so many management goals and methods should make it an attractive management option for many forest landowners in the longleaf region. Stewardship of diverse and productive longleaf pine forests, growing high-value products, will not only provide a good economic return to the landowner but can also preserve environmental values that have nearly vanished from the Southern landscape.

Successfully Planting Longleaf Pine

By **MARK HAINDS,** Outreach Coordinator, The Longleaf Alliance

The longleaf pine has long been a major timber species in Alabama. Its insect and disease resistant traits and the high quality products derived from the tree make it an obvious choice among forestland owners and land managers.

In recent years its popularity has increased largely due to the high priority it has received in the Conservation Reserve Program (CRP). In an effort to re-establish the longleaf pine ecosystem, which provides for a unique habitat for many species of plants and wildlife, some changes were made to the ranking system. Landowners who agreed to plant longleaf received more points for certain practices and thus had a better chance of being accepted into the program. Over 30,000 acres have been accepted into the program this year alone.

Another big contributor to the increased popularity of the longleaf pine is the Longleaf Alliance. The Longleaf Alliance has been instrumental in providing information about seedling availability, technical information useful in improving seedling survival, historical information about the ecosystem, and has encouraged and promoted the management of the longleaf pine.

The Alabama Forestry Commission has joined with the Longleaf Alliance to produce a brochure called "Keys to Successfully Planting Longleaf Pine." The information in the brochure is contained in this article. It is hoped that this information will help many landowners interested in planting longleaf become successful in this endeavor.

Container or Bareroot?

Due to a resurgence of interest in longleaf pine, the supply of longleaf seedlings has also increased. However, longleaf seedling supply will probably not be sufficient to meet demand over the next few years. Those waiting until mid-summer to order may have difficulty finding seedlings.

Cost-conscious consumers may blanche at containerized seedling prices. However, cost incentive programs and increased survivability make this option very feasible. Results from a 1995 region-wide survey show containerized seedling survival averaged 85 percent and bareroot survival averaged 65 percent. Keep in mind, some planters consistently average 90 percent survival with bareroot seedlings, while others consistently average less than 50 percent.

There are several factors that come into play when making the containerized/bareroot decision. Do you want the seedlings planted in very straight rows with exact spacing? If so, you probably want your seedlings machine-planted. Bareroot seedlings are well suited for machine planting on intensively site-prepared land. On most sites, machine planted bareroot seedlings will yield better depth control and better survival than hand planted bareroot seedlings.

Will you accept less than exact spacing and rows that are not quite as neat and straight? If so, hand planted containerized seedlings may be the best route for you. Hand planted containerized stock tends to have better survival rates than machine planted containerized seedlings.

Longleaf pine can be successfully planted using either bareroot or containerized seedlings if the proper care and techniques are applied. Repeated planting failures are generally the result of planting mistakes.

Two common reasons for longleaf planting failures are:
1) Incorrect planting depth (too deep or too shallow), and
2) Planting in established grasses, especially bermuda grass or bahiagrass.

Seedling Selection

Most seed sources are from Coastal Plains stands located in lower Alabama, the Florida Panhandle, and south Georgia. These sources are appropriate for the southern half of Alabama. When planting north of Atlanta, use a north Alabama/Georgia seed source commonly referred to as "mountain" or "montane" longleaf. Check the Longleaf Alliance's *Longleaf Nursery List* for nurseries that use these seed sources.

Consider the following when purchasing bareroot seedlings:

- Seedlings should have been undercut and laterally root-pruned at least once in nursery beds.
- Seedlings should have at least six primary lateral roots and a highly fibrous root system with numerous feeder roots.
- Seedlings should be 0.4-inch in root collar diameter or larger.
- Roots should be moist but not too wet. A dry root system means a dead seedling.
- Seedlings should have healthy foliage and no evidence of disease problems.

Maintain Oversight of the Planting Operation

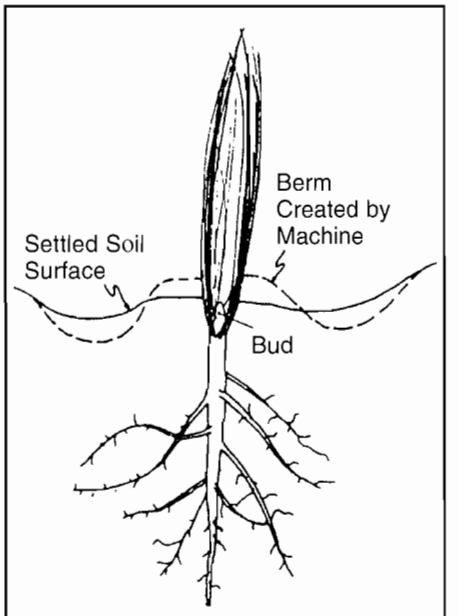
Choosing a tree planting contractor is one of the most important decisions you will make. Many planting failures can be traced to improper seedling handling and planting procedures by the planting crews. Make sure you pick the right contractor for the job. Choose one that has experience in successfully planting longleaf pine. **Ask for references.** Do not make your decision based upon per/acre cost of planting the seedlings. Paying $5-$10 per acre more for a good, reputable contractor may mean the difference between a successful planting and buying more seedlings and replanting the following year. Make sure your contractor and seedlings are compatible. If you line up a contractor whose only experience is planting containerized seedlings, don't buy bareroot. If you purchase bareroot, find a contractor who has been successful with bareroot. A list of tree

planting vendors is available through your Alabama Forestry Commission county office.

You or your representative should be on site with the planting crew to ensure that the operation meets your quality standards. You may want to hire a forestry consultant to manage or procure the contractor and planting job. Some foresters are knowledgeable about longleaf. Some are not. For a list of consulting foresters contact your local Alabama Forestry Commission office or call the Longleaf Alliance and request this information. Also, some of the larger timber corporations have landowner-assistance foresters who can help you.

Here are some rules of thumb for obtaining the best results:

- Plant early in the season; trees planted before Christmas tend to have better survival and growth rates than late planted seedlings.
- Do not plant in dry soils. Wait for adequate rain to wet at least the rooting zone (upper 6 inches of soil). You may plant as early as October provided the soil is moist.
- Do not plant if soils are frozen.
- High winds (15 mph or higher) and low humidity (30 percent or less) associated with high pressure cold fronts may dry out exposed seedling roots, potentially leading to high mortality rates if extra care is not taken.
- The best weather conditions for planting have a temperature between 33° and 75° F with a relative humidity between 30-50 percent. Wind speed should be less than 10 mph.
- Plant seedlings soon after delivery. Try to have all bareroot planted within one week of lifting from the nursery. Don't waste your money buying leftover bareroot from other planting jobs. Containerized seedlings will store better, but the sooner they are planted after lifting, the better.
- Always protect bareroot seedling bags or bales, and boxes of container seedlings from freezing, excess heat, and exposure to the sun and wind.
- Bareroot seedling roots should not be exposed to the sun and air any longer than is absolutely necessary. Never wash or prune the roots of bareroot seedlings as these procedures will reduce survival.



Machine Planted Longleaf Pine Seedling

Planting Tips

It is critical to kill Bermuda grass or bahiagrass **prior** to planting. These grasses are much more difficult to control after planting when chemical control options are severely restricted. For best survival in pastures, broadcast spray grasses in August prior to planting with one of the following: A) 5-6 qt. of Accord®/acre; B) 3 qt. Accord and 2 oz. Oust/acre; or C) 16-24 oz. Arsenal®/acre. Other herbicides labeled for grass control may be used. As an additional step, scalping sites just prior to or during planting has increased survival in pastures. For information on herbicide applications, contact the Alabama Forestry Commission or the Longleaf Alliance.

Many agricultural fields and pastures have a hard, restrictive soil layer referred to as a plowpan or hardpan. In such cases, "ripping" or "subsoiling" will fracture the hardpan, resulting in better planting conditions. Seedling root growth will also be greater, resulting in better seedling growth. Ripping should be done several months prior to planting, as several rain events are necessary to settle the soil to eliminate air pockets. Rip along the contour of the land to avoid unnecessary erosion. Seedlings should be planted about 6 inches to the side of the rip. Do not plant directly in the rip because water will frequently use the rip as a channel, uncovering some seedlings and burying others. The taproot of the longleaf will find the rip and penetrate deeper into the soil, thus minimizing the chance of wind-throw and increasing water availability to the tree.

When planting pastures or areas that will not erode, plant seedlings so that the root collar is directly at the soil surface. When planting cropland or other areas that have been heavily site-prepared, plant seedlings so that the root collar is about 1/4- to 1/2-inch beneath the soil surface. Try to anticipate how much the soil will erode so that the root collar will end up at the soil surface. Planting too shallow will result in a seedling that dies quickly. Planting too deep will result in a seedling that dies slowly. Good compaction is needed to eliminate air pockets around seedling roots. Heavy-duty machines generally do a better job of packing than the typical hand planting crew.

Use the correct tool when hand planting. As bareroot seedling roots are very large, planting shovels work best in opening a planting hole large enough to accommodate the root system. Many containerized seedlings have tools designed especially for their plug size. Using the correct tool will result in less root deformation, better survival, and better long-term growth.

Be sure your planting contractor understands your CRP or WHIP contract. If you are contractually mandated to plant less than 500 trees per acre, the crew should know this. If not, they may do you a "favor" by planting leftover seedlings between previously planted seedlings. This would result in more than 500 trees per acre and could cause you to lose your funding.

For a comprehensive list of longleaf nurseries, call your county office of the Alabama Forestry Commission or the Longleaf Alliance, at 334-222-7779, and ask for a complimentary copy of the *Longleaf Nursery List.*

TURPENTINING:

One of the South's Oldest Forest Industries

By **TILDA MIMS,** Education Specialist, Alabama Forestry Commission, Northport

In Genesis, God tells Noah to build an ark of gopher wood and seal it with pitch both inside and out. Using tar and pitch to waterproof wooden shipping vessels is one of the world's oldest trades, with records dating back more than 2,500 years.

When ships were made of wood, shipwrights used rosin to caulk boards forming the ship's decks and frame to prevent water from leaking into the holds of the vessels. Sails and their cordage were waterproofed with pitch. Ropes used to hold cargo, made from woven fibers of hemp and other plants, received a coating of tar preservative.

Turpentine distilled from the pitch provided a "diffusable stimulant, diuretic and anthelmintic, in large doses acting as a laxative," as well as lamp oil for those who sailed the seas.

The term "naval stores," coined to refer to tar and pitch used for wooden ships, is now used to describe all segments and activities related to (1) extraction of gum from living trees, (2) processing and distillation of gum into turpentine and rosin, and (3) marketing of gum turpentine and gum rosin. Products of naval stores industries are oils, resins or gums, and tars of pine trees, particularly longleaf and slash.

Colonial Export

In Colonial America, naval stores exported from Boston and other ports were big business. In 1608, only one year after Jamestown was settled, the first shipment from loblolly and longleaf pines in Virginia and North Carolina sailed to England. Later, pitch pines growing in the northern extremity of the region supplied much of the naval stores foreign market.

By 1700, naval stores were in production in all of the colonies. This was a welcome relief to England, who had been buying almost all of its naval stores from Sweden. The Swedish government had granted a monopoly to The Stockholm Tar Company, which promptly raised prices 100 percent for tar and pitch purchased by the English. English authorities responded with the 1705 Bounty Act to encourage colonial production of naval stores. Bounties amounted to four pounds per ton for tar and pitch and three pounds for rosin or turpentine. It is interesting to note that the Act also imposed restrictions on cutting pines less than 12 inches in diameter, reflecting their concern for conservation of this valuable resource.

