LONGLEAF PINE:
A HISTORY OF MAN AND A FOREST

by

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CONTENTS

PREFACE .......................................................................................................................... 1
DEDICATION ...................................................................................................................... 2
ACKNOWLEDGEMENTS ................................................................................................. 2
THE VIRGIN FOREST ......................................................................................................... 3
THE INDIANS .................................................................................................................. 3
THE PIONEERS ................................................................................................................. 5
CHANGING TIMES ........................................................................................................... 7
BOOM TIMES .................................................................................................................. 10
THE GREAT DEPRESSION .............................................................................................. 13
FOREST FIRE HERESY .................................................................................................... 16
THE SECOND FOREST ....................................................................................................... 18
WORLD WAR II ............................................................................................................... 20
POSTWAR PARADOX ...................................................................................................... 21
STEMMING THE TIDE ....................................................................................................... 26
A PLACE IN THE SUN ....................................................................................................... 33
SELECTED BIBLIOGRAPHY ............................................................................................ 36

BIOGRAPHY
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SELECTED BIBLIOGRAPHY


Crow, A. Bigler. 1962. Fire ecology and fire use in the pine forests of the South. School of Forestry and Wildlife Mgt. Louisiana State University, Baton Rouge, LA.


PREFACE

The land of the longleaf pine is a giant stage, stretching across the lower South, where centuries of human drama have been enacted. Indiana enjoyed a comparable home in these woods until defeated and evicted by whites. Spanish Conquistadores trampled the pineywoods in search of gold. Finding none, they were soon discouraged and left. Later, Scotch, Irish and other Europeans came seeking freedom from oppression and built permanent homes. Lumbermen, turpentiners, foresters, and many others have played a significant role in the drama.

There have been times of great rejoicing and prosperity, but also grim times with little hope for the future. Fortunes have been made and lost. Red, white, and black men have sweated, bled, and died under the longstraw crowns. Like many Southerners, longleaf pine forests have played an important role in my life. Tales of my early ancestors have wedded me to them. I spend much of my youth, college days, and professional forestry career in them.

Because of my association with the land, people, history, and management of the forest, this story is written from a personal viewpoint. It has, of course, been fleshed out with gleanings from the publications listed in my selected bibliography and information supplied by others.

My objective is to provide a story for the enjoyment and enlightenment of people who love or can be encouraged to love longleaf pine. Among them are those whose life/hood or that of their ancestors has come from the forest; those who have enjoyed hunting quail and other game in the parklike woods; foresters who have tackled the demanding task of managing the species; those who have battled to save this splendid natural resource from extinction; any having a personal relationship with longleaf pine.

There are many others, among them lovers of the history and folkways of the South. Longleaf pine people are as typical of the South as "grits and gravy." Also, conservationists anywhere might profit from reading this story.

Basically, I have another more important purpose for this book. Longleaf pine forests have weathered two crises that threatened their extinction. In the late 1800s lumbermen moved in and ruthlessly clearcut most of the virgin timber with no thought of regeneration. Except for a few tracts conservatively cut by far-sighted lumbermen and land that was diverted to agriculture, millions of acres lay bare and bleaching in the sun. Forest workers, unemployed, were left in hopeless poverty.

Largely without the help of man, a second forest arose from the ashes and debris of the virgin timber. But again destroyers moved in. By 1960 it appeared likely that it would be completely gone by the mid-seventies with no hope for renewal. Clearcutting followed by heavy site-preparation guaranteed its elimination. Objective of the destroyers was to replant the land with slash or loblolly pines that could be managed easier -- requiring less skill.

Alarmed, lovers of longleaf pine took aggressive action to prevent its demise as an important commercial forest. The dangerous trend was slowed down and about 4 million acres were saved -- a paltry remnant of the original 60 million acres of virgin timber.

But a new day has dawned. Unfounded prejudices against longleaf have gradually faded away and there is renewed interest in growing the species. It is my belief that this story will help accelerate this desirable trend.
DEDICATION
This book is dedicated to a future for longleaf pine, one of the finest forests that the world has ever known.

ACKNOWLEDGEMENT
Special thanks to members of the Forest Service in Atlanta for editing and publication: Stan Adams, Roger Dennington, and Sharon Young. Others who provided information and encouragement were Thomas Ellis, director of the SOFES (Southern Forest Experiment Station); John F. Kelly, SOFES; Aleta Hayden, librarian, SOUTHFORNET; Dr. Larry Walker, Stephen F. Austin University; Dr. Arthur W. Cooper, North Carolina State University; L.M. Goodwin, Jr., Weymouth Woods, Southern Pines, NC; Dr. Claude Brown, University of Georgia; William Voit, Jr., Blackshear, GA; Larkin Wade, Alabama Extension Forester; and Harold K. Steen, Editor, Journal of Forest History.

Also, thanks to the authors of the publications listed in the selected Bibliography for material used in this publication.

Stands are around 60-years-old and conversion to younger age classes is needed. Too rapid a conversion, however, would be undesirable. It would interrupt a sustained cash flow and be undesirable from the esthetic and game standpoint, besides creating an unbalanced age-class distribution.

Because of understocked nature of the forest, all cutting during the first 10 years is for the purpose of regenerating sparse stands. Those with better stocking will be left to grow.

To avoid the expenditure of large amounts of capital for regeneration, a shelterwood system is prescribed wherever stand and ground conditions are suitable. Besides reducing costs, growth on the seed trees would provide an additional volume of high-quality material to be harvested in the early years of management.

Before cutting, a survey is made in each compartment to determine if there are enough seed trees for a shelterwood system. If so, a seed cut is prescribed to begin the regeneration process. If the seed source is deficient, the compartment is scheduled for clearcutting.

The thick midstory of unmerchantable material was a serious barrier to regeneration. Fortunately, a contractor was found to chip the unmerchantable material for fuel wood to be used by a nearby pulp mill. The job is done before logging with little damage to merchantable trees at no cost to the landowner. Chipping not only eliminated the need for windrows in planting operations, but site-prep costs were also reduced. In natural stands, chipping made prescribed burning much more effective and facilitated marking and logging. Game habitats were improved by the operation.

Well-timed seedbed burns before the 1983 cone crop in shelterwood stands established fully stocked stands of longleaf pine seedlings on 376 acres. Also, 430 acres have been planted successfully during the 5 years where the site was prepared properly. When seed trees are removed in the shelterwood stands, we will have 806 acres of well-stocked seedling stands free to grow.

During the 5 years, gross returns to the landowner have averaged about $25 per acre per year. Revenue was derived from stumpage sales of pine poles, logs, pulpwood, posts, hardwood logs and pulpwood. Cutting less than growth, however, we now have more and better timber than before management began, and the forest has contributed materially to the landowner and the general economy.

This tract clearly shows the economic benefits of managing second-growth longleaf pine forests. High-grade wood products can be produced, substantial dollar returns obtained, employment for forest workers furnished, and the woods will abound with quail, deer, turkey, and other game thriving in an ideal habitat.

But there are other important intangibles that gladden the hearts of those who love the culture of the land. Who can describe the beauty of a blanket of grass penetrated by snow white pine buds searching for the sun; of the thrill of a quail hunt through a parklike forest cooled by a resinous breeze? Rusting turpentine cups and arrowheads buried in the sand, ancient churches built of heartpine, magnificent southern mansions, and old logging photos are reminders of centuries of human drama enacted on the forest stage. The historical attraction of longleaf pine is important to many people.

Then there is the challenge of salvaging our forest heritage, battered and bruised by man, but dependent on him for salvation.

The most serious threat to a future for longleaf pine has not been a lack of technology but the attitude of people. There were those who championed a cause that seemed destined to be lost; however most seemed bent on destroying the forest.

Now public opinion seems to be changing, and there is real hope for the future. The magnificent virgin forests are just a fond memory. But as long as trees grow and winds blow, the gentle breezes will ripple the longstraw crowns creating the sweetest music this side of the Mason-Dixon line.
In the 1960's and 1970's a vigorous campaign of workshops, seminars, consulting and large-scale tests, was conducted to translate research findings into practice. Prejudices against longleaf pine gradually began to fade away. Carefully prescribed burns for brownspot control face crops of browntop. Another development in 1986 has greatly brightened the future for longleaf pine. Roger Deming, softwood specialist for Cooperative Forestry Service's Southern Region, has organized an ambitious technology transfer program for the species.

A large ranger in Mississippi named Roger then visited his district in 1975 during my regional consultation project. Like many Mississippi people, he was eager to learn and was sincerely interested in promoting longleaf pine. In 1982 when he assumed his present position, he came to Bridgton to discuss the status of longleaf pine and agreed to encourage management of the species. Roger has come through with flying colors. His program is aimed not only to stop the decline in longleaf acreage but to actually increase it. He has recruited a large group of knowledgeable people, has money to do the job, and has secured the approval of his superiors and the director of the Southern Station. Prospects are extremely bright for success. In view of Deming's goal one many ask: How much acreage should be devoted to longleaf pine? Obviously, much of the original 60 million acres should remain in present uses such as agriculture. Also, other pines that replaced longleaf should continue to occupy a portion because of site quality and landowner objectives. But in my travels I have observed many sites where longleaf pine would definitely be the choicest. In many cases I have recommended a conversion to longleaf pine when the final harvest cut is planned. Evidence is accumulating that such exchanges could be best be devoted to growing longleaf. I am convinced, however, that those digging or even planting trees for profit and occupied by the species would not be out of line.

Five years' results from management of a longleaf pine forest for one of my clients suggests a desirable pattern for nonindustrial private landowners and companies as well. Eighty percent of the typical second growth forest was in longleaf pine with the remainder in slash pine-hardwood bottoms. Understocked, the forest had a desirable mixture of over 60,000 board feet per acre at 50 years. Site for longleaf pine was average: index about 70 feet height for the tallest trees at 50 years. Soils in the uplands are well drained and fire resistant to longleaf. The bottoms provide cover for game and make good firebreaks. A financial analysis of the growth potential of site 70 longleaf pine indicate a dollar return of 15 percent annually on the investment in all. While their growth during the forest's 10-year period from age 50 to 60. In the next 10 years, the return would drop to 7 percent. So a 60-year rotation was selected for management.

The forest was divided into 50 to 100 acre compartments bounded by roads, branch bottoms, and property lines. Within each compartment longleaf pine stands will be grown on the uplands; uneven-aged slash-hardwood stands in the bottoms.

Cutting during the first 10-year cycle is controlled by two methods. Volume removed in logs and poles (most- ly trees 9 inches in diameter at breast [dbh] reach 30 feet total age) is limited to less than the estimated growth in board feet on the entire forest during the period. Acreage regenerated to longleaf pine is six-tenths of the total acreage on the forest. Aim is to eventually develop ages ranging from 10 to 60 years. Unfortunately, most

THE VIRGIN FOREST

Open and parklike, the virgin longleaf pine forest dominated some 60 million acres of the prehistoric southeast forest as a major component. In battle formation, the massive trees dotted the rolling Coastal Plains in a sea of grass. Gentle breezes, laden with a resinous perfume, rippled longleaf crowns and sending the sound to the ear and slightly mournful. Occasionally, the tranquil scene was disturbed by a killer hurricane that crashed ashore from the sea telling many a man.

The forest, faced with narrow stream bottoms of hardwood and cove, provided an ideal habitat for deer, turkey, quail, and many other animals and birds. Beginning at the extreme southeastern tip of present day Virginia, longleaf's natural range extended across the Atlantic and Gulf Coastal Plains into east Texas, with broad excursions into the mountain and piedmont areas of Alabama and Georgia. It was hammed in by aridity on the west and by freezing temperatures and heavy soils on the north.

Fire was a natural architect of the forest. Ecologists classify longleaf pine as a “fire climax” type, meaning that the tree is maintained by regular fires. They speculate that the species’ affinity for sandier soils is connected to a complex fire relationship. On such soils, the ground vegetation would consist of flamboyant, flamboyant grasses. Fires, originally set by lighting and later by Indians, frequently spread over thousands of acres in this fuel class. The frequent fires accelerated naturally by natural fires and extreme resistance to fire damage, found a compatible home in this environment. In fact, their very survival depended on these fires. Without fires, aggressive hardwood and pine competitors would choke out the longleaf. The open, parklike nature of the forest was due to the clearing action of fires.

THE INDIANS

The story of the first man to enter the longleaf pine forest is lost in centuries of unrecorded history. Since the forest apparently dominated such a large portion of the land, we can assume that it profoundly affected the earliest human inhabitants. We do know something of the activities of the Indians in this forest from journals of the first European explorers.

The forest was a bountiful storehouse of valuable wood products. Foresters have estimated that the original timberlands of the southeastern United States had an estimated value of over $300 billion. Site for longleaf pine was average: index about 70 feet height for the tallest trees at 50 years. In the next 10 years, the return would drop to 7 percent. So a 60-year rotation was selected for management.

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Longleaf forests provided many of the necessities of life for woodland Indians of the southeast. Heartwood furnished fuel for warming and cooking fires. The warming fires burned in the center of the wigwam or lodge, and the smoke escaped through a hole in the roof. Soot that collected on walls was scraped off and mixed with bear oil for war paint and other ceremonial paintings. Lighterwood splinters illuminated the way on night excursions. Small trees and bark from the pinewoods were used to construct corn cribs, lodges, and other village structures. Many village streets were paved with pine bark.

Deer furnished Indians with food, shelter, clothing, and deerskins became an important item of trade after the white man arrived. The longleaf pinewoods provided an ideal locale for hunting the plentiful deer, which, when threatened by enemies, would hide in the narrow branch bottoms that penetrated the open woods. Hunters soon learned to drive deer from their hiding places with fire, making death traps of the dense cane and hardwood bottoms. With their companions set the fire hunters hid behind tree trunks in open woods and killed the deer as they rushed out to escape the flames.

When the Indians' hunting fires were not extinguished, flames spread throughout the uplands until stopped by flames spread throughout the uplands until stopped by...
DeSoto died on the western leg of his trip and was buried in the Mississippi River by his men to prevent hostile Indians from desecrating his grave. In 1708 John Lawson, an English gentleman by birth, arrived at Charleston, South Carolina and made a trip through Indian country in the Carolinas. He wrote a detailed description of his observations and relations with Sewee, Santee, and Tuscarora tribes that he encountered in the Coastal Plains of South Carolina and North Carolina. The Indians treated him kindly, guided and hunted for him on his travels, welcomed him into their villages, honored, bedded, and fed him there. He was aghast to see the ravages that the white man's social diseases and whiskey had wrought on the savages, especially their treatment of the women. Later, when he returned to North Carolina on a second trip he was captured, tortured, and killed by the Tuscaroras. Kidnapping of their children and taking them to England, presumably for education and conversion to the Christian religion, had incensed the Indians.

William Bartram, the Quaker naturalist from Pennsylvania, toured longleaf pine forests in the late 1770's. His travels took him into the Carolinas, Georgia, Florida, Alabama, and Mississippi. He praised the open, airy nature of the virgin pineywoods in the sandy uplands that he liked so much that he named them "razorbacks." He kept a detailed journal of the flora, fauna, and landscape of the Indians: Creeks, Chocawas, Seminolies, and others.

The first white men to enter the longleaf pineywoods were Spaniards in search of gold. Typical was Hernando DeSoto, who in 1539 came ashore from Florida to his base in Cuba with a large company of armor clad soldiers. DeSoto traveled through the Carolinas, Florida, Georgia, Alabama, and Mississippi. His brutal treatment of the Indians generated hate for whites. Several battles were fought and won by the Spaniards. The crude weapons of the Indians were no match for the swords and spears of the mounted, armor-clad soldiers.

To provide food, the conquistadores brought along herds of cattle and hogs. Some hogs escaped and their descendents, known as razorbacks, became a serious menace to longleaf pine seedlings.

William Bartram, famous Pennsylvania naturalist, explored the longleaf pine forests in the 1770's.

In 1986, as the last chapter in this "saga of longleaf pine" is being written, a new day has dawned. Prejudices against longleaf are fading away and there is a revival of interest in the species. Ed. Kerr, a prolific writer on forestry subjects from Louisiana; William Voight, a native of longleaf pine forests of Georgia; Eley Frazer III, president of F & W Forestry Services; and others have written articles describing the trend.

Why has this change occurred? Our exhortations during the 1960's and 1970's undoubtedly played a role, but there is a more important reason. Success has been conclusively demonstrated for regeneration practices, and there has been a significant increase in knowledge of the growth potential of the species and the important role of genetics. A better understanding of longleaf has built the confidence of many people.