The colonists extracted resinous sap from trees that lay on the ground and from stumps. Draft animals pulled fallen trees to a pit for burning. Under slow combustion, the resinous fluid was drained from the trees into wooden barrels countersunk in the ground adjacent to the pit. Tar and oleoresin in extracted pitch were separated from the burning wood as the heat reached the boiling point for the two distillates. A large wooden barrel, perhaps eight feet in diameter, was used to distill gum into turpentine and water. Turpentine, lighter than water, was drained from the top into a white oak barrel for shipment.

Shortly before the American Revolution, turpentiners developed a technique for obtaining resin from *living* trees. V-shaped cuts were chipped into the wood to stimulate resin flow. When gum ceased to flow, new openings were made. Trees were typically used for three years or until they were worked as high as a man could reach.

The first containers for collecting flowing gum were called "boxes," which were made by chopping a deep hole into the base of the tree. This practice damaged the boles for lumber, and fungi and insect entry occurred at these wounds. Clay pots and rectangular pans of galvanized metal eventually replaced boxes carved into trees. Aprons or gutters made of strips of galvanized metal were used to guide rosin into the pans.

Production Moves South

As demand for naval stores increased, production began to move further south. In 1840, North Carolina produced 95 percent of the country's naval stores, earning citizens of that state the nickname "tarheel" because the dark oxidized gum adhered to the feet of barefoot workers.

For a long time, lumbermen believed that bleeding trees for gum resulted in wood so weakened that it couldn't be made into boards. As a result, a lot of wood was wasted in the turpentined trees left standing in the forest or in the butt logs of harvested trees. Bernhard Ferrow, a German-born forester who became the third head of the USDA Bureau of Forestry (now the Forest Service) and founding professor of three forestry schools, is responsible for promoting the idea that turpentined trees were still useful. He encouraged lumbermen and turpentine farmers to integrate gum production and timber management, chipping trees for a few years, wounding only the bark, before harvest.

During the Civil War, shipment of naval stores to northern states was halted; following the war, chipping began anew near port towns in Alabama, Mississippi and Florida. Operators built company towns that contained stills, spirit sheds for storing, rosin yards, blacksmiths, cooperage sheds for barrel manufacture, wagon sheds, barns, commissaries and quarters for laborers.

Tracts to be turpentined were leased and the necessary equipment was supplied to workers. Typically turpentine orchards were "worked out" in 10 years, the camp towns abandoned and the workers moved on. Chippers, strong men who hacked trees at the rate of one thousand "faces" a week, were the highest paid. They cut gashes about 1/2-inch high and

This exhibit at the Southern Forest World Museum in Waycross, Georgia, shows how trees were turpentined over the years.

3/4-inch deep on the tree with a bark hack. The hack had a 20-inch handle with five pounds of iron on one end and a knife blade on the other. Each laborer was expected to cultivate 10,000 faces during the six months of warmest weather. A unit equaled one 50-gallon barrel of turpentine plus three and one-third 500-pound barrels of rosin. The average crop of 10,000 faces yielded about 34 units annually. It is estimated that by 1880, the Southern states were distilling more than 19 million gallons of turpentine and more than 2 million barrels of tar annually.

Industrious turpentiners were often recruited to join another camp. Recruiters could earn as much as $25 per laborer but often paid with their lives when caught. Worker pirating became such a serious problem that the Florida Legislature passed a statute in 1891 providing a penalty of up to one year in prison for walking off the job if the employee owed his employer a debt. Many turpentiners remained in debt to their employer and were unable to leave, no matter how dire the working conditions. Paychecks were often valid only for credit at the camp commissary, making it easy to sink further and further into debt, particularly when sickness or injury occurred. Many states allowed employers to lease prisoners from chain gangs and convict camps to work in turpentine camps. Prisoners slept in chains and worked under armed guard. This practice continued until 1923, when the last state, Florida, eliminated the practice.

Increased Production

Following World War II, it was discovered that sulfuric acid treatment of the wound caused sap to flow more freely, particularly from slash pine, causing the tree to produce gum twice as long as before. After 1945, many operators made the transition from weekly chipping to biweekly chipping with the addition of spray. Labor costs were diminished while gum quantity increased.

Turpentine production peaked in 1900. In 1936 the USDA offered cost-share for turpentine farmers. Even with the Naval Stores Conservation Program, production and prices fluctuated widely. Beginning in 1946 the government bought up barrels of turpentine under the Agricultural Marketing Act, and in 1972 liquidated their supplies as substitutes for gum naval stores were found in petroleum, exotic plants and in sulfate naval stores. Sulfate naval stores refers to products derived from gum obtained by the sulfate process in making paper. By 1945, the quantity of sulfate naval stores had a significant impact on the market as pulp and paper manufacturers collected the same chemicals as by-products of their day-to-day production.

The United States is fortunate to have a natural resource of slash and longleaf pine that has supported the gum naval stores industry for centuries. U.S. gum rosin is noted for its quality and is preferred by many consumers, yet China is the world's largest producer of all rosins, supplying 50 percent of the gum turpentine and 38 percent of the gum rosin. Today the U.S. produces only 3 percent of the global supply of gum turpentine, all of it from south Georgia. The United States and Canada, however, dominate the market in sulfate turpentine with about 69 percent of global production.

Largely used in making varnish and in oil painting, turpentine is also used on horses and cows for sprains, bruises, swelling and to kill parasites. Currently, most wood turpentine is upgraded into chemical resins and adhesives, and pine oils. Fragrance chemicals are the most rapidly growing market, consuming about one-third of the turpentine processed.

A turpentining operation near Brewton, Alabama, circa 1968.

Conclusion

Many industry experts believe that demand for gum turpentine and rosin will continue to grow stronger and that the U.S. should be prepared to produce whatever level of naval stores production is needed. Continued research in gum naval stores will provide a profit for U.S. timber growers and offer multiple use opportunities for the slash and longleaf region of our nation, putting us in an excellent position to take advantage of future opportunities.

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Walker, Laurence C. **The Southern Forest: A Chronicle.** University of Texas Press, 1991.

Glossary of Terms

Gum naval stores—refers to gum and its derivatives collected from living trees.

Wood naval stores—products derived from gum obtained through steam or destructive distillation of felled coniferous wood including stumps.

Sulfate naval stores—products derived from gum obtained through the sulfate process in making pulp for paper.

Herbicides & Longleaf Pine Establishment

By **MARK HAINDS,** Outreach Coordinator, The Longleaf Alliance

Less than 3 million acres of longleaf remain from a population that once covered an estimated 90 million acres. If there is to be a renaissance of longleaf forests and ecosystems, it will result from landowners and managers facing and conquering difficulties associated with the artificial restoration of longleaf pine. Indeed, halting the decline of longleaf acreage alone would prove a momentous accomplishment after 500 years of reducing and degrading this forest type.

To this day, many foresters encourage landowners to clearcut mature longleaf and plant other pine species better adapted to foresters schooled in "traditional" forest management. Likewise, many tree planters will insist that longleaf cannot be successfully planted. One way to identify these planters is through their equipment—their tractors having never seen the lower range of gears, all previous plantings having been conducted in the highest gear the tractor can pull the planter.

Longleaf can be successfully planted and longleaf does not typically spend 10 years in the grass stage. With adequate site preparation and herbaceous weed control, it is common to attain survival rates of 90-95 percent, with the majority of seedlings starting height growth by the end of the second growing season.

Artificial Regeneration/Planting

Longleaf is planted on two types of sites, cutover forestland and agricultural fields. Both areas have different requirements for site preparation, tree planting, and herbaceous release. At first glance, cutover sites would appear to be the more challenging of the two. Cutover sites can be quite trashy, even after a mechanical site preparation. Mechanical tree planters often complain about or even refuse to plant a site unless it has received a very thorough mechanical site prep. Intensive mechanical site preps have a few associated problems that can lead to tree planting failures with longleaf pine.

Container seedlings after two growing seasons. Released both years with Oust/Velpar.

In general, mechanical site preparation tends to "fluff" or loosen the soil. The more intensive the site prep, the looser and fluffier the soil. Machine tree planters have less control over planting depth in loose or fluffy soils. Planting depth is of the utmost importance with longleaf pine seedlings. Loose soils can be problematical since seedlings planted too deep or too shallow will not survive.

Another problem associated with mechanical site preparation is erosion. Erosion is more problematic with longleaf plantings than with plantings of other pine species. If soil moves onto a seedling, covering the terminal bud, new needles emerging in the spring will crinkle up beneath the soil and eventually die. If soil washes away from the seedling, thus exposing the roots or the "plug" of the container seedling, the seedlings will probably desiccate and die during the next dry period.

Chemical site preps have some advantages and disadvantages when compared to mechanical site preps. One distinct advantage is the reduction in soil movement. Alone, a chemical site prep leaves most of the stumps, logging slash, and tree root systems in place. There tends to be less erosion following a chemical site prep, as compared to a mechanical site prep. Of course, leaving the slash in place means that mechanical tree planting will be more difficult or even impossible on many of these sites. Thus, a straight chemical site prep frequently necessitates a hand planting operation. Luckily, one combination shown to be consistently successful on cutover sites is the following:

1. Harvest the trees.
2. Apply chemical site prep and wait for brownout.
3. Burn the slash and vegetation after brownout.
4. Hand plant container grown seedlings between Oct. 1 and Dec. 31.

This combination has proven very reliable even during periods of extreme drought in the spring following planting. Successful plantings of longleaf with survival rates of 80-90 percent have been witnessed, while bareroot loblolly and slash pine plantings in surrounding areas were outright failures due to prolonged dry spells in March and April.

Several different chemicals may be used for the site prep treatment. Commonly used herbicides for chemical site preps include Arsenal®/Chopper®, Accord®, Garlon®, and Velpar®. These chemicals are effective when applied at the right time of year, on the right vegetation, and on the right soil type. Rates and chemical applied will vary widely based upon these previously listed site variables.

Another advantage of chemical site preparation that may not be readily apparent is the retention of several native shrub and herbaceous species. Intensive mechanical site preps tend to remove root stocks of many of these native perennials. Depending on the chemical applied, desirable native species such as native legumes, blueberries, and other important wildlife browse species can be maintained. On sandy sites, hexazinone products in particular (Velpar L®, Velpar DF®, Velpar ULW®, and Pronone®) are

effective at controlling undesirable oaks, while retaining important quail food species such as low-bush blueberry, lespedezas, beggars-ticks, sensitive briar, pencilflower, and many other native legumes.

Switching gears, agricultural fields are a whole different ballgame. While tree planters have less to complain about in a typical old-field, good survival and growth of longleaf pine seedlings can be harder to come by in these areas.

The most common mistake leading to planting failures in old fields is planting longleaf directly into established grasses. Bermuda grass is longleaf's arch-nemesis in old fields and pastures. Bahiagrass is not much better. If Bermuda grass is present, it is imperative that it be treated prior to planting. Band spraying is not sufficient and mechanical treatments like disking just move the bermuda-tillers around. Broadcast chemical applications of glyphosate (Roundup® & Accord®) or imazapyr (Arsenal® & Chopper®) are called for. Either product can be used on its own, but tank mixes are probably more effective. These products get the best kill if applied while the grass is actively growing.

A relatively cheap operation called scalping has been shown to be very effective in improving longleaf pine survival in old fields and pastures. Scalping simply peels back the sod so that seedlings can be planted directly into the mineral soil. If scalping is done, it should follow the broadcast chemical application and should be done with the contour of the land.

Herbaceous Release

In the spring following planting, sites should be evaluated for herbaceous release. From several studies conducted by the Longleaf Alliance, longleaf seedling survival is more strongly correlated with site preparation and planting depth than with the herbaceous release. However, a herbaceous release can dramatically effect early growth rates. In general, the less herbaceous competition around a seedling, the quicker it will emerge from the grass stage.

From a "Critical Timing of Release" study conducted on a cut-over site that had been intensively mechanically site prepared, a one time application of an Velpar DF®/Oust® tank mix resulted in 93 percent of the longleaf pine seedlings starting height growth (bolting) after three growing seasons. The control plot had only 80 percent of surviving seedlings bolting after three growing seasons. Untreated seedlings were on average, one-third shorter than chemically released seedlings. Seedlings receiving two years of herbaceous weed control were roughly twice as tall as untreated seedlings. Some of the released seedlings were approximately 8 feet tall after only three growing seasons.

Since seedlings receiving a chemical release come out of the grass stage quicker, they are less susceptible to brown-spot needle-blight. In the previously discussed study, seedlings given a one-time application of Velpar DF®/Oust® had considerably less brownspot than untreated seedlings. Twelve percent of treated seedlings had severe cases of brownspot, while 27 percent of the untreated seedlings had severe cases of brown-spot needle-blight.

Depending on the type and intensity of the site preparation, a herbaceous release in the spring following planting may not be necessary. In general, mechanical site prep jobs should have a chemical release application the following spring. On areas that have received a chemical site preparation, a herbaceous release may not be necessary. The "carryover" effect on chemically prepared cutover sites frequently controls at least some of the herbaceous competition. Sometimes, little is gained from a herbaceous release in the spring following planting.

Herbaceous releases can also be very helpful in old fields and pastures. Hopefully, the worst grasses will have been eliminated prior to planting. From a recently installed study, we have observed our best weed control from a spring herbicide application occurring on soils that had been scalped, then soils that had been chemically site prepared, and the worst control came on sites that had no site preparation besides sub-soiling.

A commonly used and versatile chemical in old-field situations is Oust®. However, there may be increased activity with Oust® on high pH soils. If the soil pH is above 6.5, rates of Oust® should be reduced. If pH is above 7.0 Oust® should probably not be used. Other commonly used chemicals labeled for over-the-top release of longleaf pine in the first growing season include Oust®, Velpar®, Arsenal®, Accord®, Fusilade®, and Poast®. Some other chemicals we are examining at this time are Atrazine® and Endurance®. Dupont Corporation is testing some new chemicals that show a lot of promise with longleaf pine.

Some chemicals that should not be used over the top of young longleaf pine include Escort®, Atrazine®/Oust® tank mixes, and Arsenal®/Oust® tank mixes should not be applied before May 1.

Technically, the Velpar®/Oust® mix is the only "labeled" combination or "tank-mix" currently registered for over-the-top release of longleaf pine in the first growing season. On the other hand, mixing two individually labeled herbicides and spraying them over the top of longleaf pine seedlings is not specifically prohibited. However, one must be careful in mixing herbicides since the resultant tank-mixes can be "hot." For instance, Arsenal® or Oust® applied individually and at labeled rates tends to be fairly benign with longleaf pine seedlings. However, when these two herbicides are combined as a tank-mix, they can severely damage or kill longleaf pine seedlings. To minimize seedling damage, spray Arsenal®/Oust® tank-mixes as post-emergent applications.

The Longleaf Alliance has completed one herbaceous screening trial using bareroot seedlings and is currently working on a second using container-grown seedlings. Some observations from these two studies, and other previous studies suggest:

1. Earlier planted seedlings handle herbaceous release better than later planted seedlings.
2. Container-grown seedlings handle herbaceous release better than bareroot seedlings.
3. Seedlings are more susceptible to damage if chemical is applied during periods of severe stress such as droughts.
4. Some chemicals cause more harm than benefit.
5. Timing and rates of application are very important.

Conclusion

Herbicides can play an important role, sometimes an indispensable role, in the establishment of longleaf pine. Landowners who are not familiar with the use of herbicides would do well to seek professional help. It is easy to cause severe damage to your young longleaf pine stand if you make mistakes in your choice of chemical, rates applied, or timing of application.

Flomaton Natural Area:
A Living Museum for Longleaf Pine

By JOHN S. KUSH, Senior Research Associate,
Longleaf Pine Stand Dynamics Laboratory, School of Forestry, Auburn University

Roland Harper, Alabama state geographer in the first half of this century, wrote in his **Economic Botany of Alabama** (1928), "Longleaf pine might have once been the most abundant tree in the United States and was certainly the most abundant tree in Alabama." He went on to say, "longleaf had more uses than any other tree in North America, if not the whole world."

Longleaf pine stands once covered an estimated 80-90 million acres of the Southeastern U.S. and today occupies less than 3 million acres. As other articles in this issue discuss, there is renewed interest in longleaf pine, both within the state and across the Southeast. As part of this renewed interest, there is a need for the conservation and preservation of all remaining old-growth longleaf pine stands. A 1996 survey of the Southeast found only 14 existing old-growth longleaf pine stands totaling 9,755 acres. Of these, only four might be considered virgin, stands never having been logged. Alabama has one of these remaining stands, the Flomaton Natural Area, a 65-acre tract owned by Champion International Corporation. The stand is located on U.S. Highway 29/31 just east of the intersection between U.S. Highway 29/31 and Alabama Highway 113 in Flomaton, AL.

Aerial views of the Flomaton stand taken in the mid-1950s and in 1993.

Flomaton's Stately Status

The significance of the stand was already recognized by the Society of American Foresters (SAF) in 1963 when they designated what was then the St. Regis Tract as the E.A. Hauss Old Growth Longleaf Natural Area. The SAF's definition of a natural area is "a tract of land set aside to preserve permanently in unmodified condition a representative unit of virgin growth of a major forest type, with the preservation primarily for scientific and educational purposes."

In 1966, the U.S. Department of the Interior made inquiries into the stand for inclusion in the National Registry of Natural Landmarks. Due to a moratorium placed on additions to the register, the stand was not included.

Champion International Corporation has included the stand in their "Special Places in the Forest" program. The program recognizes unique sites situated within their working forests and sets them aside from their normal forest management operations to protect, maintain, or restore their uniqueness.

Forest History and Threats to Existence

The Flomaton Natural Area is a microcosm of the recent history for longleaf pine and the many threats it faces. The entire history of the Flomaton Natural Area is unknown. Undoubtedly, it survived severe droughts, wildfires, windstorms, and by whatever means, its cutting at the hand of man. It is known that the Alger-Sullivan Lumber Company, one-time owner, dedicated the stand to preservation some time after the turn of the century. As part of the preservation effort, the stand was regularly control burned. When Alger-Sullivan sold the stand in the 1950s, the regular control burns ceased and its survival faced new threats.

Threat #1: Cessation of fire—With the cessation of fire came the cessation of longleaf pine regeneration, as happened over so much of the Southeast after the original forest was cut.

Threat #2: Reintroduction of fire—With no regular burning in longleaf pine stands comes a second threat, and this happens when fire is brought back into a system. "Let it burn, it won't hurt anything." These were the words used to describe a small fire that occurred on a 7-acre patch of the Flomaton Natural

The Flomaton stand as it looked in 1958.

Area in May 1993. That fire in an area that had not seen fire in more than 40 years killed 91 percent of the old-growth longleaf pine greater than 15 inches in diameter. One of those trees killed had a diameter of 36 inches and was 340 years old. The fire had little impact on the hardwoods.

Threat #3—Conversion of longleaf pine stands to other species—About 30 years ago, 7 acres on the north side of the stand was cleared and planted to slash pine.

Threat #4—Sitting idly by and doing nothing—A patch of approximately 1.5 acres has been left to show what 40 years of no management does to a stand. A 40 plus year absence of fire had permitted shortleaf, loblolly, and slash pine to grow into the overstory. A substantial shrub layer and hardwood midstory dominated by oak species developed. Longleaf pine regeneration and the herbaceous vegetation component became non-existent due to an accumulation of a thick pine straw layer.

Rebirth of the Flomaton Natural Area

Many of the remnant old-growth longleaf pine stands remaining have been reduced to isolated, often degraded patches in the contemporary southeastern landscape. The Flomaton Natural Area was one of these stands. In an effort to restore the Flomaton Natural Area, an agreement was signed in 1994 among The Nature Conservancy, the Alabama Natural Heritage Trust of the Alabama Department of Conservation and Natural Resources, Auburn University School of Forestry, Champion International Corporation, the USDA-Forest Service Southern Research Station, and the Alabama Forestry Commission to cooperate with respect to restoration, management, research, education and the transfer of information and technology involving the tract.

Partners in Restoration

The School of Forestry at Auburn University, the USDA-Forest Service, and the Alabama Forestry Commission, in agreement with Champion International Corporation, implemented a program for restoring the longleaf pine ecosystem. Fire was reintroduced to approximately half the stand in January 1995 and the other half in April. The same burning regime was followed in 1996. In April-May 1996, a fuelwood operation was conducted by the Easterling Brothers of Brewton, AL. They removed 1,350 tons of hardwood chips and inflicted very little damage to the residual stand. In June 1997, a spring burn was used in an effort to reduce and eventually eliminate hardwood sprouting. The plan was to implement spring burns in 1998 and 1999 but dry weather conditions made this too dangerous. Plans are to burn the stand during the 1999 winter.

Logs from Flomaton were used for restoration purposes in Colonial Williamsburg. Here tree #281, determined to be 287 years old, is cut to be used in the Peyton Randolph home (Inset).

Photo of the Peyton Randolph home courtesy of the Colonial Williamsburg Foundation.

The Auburn University School of Forestry has been studying the dynamics of the Flomaton Natural Area as it undergoes restoration efforts. The stand is a good representation of virgin stands of longleaf pine described by early authors. Data collected from the stand suggest the conditions present at Flomaton today are not outside the historic range of variability for old-growth longleaf pine stand structure. Several trees approach the state champion longleaf pine, larger than 30 inches in diameter at breast height and nearly 120 feet tall. In addition to large size, the stand contains several trees more than 300 years old.

The cooperators and Champion International Corporation entered into a Memorandum of Understanding (MOU) to restore the original longleaf ecosystem. This MOU has resulted in implementation of a successful prescribed burning, hardwood removal, and research program that is already making significant progress towards restoring the forest ecosystem.

The U.S. Forest Service, with the assistance of the Alabama Forestry Commission, has been instrumental in conducting the prescribed burns. Given the difficulties presented in re-introducing fire to the stand, their expertise and the care taken with the first three burns has been invaluable.

Future Forest: A Living Museum or a Museum Piece?

The proposed widening of U.S. Highway 31 between Brewton and Flomaton involved the cutting of at least 6 acres of the stand. Through the efforts of the partners and the Alabama Department of Transportation (ADOT), the number was reduced to a little more than 1 acre. In addition, ADOT provided financial support to conduct studies on the trees removed and restoration efforts within the stand. In February 1998, nearly 300 trees were removed from the stand.

Through the efforts of the Longleaf Alliance and Champion International Corporation, arrangements were made with Colonial Williamsburg to receive the harvested trees. Logs, many of them pre-dating the American Revolution, were shipped to Colonial Williamsburg. There they will become floorboards, doors, and window frames in the home of Peyton Randolph, who died while serving in the Second Continental Congress, which adopted the Declaration of Independence in 1776. In exchange for the timber, Colonial Williamsburg is supposed to provide educational experiences for students in schools in Escambia County, AL and adjacent Escambia County, FL. Included in that experience should be lessons in conservation and preservation, especially for what little old-growth longleaf pine stands and trees remain.