A reliable natural regeneration system has been rigorously tested. Where properly applied on suitable sites, a shelterwood system has proven reliable. Failures are generally due to providing too few seed trees, inadequate competition control, failure to coordinate burns with seed crops, or other unwise practices.

Natural regeneration provides an attractive low-cost system, suitable and conditions are suitable, and it meets the financial and other requirements of the landowner. During the last 20 years the dismal failure of longleaf pine plantations has been reversed. Now successes have become the rule. Significant improvements in the forest are being made by some industries. Three species are producing better stock--some introducing mycorrhizae into seedbeds. Grade one or better seedlings are used. Seedlings are handled from the nursery bed to the planting site--often with cold storage protection all the way. Particular care is given to site preparation, including a drastic reduction of competition and elimination of all sources of brownspot infection. Seedlings are correctly planted, usually with machines, at the proper depth.

Even pulp mill foresters, formerly reluctant to plant longleaf pine, are converting a small area in a demonstration plot on a special site in the species in their planting programs.

Containerized seedlings are showing superior growth and survival under adverse conditions. Use of them promises to be the wave of the future for special situations.

Direct seeding, after dramatic success on large cutover tracts, particularly in Louisiana, is now used on a more limited scale because of seed cost, squirrel predation, and unfavorable sites. But it still is a viable practice to seed spoilbanks, or for quick reforestation of disaster areas.

Since the 1930's, fire use in longleaf pine forests has gradually developed for seedbed preparation, brownspot control, competition control, wildlife habitat improvement, and hazard reduction. If
palmetto needed for clothing that caused seed to be eaten. Apparently, such birds would have to be cleared out and planted where regeneration was required. I referred the problem to the competition-control project at Albany, Georgia, to find a way chemically to control palmetto. We estimated 21,000 acres suitable for longleaf pine on a detailed soil map that showed height of a water table. We were given protection from the preferred system where there was sufficient seed source. Fortunately, most of the stands scheduled for regeneration were clearcut over 100 acres in size but had only a thin canopy. We estimated 24,000 acres of longleaf pine on this district—20,000 on the Withibee.

In South Carolina I also visited the Savannah River Project. Here many slash pine plantations had suffered severe ice damage. Forests are being cleared out, sprayed with herbicide, and planting longleaf pine. Seedlings of longleaf pine seedings had poor stocking but full-lodge pine reproduction raised stocking to adequate levels. We estimated 47,000 acres of longleaf pine on the Project. In North Carolina, the two districts were quite different. Upright is in the Sassafras State Forest for longleaf pine. Most of the soils were too heavy and were at the southern limit of the longleaf pine zone. There was too much risk of frost-heaving of fall-germinated seedlings.

The Croatian District, near the Atlantic coast, had 20,000 acres suitable for longleaf pine. Ranger Mills, son of the Croatian ranger in Alabama who made the successful 1947 seedbed burnt, pointed out a unique advantage of broadleaf that blankets the landscape of portions of the district in pocosins, a forest type extremely vulnerable to dangerous crown and ground fires. Fort Marion in Florida and Fort Pickens in Alabama were the main highways to Charleston and Georgetown. The 'burning' Vernon District had many well-stocked longleaf stands with a clean understory—result of many years of fire. We estimated 44,000 acres of longleaf with 16,000 subject to military restrictions.

In South Carolina, the two districts were quite different. These forests that could be prescribed burned creating a wide band of fire. An excellent contract was completed in 1975, several supervisor's offices engaged me for follow up assistance. I worked 4 additional years in Alabama, 2 years in the Health and Welfare programs.

Besides consultation on national forests, I assisted many others on longleaf pine problems. Some of my clients were in the South Carolina legislature, many were in seedling concerns. We estimated 44,000 acres of longleaf with 16,000 subject to military restrictions.

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A written report was submitted for each ranger district and explains the locale. For example, in Tallapoosa, they had some mountains to deal with but considerable land – an estimated 46,000 acres – suitable for growing longleaf. A ton of seed or seedling cost at least $150 per acre or so. Prompt direct seeding of the cutover area with longleaf had established good seedling stands. In addition, for this area, the early 1800’s by Charles Lyell, the British geologist, who speculated that the excellent longleaf pine resulted from control of competition.

Tuskegee was at a lower elevation than the three mountain districts, but usually longleaf occurred in narrow bands along the top of ridges. This topography complicated the use of fire and other silvicultural practices. Also, there were open areas where seeding and planting had failed on 3,000 acres suitable for longleaf pine management. Conewac was by far the best district for growing longleaf. It covered favorable coastal pine soils and a gentle terrain. We estimated 50,000 acres of potential longleaf land. Despite the fact the large portions had excellent sites, some stands suitable for use of shelterwood, an unwanted amount of regeneration had been done by clearcutting and planting of slash pine. I strongly recommended against such planting. Future regeneration should concentrate on natural regeneration using a shelterwood system where adequate seed trees are available. On five districts in Florida, Appalachian, Wakulla, Seminole, Lake George and Osceola, we estimated 88,000 acres of longleaf.

Saplings, however, had more than 2,000 dominant stems per acre. We estimated, however, that 9,000 acres were suitable for natural regeneration. They had been unusually successful direct seeding of longleaf pine. It covered favorable coastal pine soils and a gentle terrain. We estimated 50,000 acres of potential longleaf land. Despite the fact the large portions had excellent sites, some stands suitable for use of shelterwood, an unwanted amount of regeneration had been done by clearcutting and planting of slash pine. I strongly recommended against such planting. Future regeneration should concentrate on natural regeneration using a shelterwood system where adequate seed trees are available. On five districts in Florida, Appalachian, Wakulla, Seminole, Lake George and Osceola, we estimated 88,000 acres of longleaf.

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Tuskegee was at a lower elevation than the three mountain districts, but usually longleaf occurred in narrow bands along the top of ridges. This topography complicated the use of fire and other silvicultural practices. Also, there were open areas where seeding and planting had failed on 3,000 acres suitable for longleaf pine management. Conewac was by far the best district for growing longleaf. It covered favorable coastal pine soils and a gentle terrain. We estimated 50,000 acres of potential longleaf land. Despite the fact the large portions had excellent sites, some stands suitable for use of shelterwood, an unwanted amount of regeneration had been done by clearcutting and planting of slash pine. I strongly recommended against such planting. Future regeneration should concentrate on natural regeneration using a shelterwood system where adequate seed trees are available. On five districts in Florida, Appalachian, Wakulla, Seminole, Lake George and Osceola, we estimated 88,000 acres of longleaf.

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Forest, to view and discuss management problems on the ground.

Additionally, Mooney Nalty sponsored a longleaf pine workshop, organized by the Alabama Forestry Commission, that was held at the Brevort. It was attended by company foresters from southwest Alabama, AFC foresters, and other including Zebulon White, the Louisiana consultant. Convivenc in the potential of longleaf, many pulp mill foresters began to include it in their planting programs.

Bill Balmer, softwood specialist with State and Private Forestry stationed in Atlanta, organized a longleaf cooking workshop that was held at Mobile. Boyer and I presented talks on longleaf pine to the large and enthusiastic group of forestry. They also toured the Escambia.

Although Brewton was the only project where research was devoted exclusively to longleaf pine, there were other people doing significant research on the species. We closely followed the publications and made visits to see their research and discuss findings with them.

Our travels included Alexandria Forestry Center in Louisiana, Lake City in Florida, Cordelle in Georgia; Savannah River Project and Charleston County in South Carolina; and Genetic Institute in Mississippi. Also, we spent a day with Hed Stoddard, the quail authority, and Ed Komerok at Tall Timbers near Thomasville, Georgia.

Moreover, International Paper Company was doing some research on longleaf pine and provided land for our Adams Tract shelterwood test. We visited their Southland Experimental Forest near Bainbridge, Georgia.

To guide our research, we were given the advice of a technical committee. Members were T.E. Maki of North Carolina State; Claude Brown of the University of Georgia; Bonninghausen of the Florida Forest Service; Bigler Crow of Louisiana State University; Walter Beers of Buckeye Cellulose; Bob Allen of Clemson University; and Jim Satin, assistant regional forester in Atlanta.

When I retired from the Forest Service in December 1974, Jim Sabin hired me for consultation on regional longleaf pine problems. The work took most of 1975. I visited 24 ranger districts in 13 national forests in seven states. This included every national forest in the longleaf pine belt where an estimated 725,000 acres of the species were growing.

Purpose was to give on-the-ground advice and training on problems and to encourage more consideration of longleaf in management problems. In my travels, I contacted 175 people in field sessions and dozens more at supervisors offices. Practically everyone, with a few notable dissenters, displayed a sincere interest in longleaf pine and were eager to learn. A broad spectrum of national forest people welcomed me: supervisors, staff men, foresters, wildlife and other specialists, technicians, and forest workers.

As a rule, two days were spent at each ranger district beginning with a get-acquainted conference to list longleaf pine problems and select field points to visit. Most of the time was spent on the forest formulating prescriptions, demonstrating techniques, working out solutions to silvicultural and management problems. We were in active demand by mariners to waterproof their sailing vessels. New Orleans traders sold the fumes of their wooden ships (tar and pitch) and livestock, products of the longleaf pine forests, played a major role in survival of the South during the early winter months.

To produce naval stores, they gathered heartwood and stacked it in conical piles in specially prepared pits. The wood was then coated with sand and set on fire. Combustion boiled out the tar, which drained into barrels or into another clay-lined pit to be converted into pitch. Pitch was then further refined in ovens. Sometimes huge out coves of cypress logs were used to transport the barrels to seaport shipping points. Some of these barrels were large enough to hold 500 barrels of naval stores.

Tar has often been featured in the folklore of America. For example, it was used as a punishment for misdeeds or other antisocial behavior, victims were tarred and feathered. The sticky black liquid was first smeared over the victims’ bodies, which were then coated with gobs of feathers. To add to the discomfort, the offenders were sometimes ridden on a rath snatched from a nearby fence.

Carolina settlers had spread westward. Homes, farming, livestock, and timbering followed a similar pattern. He enjoyed the hospitality of this man, as well as many others, who had built comfortable homes and mansions, some of brick, with large libraries and elaborately furnished. Proceeds from rice and indigo crops, as well as from large herds of cattle and naval stores operations, had made this possible.

Some settlers were engaged in timbering operations. Selected trees for spars and large logs were harvested for export, small slaves cut the timber, skidded it to the riverbank with a big wheel rig pulled by oxen, shaped the material with a broad axe, and dumped it into the river. There tongue decks were made up into rafts and floated down to the seaport for export. At Cross Creek, trading center for the Highland Scots, Bartram found a bustling village. Enterprising settlers had built grist and sawmills, powered by water. It was a trading center for pioneers who brought cattle, naval stores, and other products for transportation to Wilmington down nearby Cape Fear River. There were many skilled people in the village: blacksmiths, cooperers, carpenters, shoemakers, and the like. A comfortable tavern furnished accommodations for travelers.

Bartram’s travels took him into Georgia, Florida, North Carolina, and Mississippi as well as the Carolinas. In his journals, he reported that the culture developed by Carolina settlers had spread westward. Homes, farming, livestock, and timbering followed a similar pattern. He did find a difference in naval stores operations near Mobile, Alabama. Huge iron pots were used instead of clay-lined pits to convert tar to pitch.

Scottish-Irish and Huguenots had barely established permanent homes in the forested land between Santiee and Savannah. There the forests were whole, serene, and free. The victims’ bodies, which were then coated with gobs of feathers. To add to the discomfort, the offenders were sometimes ridden on a rail snatched from a nearby fence. After the American Revolution, a new method of naval stores operations near Mobile, Alabama. Huge iron pots were used instead of clay-lined pits to convert tar to pitch.
In 1835 the first railroad in North Carolina started at Wilmington and traversed through the pine country, reasons not including Weldon to the Virginia line. Encouraged by the success with longleaf planting, Ed Leigh McMillan II agreed to have his crews make some tests on the wood system. Seven such tests were made on the early days, rails consisted of metal strapping nailed to heart-pine timbers that were set on top of crossties. But the strapways weaved because of longleaf pine and caused many accidents and were soon replaced by iron rails moulded in a foundry. Passenger coaches were lighted with kerosene lamps and heated with iron stoves in pine country were fired with lightwood collected from the forest.

In the early days, most of the turpentine and rosin was produced in the Cape Fear region of North Carolina, in fact, until 1830 the gum naval stores industry had not spread south from there. There was a belief among turpentine producers that longleaf pine trees would not flow gum south of the Cape Fear River. This superstition was, of course, unfounded and gum production gradually expanded throughout the longleaf pine belt. Before the Civil War, however, 90 percent of gum naval stores was produced in the two Carolinas. Barrels of gum naval stores were generally shipped on flat boats, or timber rafts down rivers to markets. Many useful products were derived from them and the timbermen had no trouble finding buyers.

During the 1800’s, drastic changes in transportation occurred in longleaf pine country. Waterways, the highways of the early settlers, had been gradually supplanted by roads cut through the wildernesses. Often they followed Indian and buffalo trails. In the Carolinas, herds of buffalo had wintered in the coastal provinces but returned to the Appalachian Mountains for summer grazing. Longleaf pine was cut out, well-marked passages through the forests and some became the route of early roads. Slow moving, canvas covered wagons traversed the one-track roads laden with merchantable wood and mail and packages were delivered on horseback until stage coaches came into common use. Pioneers sometimes rode through hogheads filled with tobacco and other produce to be towed to market by slaves or mules.

When distances required overnight travel, wagon travel, vagabonds brought along cooking supplies, tents, and other camping equipment. They would meet others at favorite campgrounds and enjoy an evening of music and tall tales around crackling fires before bedding down for the night.

In the early 1800’s, rivers still provided the primary means of long distance transportation of naval stores, timber, and similar forest products. About that time steamboats were built. Before they came, an inventor lost a fortune attempting to build a boat on the Cape Fear River with horses operating a treadmill. Soon luxurious steamboats powered by rear-mounted paddle wheels instead of oars came into common use. Before the photo was taken, views a superior 30-year-old longleaf.

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Excellent reproduction was established everywhere the resistant to damage. A pre-cut study area, established earlier to determine optimum overstory densities in a shelterwood system, was used for a fire study. In each density class there were four treatments: winter, spring, and summer fires with a no-burn check. Trees in the overstory were large-sawlog size—about 60-years-old.

In a younger stand, which had been established on management system compartments, Maple installed a similar study testing winter, spring, and summer fires with an unburned check. Overstory trees were about 25-years-old at the time.

I also conducted two fire studies. One tested the concept of using "crop seedlings" instead of "average seedlings" to diagnose the need for a brownspot burn. Normal procedure at the time was to select individual seedlings to estimate degree of brownspot infection and likelihood of seedling damage by the fire. In the crop seedling method, milacres were selected mechanically and the "best" seedling on the milacre was used for the sample. The study revealed that the new method could result in a drastic difference in prescriptions more suited to the needs of the stands.

Little was known of the ability of planted seedlings to resist damage in a burn. My other study tested the survival of newly planted seedlings in hot, moderate, and cool burns. Such seedlings proved to be highly resistant to damage, except in hot burns near a forest wall.

Publication of research findings was an important phase of our battle to "save the longleaf." As studies were completed, our results were published in the Journal of Forestry and other scientific and popular outlets. Forest Farmer ran an article on early results from our shelterwood tests. In 1960 our annotated bibliography listed all significant publications on longleaf pine since Wahlenberg's monograph in 1946.

Our findings on natural regeneration, especially with the shelterwood system, were published in a summary bulletin in 1975. Coverage was comprehensive including basic ecological and biotic factors, an evaluation of several regeneration systems, and detailed coverage of the shelterwood system. Farrar summed up findings from his regional growth-and-yield study in a bulletin. It gave reliable and encouraging data on the potential of thinned natural stands. His publication was much more useful than the standard Miscellaneous Publication 50, which was based on unmanaged stands, giving growth and yield to low for managed stands.

1968 was a year of significant progress. Our article describing amazing results with shelterwood regeneration on a steep mountain slope was published. The Joseph Springs area on the Heflin Ranger District, Talladega National Forest had been selected for a test of seedbed burning. The pine overstory had been cut back to about 30 square feet of basal area per acre, which is our current recommendation of density for the seedling type. The study area covered about 50 acres was burned during the summer before the good 1961 seed crop except for small plots protected from fire. Because of the steep slope, we had to get special permission from the Region to make the burn. Excellent reproduction was established everywhere the

Escarbola researchers conducted a regional study to determine the growth potential of longleaf pine. Alabama. His publication of results was a valuable accumulation of knowledge on growth and yield of natural stands and optimum thinning densities for various products.