If you have an opportunity to visit Colonial Williamsburg, stop by the

Continued on page 21

Restoring the Longleaf Pine Forest Ecosystem

By **RHETT JOHNSON** and **DEAN GJERSTAD,** Co-Directors, The Longleaf Alliance

The story of the decline of the once vast longleaf pine forest is told elsewhere in this magazine. Knowing why and how it disappeared is the necessary first step in knowing how to stop and reverse the decline. Remember, those who fail to understand history are doomed to repeat it! Sometimes things disappear because their time is past. Not many extinctions in the grand scheme are the result of human activity, despite what some would have you believe. For a time, it appeared that the time for longleaf had indeed passed. Closer examination, however, reveals that the tree, the forest and the entire ecosystem suffered because of lack of knowledge about how to tend it, lack of appreciation for all of its qualities as a commercial product, and lack of understanding of all of its unique contributions. Is it worthy of our efforts to preserve it as a working part of the Southeastern forest? The answer, for many foresters, ecologists, biologists, naturalists, industries and landowners, is a resounding "yes."

Wiregrass and longleaf pine—a fire-driven climax forest.

When we speak of restoration of historic buildings or antique furniture, we envision a re-created version as close to the original as possible. What do we mean when we talk of restoring the longleaf forest? Do we mean getting longleaf back on the land or do we mean restoring longleaf along with the rich plant and wildlife community we commonly associate with fire maintained longleaf forests? At what point do we declare victory and move on to other sites and challenges? Perhaps we can only declare success when we have established the rudiments of a functioning longleaf system and put into place a management plan which will lead to long-term viability of that system. Then there are questions of scale and distribution across the landscape. It quickly becomes evident that restoration is a moving target and that we need to choose achievable goals as immediate targets and set new ones when those are reached. The ultimate goal of the many groups working to restore longleaf today is to make it a significant component in the Southern forest once more, contributing all of those functions and processes that longleaf forests do in a fire-driven system. Knowledgeable foresters, ecologists, and land managers recognize that the longleaf ecosystem is a fire climax system. The absence of fire invariably leads to the decline of the understory community first and, ultimately, if fire is excluded long enough, longleaf itself.

Old-time lumbermen lament the decline of longleaf, other species falling short in quality. Ecologists and naturalists point to the loss of diversity that intact and functioning longleaf ecosystems provide. Sportsmen see a critical link between fire-maintained longleaf forests and quail populations, and the decline of one has coincided with a decline in the other in many areas. Restoration of longleaf has many forms with many objectives, but two things bind them all together. First, there is the desire to retain the existing longleaf forest and to manage it to attain as many of the attributes of the fire-maintained presettlement forest as possible within the constraints and objectives imposed by the landowner. Second, there is a desire to re-establish longleaf—to the degree that meets the landowner's desires and means—on land where it originally grew.

Public and Private Lands

Much of the longleaf forest that exists today in anything resembling the restored state is located on public land and most of that on federal land. Because of geography, natural history, and frequent fires ignited by military ordnance, military reservations like Eglin AFB, Ft. Bragg, Ft. Benning, Ft. McClellan and Camp LeJeune retain hundreds of thousands of acres of fairly intact longleaf forests. The Department of Defense has made retention and restoration of that forest ecosystem a close second in priority to their military mission. The Department of Interior owns much less land that is amenable to longleaf, but, where it occurs, the Park Service and the U.S. Fish and Wildlife Service have made retention and restoration of longleaf a management goal. The U.S. Forest Service, in keeping with their stated objective of maximizing natural biodiversity on National Forests, has featured longleaf management and restoration on all natural longleaf sites, protecting and adding tens of thousands of acres to the total of longleaf in existence today. Several state forests, including Blackwater in Florida and Geneva and Little River in Alabama, contain and manage thousands of acres of longleaf pine forest. This public land has great stability and promise for the future, but it makes up less than 10 percent of the land in the historical longleaf region and less than 5 percent of the forestland in Alabama.

More than 90 percent of the land in the former longleaf region is privately owned and there lies the hope for making longleaf a significant component of the

Southern forests once more. A few forest industries, like T.R. Miller/Cedar Creek Land and Timber Co. of Brewton, have historically managed the native longleaf on their lands for their own mills, producing high quality lumber and poles for the commercial market. Another landowner group who owns and maintains large tracts of longleaf today is the group who owns and manages land for quail. These traditionally managed plantations have retained much of the longleaf diversity almost by default. The ability to manage quail and quail habitat with fire is dependent on the tolerance of the forest itself to fire, and longleaf is truly a creature of fire.

Many private landowners have either inherited or purchased longleaf forests and wish to manage them. Others have memories of the longleaf forests of the past and want to re-create them. Some plant and manage longleaf to encourage quail on their properties and still others want to reap the economic benefits from pine straw and lumber that longleaf pine can yield. The Conservation Reserve Program (CRP) recognizes longleaf as a National Conservation Priority Area, giving preferential treatment to landowners who want to plant it on agricultural lands. The greatest opportunity to make longleaf a significant component of Southern landscapes again is on private lands, since they make up the vast majority of ownerships in the region.

Groups Take the Lead

Many groups have undertaken the restoration of longleaf and longleaf ecosystems in the past several years. Tall Timbers Research Station, located in the rolling Red Hills quail plantation region between Tallahassee and Thomasville, Georgia, probably pioneered the effort to understand the relationship between fire and quail and longleaf. The U.S. Forest Service also began early work on fire and longleaf at the Escambia Experimental Forest near Brewton. The drive to actually restore whole longleaf ecosystems is relatively recent, however, dating back only a decade or so on any appreciable scale. The Nature Conservancy has been active in cataloguing the longleaf resource, protecting it where possible, and attempting to re-create pre-settlement conditions, learning much in the process. Several years ago, the Jones Ecological Research Center was created in South Georgia and has focussed intensive scientific scrutiny on both familiar and less obvious aspects of functioning longleaf ecosystems.

Today, the Department of Defense, the U.S. Forest Service and the U.S. Fish and Wildlife Service all manage the longleaf forests they control so as to restore them to some semblance of the pre-settlement, fire climax condition, complete with wiregrasses, pitcher plants, legumes, gopher tortoises, red-cockaded woodpeckers and longleaf pine. State agencies like the Alabama Forestry Commission are involved in similar efforts, as well as assisting landowners in managing their longleaf forests to achieve their own objectives. The Longleaf Alliance, based at the Solon Dixon Forestry Education Center in Covington and Escambia Counties, acts as an umbrella organization for all of the above mentioned efforts and more. The transfer of knowledge gained through research and hard won experience to resource professionals, landowners, and land managers may be the Alliance's greatest contribution to the recovery of longleaf across its range. The Alliance tracks, coordinates, and facilitates efforts by all of the above mentioned groups, attempting to make sure that advances in science and management and opportunities for financial assistance are made known to user groups like private landowners.

Restoration Goals

Restoration may mean different things to different people, as stated above, but there are some things that are generally agreed on. The establishment of longleaf pine is the primary goal, although it may very well not be the first or most important. The introduction of periodic fire and recovery of groundcover and wildlife communities may be possible without longleaf for the short term. Eventually, however, the fire regime necessary to maintain the desired groundcover and wildlife communities can only be maintained in longleaf forests.

Shortcuts like hardwood removal through the use of herbicides or mechanical means can speed up the restoration process over the use of fire alone. On natural, relatively undisturbed forest sites, fire, hardwood removal, and patience may be all that is necessary to recover the longleaf ecosystem, even where the longleaf has to be replanted. Research suggests that even stands that have supported relatively intensive slash or loblolly pine stands retain enough of the original seed bank to be converted back to a semblance of the intact longleaf ecosystem with the introduction of fire, particularly growing season fire, and canopy reduction. To retain the maximum groundcover diversity in longleaf stands, artificial disturbance should be avoided or cautiously applied. Disking, fertilization, persistent pine straw raking, and some herbicides can devastate native plants and actually encourage other plant communities. Techniques for artificially reintroducing native vegetation like wiregrass are poorly developed and very expensive at this stage of our understanding.

Old field sites, even those abandoned many years ago, are much more difficult to restore to pre-settlement condition. The persistent soil disturbance common to agriculture, not to mention the introduction of very competitive grasses and weeds, usually eliminates native seed banks over time. Again, artificial re-establishment of species like wiregrass is still in the trial stage, very expensive and often unsuccessful. Some recolonization of these sites from nearby natural stands is possible, but generally very slow.

Obviously, restoration can be a frustrating objective for a landowner. When do you know you're there? The Longleaf Alliance's approach is pragmatic. You're there when you're happy with the results. If re-creating the complete functioning ecosystem is your goal, then the Alliance suggests that better is better. In other words, longleaf is better than cotton; longleaf with wiregrass and native legumes is better than longleaf alone; longleaf with wiregrass and native legumes and quail is better than longleaf and native ground cover alone; longleaf with native groundcover, quail, and gopher tortoises is even better, etc. For more information on how you can help restore longleaf, contact the Longleaf Alliance at 334-222-7779.

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Products of the Longleaf Pine

By JIM R. GOBER, Coordinator, Marketing and Economic Development,
Alabama Forestry Commission, Gardendale

The history of longleaf pine, both enduring and rich as its beauty, began in the South where virgin forests covered more than 100,000 square miles. These forests, averaging 125 miles in width, ran from Virginia to central Florida, and westward along the Gulf Coast as far west as Texas. This forest of longleaf pine as discovered by colonists consisted of majestic trees reaching 125 feet or more in height that took 150 to 400 years to mature and seemed to exist in limitless supply.

Longleaf pine, or *Pinus palustris,* has been referred to by many names in the South. For example, the Gulf Coast states have referred to it as "fat" pine; the Atlantic states call it "longleaf;" "turpentine" or "rosemary" in North Carolina; "orchard" in Texas; and "brown" in Tennessee. The forest products industry traditionally has referred to it as "southern," "yellow," "heart" or "pitch."

Historical Uses

The colonists discovered that longleaf could be utilized for a great variety of purposes. They found the straight grain, dense and resinous wood to be an exceptional building material. The wood was unsurpassed for dimension stock, posts, piles and joists, especially in bridge, railroad trestle, warehouse and factory construction.

The strength of longleaf pine made it suitable for railroad cars and ties, sailing masts, farm implements, paving blocks and flooring. As a matter of fact, the keel of the U.S.S. Constitution, the legendary revolutionary warship, was made with a single heart pine timber. In American ports from New York to New Orleans, wharves were constructed with longleaf pine. The colonists in the Carolinas, Georgia and Florida built 75 percent of the houses and commercial structures from longleaf. Longleaf pine tar and pitch extracts were used for caulking wooden ships and were exported from Virginia as early as 1608.

Revolutionary Symbol

The Boston Tea Party has historically been proclaimed as a symbolic act of defiance to the British crown. However, an earlier act of civil disobedience directed toward the crown resulted from an edict issued by King George II concerning longleaf pines. He declared, due to the scarcity of lumber in Europe, that all straight pines over 24 inches in diameter be marked as the property of the crown and henceforth, branded with a broad arrow by the king's surveyors. The colonists, realizing the value of the resource to the future of the colonies, promptly demonstrated their proprietary rights to the longleaf pine by tarring and feathering the king's surveyors.

Longleaf Pine Decline and Renewal

Longleaf pine forests originally contained an estimated 200 billion board feet. Following European settlement in Virginia, human impact on the longleaf forest was minor and limited to Virginia, North Carolina, and the major river courses for more than 250 years. To about 1900, sawmills consisted mostly of small tidewater operations along coastal areas. The vast interior longleaf forest was relatively intact.