During the 1960's and 1970's growth and yield data from plantations in Louisiana were published by Shoulders, Lowery and others. Their data exploded the generally held myth that longleaf pine grew too slowly to be considered for commercial management.

A seedbed burn established an overdense seedling stand on Kaul Forest that gave Bob Maple an opportunity to try to thinn them with fire. Before his study, our careful survey had revealed that a medium stand of about 5,000 seedlings per acre might survive. Those were seedlings germinated, which had been expected to die, on bare soil in contrast to others established on duff. At the time they were only one-year-old—1 inch at the root collar—a size usually expected to be killed.

Maple put in a carefully controlled winter fire under ideal weather conditions and succeeded in saving the 5,000 seedling density. Fire had done a good job of reducing the undesirable stocking of some 50,000 seedlings per acre.

Dave Bruce had thoroughly investigated fire mortality of grass-stage longleaf seedlings during the 1950's. Little had been done to explore the resistance of seedlings height growth to fire damage. Maple installed a basic study using thermocouples and an on-site weather station to determine damage to such seedlings. In addition to the intensity of the burn, correlated with weather, he found that seedling characteristics were important. Those with thin bark, unprotected by green straw, were severely damaged. Opposite having thick bark, protected by a sheaf of pine straw, were more resistant to damage.

In another study, he observed mortality of grass-stage seedlings in a winter fire under a range of overstory densities. Although mortality increased under heavier densities, overall damage was light in the winter burns. A prep-cut study area, established earlier to determine optimum overstory densities in a shelterwood system, was used for a fire study. In each density class there were four treatments: winter, spring, and summer fires with a no-burn check. Trees in the overstory were large-sawlog size—about 60-years-old.

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Our John Hill test on the Kisatchie National Forest in Louisiana was made in an area that had been part of an old cottonfield. There were some migrants living like pioneers in the virgin forest. Many of these migrants lived like pioneers in the virgin forest. Historian Nollie Hickman described them as inhabitants of forest wildernesses with no near neighbors and desiring none. They subsisted on open range livestock, hunting, fishing, and small gardens.

Timbering in the longleaf forest provided a living for others. Over the years there had been many changes in logging and milling. Pit sawing of pioneer days had been replaced by slash saws powered by water. Circular saws came into existence in the 1850's making slash saws obsolete.

The basic task of cutting trees and trimming timbers required great endurance and exceptional skills with the axe. A day's work was from "tin ti lunt," from first light of day until dark. As long as the timbermen used axes, they cut stumps waist high. When the crosscut saw was introduced after the war, less timber was wasted because stumps were cut lower. At first, pine gum made the crosscut impractical but soon sawyers learned to use kerosene to dilute the gum. The kerosene kept the saw from sticking.

Steam replaced water to power the mills in the 19th Century and larger mills with greater daily production were developed. Many of these large mills were generally located near rivers or creeks so logs could be rafted to them. Logging was done by independent operators. To move the logs to the river, oxen were used. The drivers were masters at getting maximum effort from their animals. They used rawhide whips to control them. In the hands of an expert teamster, the whip would crack like a bolt of lightning near the ear of a stubborn beast causing him to change his direction or urging him to greater effort.

During the "river era" oxen were used to haul logs.

The practical skidding range did not exceed 4 miles, so cutting was done along streams where water was deep enough to float logs. Logs were assembled into rafts on the rivers to be floated to the sawmill. Rafting required considerable knowledge, and Louisiana was made in an area that had been part of the back country out of reach of timbermen.

In the absence of my key researchers, I concentrated on my regeneration studies. Shelterwood systems were tested in a regional study at 10 locations in North Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana. Each shelterwood test, usually about 80 acres, was given a code name to simplify identification of the study area.

Our first test, Bicol-109, was installed on Kauai Forest in 1966. The seed tree overstory consisted of 109-year-old pines, probably saved from cutting by the Kauai Lumber Company management plan prepared by the Forest Service in 1950. Our cooperating loggers were Hugh Kaul and Lewis Wessner. Kaul was provided additional land for regeneration and fire studies.

The same year, we established the Ebenezer test on the Centerville Ranger District, Talladega National Forest, in Alabama. Study area was in a 70-year-old longleaf pine stand that apparently originated after the Civil War on an old cottonfield. There were some excellent five-log trees in the stand.

Joe Riebold, supervisor of the Florida National Forests, helped me locate the Lavender-Forbes trail on the Appalachian National Forest south of Tallahassee. Riebold, a graduate of Mont Alto Forestry School in Pennsylvania, had successfully regenerated longleaf pine on the Francis Marion when he was supervisor of the National Forest. He was a strong booster of our shelterwood research. Incidentally, Joe helped conduct the ranger school meeting I attended at Gulfport, Mississippi, in 1935.

The Spanish Trail test on the Blackwater State Forest was established in well-stocked second growth stands that had been in existence in the late 1920's. A strong booster of longleaf pine and the shelterwood system was Bonnighausen, assistant state forester, who often visited us thoroughly familiar with our Escambia research. Bob Brit, forester for Egin Air Force Base in Florida, would have preferred a better site for our Oglesby ditch test. It was representative of the lower Coastal Plain with severely gallberry and palmetto competition. But, when I pointed out that we needed such a critical test in that province for the study, he agreed.

Our Adams test was made on International Paper Company's Southland Experimental Forest near Bainbridge, Georgia. It was a promising site with an excellent overstory of pines and a clean understory. Even with favorable conditions we did not successfully complete the regeneration cycle in 20 years. Our problem was a lack of seed production.

On the Black Creek Ranger District, DeSoto National Forest, in Mississippi, we established the Flatt Branch test. DeSoto was damaged through Hurricane Camille and a small accidental fire. It was the most successful of all our regional tests. The site trees were fruitful and the understory had been kept clean by the National Forest with frequent prescribed fires. The study area was not far from towns and cities in the camp that I visited in 1947. Our seed trees in the test were probably seedlings hidden in the grass at that time.

Our John Hill test on the Kisatchie National Forest in Louisiana was made in an area that had been part of an old cottonfield in World War II. Our crew used metal detectors to avoid striking unexploded shells while setting surveying posts. I visited the Kisatchie Test Site, George Tannhill, who was still ranger of the Winn District, invited me up to see people and places I had not seen since the Great Depression.

Our Rome Davis test was established on the Bladen Lakes State Forest near Elizabethtown, North Carolina. Cooperatives were set up at home and experiment stations at the Forest, and Graham Chambell, assistant state forester. Interestingly, we found earthworks of an old tar kiln in the study area.

In South Carolina, John Tiller, state forester, for American Hill test made on the Sandhills State Forest. Tiller was a district forester when I had a similar position at Aiken in 1942. All 10 shelterwood test areas have been maintained for 20 years and valuable guidelines for applying the system have accumulated from them. In addition to the regional shelterwood study, I conducted replicated plot research to add to our fund of regeneration knowledge. In a 1956 study, seedling height growth had been increased seven-fold by scalping grass exposing mineral soil with a BSW plow. Following this lead, I conducted a seedbed preparation study using an array of treatments on two contrasting sites. Included were combinations of fire, offset, and mechanical treatments. Dibon was used to control grass; disk; roto-tilling, and shallow furrows to modify the seedbed mechanically. In a controlled crop, we determined binoculars counts of flowers and cones taken from a single position on one side of the seed tree. Sample trees were felled and binoculars measurements taken from a single position on one side of the seed tree. Sample trees were felled and binocular measurements taken. From these data, blow-up factors for binocular counts were derived. In a study of crop level, tree age, and other factors on seed per cone were determined. Seed per cone was needed, along with cone crop forecasts and expected cone production for the estimations of probable success of seedbed treatments.

When Bill Boyer returned from Duke, he picked up Crali's soil and site studies and conducted some additional regeneration research. He made a study of the effects of slash on the development of both male and female longleaf pine. His findings, used for his Ph.D. thesis, were very useful techniques for determining when to make one-crop forecasts.

Bob Farrar plunged into establishment of his regional growth and yield study when he returned from the University of Georgia. His plots, established on cooperated land, tested a wide array of ages, sites, and stand densities. Besides his regional growth and yield studies, which was installed in natural stands, Farrar also conducted a plantation yield study. Data were taken in all plantations we were able to find throughout the South. Plantations were representing many ages, sites, and degrees of stocking were located in North Carolina and Texas. In both of those regional studies, I worked closely with Farrar securing cooperator support and helping him maintain the plots.

Farrar also analyzed data that had accumulated for about 35 years from theLuxley plots in Baldwin County, Alabama.
By 1965, despite the interest focused on longleaf by Wahlenberg's monograph in 1946 and significant research findings in the postwar years, the species faced a dismal future. Regeneration failures, slow seedling height-growth, infrequent seed crops, and unfounded beliefs had prejudiced many foresters and landowners against the tree.

A modern day army of men and machines moved into the second growth forest with a singleness of purpose. Their objective was to clearcut the longleaf and replace it with other pines. There was no hope of recovery from these operations. Every merchantable cut was cut and removed. Unmerchantable trees and logging debris was pushed into windows and burned or crushed into the ground with huge machines. There were no scarps and a new stand of trees planted.

Much of the conversion was done by pulp companies but there were others bent on destruction of the longleaf forest. Even foresters on the southern national forests were following in the footsteps of the pulp mill foresters. Locally, sale of the magnificent Alpipe Sulphur Longleaf Forest for conversion into slash and loblolly pine plantations was particularly disheartening to us at Brewton.

In the 10-year period between 1955 and 1965 the longleaf pine forest was reduced from 13 million to 7 million acres. Unless a change was made, longleaf pine as an important commercial species would disappear from the South by the mid-1970's.

The Brewton unit was the only place in the South where research was aimed exclusively at longleaf pine. If any significant advancements were made in the South in the 1950's and 1960's that most foresters considered the practice too risky and switched to slash and loblolly pine.

**STEMMING THE TIDE**

On April 24, 1965, Verne Harper came for an inspection visit to Brewton. Earlier in a meeting with Director Zilgitt and his staff in New Orleans, most observers were convinced that he would recommend closing Brewton's loblolly pine research.

Despite our fears for the future, professional staff and I were determined to make a final effort to save our research program. When the visitors came, I outlined our program and emphasized the importance of the longleaf pine forest and its dismal fate if our research were abandoned. After the conference we toured the Essegee where Boyer, Farrar and Clark had a mastaba and a million dollars to present their research.

After Harper left we got some amazing news from New Orleans. The director there was very much opposed to this story and decided to make Brewton a full fledged project with no tie to Marianna and promising me as leader in charge. Needless to say we were delighted with his decision and plunged into our research with renewed zest.

In order to stem the tide that was rolling against longleaf pine, an aggressive program of research at Brewton was needed. But I was plagued with a shortage of research began to do this, the system employed for employment as a professor at a northern college. Both Boyer and Farrar were gone for two years working...
Since 1914, when the war started in Europe, German submarine warfare had dried up export markets for southern pine lumber. In 1917, the situation was changed drastically. Carloads of lumber were needed for wooden barracks to house soldiers and additional lumber was required for railroad cars. Also, there was an urgent demand to construct 1,000 wooden ships. Southern lumbermen assured the nation that they would furnish timber needed to win the war.

W.H. Sullivan of Great Southern Lumber Company predicted that enough timber could be produced from the virgin longleaf pine forests of the South to turn out 20 to 30 vessels a day from southern shipyards. But the lumbermen faced many problems with the ship building program. A great number of timber, 12" x 12" x 24", were needed. Wood-cut lumber did not furnish enough of that material, and suitable trees had to be hunted out, which reduced overall production. Changes in ship design created other problems. Drafting of men for the armed services and migration of workers to other war jobs caused labor shortages.

During World War I huge longleaf pine trees were cut to build a fleet of wooden ships.

Despite all the difficulties many wooden ships were built until the demand slackened in late 1918 when steel became available for ship construction.

In the skurry and bustle of the time, little thought was given to growing a second crop of trees. Most lumbermen considered regeneration highly impractical, and, indeed, local tax policies encouraged them to “cut out and get out.”

But there were a few, encouraged by pioneering foresters like Austin Carey, who braved the scorn of their fellows and made some provision for a second crop. In Alabama, the Alger Sullivan Company, T.R. Miller Mill Company, and Kaul Lumber Company were early converts to conservation.

In 1905, at the request of Kaul Lumber Company the USDA Forest Service prepared a management plan calling for modification of cutting practices and fire protection. It was approved by the nation’s chief forester, Gifford Pinchot.

Louisiana’s Henry E. Hardtner, known as the “Father of Forestry in the South,” cooperated with Herman H. Chapman of Yale University to find ways to regenerate longleaf pine. At Bogalusa, Louisiana, Red Bateman, chief ranger with Great Southern Lumber Company, designed a dibble, still used by many, and planted some 20,000 acres of longleaf seedlings he grew locally. In 1920 Austin Carey, noting a good longleaf pine cone crop, suggested that Bateman burn the seedbed to prepare for a catch. His suggestion was taken and several thousand acres were seeded naturally. Bateman arranged that the company fence the area to protect the seedlings from hogs and keep fire out of them. When the virgin overstory was logged, the seedlings survived and the area did not have to be planted.

Henry E. Hardtner, known as “The Father of Forestry in the South,” cooperated with Professor H.H. Chapman of Yale University to find ways to regenerate longleaf pine.

There were others like Posey Howell of Dantzler Lumber Company in Mississippi and Goodrich Jones in Texas who made an effort to get a second crop of longleaf, but the virgin forest generally was considered a nonrenewable resource to be mined like iron ore.

The railroad loggers swept across the longleaf belt from east to west. Intensity of cut increased with the westward movement, reaching a crescendo in Louisiana. Few trees escaped the battering of the skidders. By 1930, it became apparent that the end was near. Only

In 1957, I began development of a seeder that would simultaneously prepare the seedbed and plant the seed in rows to reduce the overall cost. Next year Seaman Hudson secured a grant from Container Corporation to build a prototype machine that was later called the H-C Furrow Seeder.

In 1958 the author invented the HG Furrow Seeder, a machine that simultaneously prepared a seedbed and planted forest seed.

New York scientists discovered and perfected bird and rodent repellents that made direct seeding of longleaf pine practical.

In the next few years Walker, Boyer and I conducted studies to confirm or reject the shelterwood hypothesis and develop knowledge and techniques for applying the system. We learned the best overstory density for preparatory and seed cuts, timing for removal cuts, methods to forecast cone crops, acceptable levels of cone crops and seedling stands, use of fire, logging damage and other basic knowledge. From our studies, we were convinced that the shelterwood system would work by using the techniques we had developed. It was not ready for testing over a wide range of conditions.

Bill Mann and other researchers at Alexandria, Louisiana discovered a bird repellent in 1955 that significantly boosted the opportunity for regenerating longleaf pine. In several years of additional research they perfected guidelines, including more potent repellents, for direct seeding.

One objection to direct seeding was the lack of space control where seed was broadcast. Charlie Lewis built a machine in Louisiana for seeding in rows and John Cassady, officer in charge at Marianna, Florida, also built a successful row seeder. Both machines could only be used on site-prepared ground.

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and returns. Much practical information was learned of ticks and starvation. Foresters were highly skeptical.

One junior forester to head up planting at each CCC accident in 1933. Odom, with our help, built the fence and put 75 cattle carcass of a cow that had succumbed to the twin hazards Buzzards circled overhead and frequently feasted on the system. It would require rigid testing before it could be recommended with confidence for longleaf pine. Most of the big mills had cut out and many operators had moved on. Banks and businesses dependent on them failed. Tax revenues for local governments dried up. Ghost towns were tragic reminders of better days. The landscape had drastically changed. Cool, green shadows of the virgin forest were replaced by bare and desolate land (Kisatchie National Forest).

**THE GREAT DEPRESSION**

The Great Depression that plagued the nation in the Thirties plumbed unusual depths in the land of the longleaf pine. Most of the big mills had cut out and many operators had moved on. Banks and businesses dependent on them failed. Tax revenues for local governments dried up. Ghost towns were tragic reminders of better days. The landscape had drastically changed. Cool, green shadows of the virgin forest were replaced by bare and desolate land (Kisatchie National Forest).