Events would greatly accelerate the longleaf harvest. Locomotives specifically designed for logging increased accessibility, steam skidders increased the number of logs that could be hauled, and new band saws increased milling capacity tenfold. The period between 1900 and 1930 witnessed the establishment of large inland mills. The longleaf pine harvest peaked in 1909, and by 1935 the once vast longleaf forest was one-third its original size, or about 20 million acres. After 1930, the species continued its drastic decline due to the clearing of land for agriculture and development, regeneration failures, and replacement by faster growing loblolly and slash pines. The most recent data show only 3 million acres of longleaf remaining, which is less than 5 percent of its original extent. The longleaf pine had become a victim of the American industrial revolution and the ever-increasing demand for wood products by an expanding population.

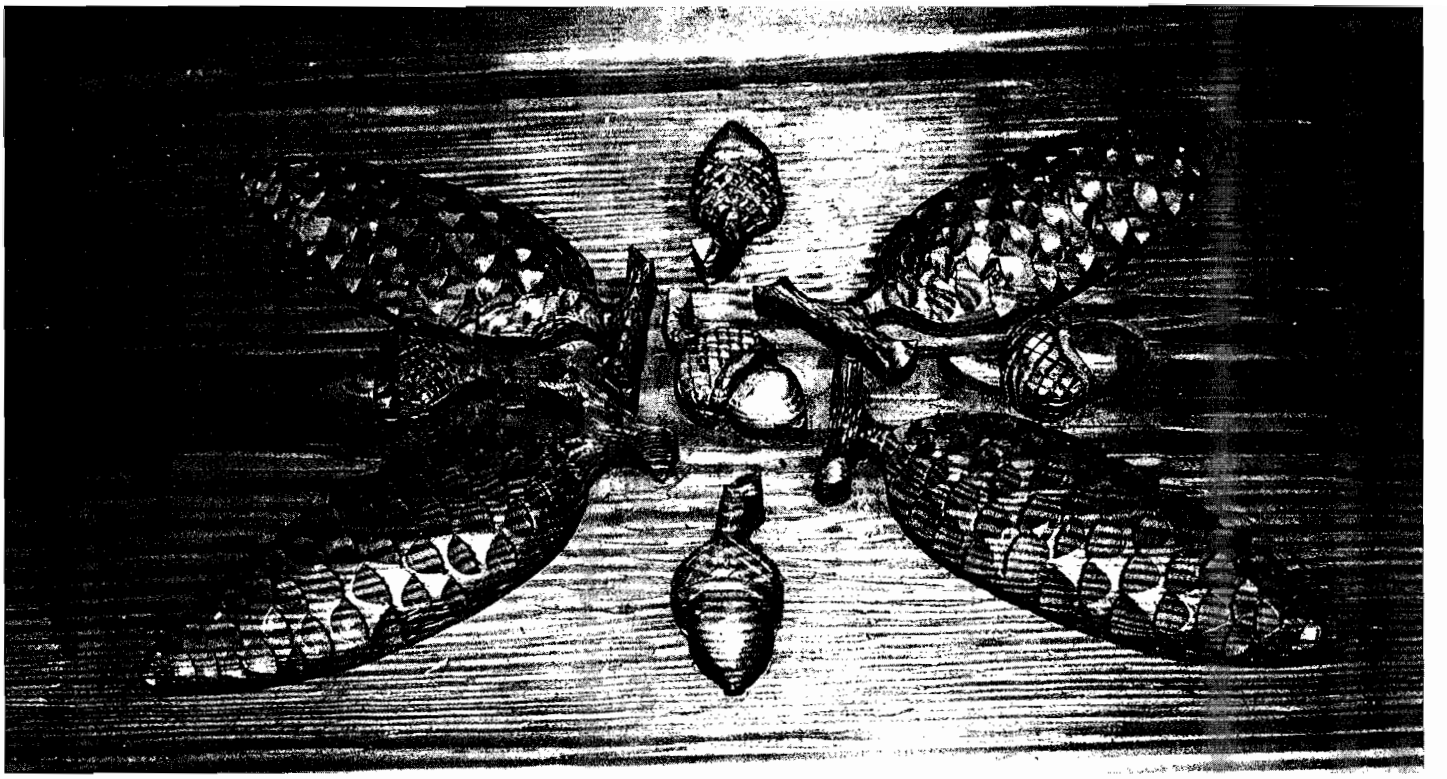
Forest landowners and others have become increasingly interested in restoring longleaf pine to its natural range. There are many reasons for the renewed interest in longleaf pine. Today's wood products capture the strength and enduring characteristics of longleaf pine. Utility poles, glue-laminated beams, modern wooden bridge components, recycled longleaf timbers made into flooring and panels, as well as other traditional products drive the renewed interest in maintaining and expanding the longleaf back from its decline.

Fiber Strength and Utility

The four major Southern pines include longleaf pine, shortleaf pine, loblolly pine, and slash pine. Overall, longleaf pine has the better strength and product utility. As compared to the other Southern pine species, longleaf pine is classified as heavy, strong, stiff, hard, and moderately high in shock resistance. Industry standards single out lumber made from longleaf pine because of the density of the growth rings and its good mechanical properties indicating clear straight-grained wood. For example, the lumber that is classified as longleaf in the domestic trade is known also as pitch pine in the export trade.

Selected Manufactured Products

Poles—For landowners and the forest products industry, the longleaf pine has potential financial advantages over loblolly and slash pines, particularly in sawtimber-length rotations. Longleaf pine stands usually produce a greater percentage of high-valued poles than other species of pine. The natural form of longleaf pine is characterized by above average height and straight, knot-free boles. On average, studies show approximately two-thirds of longleaf pine sawtimber-sized trees could be manufactured



While poles may be the most traditional use of longleaf pine, the wood has many uses, such as for this table at the Alabama Forestry Association building in Montgomery. Carvings on the table make it more than just a functional piece of furniture.

into poles. The percentage of slash and loblolly pine sawtimber meeting pole market specifications is much less.

Flooring and Paneling—The beauty of longleaf pine is being projected by the recycling of large longleaf timbers retrieved from buildings constructed many years ago, most in the 1800s. These timbers are being made into "antique" or longleaf "heart" flooring, paneling, molding, and beams. The recycled timbers contain a dense, straight grain and rich color ranging from a light honey to dark reddish-brown. The beauty of the heartwood characteristics of longleaf pine (growth rings being very dense or close together with very little sapwood) intensify with age, and due to its high resin content the wood is virtually impervious to bug infestation and rot.

Structural Glue-laminated Beams and Timber Bridge Components—The inherent strength, straight bole, and knot-free sawtimber-length rotation advantages over other pine species makes longleaf pine a preferred choice by manufacturers of structural glue-laminated beams and timber bridge components. Glue-laminated beams, primarily used in building structures where structural strength and aesthetics are desired, and glue-laminated bridge timbers, used to maintain and replace the nation's aging bridge infrastructure, are produced by laminating together, face-to-face, individual pieces of solid-sawn lumber. Glue and intense pressure are applied in the manufacturing process.

Conclusion

With (1) markets for wood products manufactured from longleaf pine expanding; (2) the importance of the longleaf pine ecosystem to plant and animal life being expounded; and (3) the increased access that forest landowners have to knowledge and techniques to largely overcome factors that limit initial reforestation efforts with longleaf pine, the renewed interest in restoring longleaf pine to its natural range will continue.

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Flomaton Natural Area

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Randolph home and behold what the Flomaton Natural Area provided. There you can get a sense for what and how the early settlers utilized longleaf pine. Better yet, visit the Flomaton Natural Area and experience what the Native Americans and early settlers saw, including some of the same trees they did. In front of you is a living museum of longleaf pine. We have the opportunity to see an example of a pre-settlement forest here in our great state when visiting the Flomaton Natural Area. We need to afford that opportunity to our children's children. We can ask: "How much old-growth is enough?" The answer has to be: "All that we can possibly have." It would be a social crime to have some construction piece in Colonial Williamsburg as the only place to view old-growth longleaf pine. The Flomaton Natural Area was, is, and should always be one of *Alabama's* ***Treasured*** *Forests.*

The Longleaf Alliance:

A REGIONAL LONGLEAF PINE RECOVERY EFFORT

By **DEAN GJERSTAD** and **RHETT JOHNSON,** Co-directors, The Longleaf Alliance

Longleaf pine was once the dominant forest over nearly 70 percent of Alabama ranging from just south of the Tennessee Valley to the Gulf Coast. Today longleaf represents less than 3 percent of Alabama's forest acreage. However, a dramatic recovery of this most important Southern ecosystem is underway with interest and support at an all-time high among landowners, agencies, and conservation groups.

Desirable Characteristics

Longleaf has many attributes desirable to landowners. From a timber point of view, longleaf pine is superior to other Southern pines in the production of high value wood products. Its growth form, with typically high form classes and straight boles, results in the production of a high percentage of poles, pilings and high quality logs. Its wood is denser and heavier than that of other pines, an important factor when most wood products are sold on a weight basis today.

Longleaf is resistant to many diseases, insects, and other damaging agents common to other Southern pines, reducing investment risk. It is seldom damaged by fusiform rust, a serious pathogen in slash and loblolly pine, resists attack by the Southern pine beetle, and is very tolerant of fire throughout most of its life cycle. Its open stands are conducive to a diverse ground cover plant community, providing habitat to a multitude of insects, birds and animals. With so many attributes, why then has the longleaf forest been systematically harvested and then regenerated to other species? The reasons for its precipitous decline are many and are rooted in the history of the South.

The pre-settlement Southern landscape looked a lot like this—scattered big trees in a sea of grasses.

Reasons for Decline

For much of the past five millennia longleaf pine was the dominant tree species on the Southern uplands ranging from southeast Virginia down the Atlantic Coast and across the Gulf Coast to east Texas. Landscape-scale fires that swept across most sites every 3-5 years maintained this prehistoric longleaf forest, eliminating other less fire-tolerant species. These frequent fires not only resulted in longleaf dominating the upland sites, but also produced fire-dependent animal and ground cover plant communities considered among the most biodiverse of all forest systems.

European explorers described these forests as open, park-like stands with grassy ground cover containing little or no hardwood. Early lumbermen prized longleaf in the production of high value wood products because of its straightness and superior wood properties as compared to other Southern pines. The initial extraction of longleaf was slow because only timber adjacent to waterways was accessible for harvesting until the development of steam power. Harvesting of the interior uplands peaked in the early 20th century when railroad logging was able to reach the remaining large tracts. When much of the longleaf timber was depleted in the 1920s, mills closed, lumbermen moved on and few were concerned with regenerating the Southern forest when vast tracts of virgin timber lay waiting in the West.

The human influence on the longleaf forest was exacerbated by the fire prevention effort instituted during the first half of the 20th century led by the familiar Smokey Bear. This campaign was designed to stamp out this "destructive" force at all costs. Fire prevention allowed many fire intolerant hardwood and herbaceous species to invade and dominate sites once home to various longleaf ecosystems. The development of the pulp and paper industry during the 1950s and 1960s began the South's most significant economic revival since the Civil War. Unfortunately for the longleaf ecosystem, the emphasis of this industry was—and is—on wood fiber production. Although longleaf growth rates are competitive with those of other Southern pine species on most sites over periods of 30 years or more, the best return on forest investment for companies whose product requires only fiber comes from highly productive short rotation plantations, a kind of silviculture for which longleaf is not well suited.

The major hindrance to longleaf establishment in the minds of many is that longleaf is more difficult to regenerate than loblolly or slash pine. Natural regeneration efforts can be hampered by longleaf's sporadic seed production. Seedling planting must be done to exact specifications because the grass stage seedling has no stem. Weedy competition can retard growth, resulting in seedlings remaining in the grass stage for several years. Fortunately, through current technology, these regeneration problems have for the most part been overcome, enabling landowners to regularly and successfully establish vigorously growing longleaf stands.

Although fast-growing species like loblolly and slash pine are ideal for the pulp and paper industry, many nonindustrial private

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LONGLEAF PINE—

The Ultimate Survivor

By DALE C. PANCAKE, JR., Assistant Director, Solon Dixon Forestry Education Center

An open understory is maintained by fire.

An oppressive July heat lies like a blanket across the south Alabama pinelands. Under the intense afternoon sun not a leaf stirs, not a bird sings. Only the droning of a few restless yellow flies breaks the heavy stillness. Weeks of drought have parched and burned the landscape, curling the leaves of the wiregrass and bluestem—slowly drawing the moisture from the myriad of forbs and brushy species of plants growing near the ground. Even the needles of the veteran longleaf pines hang limp and tired in the overstory. The hillside bog of pitcher plants and sedges, orchids and sundews, which was lush and green back in the spring, has paled and faded as the life-sustaining moisture has been depleted. The rainwater that once trickled through the drain between the low hills has long since disappeared, leaving the leaves of the titi and bay, gallberry and tupelo wilted and curled. Here, even the surface organic layer beneath the leaf litter has dried to a crumbly texture. All creatures seek to escape from the sun and heat: finding what refuge they can in the shade under downed logs, in gopher tortoise burrows, or tree cavities. The world is suspended, waiting, persevering, and anticipating the relief that must eventually come.

The white puff of a cloud forms slowly on the horizon and grows with the convection lifted by the heated landscape. Soon it rises hundreds of feet in the air, then builds, darkens, and continues to rise, now thousands of feet. The needles of the pines begin to flutter as the storm draws yet more heat into itself, pulling air in and then up. As it intensifies and draws closer, the wind whips the vegetation with increasing fury and the sun is suddenly gone. With a flash and a shattering boom, lighting rips an old longleaf pine from ground to top, leaving scars up two sides and sending a cascade of smoldering bark fragments into the grass and brush below. Fanned by the wind, these embers soon ignite the grass and pine needles on the surface and fire begins to race across the landscape. Flames leap 20 and 30 feet or more in the air, licking at the base of the crowns of the overstory trees and consuming the dry fuel and brush at the surface. A black, oily cloud of dense smoke rolls up from the head of the fire rising hundreds of feet and feeding more heat and moisture into the clouds of the thunderstorm. As the headfire moves down slope to the drain it slows briefly then bursts into the thick brush along the margin. The waxy leaves of the hardwoods explode with the heat and the fire intensifies, now reaching 40 feet in height and causing some larger trees to torch as their leaves or needles are heated past ignition temperature. The flames burst out of the other side of the drain and again race uphill through the grass and low brush, raging through the flammable gallberry and waxmyrtle that have invaded the bog site—wiping it clean with a single pass.

Downdrafts from the thunderstorm continue to feed oxygen into the front of the fire, pushing it across the countryside. Eventually, some miles away, rain begins to fall and that part of the fire slows, sputters and is gradually extinguished. But back at the point of origin, no rain has fallen. Upwind of the blackened landscape a slow backfire is now creeping into the wind. This fire, too, consumes all of the dry surface fuel, blackening the stems of the brush and scorching the base of the larger pines. But, the intensity is less and the overstory foliage is not scorched. This fire spreads both upwind and to the sides. It may burn for days or even weeks until it encounters some waterway or until summer rains again dampen the surface fuels.

The scenario just described has been played out time and again in the history of the longleaf pine ecosystem. The picture of blackened devastation that such a fire brings to mind is both frightening and repulsive from our human perspective. We instinctively fear the destruction caused by uncontrolled fire and, after 50 years of Smokey Bear fire prevention campaigns,

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Longleaf Pine: The Ultimate Survivor of Trial by Fire

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are repelled by the loss of valuable timber and wildlife habita caused by wildfire. But is that all of the story? A closer look reveals a very different and complex situation.

A Fire-resistant Species

Nature provides us with a wondrous array of plants and animals that are adapted to their specific environment. Fire has been a natural part of the longleaf pine ecosystem for tens of thousands of years and longleaf pine represents an excellent example of a species that is well adapted to withstand the disturbance caused by frequent fires. Indeed, the species can be said to be fire dependent or fire maintained. Longleaf once was the dominant species on an estimated 90 million acres of land in the southeastern United States. Today only scattered remnants of that once great forest remain. This change has been brought about by land clearing for agriculture and cities, by early excessive logging, by reforestation with other species, and, last but not least, by fire exclusion.

Longleaf, while not fireproof, is quite fire resistant. The thick bark of older trees insulates the trunk from the destructive effects of all but the most intense fires. The long tufted needles on thick twigs in the crown protect the buds even when the heat from surface fires scorches most—or even all—of the needles. Longleaf seedlings are adapted to survive fire as well. The seed is released from the cones in the fall and usually germinates within two weeks. This allows the seedlings to grow and become established before the onset of the next summer lightning season. The "grass stage" of longleaf is a special fire adaptation. Rather than starting height growth immediately after germination, the seedlings put on a cluster of needles around a bud at ground level, resembling a clump of grass. They spend the first three to five (up to 10 plus) years developing a deep taproot and strong root system, thus building root reserves. While it is in the grass stage, the seedling has no stem and the bud remains at the surface, surrounded by its cluster of long needles. When a fire occurs, the needles protect the bud from the fire's direct heat. Fire may scorch or even consume the needles, but the bud remains intact. Within weeks after the fire, a new flush of needles can usually be seen. By contrast, seedlings of our other Southern pines, which start height growth immediately after germination, are killed by fire. The thin bark on their young stems offers little protection to the tender tissue of inner bark.

Once longleaf seedlings reach about one inch in root collar diameter they begin rapid height growth. Flushes of three to five feet a year for the first few years are not uncommon. Longleaf seedlings are vulnerable to fire during this period until the bark thickens and until the terminal bud at the top of the young tree is out of reach of the flames of surface fires. Once past this susceptible stage, they become quite fire resistant again. This combination of a long grass stage followed by rapid height growth is an adaptation that has allowed longleaf to survive and prosper in an environment of frequent surface fires.

Longleaf seedlings are very intolerant of shading by overtopping weeds and brush, and must be free of such competition to begin height growth. Periodic fire releases the seedlings, thereby exposing them to the full sun they need to grow and develop. The long, flammable needles of longleaf pine and the fine blades of wiregrass and or bluestems frequently associated with it may actually play a role in inducing frequent fire. These fine, easily ignited fuels dry so quickly that they can support a fire

Prescribed fire under controlled conditions can mimic the beneficial effects of natural fires.

The needles of longleaf pine protect the bud from the direct heat of a fire. Fire may scorch or even consume the needles, but the bud remains intact.

within hours after a rain. All that is needed is an ignition source such as a lightning strike.

Longleaf pine is resistant to most diseases. One exception is brown spot needle blight, a soil borne fungal disease of the needles of grass stage seedlings. The needles often become infected in the second or third year after germination and turn brown and die. As the disease progresses, seedling growth is severely reduced or stops. New needles are infected as well and the seedlings decline and eventually die. Surface fire plays an important role in the control of this disease by consuming the infected needles and sterilizing the area surrounding the seedling. A new flush of needles can then be put on, allowing the seedling to grow disease free for one to two years. This is normally enough time to start height growth. Once the needles of the tree are no longer in contact with the ground, they are no longer susceptible to infection.

In the beginning of this article we "watched" as a lightning caused fire burned across a stand of longleaf pine. What can we now predict to be the results of the fire? Where the headfire burned with great intensity, most of the needles on older trees would be scorched and would die and fall off within a couple of weeks. But the buds at the tips of the branches would survive and would put out a flush of new needles. Some growth would be lost but the trees would likely survive. Many grass stage seedlings would survive the fire and might even be stimulated by it to begin height growth. Early height growth seedlings would be killed, but the site would be prepared to receive new seed in the fall, renewing the cycle. Hardwood brush would be killed back to the ground over most of the burned area, thereby reducing competition for light, water and nutrients. The pitcher plant bog site would benefit from the fire. Most of the plants there would be top-killed, but the true bog site species would come back quickly. More importantly, the invading brush species that dominate in the absence of fire would be killed by fires that penetrate the bogs in dry periods. The same is true along the drains. Fires in normal years burn up to the edge of the drains and slow or stop when they encounter the moist conditions found there. Fires in dry years may penetrate or even pass completely through those drains. This keeps the understory and midstory open and reduces the accumulation of fuels, which in turn helps prevent damaging crown fires from killing pines in the drains themselves.

Conclusion

Is fire necessary to maintain a healthy longleaf pine ecosystem today? The answer is yes, but... Yes, fire is needed to maintain the conditions necessary for longleaf to reproduce, grow and prosper. Yes, fire is needed to maintain the rich diversity of species of plants and animals associated with the longleaf ecosystem. But, no, we do not have to wait for the occurrence of destructive natural wildfires, nor do we need to risk the potentially dangerous results. As land managers we can mimic the beneficial effects of natural fires by applying prescribed fire under controlled conditions of our choosing. We can help restore and maintain this great tree, recognizing that it is truly a survivor of thousands of years of trial by fire.

Does Longleaf Make Dollars *And* $ense?

By RHETT JOHNSON, Co-Director, The Longleaf Alliance and Director, Solon Dixon Forestry Education Center

With interest in longleaf at its highest point in decades, maybe ever, landowners and managers are asking what kind of investment it actually is. The answer surprises some, but there is every reason to expect very positive returns on investment and in a reasonably short time span. Lumbermen have long realized the value of longleaf products like high quality straight-grained dimensional lumber and strong durable poles. The market continues to recognize this quality by paying top prices for these products.

For years, however, longleaf was regarded as a poor investment for a couple of reasons. First, it was considered a difficult species to plant. If it was established successfully, a lengthy period in the grass stage before it initiated height growth extended the period before income could be earned, gaining longleaf a reputation for slow growth. The tree was also often relegated to "longleaf sites," usually deep dry sands where growth was indeed slow, as it would have been for any species. Recent developments in nursery techniques, management practices, and markets have made that prognosis dated.

Risk Reduced

Better quality bareroot seedlings and containerized seedlings have taken much of the risk out of planting longleaf. We have learned much about handling and planting longleaf seedlings in the past several years as well. These gains, coupled with increased knowledge about the role of competing vegetation and the development of selective herbicides to control it, have made it possible to shorten and in many cases eliminate the grass stage. That accomplished, we have learned that longleaf is not, as often reported, a slow grower—only a slow starter. Research has shown that once established on average and poor sites, it will catch and pass faster starting loblolly or slash pine in a reasonable time, 12-15 years on poor sites and 25-30 years on average sites. On very good, productive sites, it takes longer to catch up, often outside a reasonable investment period if return on investment is the only measure used.

One consideration often overlooked is that the growth rate of wood volume is not the only or even the most important measure of the value of a forestry investment. The more important measure is the growth rate in value or dollars. Remember that longleaf products return a premium and value is actually growing at a faster rate than volume.

Projected Financial Return

All investment analysis must be based on assumptions or projections of future performance. Forestry investments are no different. The accuracy of these projections is critical to the accuracy of the analysis. The basic information needs are growth and yield projections. Growth is projected in terms of volume of wood produced and yield in terms of products grown and in what proportions. Unfortunately, we have little information to draw on with longleaf, particularly planted longleaf, and even less information on longleaf planted in old agricultural fields, as is taking place all over the South with the Conservation Reserve Program (CRP) program. The limited data we do have, however, indicate very good growth can be expected if management is done properly and that product yields are very favorable, with a high proportion of poles and quality sawtimber produced.