A wildfire in 1947, before the bumper seed crop, established well-stocked stands of seedlings on several management system compartments scheduled to be cut back later to seed trees. When the compartments were cut, I kept a record of the fate of the advance reproduction and seedlings established from the seed trees. This suggested a revolutionary new way to regenerate longleaf pine—a shelterwood system. I followed up the lead by investigating the history of second-growth forests established on U.S. Steel land in Baldwin County and on Geneva State Forest.

I was astonished to find that the advance reproduction survived well, but we were getting practically nothing from the seed trees.

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By the late 1920's most of the "railroad loggers" had to cut out leaving a bare and desolate land (Kisatchie National Forest).

My first winter there I supervised CCC enrollees planting some 2 million longleaf and slash pine seedlings in a bare "stump orchard" protected by a fence from delinquent company lands and scratched out a bare existence with small garden patches, submarginal farms and scrub livestock. Hard cash for medical service or other emergencies was nonexistent. Stunned and despondent, the people of the longleaf belt faced a grim future.

I spent the early days of the Depression as a forestry student at North Carolina State, enrolling as a freshman in 1929: the year the stock market crashed. After earning a degree in Forestry in 1933 and working almost two years in the Southern Appalachian I was transferred to the Kisatchie National Forest in Louisiana. The cutover land was not as attractive as the luxuriant hardwood forests and clear streams of the mountains, but the opportunity to work in longleaf pine was especially appealing to me.

**Suffering was most acute among forest workers left behind when the mills left. Many stayed on tax-delinquent company lands and scratched out a bare existence with small garden patches, submarginal farms and scrub livestock. Hard cash for medical service or other emergencies was nonexistent. Stunned and despondent, the people of the longleaf belt faced a grim future.**

Bud Brantley, Owen Carrol, Yancy Odom and Earl Odom, with our help, built the fence and put 75 cattle on the Kisatchie National Forest in Louisiana. The cutover land was not as attractive as the luxuriant hardwood forests and clear streams of the mountains, but the opportunity to work in longleaf pine was especially appealing to me.

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Sullivan, Ben May, Mashmeyer, M.C. Stalworth, Charles Dixon, McMillian Trust, and Senator Swift. With the money, we hired Larry Walker who came in 1983 and helped out for a year writing up a backlog of research and installing new regeneration studies. After Walker left, federal funds became available to hire Bill Boyer, construct an office-lab in Brewton, and hire some extra help. Encouraged by local supporters of our program, Congressmen Bob Bikes and George Grant along with Senators Lister Hill and John Sparkman helped get the federal money to keep longleaf pine research going in the fifteen.

In 1952, an Alabama state law was passed outlawing open range grazing of cattle. Miller officials agreed to furnish fencing material and allow grazing on their land to organized cattlemen associations who would build the fences for their cattle. We helped organize an association of four cattlemen to graze cattle on the Experimental Forest in accordance with research requirements including limitation of stocking, use of good management practices, and keeping of records for us.

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With two junior foresters to assist me, I was put in charge of planting at Provencal camp near Natchitoches. Superintendent Cagle assigned about seven 20-man crews to each with a foreman, tree tender, and 18 planters. After a few days of intensive training, production per crew began to average over 5,000 trees per day—good compared with that of other camps. Later a staff man from the Supervisor’s office came out and we worked with him to develop a more efficient crew organization and controllable production. We found that one man handling both dibble and planting tray was much better than the two-man units we were using.

To help find the land and people, I arranged for George Cunningham, a retired company land agent, and local man stationed at the camp, to help. During the next 3 months, we found 175 cases of occupancy, mostly by unemployed company workers who had either “squatted” on the land or fenced company property next to their small farms. Only one man refused to sign for the permit and decided to claim title. Everyone treated us courteously. Many invited us in for dinner in poor homes where we were accepted provided they would share our GI sandwiches that I did not consider as tasty as their home-cooked food.

But there was a deep-seated undercurrent of resentment and apprehension. Often they spoke of the shock of losing their timber jobs and many felt that the company was to blame for their predicament. Also, there was fear that the Federal government would make them move. They were somewhat relieved when I told them they could probably stay by signing for a special-use permit. But a nagging fear still remained. Open-range cattle and hogs were important to their livelihood. Could they still graze government land unmolested?

Every spring for years they had burned the range to green up the grass. Would this be permitted? The company had been very lenient about cutting firewood and “board” trees for buildings. They even looked the other way when crossties and ash logs were cut for sale.

Almost everyone was an admirer of Huey Long, the Kingfisher, who was a native of Winn Parish. They were looking forward to his election next year bringing a better life with his “Share the Wealth” program. In 1932 Long had supported Roosevelt, but then he had fallen out with the administration and allied the CCC. “To the people, the Forest Service represented their political enemy—Roosevelt.”

A widow, living in a small clearing on a scrub oak ridge near Saline Bayou, was typical of the plight many suffered. Her dwelling would have been considered poor shelter for a mule. It was frantically built with a corn shuck mattress and wobbly table covered with a grease cloth. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress; and a wobbly table covered with a greasy rag. When we drove up, she was hoeing vegetables in a small garden patch. Courteously, she brewed coffee for us, after wiping out the cups with a greasy rag, and helped us make a survey of her improvements. Besides the shack, there were fences around the garden patch and a small cornfield, and a well. She readily signed the application for special use.

Our most perplexing case of occupancy was in 3,000 acres, devastated by a skidder operation, known as the Chandler Camp. In the center of the clearing there was a dirt floor. Inside, the furnishings were even more pitiful. There was an ancient stove, a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy cloth. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. We found a few rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. We found a few rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. We found a few rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. We found a few rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag. On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed with a corn shuck mattress and wobbly table covered with a greasy rag.

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Annual harvests from the Farm Forty study, demonstrating a management system for pine woodlots, were observed each fall by hundreds of visitors.

Sheriff "Doc" Fountain agreed to appoint a "hog deputy" to trap the animals and collect fines from the owners. Albert Harris, the deputy, built a dozen wooden traps with material furnished by the government. He successfully trapped many hogs. Owners, alarmed by the loss of their hogs that always "died" in the pound, hastily built fences and penned their animals. A few, angered by the trapping program, stole traps, and set wildfires. But vigorous action by George Ward, the state ranger, and a cooperative FBI agent caused the vandalism gradually to die down.

In 1947, H.O. Mills, district ranger on the Conecuh National Forest, noticed a heavy crop of longleaf pine cones. He, along with Don Morris, assistant supervisor, decided to try a seedbed burn that summer. To bolster their confidence, they called on the station to have someone come over and help them decide. Dave Bruce, foremost fire investigator, and I met with them and looked at several candidate stands. We all agreed that the burn should be attempted. Mills successfully established seedlings on 26,000 acres that he burned that summer. In 1951, a drastic change in the Breveton Branch organization occurred. Ed Gaines transferred to Arizona, and Walt Hopkins came to head up a new branch station combining Breveton and Marianna. Florida, with headquarters at Marianna. Florida research would be centered on the Chipola Experimental Forest and be devoted to finding a way to regenerate the sandhills known as “Deserts in the Rain.”

Breveton became a subunit of the new East Gulf Coast Branch, and I was responsible for the longleaf pine research there. A drastic retrenchment was necessitated in the Breveton program, which had been planned for four researchers. Only $15,000 was available to pay the salaries for two technicians, me, and everything else. It was barely enough for salaries with little left for operating expense including rental of office space.

With the blessing of Lew Grosenbaugh and Phil Wheeler, New Orleans division chiefs, we set out to "boil the fat" out of the program. The management systems study was abandoned, so we had the 24 compartments available as a locale for silvicultural studies. Farm 40 and Investment Forest studies were kept. Other studies such as seed tree and forest wall, timing of oak control, Lovley thinning plots, and a few others were put on a maintenance basis.

Obviously, additional funds had to be found if a viable research program was to be continued. Since no Federal funds were available, Walt Hopkins and I contacted T.R. Miller & Company people to see if private money could be found. They agreed to head up a program to collect private donations. We were gratified by the response of local people. Contributors were T.R. Miller, Alger...
In 1947 the Escambia Experimental Forest was established in South Alabama for longleaf pine research. A haphazard collection of boxcar sheds that housed a dozen or so unemployed forest workers and their families. There were 10 large fields but several garden patches. A herd of goats grazed on the coarse grass and some chickens scratched in the bare yards, bleaching in the sun.

Obviously, the clearing would have to be fenced, livestock and families removed, and trees planted. We called a meeting of the men to discuss the situation. Our announcement created a cloud of gloom and despondency as well as anger. But we finally agreed on a plan to fence in the field and all signed up, hoping that some way they would be able to stay. Later, arrangements were made with the Resettlement Administration to find homes elsewhere for them.

Forest conditions were unexpectedly favorable on the Winn unit. In the early years, Botsw Lumber Company had cut conservatively leaving a fair stand of longleaf timber. In many places there were enough longleaf pine seed trees for natural regeneration, and some well-stocked second growth that would soon support a sale. In the last few years, however, they decided to clearcut and close the mill. This operation left two large tracts, Chander Camp and Gum Springs, that would have to be fenced and planted.

When I submitted the signed occupancy statement I got startling news. There was a new supervisor in Alexandria, and George Tannehill would be the new ranger. I would remain on the Winn District as his assistant.

From the first I got along well with George. His father, an official with the Urania Lumber Company, had been our host on my 1933 trip with the North Carolina State Forest. We had been told that the ash loggers were working in the daytime. So we staked out the cutting areas, and with two others, cut several sections from stumps.

Two CCC Camps had been established, Calvin and Chestnut, and we had to be stopped. At the time, ash logs delivered to Bodcaw Lumber Company. We were able, however, to get the company to deduct the value of the logs from the land price.

Junior foresters at the CCC camps supervised planting of the two clearcut areas that winter. I helped train and organize the crews but could spend very little time with them. My main activity was investigating unauthorized cutting. Fortunately, we were able to issue free use-permits to local residents for firewood but cutting of merchantable trees for crossties and ash logs for sale had to be stopped. At the time, ash logs delivered to Shreveport were bringing the unbelievable price of $50.00 per 1,000. Cutters were diligently searching the forest for them.

In September 1935, soon after the death of Long, we noted a bumper crop of cones on longleaf pine seed trees. Stuart nursery had been "crying for cones," so I organized a CCC crew to collect them. Local fishermen were using white cedar poles to fish for buffalo (carp) fish. They were extraordinarily light and strong so I secured a few of them and bolted a strap metal hook at each end. My climbers used them to dislodge the ripe cones from the others on the ground to collect. We harvested and sent several dump truck loads to the nursery. Tannehill suggested that we dig grass from the seedbed under seed trees near Gum Springs tower to see if it would increase the catch of seedlings. We found it did.

A few days later we received tragic news. Henry Hardtner, president of Urania Lumber Company, had been killed in a accident at a railroad crossing south of Winfield, George and I attended the funeral and helped organize the crews but could spend very little time with them. Tannehill valued the knowledge I had gained during the occupancy survey of the people, and management problems. I took him to meet many of the people, and we spent several days driving together over the district, discussing the situation, and making plans. But there was one basic problem that we had not been able to correct and that it did.

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deal with. We averaged only about 30 fires a year, usually small, because we had good detection and well trained CCC crews. On southern districts fire occurrence ran into hundreds of big fires. We did have one grudge fire set by an old man to spite the CCC enrollees. Luckily, a survey crew caught him in the act of throwing down lighted matches while they were sitting in the grass eating lunch. George and I spotted the smoke from Eagle Mountain lookout. When we arrived the CCC men were sitting on the old man. They had beaten him because he threatened them with a knife when they ran them down. George took him to town for treatment and arrest by the U.S. marshal. Because of his age the judge gave him a two year suspended sentence.

Fire suppression, investigating timber trespass, planting and the other activities kept me busy, often seven days a week. After the junior foresters finished planting I organized them into a timber survey crew to collect data for a management plan.

FOREST FIRE HERESY

Regard forest management, a pitched battle between people advocating use of a controlled fire in the longleaf pine forests and those opposed reached a climax during the thirties. Beginning with the first settlers, annual burning of the woods had become a firmly established practice in the Southland. Cattlemen used fire to green up the grass and help control movement of open range cattle. Turpentine men raked straw from around faced trees and control the burned area to protect them from accidental fires. Hunters drove game with fire and collectors of lightwood swung off the grass to make the wood easier to find. There were numerous other reasons for burning: to open up the woods making travel easier; to kill snakes and ticks; and just “for the hell of it.” Coming of spring always meant smoke in the pineywoods.

Besides the local residents, there were others who supported a desirable role for fire in the longleaf woods. As early as 1850, Charles Lyell, a British scientist and traveller, noted that the hills near Tuscaloosa, Alabama, were covered with pine seedlings. He speculated that they resulted from Indian fires that kept hardwoods under control and favored longleaf pine.

In 1908 Herman H. Chapman, a Yale professor, explored longleaf forests on Kaul Company lands in Alabama. From his observations he concluded that fire was beneficial to the forests. After much delay, approval came back but it was too late. We did have one grudge fire set by an old man to spite the CCC enrollees. Luckily, a survey crew caught him in the act of throwing down lighted matches while they were sitting in the grass eating lunch. George and I spotted the smoke from Eagle Mountain lookout. When we arrived the CCC men were sitting on the old man. They had beaten him because he threatened them with a knife when they ran them down. George took him to town for treatment and arrest by the U.S. marshal. Because of his age the judge gave him a two year suspended sentence.

Fire suppression, investigating timber trespass, planting and the other activities kept me busy, often seven days a week. After the junior foresters finished planting I organized them into a timber survey crew to collect data for a management plan.

The biter battle between the fire exaltationists and control burners was won by the burners in the 1920’s. Afterwards prescribed burning became standard practice.

After much delay, approval came back but it was too late. The dredging equipment had been moved and was no longer available to do the job.

On April 12, 1945, President Roosevelt died of a stroke. Symbolically, he died at Warm Springs, Georgia, in the CCC. His conservation policies had contributed so much for forestry. His CCC boys had planted thousands of acres of cutover land with pine, several new national forests were established, and old ones expanded in the longleaf pine belt.

POST WAR PARADOX

In January 1946, W.G. Wahlenberg published his monograph on longleaf pine monograph. It documented practically everything that had been written on the species for 40 years. Coverage was comprehensive including the longleaf problem, resources, uses, properties, ecology, fire relationships, protection, and management.

Dedicated to a future for longleaf pine, the book, with its comprehensive documentation of published material and a scholarly evaluation by the author, was hailed by Raymond Pack and H.S. Graves, as a significant boost for the management of the species. In a more subdued note, Wahlenberg described it as being useful to many people but pointed out gaps in knowledge requiring more research. He recommended a major revision in two or three decades because much of the material was based on virgin stands whereas the need was for management of second growth stands.

The author began by summarizing the longleaf pine problem: the reduction in forest acreage, years of mismanagement, encroachment by other species, inherent limitations of longleaf as well as its attributes. In the “Resources” section, he estimated that the acreage in the second growth forest was only a third of the original. In the time of his monograph, that acreage was less than 2 million acres, and the pine stand of some 200 billion board feet had been reduced to one-tenth of the original, practically all in second growth stands.

Uses and properties of the wood are described in detail as well as milling practice, preservation and drying. Its value for naval stores is cited. Ecology covered botanical and commercial range, stand associates, soils, biological, and human influences.

Role of fire in regeneration is described in detail. It is generally proclaimed that it is essential. The knowledge on the biology of seed development, dissimilation of seed, seedbeds, seedling classification, and development was thoroughly documented.

Wahlenberg was pessimistic for the success of natural regeneration. He begins this section with the statement that “deliberate regeneration has rarely been accomplished.” Following is a litany of problems: irregular seed crops, slow height-growth, and many unexplained failures.

He cites one case of successful direct seeding but failing in reproduction. Usually the large, nutritious seed is gobbled up by birds and other predators.

He believed that planting is the only viable way to regenerate longleaf pine. He lists a wealth of knowledge, developed in recent years, on the entire process including seed procurement, nursery practice, care of planting stock, seedling grades, and planting practice. Protection against the myriad of pests, hogs, brownspot, and other minor problems. In general, longleaf pine is pictured as resistant to the hazards of the southern environment if given a reasonable degree of protection.

In a major division called “Management,” naval stores operations are discussed along with timber improvement, pruning, and harvest cutting is covered. The author states that longleaf should be grown in even-aged stands and recreation strips, or a scattering of seed-tree system. In view of earlier sections of the book, however, the seed tree system does not hold up much promise.

Despite obvious gaps in knowledge, the monograph set the stage for more research that promised a bright future for longleaf pine.

Indeed, in 1946 a new concept for forest research was developed in the South. Local research centers concentrating on major forestry problems in a defined territory was established. Each was in effect a branch of the Southern and Southeastern Forest Experimental stations. Seven were established in the longleaf pine belt: Alexandria, Louisiana; Gulfport, Mississippi; Brevort, Alabama; Lake City, Florida; Cordele, Georgia; and Charleston, South Carolina.

It was my good fortune to obtain employment as a research forester on the Brevort Branch. In December 1946, I began work to investigate the mysteries of longleaf pine management. T.R. Miller Mill Company had offered the government 3,000 acres of their land for an experimental forest to serve the Branch. My first job was to make a reconnaissance survey of their 200,000 acre forest to select candidate areas for research meetings. A committee established by the Station. Arnold Mignery, a young veteran, and I spent several weeks on the survey and picked out three suitable areas. We all agreed that an area we called “Dixonville” was best.

Director Charles Connaughton sent a committee from New Orleans to make the final selection. This committee was composed of John Curry, Bob Campbell, and Walt Bond. They looked over the three areas and agreed with us that we should try to get Dixonville.

Next day we met with Company officials to present our findings and get a decision from them. Representing the Company were Tom Neal, Sr.; Ed Leigh McMillan; John Miller, Sr.; his son John Richard Miller; and Brooks Lamb. Representing the Station, besides the New Orleans committee, were Ed Gaines, officer in charge of the Brevort Branch, Mignery, and I.

After our presentation the officials moved to the far end of the long office and conferred briefly. Then President Neal announced, “The land is yours.” Later, in 1947 they signed a lease giving the government use of the land without cost for 99 years. So the “Dixonville Area” became known as the Escambia Experimental Forest. After surveying the Experimental Forest and dividing it into 40-acre compartments we began work on three compartment-sized studies and one regeneration study of smaller plots.

The management Systems Study, aimed to test forest management and economic aspects of three rotations for longleaf pine: short (40 years), medium (60 years), and long (80 years) in even-aged and uneven-
Alabama. Office of the Forest Service. Bunker, State Forester of Alabama. He poked fun at the fire and got signed statements from landowners agreeing to approval from Washington. To get approval, we made their equipment to do the job but would need to turn it out so well. Joe Brady, a Birmingham industrialist, contacted me and proposed that we conduct demonstrations of controlled burning. Large areas of hardwood were burned, and the Army Engineers found that fire-resistant longleaf pines could be quadrupled. Fortunately, I had assigned a technician who was skilled in the use of chainsaws. He was also a master mechanic. We conducted a series of demonstrations over the state, and because of the success of the controlled fires, we were able to reduce the problem. Many people were educated to despite woods burning. Joe Brady, a Birmingham industrialist, contacted me and proposed that we conduct demonstrations of controlled burning. 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Goaded into action by Chapman and others, E.L. Demmon, director of the Southern Forest Experiment Station, began research on use of fire in longleaf pine forests. Many of the studies were conducted on three experimental forests that he organized: Harrison on the DeSoto National Forest in Mississippi, Olustee on the Osceola National Forest in Florida, and Palustris on the Kisatchie National Forest in Louisiana. Work was also done on other areas.

Findings by the researchers swung the battle in favor of the controlled burning. After a comprehensive study of townspoint, P.V. Siggers published an article in the Journal of Forestry in 1932 confirming Chapman's opinion that fire could be used to control the disease. Heyward and Barrett found that controlled burning could be done without serious damage to soil. In fact, it was slightly beneficial to the minerals in the soil. Other studies explored the damage of fire to seedlings and trees; effect on the range; seedbed burning benefits; and other fire relationships. Research supported the contention that properly controlled fire could be used as a helpful management tool in longleaf pine forests.

In 1932 a 12,000 acre fire on the Osceola burned many foresters over to hazard-reduction burns. As President of the Society of American Foresters, Chapman arranged the 1935 annual meeting at Lake City, Florida. The topic was "Southern Forest Fires." Emphasis was on the possible desirable use of fire in longleaf forests. Speakers were Demmon, Greene, Stoddard, Hardtner, Wahlenberg, and Eldredge. It was the consensus of those attending that fire was a useful tool for management of longleaf forests but publicly should be handled carefully. Wildlife prevention and control were still vital for southern forestry.

After the meeting, the Forest Service decided to permit administrative tests of prescribed burning on national forests in the longleaf type. Arthur Hartman burned about 900 acres in the Red Dirt Pasture, Kisatchie National Forest, to prepare the seedbed for the bumper 1935 crop. Results were very good.

Supervisor L.L. Bishop put in two burns that year in Texas and burning was also done by Raymond Conarro in Mississippi. He was the originator of the term "prescribed burning."

Some state foresters began to advocate the planned use of fire and many other people found that it was a powerful management tool if carefully applied. The practice spread to other forest types from its beginning in the longleaf forest. Acceptance of prescribed burning was a significant milestone in the longleaf pine story that argued well for the species. Lack of fire, perhaps more destructive than fire, had prevented the establishment of seedlings by the invasion of brush and other pines less resistant to fire.

**THE SECOND FOREST**

Like the fabled Phoenix bird, a second forest sprung from the ashes of the virgin timber. It covered only about a third of the original acreage, about 20,000 acres according to the forest survey of the 1930's. Often the stands were poorly stocked and sometimes nothing but scattered "mule tail" pines overlooking a wilderness of grass and stumps. A lot of the land had been converted to crops or other uses. Also, hardwoods, other pine species, and razorback hogs had prevented regeneration of longleaf pine on millions of acres.

Before the advent of man, the virgin forest had held its own by natural processes. Openings caused by lightning or other reasons were rapidly filled by seedlings from nearby mother trees. When hurricanes crashed ashore, ripping gaps through the forest, they were rapidly healed. Destruction of the magnificent virgin forest was done during the railroad era when most loggers clearedcut without any provision for the future. Despite man, millions of seedlings emerged from the grass and grew into merchantable stands. How did this happen? Many seedlings were incidentally established when cattlemen, hunter, or turpentiner fires happened to come just before a good cone crop. If the area was not burned for a year or so, the seedlings survived future fires. These seedlings, stored under the sheltering tree crowns of the virgin timber, grew to occupy the site when the old trees were felled in a hurricane or were clearcut by loggers. In south Alabama, many excellent second-growth stands originated in this way after hurricanes. On the DeSoto Forest in Mississippi good stands came from seedlings stored in the understory when the loggers swept through by clearcutting every merchantable tree.

Although few and far between, some second growth stands were the result of deliberate action by people. An excellent example was the longleaf pine stand established on Great Southern Lumber Company lands in Louisiana. These came from a prescribed burn prescribed by Austin Carey before the bumper 1920 cone crop. Subsequent promotion of established seedlings from hogs and fire, and clearcutting of the virgin timber released the advance reproduction.

Prescribed burning on national forests before the 1935 crop established several thousand acres of seedling stands on the Red Dirt Pasture in Louisiana, the Boykin Springs area in Texas, and others in Mississippi. In three thousand acres were planted by CCC crews. Scattered here and there across the South a few successful plantations were established by others. T.R. Miller Mill Company and Kaul Lumber Company in Alabama, Urania in Louisiana, and other lumber companies made an effort to protect young trees when the original timber was cut. Some of these grew into merchantable second-growth forests.

Remains of the virgin forest left most second-growth stands generally second-growth forests. Notably, the rubber-tired logging truck replaced the steel tracks and logging locomotives. Small skidders like the "loggers dream" replaced the Clyde. They were used to extract one small log at a time from narrow branch bottoms that penetrated the longleaf woods.

Later, logs and pulpwood were loaded with power equipment. Mule teams skidded logs to "landing" and was hauled them onto short body trucks. Pulpwod was usually loaded by hand on "bobtail" trucks.

Until World War II most logs were cut with crosscut saws. Gradually chain saws were introduced and replaced later by tree shears. Pulpwod was cut with crosscut and bow saws. Later, crews used a circular saw mounted on bicycle wheels and powered by a small gasoline motor. Pulpwod was also harvested by a machine that cut and baled the wood.

Some logs were trucked to the stationary mills to be sawn. At first, however, much of the lumber was produced in the woods by portable "peckerwood" mills that moved from place to place leaving piles of sawdust in their wake. Rough green lumber from these little mills was hauled by truck to central concentration yards where it was stacked in triangular piles for drying. After drying it was dressed in the planer mill for shipment by rail or to be sold to local markets. Presently, most logs and pulpwod are cut tree length and hauled to central sawmills. Rubber-tired skidders, compatible with selective logging, have replaced mules.

Despite the radical change in technology, lumbering in the second forest still provided a living for many southern people. In many cases, the forest workers are also part time farmers living on small subsistence farms.

Turpentiners moved into the second forest without much change in technology. It was still labor-intensive, and operators continued to supply their workers with a commissary. As long as there was virgin timber, most gum naval stores were produced in longleaf pine forests. Operations in second-growth forests have almost disappeared from longleaf woods and are not centered in the slash pine of southern Georgia and northeastern Florida.

The last contribution of the virgin longleaf pine forests to the economy are stumps that are pulled from the ground and are hauled to plants that extract resin and turpentine from them.

Open range range has gradually disappeared from the second growth longleaf pine forests. Where grazing is permitted, it is coordinated with timber growing.
The second growth forest was a far cry from the virgin forest, and logging technology had to be changed. At first pulpwood was loaded by hand and mule teams crosshauled logs on trucks.

Before the advent of the virgin forest, the virgin forest had held itself by natural processes. Openings caused by lightning or other causes were rapidly filled in by seedlings from nearby mother trees. When hurricanes crashed ashore, ripping gaps through the forest, they were rapidly healed in like the second forests of these lands that had already been established under the virgin trees.

Indians made little inroad on the virgin acreage, nor did the early pioneers. Déforestation of the magnificent virgin forest was done during the railroad era when most loggers cleared without any provision for the future. Despite man, millions of seedlings emerged from the grass and grew into merchantable stands. How did this happen? Many seedlings were accidently established when cutters, or hunters, or turpentine first hangers, or loggers, or railroad men, or Indians, or others decided to come just before a good cone crop. The area was not returned for a year or so, the seedlings survived future fires. These seedlings, stored under the shelter of the tree crowns of the virgin timber, grew to occupy the site when the old trees were felled in a hurricane or were cleared for logging. In south Alabama, many excellent second-growth stands originated in this way after hurricanes. On the DeSoto Forest in Mississippi, good stands came from seedlings stored in the understory when the loggers swept through clearing every merchantable tree.

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In three timber blocks were planted by CCC crews. Scattered here and there across the South a few successful plantations were established by others. T.R. Miller Mill Company and Kaur Lumber Company in Alabama, Urania in Louisiana, and other lumber companies made an effort to protect young trees when the original timber was cut. Some of these grew into merchantable second-growth forests.

Remains of the virgin forest left most second-growth stands presented high and fragmented into smaller tracts, a far cry from the massive acre blocks of prime timber that greeted the railroad loggers. The powerful skidders, loaders, and locomotives were gone by the Thirties along with most of the big double-bend mills. Organizations of skilled loggers and mill men had been disbanded. Company commissaries were no longer needed.

Slowly a new technology was developed adapted to harvesting the second-growth forests. Notably, the rubber-tired logging truck replaced the steel tracks and logging locomotives. Small skidders like the “loggers dream” replaced the final Huy. They were used to extract one small log at a time from narrow branch bottoms that penetrated the longleaf woods.
WORLD WAR II

With the beginning of World War II, I returned to South Carolina to work for a few months in the land of the longleaf pine forests. As a district forest officer employed by the Forest Service on the Timberland Production Project, it was my responsibility to help lumbermen and pulpwood cutters and navigable vessels with their production problems. My territory covered the south-west part of Alabama.

In southwest Alabama most sawmills were large but there were a few pecky-fewanderns. Mills run on steam were in a state of inactivity, and only a few were running. A farmer who had a water wheel, a carriage feed rate and the RPM on the power unit was too slow to build up enough horse power. I analyzed several mill operations and determined that they were not turning out wood so well. Joe Brady, a Birmingham industrialist, contacted me and proposed that we conduct demonstrations on the Creston Forest. He predicted that the usual quota of 50 logs per day for crosscut saw crews could be quadrupled.

Fortunately, I was assigned to a technician who was skilled in the use of chain saws. He was also a master mechanic. We conducted a series of demonstrations over a ten day period, and after he learned to set proper fire in the woods, although weak and largely ignored, were passed. Crows nest lookouts to detect fire were mounted in the tops of trees and on occasion, on high points such as silos. Fire wardens were hired and equipped with primitive tools to suppress fires. Speeches were also made to emphasize fire prevention, and signs were posted.

We tried to help train crews, and I almost killed when a "wickerman" stuck my shoulder while feeling a log. The job was difficult, and I discovered there was still in the urbano environment. Fortunately, a woods road ran perpendicular to the path of the flames and our backfire along this road stopped the flames.

Our skeleton organization was busy controlling wildfire until end, and we kept a sharp eye out for fires. Our major contribution to the war effort was an intensive timber management program. For a fee, we marked and crushed cordwood, computed the volume and value, and helped them with the sale of timber needed by the armed forces.

When I began work, a boy by local lumbermen of State-marked timber was a major problem. We had several tracts already marked that could not be sold, and lumbermen were refusing to sign up for our assistance. Our efforts to stimulate production of wood products were blocked. To overcome the boycotting, I managed to get an agreement with the local lumbermen that we would pay a fair price for all tracts containing material ordered by the military. After this, local buyers resumed bidding.

Although the shortage of stocked longleaf pine forests in our district, some were as good as those found anywhere in the South. In the Hitchcock Estate, I measured a tract which contained 43,000 of prime timber board feet per acre.

Forest products were critically needed by the armed forces for ammunition, durable gear, and for many other purposes. As a district officer employed by the Forest Service on the Timberland Production Project, it was my responsibility to help lumbermen, pulpwood cutters, and navigable vessels with their production problems. My territory covered the south-west part of Alabama.

Roland Harper, an Alabama naturalist, wrote several articles between 1911 and 1914 pointing out the importance of fire control in the longleaf pine forests. He described the natural succession and the fire-resistant longleaf to survive. He speculated that lightning kept the wood from burning and suggested that the rational approach to fire control was to allow the fire-resistant longleaf to survive.

In addition to these men there were other people who noted longleaf pine's ability to withstand forest fire and saw its potential for use as firewood. Fire-resistant forest fires, mostly from the North, were shocked at the widespread occurrence of forest fires in the South. Influenced by the lightning-burned fires in Michigan and the West, they had a morbid fear of all forest fires. They saw longleaf pine as an insurance against the exclusion of fire from the woods. They were dismayed by Southerners who considered woods burning normal, like the lightning, and believed that controlled fires did some good.

So these forests mounted a vigorous campaign aimed at the forest fires. Their missionary work was slow and discouraging but gradually some progress was made.

State forestry departements, with the primary objective of controlling fires to conserve their forest resources, set fires in the woods, although weak and largely ignored, were passed. Crows nest lookouts to detect fire were mounted in the tops of trees and on occasion, on high points such as silos. Fire wardens were hired and equipped with primitive tools to suppress fires. Speeches were also made to emphasize fire prevention, and signs were posted.

If an uphill battle because the public was generally against them. Their best friends were conservation-minded lumbermen like Henry Hardtner, who did recognize some value for fire, but was vigorously opposed to wildfire.

The stage was set for a battle between the fire exclusionists and advocates of controlled fire. It was joined in the longleaf pine forests where the woods burned the strongest case for the use of fire. Harmless, low-grade fires are a natural part of the ecosystem; burning stirred up a great controversy within the forestry profession by proclaiming benefits for fire. With the controversy, what scientist found that the possibility of naturally regenerating longleaf pine. Using Yale forestry students as assistants, Chapman studies were conducted of fire-resistant forests. Chapman's studies in north Louisiana for several years.

In 1926, he published a bulletin with his findings. He strongly advocated several ways fire could be used beneficially. When a good corn crop appears, he recommended burning your harvest before fallow in October. Such burning, he said, would remove grass and pine needles and allow the seed to reach the soil. He reported, for instance, he found more seedlings on those that were burned. He also speculated that fire disturbed the soil, increased the amount of woody debris, and contaminated areas could be used; and that fire might help control broomweed, a fungus disease especially damaging for seedlings.

Sustained by his research, Chapman mercilessly contended that fire was beneficial and more conservative foresters, especially state foresters and the Washington Office, were lukewarm on his views. The old fire theory that lightning and Indian fires helped create the virgin forests. In his opinion, fire was an unmitigated evil.