We also know that the wood from longleaf is heavier than that of other Southern pines. That means that when wood is bought on a weight basis, and it almost always is, more money is paid for longleaf than for the same volume of other pines. One 20-year data set, collected in Mississippi by the consulting firm John Guthrie and Son's, indicates a premium of 10 to 20 percent paid for sales containing mostly longleaf in every year, in good markets and bad.

In addition, longleaf pine straw has become very valuable in the landscaping business. Returns of $100 to $500 per acre per year have been reported and management techniques for straw production are the subject of much study.

One analysis, done by Rick Hamilton of North Carolina State University, predicted a very reasonable internal rate of return of 7.9 percent for planted longleaf on a site with a site quality index of 45 and an internal rate of return of 9.4 percent for a site quality of 55. These rates were calculated for revenues earned by sale of wood only. Both are comparable with rates earned by most investments, even the stock market over the long term. When the sale of pine straw is added to the mix, the return rate of the investment increases to 9.35 percent and 10.1 percent respectively.

A general truth in financial analysis is that the earlier in the investment revenues are earned and the later in the investment costs are incurred, the better the investment. This is due to the power of compounding interest and the importance of time when discounting incomes and costs back to the year of investment to make comparisons between investment opportunities possible. Unfortunately, in forestry investments, the opposite is generally the case. Costs are incurred early in the investment and profits are earned later or even at the end of the investment. Early returns from the sale of straw before commercial wood products are produced help longleaf produce income at about the same age as faster starting loblolly or slash. CRP payments offset the early costs of planting very quickly and make forestry, and particularly longleaf, a very lucrative investment indeed. Since longleaf plantings are currently eligible for CRP contracts of 15 years rather than 10 like other pines, they are particularly attractive. An analysis using a planting cost, after cost share, of $97 per acre; a one-time first year herbicide application cost of $45 per acre; $10 per acre per prescribed burn costs at ages 8, 11, and 14; and an annual CRP payment of $40 per acre, yields a very attractive Internal Rate of Return of nearly 29 percent! Remember, this is after most of the significant costs have been incurred and before the first stick of wood or bale of straw is sold from the land. This return is the result of essentially front-loading the investment with early returns, the CRP payments. This is also an almost entirely risk-free investment scenario. The CRP payments are guaranteed by the government if the landowner can keep as few as 200 trees per acre alive during the life of the investment.

Longleaf is resistant to diseases and insect attacks, and notably tolerant of fire, reducing risk of loss to these factors significantly. It is difficult to calculate the value of this risk reduction, but this natural insurance policy against loss does indeed have value. The long-term value of this investment is maximized if the trees are allowed to grow into poles, often thought to be optimal in rotations of 55 years or so on most sites, but the CRP payments make it a very profitable investment over the short term as well. Most of us can appreciate the long-term value of an investment, say in 50 years, but have a much greater interest in return in terms of our own lifetimes.

David Morehead and Coleman Dangerfield, economists at the University of Georgia, estimated internal rates of return of more than 80 percent using reasonable growth and yield figures, costs, and prices and factoring in aggressive management, wood sales, pine straw, and CRP payments. We cannot predict growth and yield with great confidence at this time, and have even less assurance about things like markets and prices, but it is pretty obvious that longleaf is a good investment.

Conclusion

The Longleaf Alliance is in the planning stages of a regional growth and yield study that should refine our ability to make those projections and make investment analysis more dependable. Other areas of interest include the financial attractiveness of natural regeneration and uneven-aged management. The potential for increased wildlife lease value for longleaf plantings is also a subject of much interest. The Longleaf Alliance has adopted the philosophy that the way to save something is to give it value, and one sure way to give something value is to use it. Museums lock up and protect things that once were and won't be again. We don't want to relegate longleaf to the museum, but make it a contributing component in the southern landscape. In order to accomplish that, it is necessary that private landowners play a significant role. Private landowners have a right to expect a positive return from their lands and on their investments. Longleaf can provide that profit and a host of other benefits as well.

The Longleaf Alliance

Continued from page 22

forest landowners prefer longleaf pine forests for their valuable timber and associated ecosystem, one that is both aesthetically pleasing and conducive to a diverse plant and animal community. Unfortunately, many of these landowners have been unable to readily obtain information and advice on longleaf management.

Longleaf Alliance Established

The Longleaf Alliance was established in 1996 with the express purpose of coordinating efforts to restore longleaf and its accompanying ecosystem on lands where they are compatible with the objectives of the landowner. This initiative resulted from the recognition that interest in the longleaf ecosystem and the tree itself was growing rapidly. Ecologists, foresters, wildlife biologists, landowners and land managers were all searching for information or for an outlet to distribute what they had learned. A growing body of anecdotal information, personal experience, and scientific data was being passed on fitfully and many areas of the public were not being reached. The Longleaf Alliance was formed in an attempt to serve as a clearinghouse for information on longleaf and longleaf forests for the general public.

The Longleaf Alliance is based at Auburn University's Solon Dixon Forestry Education Center in southern Alabama in the heart of the largest longleaf concentration left in the country. It is a nonprofit collaborative effort incorporating a broad community of similar interests in the longleaf forest system. Its structure is simple, its goals direct: **the establishment of a functional longleaf forest ecosystem to the extent feasible in today's Southern forest environment.**

Recognizing and emphasizing the importance of both the economic and ecological value of the longleaf forest broadens the appeal of the Alliance and gives it credibility with both the scientific and private communities. Members include researchers, outreach providers, landowners and managers, tree nurseries, state and federal natural-resource agencies, forestry and wildlife consultants, forest industries, and forestry service providers. Because the vast majority of forestland acreage in the Southeast is privately owned, the Alliance has directed significant effort to the management and re-establishment of longleaf forests on private lands. This has been done by conducting workshops focused on establishment and management techniques, responding to numerous daily specific inquiries and producing timely publications pertinent to longleaf issues. The effort and the organization are regional in scope, and the Alliance presently has nearly 700 members from every state in the longleaf region. As a benefit to members, the Alliance maintains and constantly updates databases on current longleaf related research, longleaf seedling nurseries, forestry and wildlife consultants with longleaf expertise, and pertinent research and demonstration sites.

The Alliance has held two regional meetings that each attracted large enthusiastic audiences. The first was held in Mobile, Alabama in 1996 and was attended by over 250 longleaf fans and the second, held in Charleston in November 1998, attracted 400 attendees. Numerous publications including conference proceedings, a landowner's guide to management of longleaf forests, research notes, newsletters and other pertinent resources are available at a nominal cost.

The Longleaf Alliance is funded through donations, memberships, and grants. Further information on the Alliance is available by writing The Longleaf Alliance, Rt. 7, Box 131, Andalusia, Alabama 36420, telephone 334-222-7779, fax 334-222-0581; e-mail addresses: dxnctr@alaweb.com; gjerstad@forestry.auburn.edu; or hainds@alaweb.com.

Dean Gjerstad is also a professor at the School of Forestry, Auburn University; Rhett Johnson is also director of the Solon Dixon Forestry Education Center in Andalusia, AL.

Biological Diversity in the Longleaf Pine Ecosystem

By **JAREL HILTON,** Director, Alabama Natural Heritage Program℠

The longleaf pine ecosystem once dominated the coastal plain from southeastern Virginia to central Florida and eastern Texas. At the time of European settlement, it covered 92 million acres and supported thousands of native plant and animal species. At least 1,200 vascular plant species are endemic (found nowhere else) to the longleaf pine system, many of which are considered rare, threatened, or endangered by state and federal authorities. The longleaf system is one of the most diverse regions in North America in terms of species richness, species endemism, and community diversity. This system is now reduced to less than 5 percent of its former range, making it one of the most endangered landscapes in North America.

Habitat Reduced

Conversion to pine plantations, agriculture, and suburban development and roads has drastically reduced the amount of habitat in this system. In addition, the most important ecological process that maintains this ecosystem—periodic fire—has been suppressed, further reducing the amount of acreage in its natural condition. The longleaf pine ecosystem is dependent on recurring fires, approximately every 2-6 years in order to maintain its structure, species composition, and the high diversity of plants and animals. Much of the biodiversity of the longleaf pine system exists in the herbaceous ground layer, where a single stand can contain some 200 species of plants, one of the highest diversities of herbaceous plants in the world. The once vast forest of towering trees scattered in a mosaic of open savanna-like stands and wet pine savannas now exists largely as isolated community remnants.

Al Schotz, FNAI

Panhandle lily (Lilium iridollae)

White-topped pitcher plant (Sarracenia leucophylla)

Species Associated with Longleaf

There are an estimated 27 federally listed species and 99 species of special concern associated with the longleaf pine ecosystem. Many of these species are vascular plants that inhabit the herbaceous layer of the open pine savannas or occur in high levels of species diversity in pitcher plant bog and seep habitat. A few of the federally listed species and species of special concern include the southern three-awned grass (*Aristida simpliciflora*), southern milkweed (*Asclepias viridula*), Apalachicola wild indigo (*Baptisia megacarpa*), Flyr's nemesis (*Brickellia cordifolia*), many-flowered grass pink (*Calopogon multiflorus*), Elliot's croton (*Croton elliottii*), pineland bogbutton (*Lachnocaulon digynum*), Panhandle lily (*Lilium iridollae*), bog spicebush (*Lindera subcoriacea*), Alabama anglepod (*Matelea alabamensis*), small-flowered meadowbeauty (*Rhexia parviflora*), white-topped pitcher plant (*Sarracenia leucophylla*) and American chaffseed (*Schwalbea americana*). Many of these species occur in association with seepage bogs. These specialized habitats are embedded in a matrix of longleaf pine habitats. Fire and surface hydrology are the two influencing ecological processes important in maintaining these systems. Very few intact landscape scale examples are left in existence today.

The diversity of reptiles and amphibians is diverse in the longleaf pine ecosystem as well. Of the 290 species native to the Southeast, 170 (74 amphibians, 96 reptiles) are found within the range of the longleaf pine ecosystem. Many of these species are endemic, listed as federal or threatened species or as species of special concern. Examples include the flatwoods salamander (*Ambystoma cingulatum*), dusky gopher frog (*Rana capito sevosa*), Eastern indigo snake (*Drymarchon corais couperi*), gopher tortoise (*Gopherus polyphemus*), Eastern diamondback rattlesnake (*Crotalus adamanteus*), and the Florida pine snake (*Pituophis melanoleucus mugitus*). Information on the status, trends, and habitat requirements of these species comes from limited studies of selected species or populations within the last decade. Most of the studies have been species inventories that last 1-2 years in duration, or from studies conducted by universities, private organizations, or state resource agencies. Although not well documented, concern for these rare species and reptiles and amphibians as a group can be tied to their declining habitat in the documented loss of the longleaf pine system.

Perhaps most well-known for its imperiled status and dependence upon the longleaf pine system is the red-cockaded woodpecker (*Picoides borealis*). This species is territorial, nonmigratory, and cooperatively breeds in colonies. Its requirements include habitat suitable for relatively large home ranges of 84 to 500 acres, old pine trees with hollow centers for nesting and roosting, and open, park-like forested landscapes for population growth and dispersal. Historically the longleaf pine ecosystem stretched contiguously across the coastal plain with recurrent fire providing open habitat for a nearly continuous distribution of woodpeckers throughout the Southeast. Because red-cockaded woodpeckers were the only species to excavate cavities in living pine trees, they provided cavities for other cavity-nesting birds and mammals, as well as some reptiles, amphibians, and invertebrates. The loss of open contiguous habitat has caused the dramatic decline of the red-cockaded woodpecker, leading to its listing as an endangered species in 1970.