On a grazing study conducted on the McNeil Tract, DeSoto National Forest, he found that cattle gained more weight when pasture was burned than when it was not. His findings were embarrassing to foresters who contended that burning damaged the range. Because from the 1930s on, the federal government was able to get approval from USDA officials for publication for several years. Frutuosity, he bitterly condemned the fire exclusionists. After some delay he was able to get an article published in American Forestry magazine.

A later letter to the editor on authority on management, also preached a gospel of woods burning to benefit these upland game birds.

Noting the actions of two respected members of the Forest Service added support to the burners. "Cap" Elrod, a native southerner and first official, and a forester with the U.S. Forest Service, Arthur R. Sprout, rural economy, also advocated the use of fire for range and forest. He was particularly interested in reducing the fire damage on southern forest and the people, was converted to the use of fire in longleaf pine forests. Of course, he strongly advocated the controlled burning. The forester noted the similarity of a fire on B.W. Wells, an ecology professor at North Carolina State, agreed with Roland Harper that longleaf pine was a fire subclimax type dependent on fire for its existence.

Fire exclusionists were horrified by the turn of events. They deplored statements in favor of fire by respected foresters. One scientist, Dr. Oliver Chapman, a friend of the author of the book, said that the author of the book felt that this division in the ranks was doing untold damage to forestry. So they redoubled their fire protection actions.

Caught up in the fever of the battle, some people greatly exaggerate the damage from fire. One forester predicted that a fire in a section of longleaf pine, which cluttered up the woods and made travel difficult. This view was directly opposed to the contention of burners who said that the presence of valuable timber immune to fire damage.

To promote fire prevention, the Forest Service hired H.N. "Cap" Elrod, a native southerner and first official, and a forester with the U.S. Forest Service, Arthur R. Sprout, rural economy, also advocated the use of fire for range and forest. He was particularly interested in reducing the fire damage on southern forest and the people, was converted to the use of fire in longleaf pine forests. Of course, he strongly advocated the controlled burning. The forester noted the similarity of a fire on B.W. Wells, an ecology professor at North Carolina State, agreed with Roland Harper that longleaf pine was a fire subclimax type dependent on fire for its existence.

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Caught up in the fever of the battle, some people greatly exaggerate the damage from fire. One forester predicted that a fire in a section of longleaf pine, which cluttered up the woods and made travel difficult. This view was directly opposed to the contention of burners who said that the presence of valuable timber immune to fire damage.

To promote fire prevention, the Forest Service hired H.N. "Cap" Elrod, a native southerner and first official, and a forester with the U.S. Forest Service, Arthur R. Sprout, rural economy, also advocated the use of fire for range and forest. He was particularly interested in reducing the fire damage on southern forest and the people, was converted to the use of fire in longleaf pine forests. Of course, he strongly advocated the controlled burning. The forester noted the similarity of a fire on B.W. Wells, an ecology professor at North Carolina State, agreed with Roland Harper that longleaf pine was a fire subclimax type dependent on fire for its existence.

Fire exclusionists were horrified by the turn of events. They deplored statements in favor of fire by respected foresters. One scientist, Dr. Oliver Chapman, a friend of the author of the book, said that the author of the book felt that this division in the ranks was doing untold damage to forestry. So they redoubled their fire protection actions.
deal with. We averaged only about 30 fires a year, usually small, because we had good detection and well trained CCC crews. On southern districts fire occurrence ran into hundreds of big fires.

We did have one grudge fire set by an old man to spite the CCC enrollees. Luckily, a survey crew caught him in the act of throwing down lighted matches while they were sitting in the grass eating lunch. George and I spotted the smoke from Eagle Mountain lookout. When we arrived the CCC men were sitting on the old man. They had beaten him because he threatened them with a knife when they ran them down. George took him to town for treatment and arrest by the U.S. marshal. Because of his age the judge gave him a two year suspended sentence.

Fire suppression, investigating timber trespass, planting, and the other activities kept me busy, often seven days a week. After the junior foresters finished planting I organized them into a timber survey crew to collect data for a management plan.

**FOREST FIRE HERESY**

Regarding forest management, a pitched battle between people advocating use of a controlled fire in the longleaf pine forests and those opposed reached a climax during the thirties.

Beginning with the first settlers, annual burning of the woods had become a firmly established practice in the Southland. Cattlemen used fire to green up the grass and help control movement of open range cattle. Turpentine growers kneeled straw from around faced trees and control the burned area to protect them from accidental fires. Hunters drove game with fire and collectors of lightwood swung off the grass to make the wood easier to find. There were numerous other reasons for burning: to open up the woods making travel easier; to kill snakes and ticks; and just "for the hell of it." Coming of spring always meant smoke in the pineyards.

Besides the local residents, there were others who supported a desirable role for fire in the longleaf woods. As early as 1850, Charles Lyell, a British scientist and traveller, noted that the hills near Tuscaloosa, Alabama, were covered with pine seedlings. He speculated that they resulted from Indian fires that kept hardwoods under control and favored longleaf pine.

In 1908 Herman H. Chapman, a Yale professor, explored longleaf forests on Kaulb Company lands in Alabama. From his observations he concluded that fire was beneficial to the forests.

After much delay, approval came back but it was too late.

The dregging equipment had been moved and was no longer available to do the job.

On April 12, 1945, President Roosevelt died of a stroke. Symbolically, he died at Warm Springs, Georgia, in the CCC hospital. Conservation policies had been kept up for so much forestry. His CCC boys had planted thousands of acres of cutover land with pine, several new national forests were established, and old ones expanded in the longleaf pine belt.

**POST WAR PARADOX**

In January 1946, W.G. Wahlenberg published his monograph, "Longleaf Pine Monograph." It discussed practically everything that had been written on the species for 40 years. Coverage was comprehensive including the longleaf problem, resources, uses, properties, ecology, fire relationships, protection, and management.

Dedicated to a future for longleaf fire, the book, with its comprehensive documentation of published material and a scholarly evaluation by the author, was hailed by Raymond Pack and H.S. Graves, as a significant boost for the management of the species. In a more subdued note, Wahlenberg described it as being Useful to many people but pointed out gaps in knowledge requiring more research. He recommended a major revision in two or three decades because much of the material was based on virgin stands whereas the need was for management of second growth stands.

The author began by summarizing the longleaf pine problem: the reduction in forest acreage, years of mismanagement, encroachment by other species, inherent limitations of longleaf as well as its attributes.

In the "Resources" section, he estimated that the acreage in the second growth forest was only a third of the original. At the time of his monograph, that acreage was less than 2 million acres, and the virgin stand of some 200 billion board feet had been reduced to one-tenth of the original, practically all in second growth stands.

Uses and properties of the wood are described in detail as well as milking practice, preservation and drying. Its value for naval stores is cited. Ecology covered botanical and commercial range, stand associates, soils, biological, and human influences.

Role of fire in regeneration is described in detail. It is generally proclaimed that fire is the key. The knowledge on the biology of seed development, dissimilation of seed, seedbeds, seedling classification, and development was thoroughly documented.

Wahlenberg was pessimistic for the success of natural regeneration. He begins this section with the statement that "deliberate regeneration has barely been accomplished." Following is a litany of problems: irregular seed crops, slow height-growth, and many unexplained failures.

He cites one case of successful direct seeding but finds that this technique is unique. Usually the large, nutritious seed is gobbled up by birds and other predators.

He believed that planting is the only viable way to regenerate longleaf pine. He lists a wealth of knowledge, developed in recent years, on the entire process including seed procurement, nursery practice, care of planting stock, seedling grades, and planting practice. Protection of plantings from fire, hogs, brownfoot, and other minor problems. In general, longleaf pine is pictured as resistant to the hazards of the modern environment given a reasonable degree of protection.

In a major division called "Management," naval stores operations, growth and yield, and management are presented. Fire, pruning, and harvest cutting is covered. The author states that longleaf should be grown in even-aged stands and recommends thinning and planting to a well-planned site or a scattered seed-tree system. In view of earlier sections of the book, however, the seed tree system does not hold up well.

Despite obvious gaps in knowledge, the monograph set the stage for more research that promised a bright future for longleaf pine.

Indeed, in 1946 a new concept for forest research was developed in the South. Local research centers concentrating on major forestry problems in a defined territory was established. Each was in effect a branch of the Southern and Southeastern Forest Experimental stations. Seven were established in the longleaf pine belt: Alexandria, Louisiana; Gulfport, Mississippi; Brevort, Alabama; Lake City, Florida; Cordele, Georgia; and Charleston, South Carolina.

It was my good fortune to obtain employment as a research forester on the Brevort Branch. In December 1946, I began work to investigate the mysteries of longleaf pine management. T.R. Miller Mill Company had offered the government 3,000 acres of their land for an experimental forest to serve the Branch. My first job was to make a reconnaissance survey of their 200,000 acre forest to select candidate areas for research meetings. Four areas were chosen at the criteria established by the Station. Arnold Mignery, a young junior forester, and I spent several weeks on the survey and picked out three suitable areas. We all agreed that an area we called "Dixieville" was best.

Director Charles Connaughton sent a committee from New Orleans to make the final selection. This committee was composed of John Curry, Bob Campbell, and Vald Bord. They looked over the three areas and agreed with us that we should try to get Dixieville.

Next day we met with Company officials to present our findings and get a decision from them. Representing the Company were Tom Neal, Sr., Ed Leigh McMillan; John Miller, Sr.; his son John Richard Miller; and Brooks Lamb. Representing the Station, besides the New Orleans committee, were Ed Gaines, officer in charge of the Brevort Branch, Mignery, and I.

After our presentation the officials moved to the far end of the long office and conferred briefly. Then President Neal announced, "The land is yours." Later, in 1947 they signed a lease giving the government the land for 10 years without cost for 99 years. So the "Dixieville Area" became known as the Escambia Experimental Forest. After surveying the Experimental Forest and dividing it into 40-acre compartments we began work on three compartment-sized studies and one regeneration study of smaller plots.

The management Systems Study, aimed to test Forest management and economic aspects of three longleaf pine rotations (short: 40 years), (medium: 60 years), and (long: 80 years) in even-aged and uneven-
In 1947 the Escambia Experimental Forest was established in South Alabama for longleaf pine research.

Aged compartments. Dependent variables were growth and yields, logging and management costs, and value of products. Also, it was expected that knowledge on longleaf regeneration, stand maintenance, and the like would accrue. With four yearly replications, the huge study took six of the Experimental Forest’s 40 acre compartments.

Each year this study required an enormous amount of time for 100 percent inventories, marking, supervision of loggers, scaling, collecting and posting of data in two large journals—one designated stand and stock; the other cost and value.

Each log and pole had to be scaled in the woods and this compared with the company scale at the mill. Pulwood had to be scaled after loaded on railroad cars at Brewton and compared with the company tickets.

Volume of all products had to be compared with the tree estimate made during the marking process.

Contract loggers hired by Brooks Lambert for the Company did the logging under our close supervision. Detailed costs were collected for truck miles, equipment costs, upkeep of mules, labor rates, as well as stumpage and delivered value of products.

My “Farm Forty” study was very popular and thousands of visitors viewed results an annual field days that were planned to meet the increasing need for increasing management of a farm owner of a typical longleaf pine woodland. All activities including logging and turpentine operations were to be done by the owner with average

Jack Neal, son of Miller President Tom Neal, in a 26-year old longleaf pine stand on Co. land planted with HC Furrin-Swander farm equipment including a wheel tractor, and cut-off saw attached to the PTO of the tractor.

Each fall all harvested products except naval stores, represented by empty barrels, were stacked on a yard for visitors to see. The annual harvest of wood products was limited to 2/3 of the computed growth on the 40 during the year.

The main value of the study was in demonstrating the concept of managing a forest like a crop for annual yields. We emphasized that after logging there was always more and better timber left than before management began.

My third compartment study was known as the Invest- ment Forest. It stimulated practical management by a typical investment owner. Logging was done by company contract crews and management activities were done by station personnel including cruises, marking, timber stand improvement, and prescribed burning. The management plan specified a 60-year rotation and the 640-acre tract was partitioned into compartments, bordered by branches, roads and boundary lines for application of prescriptions. Careful records were kept of all activities and results were analyzed and reported in publications.

A critical protection problem was created by destruc tion of longleaf pine seedling by hogs roaming at large whose owners were in violation of State law. Appeals to hog owners did not work, so we decided to arrange for enforcement of the law.

In September 1935, soon after the death of Long, we noted a bumper crop of cones on longleaf pine seed trees. Stuart nursery had been “crying for cones,” so I organized a CCC crew to collect them. Local fishermen used white cedar poles to fish for buffalo (carp) fish. These fish were swimming light and strong so we secured a few of them and bought a strap metal hook at each end. My climbers used them to dislodge the ripe cones from others on the ground to be collected. We harvested and sent several dump truck loads to the nursery. Tannehill suggested that we bag grass from the seedbed under seed trees near Gum Springs tower to see if it would increase the catch of seedlings. We found that it did.

Junior foresters at the CCC camps supervised planting of two of the clearcut areas that winter. I helped train and organize the crews but could spend very little time with them. My main activity was investigating unauthorized cutting. Fortunately, we were able to issue free use-permits to local residents for firewood but cutting of merchantable trees for crockies and ash logs for sale had to be stopped. At the time, ash logs delivered to Shreveport were bringing the unbelievable price of $50.00 per 1,000. Cutters were diligently searching the forest for them.

To spot our coring treated, we scouted the district for haul roads. One clever culprit, knowing this, tried to hide his road by skidding his crosstom down the railroad track with a mule to Coldwater siding. Fortunately, I happened to find his logged area while scouting for a land corner. I cut several sections from stumps, compared them with the ties that had not been taken up, and found the name of the seller from the agent. When Tannehill and I confronted the thief with our evidence, he reluctantly accepted the option of paying penalty, stumppage to avoid a Federal case.

We had been told that the ash loggers were working at night so I spent several cold nights trying to catch them. Apparently we had been misinformed, and they were logging during the day. However, we caught them in the daytime and, luckily, caught them loading logs. Unfortunately, we were not able to prosecute because the title for the land where they were cutting had not been cleared from Bodacaw Lumber Company. We were able, however, to get the company to deduct the value of the logs from the payments they owed us.

With strict law enforcement, we were gradually able to reduce the loss of timber to thieves. Stopping of wild fires proved to be another problem that plagued us. We caught between the proverbial “rock and a hard place.” Forest Service policy at the time was that fire could not be fought on longleaf except for a trail of prescribed burning approved for another district.

Moreover, our cattlemen friends pointed out the value of greening up the grass for their cattle and the lack of damage to the longleaf forest. Too, some wanted a small burn near dipping vats where they periodically had to treat their cattle for Texas fever ticks. The green grass on the burned area made their cattle eat the grass more easily. But we had to deny all their requests, for fire danger. This made them angry and some tried to set fires anyway.

But our fire problem was much lighter than other districts, especially where foresters had sheep men to
With two junior forestiers to assist me, I was put in charge of planting at Provencal camp near Natitchothes.

Superintendent Cagle assigned about seven 20-man crews to us: each with a foreman, tree tender, and 18 planters. After a few days of intensive training, production per crew began to average over 5,000 trees per day—good compared with that of other camps. Later a staff man from the Supervisor’s office came out and we worked with him to develop a more efficient crew organization that would permit continuous production. We found that one man handling both dibble and planting tray was much better than the two-man units we were using.

Civilian Conservation Corps crews replanted some of the cutover land.

By March we finished our assigned quota having planted seedlings on some 2,000 acres of bare cutover land. They would grow into a productive forest to support future generations.

After the planting season, I got exciting news from the supervisor. The Forest Service was in the process of buying 125,000 acres from Bodcaw Lumber Company in Winn and Natitchothes parishes. This land, along with some smaller purchases, would be organized into a new ranger district. A new ranger would be appointed and I was considered a prime candidate. To groom me for the job he had arranged attendance at a ranger school to be held in Mississippi by Supervisor Raymond Conarro and his assistant, Joe Riebold.

After a week of training at Gulfport we enjoyed a delightful "quail on toast" supper at a CCC camp near Wiggins. Surrounding the camp was a great cutover area so flat that you could see a cow for over a mile. Little did we suspect that millions of longleaf pine seedlings were hidden in the grass and would grow there into fully stocked second growth stands on the DeSoto National Forest.

After the school I was assigned to a job on the new purchase unit that gave me valuable knowledge of forest conditions, management problems, and above all, contacts with the people in the area.

My work was officially known as an "occupancy survey." Before government lawyers could complete the Bodcaw sale a Forest Service official had to thoroughly examine the property and map any buildings, fences, or other improvements owned by people who might claim title to the land. Where improvements were found the owner was asked to sign an application for a special-use permit. If he did, this was evidence that he did not claim title. Each application had to be accompanied by a map, which I prepared with a plane table.

To help find the land and people, I arranged for George Cunningham, a retired company land agent, and local man stationed at the camp, to help. During the next 3 months, we found 175 cases of occupancy, mostly by unemployed company workers who had either "squatted" on the land or claimed next ownership in small farms. Only one man refused to sign for the permit and decided to claim title. Everyone treated us courteously. Many invited us in for dinner in case we accepted provided they would share our GI sandwiches that I did not consider as tasty as their home-cooked food.

But there was a deep-seated undertone of resentment and apprehension. Often they spoke of the shock of losing their timber jobs and many felt that the company was to blame for their predicament. Also, there was fear that the Federal government would make them move. They were somewhat relieved when I told them they could probably stay by signing for a special-use permit. But a nagging fear still remained. Open-range cattle and hogs were important to their livelihood. Could they still graze government land unmolested?

Every spring for years they had burned the range to green up the grass. Would this be permitted? The company had been very lenient about them cutting firewood and "board" trees for buildings. They even looked the other way when crossties and ash logs were cut for sale. There were rumors that no cutting would be permitted on government land—even for firewood.

Almost everyone was an admirer of Huey Long, the Kingfisher, who was a native of Winn Parish. They were looking forward to his election next year bringing a better life with his "Share the Wealth" program. In 1932 Long had supported Roosevelt, but then he had fallen out with the administration and tried to organize the "trees planted by the CCC." To the people, the Forest Service represented their political enemy—Roosevelt.

A widow, living in a small cleaning on a scrub oak ridge near Saline Bayou, was typical of the plight many suffered. Her dwelling would have been considered poor shelter for a mule. It was framed, with a center brick, side door, and one window. She was called the "tramp shack" mattress and a wobbly table covered with worn oilcloth.

On a few board shelves were some rusty cups, tin plates, and other utensils; a rusty iron bed that the corn boll weevil had ruined, a rusty iron pot, and a few scattered old tubs. The only material for a bed were some feed, mostly meal, fatback and coffee. The most important feature of the interior was a large campaign poster showing the smiling face of the Kingfisher.

When we drove up, she was hoeing vegetables in a small garden patch. Courteously, she handed coffee for us, after wiping out the cups with a greasy rag, and helped us make a survey of her improvements. Besides the shack, there were fences around the garden patch and a small cornfield, and a well. She readily signed the application for special use.

Our most perplexing case of occupancy was in 3,000 acres, devastated by a skidder operation, known as the Chandler Camp. In the center of the clearing there was annual harvest from the Farm Forty study, demonstrating a management system for pine woodlots, were observed each fall by hundreds of visitors.

Sherrif "Doc" Fountain agreed to appoint a "hog deputy" to trap the animals and collect fines from the owners. Albert Harris, the deputy, built a dozen wooden traps with material furnished by the government. He successfully trapped many hogs. Owners, alarmed by the loss of their hogs that always "died" in the pound, hastily built fences and penned their animals. A few, angered by the trapping program, stole traps, and set wildfires. But vigorous action by George Ward, the state ranger, and a cooperative FBI agent caused the vandalism to gradually die down.

In 1947, C.W. Mills, district ranger on the Conewca National Forest, noticed a heavy crop of longleaf pine cones. He, along with Don Morris, assistant supervisor, decided to try a seedbed burn that summer. To bolster their confidence, they called on the station to have someone come out and help them decide. Dave Bruce, forest fire investigator, and I met with them and looked at several candidate stands. We all agreed that the burn should be attempted. Mills successfully established seedlings on 26,000 acres that he burned that summer.

In 1951, a drastic change in the Brevort Branch organization occurred. Ed Gaines transferred to Arizona, and Walt Hopkins came to head up a new branch station combining Brevort and Marianna, Florida, with headquarters at Marianna. Florida research would be centered on the Chipola Experimental Forest and be devoted to finding a way to regenerate the sandhills known as "Deserts in the Rain.

Brevort became a subunit of the new East Gulf Coast Branch, and I was responsible for the longleaf pine research there. A drastic realignment was necessitated in the Brevort program, which had been planned for four researchers. Only $15,000 was available to pay the salaries for two technicians, me, and everything else. It was barely enough for salaries with little left for operating expense including rental of office space.

With the blessing of Lew Grosenbaugh and Phil Wheeler, New Orleans division chiefs, we set out to "boil the fat" out of the program. The management systems study was abandoned, so we had the 24 compartments available as a locale for silvicultural studies. Farm 42 and Investment Forest studies were kept. Other studies such as seed tree and forest wall, timing of oak control, Lovel's thinning plots, and a few others were put on a maintenance basis.

Obviously, additional funds had to be found if a viable research program was to be continued. Since no Federal funds were available, Walt Hopkins and I contacted T.R. Miller & Company people to see if private money could be found. They agreed to head up a program to collect private donations. We were gratified by the response of local people. Contributors were T.R. Miller, Alger
Company personnel cooperated with Escambia researcher to develop improved methods for planting longleaf pine. Many foresters, who came to see the successful plantations, were encouraged to plant.


With the money, we hired Larry Walker who came in 1953 and helped out for a year writing up a backlog of research and installing new regeneration studies. After Walker left, federal funds became available to hire Bill Boyer, construct an office lab in Brewton, and hire some extra help. Encouraged by local supporters of our program, Congressmen Bob Bikes and George Grant along with Senators Lister Hill and John Sparkman helped get the federal money to keep longleaf pine research going in the fifties.

In 1952, an Alabama state law was passed outlawing open range grazing of cattle. Miller officials agreed to furnish fencing material and allow grazing on their land to organized cattlemen associations who would build the fences for their cattle. We helped organize an association of four cattlemen to graze cattle on the Experimental Forest in accordance with research requirements including limitation of stocking, use of good management practices, and keeping of records for us.

Bud Brantley, Owen Carrol, Nanci Odom and Earl Odom, with our help, built the fence and put 75 cattle on the forest. Cattle were ear-tagged, rounded-up, and weighed twice a year, and data were recorded of costs and returns. Much practical information was learned about problems and benefits of coordinating grazing with timber management. Later, grazing began to interfere with our silviculture studies and eventually all cattle were removed from the forest.

A wildfire in 1947, before the bumber seed crop, established well-stocked stands of seedlings on several management system compartments scheduled to be cut back later to seed trees. When the compartments were cut, I kept a record of the fate of the advance reproduction and seedlings established from the seed trees. I was astonished to find that the advance reproduction survived well, but we were getting practically nothing from the seed trees.

This suggested a revolutionary new way to regenerate longleaf pine—a shelterwood system. I followed up the lead by investigating the history of second-growth forests established on U.S. Steel land in Baldwin County and on Geneva State Forest. Also, I wrote Garrison for information on the second growth established in the twenties in a like manner on Great Southern Lumber Company land in Louisiana. Convinced that shelterwood might offer a way to overcome many of the problems of natural regeneration I wrote an article, published in the *Journal of Forestry* in 1956, suggesting the possibilities of the system. It would require rigid testing before it could be recommended with confidence for longleaf pine. Most foresters were highly skeptical.

By the late 1920's most of the "railroad loggers" had cut out leaving a bare and desolate land (Kisatchie National Forest). A few tracts of the 60,000,000 acre virgin forest remained. Many lumberman closed down their mills and moved to the West Coast to log virgin stands of Douglas-fir, ponderosa pine, and redwood. The finest hour of the longleaf had come to a close. Shocked silence replaced the din that had greeted the dawn of the 20th Century. Four decades of feverish activity had ground to a halt.

The GREAT DEPRESSION

The Great Depression that plagued the nation in the Thirties plowed unusual depths in the land of the longleaf pine. Most of the big mills had cut out and many operators had moved on. Banks and businesses dependent on them failed. Tax revenues for local governments dried up. Ghost towns were tragic reminders of better days. The landscape had drastically changed. Cool, green shadows of the virgin forest were only memories, and no longer did the roaring breezes ring through the tufted tree crowns. Instead the refuse of logging lay bleaching in the sun on millions of acres. Except for stumps and an occasional "mule tail" pine the bare land was reminiscent of the western plains.

Scrummy cattle picked at the coarse grass and razorback hogs roosted out the remaining seedlings. Buzzards circled overhead and frequently feasted on the carcass of a cow that had succumbed to the twin hazards of ticks and starvation.

Suffering was most acute among forest workers left behind when the mills left. Many stayed on tax-delinquent company lands and scratched out a bare existence with small garden patches, submarginal farms and scrub livestock. Hard cash for medical service or other emergencies was nonexistent. Stunned and despondent, the people of the longleaf belt faced a grim future.

I spent the early days of the Depression as a forestry student at North Carolina State, enrolling as a freshman in 1929; the year the stock market crashed. After earning a degree in Forestry in 1933 and working almost two years in the Southern Appalachian I was transferred to the Kisatchie National Forest in Louisiana. The cutover land was not as attractive as the luxuriant hardwood forests and clear streams of the mountains, but the opportunity to work in longleaf pine was especially appealing to me.

My first winter there I supervised CCC enrollees planting some 2 million longleaf and slash pine seedlings in a bare "stump orchard" protected by a fenceline from razorbacks. Before planting began we were trained at the Stuart Nursery by nurseryman Arthur Reed and Philip Wakely at the Southern Forest Experiment Station. The Nursery, largest in the South, was named for Chief Forester Stuari, who had been killed in a tragic accident in 1933.

On the last day of the training school Reed designated one junior forester to head up planting at each CCC
Since 1914, when the war started in Europe, German submarine warfare had dried up export markets for southern pine lumber. In 1917, the situation was changed drastically. Carloads of lumber were needed for wooden barracks to house soldiers and additional lumber was required for railroad cars.

Also, there was an urgent demand to construct 1,000 wooden ships. Southern lumbermen assured the nation that they would furnish timber needed to win the war. W.H. Sullivan of Great Southern Lumber Company predicted that enough timber could be produced from the virgin longleaf pine forests of the South to turn out 20 to 30 vessels a day from southern shipyards.

But the lumbermen faced many problems with the shipbuilding program. A great number of timber, 12' x 12' x 24', were needed. Wood-cut lumber did not furnish enough of that material, and suitable trees had to be hunted out, which reduced overall production. Changes in ship design created other problems. Drafting of men for the armed services and migration of workers to other war jobs caused labor shortages.

During World War I huge longleaf pine trees were cut to build a fleet of wooden ships.

Despite all the difficulties many wooden ships were built until the demand slackened in late 1918 when steel became available for ship construction.

In the skurvy and bustle of the time, little thought was given to growing a second crop of trees. Most lumbermen considered regeneration highly impractical, and, indeed, local tax policies encouraged them to “cut out and get out.”

But there were a few, encouraged by pioneering foresters like Austin Carey, who braved the scorn of their fellows and made some provision for a second crop. In Alabama, the Alger Sullivan Company, T.R. Miller Mill Company, and Kaul Lumber Company were early converts to conservation.

In 1905, at the request of Kaul Lumber Company the USDA Forest Service prepared a management plan calling for modification of cutting practices and fire protection. It was approved by the nation’s chief forester, Gifford Pinchot.

Louisiana’s Henry E. Hardtner, known as the “Father of Forestry in the South,” cooperated with Herman H. Chapman of Yale University to find ways to regenerate longleaf pine. At Bogalusa, Louisiana, Red Bateman, chief ranger with Great Southern Lumber Company, designed a dibble, still used by many, and planted some 20,000 acres of longleaf seedlings he grew locally. In 1929 Austin Carey noted a good longleaf pine cone crop, suggested that Bateman burn the seedbed to prepare for a catch. His suggestion was taken and several thousand acres were seeded naturally. Bateman arranged that the company fence the area to protect the seedlings from hogs and keep fire out of them. When the virgin overstory was logged, the seedlings survived and the area did not have to be planted.

In the next few years Walker, Boyer and I conducted studies to confirm or reject the shelterwood hypothesis and develop knowledge and techniques for applying the system. We learned the best overstory density for preparatory and seed cuts, timing for removal cuts, methods to forecast cone crops, acceptable levels of cone crops and seedling stands, use of fire, logging damage and other basic knowledge. From our studies, we were convinced that the shelterwood system would work by using the techniques we had developed. It was not ready for testing over a wide range of conditions.

Bill Munn and other researchers at Alexandria, Louisiana discovered a bird repellent in 1956 that significantly boosted the opportunity for regenerating longleaf pine. In several years of additional research they perfected guidelines, including more potent repellents, for direct seeding.

One objection to direct seeding was the lack of space control where seed was broadcast. Charlie Lewis built a machine in Louisiana for seeding in rows and John Cassady, officer in charge at Marianna, Florida, also built a successful row seeder. Both machines could only be used on site-prepared ground.

In 1937, I began development of a seeder that would simultaneously prepare the seedbed and plant the seed in rows thus reducing the overall cost. Next year Seaman Hudson secured a grant from Container Corporation to build a prototype machine that was later called the H-C Furrow Seeder.

Louisiana scientists discovered and perfected bird and rodent repellents that made direct seeding of longleaf pine practical.
Joe Brady sponsored the construction of a dozen furrow seeders to be sold to interested companies for testing throughout the South. The machines were quickly bought and I assisted many in testing them and developing modified versions. John Hatcher at Aiken, South Carolina, also developed a furrow seeder that was used widely.

Thousands of acres were successfully seeded where the seeders were used properly. Failures were usually due to plowing furrows too deep, using them on unsuitable sites, failure to control brownspot with fire before seeding, using poor seed, and other avoidable errors. But a serious limitation occurred in squirrel-infested areas. The rodents were attracted to the furrows and quickly gobbed up any seed that was planted. No way was every found to deter them.

Phillip Wakely, a long-time planting researcher, published his monograph, "Planting the Southern Pines" in 1954. Despite the invaluable guidelines for collection of seed, nursery practice, and out-planting, failures in longleaf plantations were more common than successes. A local example was the failure of a replication of Wakely's regional seed source study conducted in 1954 at Brevort. Our planting on an old field that was burned, under Wakely's personal supervision, succumbed the next year.

In the west Florida sandhills, every planting of longleaf pine failed on sites where sand and slash pine occurred. Shipman in 1950 reported that overall survival of longleaf in the South Carolina sandhills was only 35 percent. There were so many failures of longleaf plantations not shown on the map in the 1960's and 1960's that most foresters considered the practice too risky and switched to slash and loblolly pine.

By 1965, despite the interest focused on longleaf by Wahlenberg's monograph in 1946 and significant research findings in the pine stands, it was feared that the species faced a dismal future. Regeneration failures, slow seedling height-growth, infrequent seed crops, and unconfounded beliefs had prevailed, much forestry and landowners against the tree.

A modern day army of men and machines moved into the second growth forest with a singleminded purpose. Their objective was to clearcut the longleaf and replace it with other pines. There was no hope of recovery from these operations. Every merchantable tree was cut and removed. Unmerchantable trees and logging debris was pushed into windows and burned or crushed into the ground with huge machines. There were just a few, and a new stand of trees planted.

Much of the conversion was done by pulp companies but there were others bent on destruction of the longleaf forest. Even foresters on the southern national forests were following in the footsteps of the commercial forests.

Locally, sale of the magnificent Alpenglow Longleaf Forest for conversion into slash and loblolly pine plantations was particularly dishheartening to us at Brevort.

In the 10-year period between 1955 and 1965 the longleaf pine forest was reduced from 13 million to 7 million acres. Unless a change was made, longleaf pine as an important commercial species would disappear from the South by the mid-1970's.

The Brevort unit was the only place in the South where research was aimed exclusively at longleaf pine. If any significant deterioration in the health of the forest, we believed it was up to us. But the prospect was disheartening. There were rumors that Verne Harper would be coming soon from Washington to phase out our research.

STERMING THE TIDE

On April 24, 1965, Verne Harper came for an inspection visit to Brevort. Earlier in a meeting with Director Ziffitt and his staff in New Orleans, most observers were convinced that he would recommend closing Brevort's longleaf pine research.

Despite our fears for the future, my professional staff and I were determined to make a final effort to save our research program. When the visitors came, I outlined our program and emphasized the importance of the longleaf pine forest and its dismal fate if our research were abandoned. After the conference we toured the Escambia where Boyer, Fassler, Gilchrist and I were given a most expensive and laborious job of presenting their research.