Conclusion

All is not lost, especially here in Alabama where there are still remnant longleaf pine communities in good condition, and where there are still a few landscape scale examples representative of what the Southeast once looked like. The Conecuh National Forest is one such example of a landscape scale mosaic of many different longleaf pine communities and their associated biodiversity. Another example of contiguous longleaf pine savanna habitat is the Grand Bay Savanna area located in southeastern Jackson County, Mississippi and southern Mobile County, Alabama. Alabama also has one of only five known sites of virgin longleaf pine left in the Southeast. Although not high in diversity, this site is in existence within the city limits of Flomaton, Alabama, where management, research, and restoration efforts are currently underway. The Flomaton Longleaf Pine Stand, owned by Champion International Corporation is a small stand of virgin trees currently under a cooperative management agreement with the Auburn School of Forestry, the Alabama Forestry Commission, Southern Forest Experiment Station and the Southeastern Forest Experiment Station, Alabama Natural Heritage Program℠, and the Alabama Chapter of The Nature Conservancy. Read more about the Flomaton stand starting on page 16.

Al Schotz, FNAI

Pineland bog-button (Lachnocaulon digynum)

Al Schotz, FNAI

Alabama spiny-pod (Matelea alabamensis)

The Conecuh National Forest is an example of a landscape scale mosaic of many different longleaf pine communities and their associated biodiversity.

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LONGLEAF PINE FORESTS...

...in the Mountains?

Morgan Varner

View of Choccolocco Mountain of Fort McClellan. (Below) While cone crops in most longleaf pine forests are infrequent, mountain longleaf pine crops are much more reliable, making longleaf an excellent management option in Alabama's mountain region.

By MORGAN VARNER,
Graduate Research Assistant, Auburn University School of Forestry

While most people familiar with Alabama's forests associate longleaf pine with the gently rolling hills of lower Alabama, longleaf pine forests extend up into the hills, ridges and mountains of north Alabama. These forests, termed "montane" or "mountain longleaf," still thrive in several spots, but are becoming increasingly rare. These rare and breathtaking forests offer a glimpse of what was and could be again.

What Was the Mountain Longleaf Pine Forest?

In the late 19th century, Dr. Charles Mohr, an early University of Alabama professor of botany, described north Alabama's longleaf pine forests in this way: "At the foot of Rebecca Mountain (present-day Talladega National Forest near Hollins) I saw more timber today than any area east or west of the Mississippi River." He noted that diameters averaged 24 to 25 inches, with heights exceeding 120 feet. Along the ridgetops, he observed that the longleaf pines were "shorter, knottier, and more infected with dry rot."

Roland Harper, State Geographer, botanist, and naturalist described his beloved longleaf pine, so far from its Coastal Plain home, this way: "It naturally thrives best on sunny southern slopes, but is not confined to them. On the flanks of Cheaha Mountain, even on its north side, it ascends to 1,900 and perhaps 2,000 feet."

The rugged topography of northern Alabama provided an excellent target for lightning and the fires it created. Fire in these forests, as with all longleaf pine forests, was frequent. Frequent fire created open canopies with diverse ground covers, blanketing the mountains of north Alabama and Georgia. As in south Alabama, fires originating in the upland longleaf forests traveled down into adjacent communities. Mountain examples include the federally protected green pitcher plant (*Sarracenia oreophila*) and white fringless orchid (*Platanthera integrilabia*) bogs that are scattered within the mountain longleaf pine forest.

Aside from topography, the only other major difference between mountain longleaf pine and the Coastal Plain longleaf pine seemed to be cones—mountain longleaf pine has them. The infamous characteristic that for so long has haunted longleaf pine—its infrequent and erratic seed production—ceases as you move to the mountains. William Boyer, retired research forester with the U.S. Forest Service and noted expert on longleaf pine, says, "Mountain longleaf not only produces more cones, but does it more often than Coastal longleaf."

What Is the Mountain Longleaf Pine Forest Today?

Today, a visitor to north Alabama would hardly notice longleaf pine, and probably couldn't imagine the forests that were so common not too long ago. The contemporary mountain longleaf pine forest exists as either Dr. Mohr's "ridgetop" variety—the short and gnarled trees that dot even metropolitan Birmingham's ridgelines—or as an ever-decreasing component of a mixed oak-pine forest. Both varieties are common; however, true *forests* of mountain longleaf pine number fewer than 75,000 acres in north Alabama. Of this total, 70 percent is managed by the U.S. government (Talladega National Forest and Fort McClellan Army Post). Even on these pristine lands, longleaf pine is usually found only on dry, southerly aspects or as a component of a mixed hardwood forest. Without fire, the mountain longleaf pine forests are destined to be seen only in old museum photos and forgotten.

How Do We Get It Back?

Rising interest from both public and private landowners in longleaf pine restoration is catching on in the mountain longleaf pine region. First, closure of Fort McClellan—an 18,000-acre U.S. Army post near Anniston—sparked interest from the U.S. Fish and Wildlife Service. Bill Garland, a wildlife biologist with the agency, says, "Ironically, due to decades of Army training, Fort McClellan contains the closest example of a pristine mountain longleaf pine forest in existence." Recent research by Auburn University's School of Forestry has located 12 old-growth mountain longleaf pine stands. John Kush, a researcher

HIDDEN TREASURES

Cherokee County Landowner Helps Restore Longleaf

By **COLEEN VANSANT,** Information Specialist, Alabama Forestry Commission, Cullman

Most people don't think of finding longleaf pine thriving on the mountains of northeast Alabama. Because of the efforts of landowners like Willodene Mathews, though, longleaf is once again being seen on the scenic mountain ridges of Cherokee County.

Historically, longleaf pine was a dominant species as far north as Cherokee County. The decrease in burning due to the decline of the Native American population and the evolution of the natural forests of the state contributed to its decline as the top tree. In the past few years longleaf has begun to make a comeback in the central and northern counties of our state because landowners are reintroducing the species.

Kevin Taylor, Alabama Forestry Commission, and Willodene Mathews look at side-by-side stands of loblolly and longleaf.

Mrs. Mathews says the conversion to longleaf should be credited to her late husband John Mathews. His job took him all over the state and he loved the longleaf pine forests of south Alabama. According to Mrs. Mathews, "His goal was to ride his woods and see longleaf." During the past few years around 93 acres of the 944-acre TREASURE Forest has been planted in containerized longleaf. Much of it is thriving alongside adjacent tracts of loblolly pine the same age.

Alabama Forestry Commission County Manager Kevin Taylor explains that although longleaf is being reintroduced into the county by landowners, there are still areas in the higher elevations where natural longleaf grows. He says that for many years he and local rangers have discovered natural longleaf stands in mountainous areas while suppressing wildfires.

Taylor adds that this year around 500 more acres of longleaf were planted in Cherokee County under the Conservation Reserve Program. Six landowners are planting longleaf on cutover land and a local nursery is currently growing containerized longleaf.

The Mathews were the state's 177th TREASURE Forest and were the recipients of the Helene Mosley Award in 1987. For years the couple shared in the management and enjoyment of their land of their land. Since Mr. Mathews' death in February 1996, Mrs. Mathews has carried on with the goals they set and with the standards of the TREASURE Forest program.

Mrs. Mathews attended a Southeastern landowner conference in Nashville and hunting leases was one of the seminars offered on the program. For the first time, she is leasing her land to a hunting club. She says they have helped by putting up gates, clearing roads and watching the property (Mrs. Mathews is an absentee landowner residing in Decatur). The introduction of longleaf on her farm will help native wildlife and increase habitat for smaller animals.

She says her "heritage is in timber." Much of the land she and John acquired was part of her grandfather's farm. He operated a sawmill and was a logger. Mrs. Mathews tells of a letter that her grandmother had written years ago about her grandfather that reminds her of a connection to forestry that started long ago. It says, "John is logging today."

Mrs. Mathews may be tiny in stature but not in energy. She is a member of the Northeast Alabama TREASURE Forest Association, Inc., a member of the Cherokee County Planning Committee, served as a TREASURE Forest county leader, serves on the TREASURE Forest Subcommittee, and is a very active volunteer with the Huntsville-Madison Botanical Gardens.

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in the AU School of Forestry, refers to Fort McClellan's mountain longleaf pine forests as "the biggest, oldest, and most intact." Presently, the U.S. Fish and Wildlife Service is negotiating to create the Mountain Longleaf National Wildlife Refuge out of a portion of the Fort's wildlands.

Interest in restoring mountain longleaf pine in Alabama's National Forests began to increase in the early 1990s. Eugene Brooks, forester for the U.S. Forest Service's Talladega National Forest in Heflin, recalls, "Longleaf was naturally here, and to meet the diverse goals of ecosystem management, it was a natural choice." Brooks adds, "We plan to continue our restoration efforts, with an aggressive education program to help bring back mountain longleaf."

The keys to restoring mountain longleaf pine forests are 1) understanding fire, 2) obtaining sufficient quantities of high-quality seedlings, and 3) garnering public support. Fire research and management in mountain longleaf pine are in their infancy. Complications involving heavy accumulations of fuels, smoke liability in an increasingly urban north Alabama, and watershed effects can be severe and unforgiving. As is the case throughout the region, seedling supply over the next few years will dictate the extent of any restoration activities. Finally, convincing a pine plantation-weary public that this pine is a "good guy" will be critical for restoration, both public and private.

Mountain longleaf pine forests offer landowners many benefits: natural regeneration, insect and disease resistance, drought tolerance, and high quality wood products. Finally, as our state tree and a symbol of our southern biological heritage, it offers something special that a price tag can't replace.

Places to See Mountain Longleaf Pine Forests

1. Fort McClellan near Anniston, Calhoun County
2. Talladega National Forest—Oakmulgee, Talladega, and Shoal Creek Ranger Districts
3. Cheaha State Park

Brown Spot Needle Blight on Longleaf Pine

By **JIM HYLAND,** Alabama Forestry Commission

Longleaf pine is the only species in the South that is damaged by brown spot needle blight. Longleaf pine seedlings go through what is called the "grass stage" until the seedling root collar reaches about 1/2 to 1 inch in size. This may take from 1 to 20 years. The growth of the root depends on the competition and if anything affects the needle growth. Brown spot needle blight attacks the longleaf needles and slows their growth and the root growth. Seedlings are often heavily infected while in the grass stage and often die after repeated defoliation.

Identifying the Injury

Infected needles develop gray-green spots, which later turn brown. Eventually, a yellow band develops on the needle. The affected area then increases in size, resulting in death of the needle. In the grass stage the seedling looks brown and the dead needles will fall off; if new needles are repeatedly infected, the seedling will die. On large trees, the needles will turn brown and drop off, but usually the tree will not die.

Spores are released from the fruiting bodies on the needles throughout the year.

The spores are splashed short distances by raindrops. During the winter and early spring, spores are produced on dead needles. These spores are responsible for longer distance spread of the fungus.

Control

Plant resistant or high-quality seedlings on intensively prepared sites. Fungicides are used in the nurseries in controlling this disease so nursery grown seedlings should be disease-free when planted. Site preparation should include killing all residual longleaf trees and burning the site to destroy diseased needles.

In plantations, spray herbaceous weed control herbicides to control weed competition. Where natural regeneration is used, burn in the fall to destroy diseased needles. When seedlings are established, burn during the dormant season to destroy diseased needles.

Reference

Forest Health Protection, Southern Region, USFS

Visit the Alabama Forestry Commission Web Page:
www.forestry.state.al.us

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