After Harper left we got some amazing news from New Orleans. The unit was saved by a general decision to make Brevort a full fledged project with no tie to Marianna and promoting me as leader in charge. Needless to say we were delighted with his decision and plunged into our research with renewed zest.

In order to create the pressure that was rolling against longleaf pine, an aggressive program of research at Brevort was needed. But I was plagued with a shortage of research began to do this, I was able to relocate for employment as a professor at a northern college. Both Boyer and Farrar were gone for two years working

The rod and white pine forests of New England and the Lake States were almost cut over. Now the nation looked to the vast pine forests of the South to satisfy urgent domestic needs and a demanding export market.

The heyday of the longleaf pine timber industry was reached in the first quarter of the 20th Century. The all-time peak of yellow-pine lumber production was reached in 1909. New logging methods were needed to reduce costs and step-up productions. To reach great blocks of timber in the back country, railroad logging was introduced. Spur lines were laid inside the forest at quarter mile intervals. Slow-moving oxen teams were replaced by powerful Clyde and Lidgerwood skidders that could handle five or six huge logs at a time. Skidders greatly increased production but destroyed young timber. There was a little left following a skidder operation but a scarred landscape.

The logs were piled alongside the tracks where a McCullar loader, straddling the rails, loaded the cars that passed underneath. Spur tracks were often carelessly built, and accidents were frequent. To keep the power moving, supplies of logs, timber stands were cleared by great throngs of saw crews. To house them and other forest workers, towns were hastily built in the longleaf pine belt. Many were shantytowns that were moved from place to place as timber stands were exhausted. Others were more permanent and some grew into modern towns and cities.

Despite the accumulation of knowledge for managing longleaf pine, foresters and landowners were discouraged by regeneration failures. Thousands of acres were cleared, site-prepared with huge machines and planted with slash and loblolly pine seedlings.

By 1960, our Brevort budget was increased enough to support four researchers. While Boyer and I concentrated on clearcut and compartment studies, Bob Farrar analyzed the Loxley Plot data and began plans for a regional stand and growth study. Phil Crail began using a neutron probe for measuring of soil moisture. Research knowledge vital to the success of longleaf pine management was accumulating.

shallow chipping and a cup and gutter replaced the destructive box. At first, clay cups were used, but later metal cups and gutters became popular. Use of the cup and gutter system achieved widespread use after 1910.

To protect turbine fires from face, operators raked a cleared strip around each tree and control burned the area. These fires destroyed many newly germinated seedlings, because the block was usually burned annually. Sometimes there was a delay in burning, and a new crop of pines were established if the previous burn had happened to come before a good seed crop.

Navel stores laborers lived in camps provided by their employers. Groceries, work clothes, and other supplies were furnished at a commissary. Workers developed special skills, depending on their ambition and talents. Recruitment of labor was a special problem and each operator was alert to preventing "pirating" of his workers by others. Sometimes an unscrupulous turpentine worker would send rumors of his new work to lure laborers away. This was a dangerous business and the recruiter sometimes paid with his life for this practice.

In 1914, World War I broke out in Europe. Most Americans were not greatly concerned until German submarines sank the Lusitania drowning many of our countrymen. President Woodrow Wilson was reelected in 1916 promising to keep the nation out of war and the nation hoped he would be successful.

Clay cups replaced the destructive "chop boxes" for transporting in the early 1960's.

26

11
had inherited. Much of it was stocked with virgin forests that speculators later sold to lumber companies. He built a substantial two story home of squared pine logs that withstood the buffeting of storms for more than a century; fields were plowed and planted in cotton.

After the war many men, disgraced by the dim prospects of their homeland, migrated west. Some of these were younger sons who had not inherited land from their parents. It was the custom at that time for all property to go to the oldest son.

Many of these migrants lived like pioneers in the virgin pine forests of Minnesota, Wisconsin, and Texas. Historian Nollie Hickman described them as inhabitants of forest wildernesses with no near neighbors and desiring none. They subsisted on open range livestock, hunting, fishing, and small gardens.

Timbering in the longleaf forests provided a living for others. Over the years there had been many changes in logging and milling. Pit sawing of pioneer days had been replaced by slash saws powered by water. Circular saws came into existence in the 1850's making slash saws obsolete.

The basic task of cutting trees and squaring timbers required great endurance and exceptional skills with the axe. A day's work was from "kijn til kant," from first light of day until dark. As long as the timbermen used axes, they cut stumps waist high. When the crosscut saw was introduced after the war, less timber was wasted because stumps were cut lower. At first, pine gum made the crosscut impractical but soon sawyers learned to use kerf to dilute the gum. The kerf kept the saw from sticking.

Steam replaced water to power the mills in the 19th Century and larger mills with greater daily production were built. Millponds were generally located near rivers or creeks so logs could be rafted to them. Logging was done by independent operators. To move the logs to the rice, the trunks of oxen were used. The drivers were masters at getting maximum effort from their animals. They used rawhide whips to control them. In the heat of the day, they would sometimes douse the whip with water so it would crack like a bolt of lightning near the ear of a stubborn beast causing him to change his direction or urging him to greater effort.

BOOM TIMES

As the 19th Century waned, strange sounds were heard in the longleaf forest. The scream of locomotives, din of power skidders driving logs to railroads, and the chant of track-laying crews signaled the start of a new era. Railroad lumbermen had arrived in force to harvest a bonanza of yellow-pine timber.

During the "river era" oxen were used to haul logs. The practical skidding range did not exceed 4 miles, so cutting the trees and hauling along streams where water was deep enough to float logs. Logs were assembled into rafts on the rivers to be floated to the sawmill. Rafting required considerable knowledge, and logmen were subjected to many difficulties. Log jams were a constant threat; droughts and floods were special hazards. Logs could not be moved during droughts. On the other hand, floods carried the logs far back in the bottomlands where many were lost. Those that could be found had to be skidded to the stream. In addition, some of the cut trees sank and were lost.

Millmen paid loggers by the thousand board feet delivered. To separate one man's logs from another's each log had a distinctive brand that had been recorded in the local courthouse in the same manner as livestock ear marks and brands.

A unique northwestern woodskidding was conducted by Cedar Creek Lumber Company at Brevort, Alabama. Board ditches were constructed in Cedar and Murder creeks to float the logs to the mill. The ditches were boxed in with a trough of heart-pine boards fastened to posts driven in the stream. At strategic locations, the creek was dammed to collect a head of water. When the pond was filled with logs, skidded there with oxen teams, the floodgate was opened, and the logs floated down the ditches.

At the mill the logs were squared to make "deals" to be exported to Europe and other markets. Those deals were floated down Murder Creek to Conocu River where they were assembled into rafts. A company man camped on the raft and piloted it to Pensacola Bay. After delivering his timber he hiked the 60 miles back to Brevort.

The river era gradually passed with the advent of railroad and motorway transport. The Great Northern Railroad for the Century. During this primitive period, longleaf pine forests had provided a livelihood for many thousands of southerners, but the impact on the environment was dramatically reduced in 1936. The Spanish Trail test on the Blackwater State Forest was established in well-stocked second growth stands that demonstrated the practice cut of the 1920’s. A strong booster of longleaf pine and the shelterwood system was Bonninghaus, assistant to the supervisor, who often visited us and was thoroughly familiar with our Escambia test. Bob Britt, forester for Eglin Air Force Base in Florida, would have preferred a better site for our Oglesby Ditch test. It was representative of the lower Coastal Plain with several good stands of both male and female longleaf pine. When I pointed out that we needed such a critical test in that province for the study, he agreed.

Our Adair Creek test was made on International Paper Company's Southland Experimental Forest near Bainbridge, Georgia. It was a promising site with an excellent inventory of pines and clear understory. Even with favorable conditions we did not successfully complete the regeneration cycle in 20 years. Our problem was the lack of seed production.

On the Black Creek Ranger District, DeSoto National Forest, in Mississippi, we established the Flat Branch test. DeSoto was damaged throughout by Hurricane Camille and a small accidental fire. It was the most successful of all our regional tests. The sites treated with fire and the understory had been kept clean by the National Forest with frequent prescribed fires. The study area was not far from the Spanish Trail test in the camp that I visited in 1936. Our seed trees in the test were probably seedlings hidden in the grass at that time.

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Joe Reebold, supervisor of the Florida State Forests, helped me locate the Lavender-Fortes trail on the Appalachila National Forest south of Tallahassee. Reebold, a graduate of Mont Alto Forestry School in Pennsylvania, had successfully regenerated longleaf pine on the Francis Marion when he was supervisor of the Southern Forest Experiment Station. The scheme was a booster of our shelterwood research. Incidentally, Joe helped conduct the ranger school meeting I attended at Guluvillet, Louisiana.

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Our John Hill test on the Kisatchie National Forest in Louisiana was made in an area that had been part of an enlarged World War II. Our crew used metal detectors to avoid striking unexploded shells while setting the test posts. The Kisatchie test, with George Tannhill, who was still ranger of the Winns District, invited me up to see people and places I had not seen since the Great Depression.

Our Rome Davis test was established on the Bladen Lakes State Forest near Elizabethtown, North Carolina. Cooperatives are experiments between the Forest, and Graham Charibee, assistant state forestier. Interestingly, we found earthworks of an old turk kiln in the stands near this test.

In South Carolina, John Tiller, state forestor, supervised the Society Hill test made on the Sandhill State Forest. Tiller was a district forestor when I had a similar position at Aiken in 1942. All 10 shelterwood test areas have been maintained for 20 years and valuable guidelines for applying the system have accumulated from them. In addition to the regional shelterwood study, I conducted replicated plot research to add to our fund of regeneration knowledge.

In a 1956 study, seedling height growth had been increased seven-fold by scalping grass exposing minimal soil with a BSW blow. Following this lead, I conducted a seedbed preparation study using an array of treatments on two contrasting sites. Included were combinations of fire, chemical, and mechanical treatments. Disposal was used to control grass;disking, roto-tilling, and shallow furrows to modify the seedbed mechanically. In a Carolina coast plot, we used binocular counts of flowers and cones taken from a single position on one side of the seed tree. Sample trees were felled and binocular counts recorded. These data, bloom factors for binocular counts were derived. All or some of the seed crop, tree age, and other factors on seed per cone were determined. Seed per cone was needed, along with cone crop forecasts and expected tonnage to estimate the probability of success of seedbed treatments.

When Bill Boyer returned from Duke, he picked up Crail's soil and site studies and conducted some additional regeneration research. He made a study of the effects of slash on the development of both male and female longleaf pine. His findings, used for his Ph.D. thesis, were very useful techniques for determining when to make cone-crop forecasts.

Bob Farrar plunged into establishment of his regional growth and yield study when he returned from the University of Georgia. His plots, established on abandoned cooperator land, tested a wide array of ages, sites, and stand densities.

Besides regional growth and yield study, which was installed in natural stands, Farrar also conducted a plantation yield study. Data were taken in all plantations we were able to find throughout the South. Plantations were representing many ages, sites, and degrees of stocking were located in both North Carolina and Texas. In both of these regional studies, I worked closely with Farrar securing cooperator support and helping him maintain the longleaf pine program.

Farrar also analyzed data that had accumulated for about 35 years from the Luxley plots in Baldwin County,
General William T. Sherman wrought havoc through the longleaf pine belt of Georgia and the Carolinas in 1865. 

In another study, he observed mortality of grass-stage seedlings in a winter fire under a range of overstory densities. Although mortality increased under heavier densities, overall damage was light in the winter burns. A pre-cut study area, established earlier to determine optimum overstory densities in a shelterwood system, was used for a fire study. In each density class there were four treatments: winter, spring, and summer fires with a no-burn check. Trees in the overstory were large-sawlog size—about 60-years-old.

In a younger stand, which had been established on management system compartments, Maple installed a similar study testing winter, spring, and summer fires with an unburned check. Overstory trees were about 25-years-old at the time.

I also conducted two fire studies. One tested the concept of using "crop seedlings" instead of "average seedlings" to diagnose the need for a brownspot burn. Normal procedure at the time was to select individual seedlings to estimate degree of brownspot infection and likelihood of seedling damage by the fire. In the crop seedling method, milacres were selected mechanically and the "best" seedling on the milacre was used for the sample. The study revealed that the new method could result in a drastic difference in prescriptions more suited to the needs of the stand.

Little was known of the ability of planted seedlings to resist damage in a burn. My study tested the survival of newly planted seedlings in hot, moderate, and cool burns. Such seedlings proved to be highly resistant to damage, except in hot burns near a forest wall.

Publication of research findings was an important phase of our battle to "save the longleaf." As studies were completed, our results were published in the Journal of Forestry and other scientific and popular outlets. Forest Farmer ran an article on early results from our shelterwood tests. In 1969 our annotated bibliography listed all significant publications on longleaf pine since Wahlenberg's monograph in 1946.

Our findings on natural regeneration, especially with the shelterwood system, were published in a summary bulletin in 1975. Coverage was comprehensive including basic ecological and biotic factors, an evaluation of several regeneration systems, and detailed coverage of the shelterwood system. Farrar summed up findings from his regional growth- and-yield study in a bulletin. It gave reliable and encouraging data on the potential of thinned natural stands. His publication was much more useful than the standard Miscellaneous Publication 50, which was based on unmanaged stands, growing yield and low to low for managed stands.

1968 was a year of significant progress. Our article describing amazing results with shelterwood regeneration on a steep mountain slope was published. The Joseph Springs area on the Helfin Ranger District, Talladega National Forest had been selected for a test of seedbed burning. The pine overstory had been cut back to about 30 square feet of basal area per acre, which is our current recommendation of density for the seed out in shelterwood. The vegetation of about 50 acres was burned during the summer before the good 1961 seed crop except for small plots protected from fire. Because of the desire to get special permission from the Region to make the burn. Excellent reproduction was established everywhere the

Saw crews clearcut the virgin timber.

the development of large plantations. Gleaming white mansions at the end of the long tree-lined lanes hid rows of cabins in the black slaves’ quarters.

The larger plantations were self-sustaining with a cotton gin, blacksmith shop, grist mill, barns, and related facilities. Teams of mules and oxen powered wagons and plows; carriage horses drew surrives and buggies for the white owners. Spritied saddle horses were used for hunting and riding.

Most Southerners in the land of the longleaf pine supported the Confederacy. Many regretted that they had to fire on the flag of the country their ancestors had fought to establish. But they felt that it was necessary to defend their homeland from an unconstitutional invasion of their rights.

After the war, disheartened Confederate veterans returned to a homeland where their antebellum way of life had been destroyed forever. Suffering was most acute in Georgia and the Carolinas where Sherman had wrought his campaign to destroy the peoples' means of survival.

The dismal future that faced my grandfather when he returned from service as an officer in the Confederate army was typical. Colonel Sam John Montgomery, his father, who was too old for active service, had died during the war. The plantation was in shambles; most of his large work force of slaves were gone; livestock were butchered or driven off; buildings destroyed; and cropland was growing up in weeds.

Endowed with inherited Scotch-Irish resilience, the young veteran set out to rebuild. To obtain cash he sold, for as little as 12 cents an acre, large tracts of land he
At the still the gum was dumped into a kettle and brought to the boil. The vapor, when cooled, condensed into a mixture of water and tarpine. Lighter than water, the tarpine came to the top and was skimmed off. Residue of the still was drained, strained, and put into barrels for shipment. Value of resin was determined by its color—light tars being the most valuable. Three pounds of resin could make 15 amugie fires to ward off mosquitoes, a troublesome pest in naval stores country most of the year.

The highly flammable tarpine was a serious fire hazard. Because of an accidental fire, an ordinance was passed that prohibited storage of them in the city of Fayetteville, North Carolina. Several years earlier, a great store of naval stores on the loading dock at the river had been set afire and destroyed by a man who pitched a match into some tarpine leaking from a barrel to see if it would burn. In the early days most of the tarpine and resin was produced in the Cape Fear region of North Carolina. In fact, until 1830 the gun naval stores industry had not spread south from there. There was a belief among tarpine that longleaf pine trees would not flow gum south of the Cape Fear River. This superstition was, of course, unfounded and gum production gradually expanded throughout the longleaf pine belt. Before the Civil War, however, 90 percent of gum naval stores was produced in the two Carolinas. Barrels of gum naval stores were generally shipped on flat boats, or timber rafts down rivers to markets. Many useful products were derived from them and the tarpine had no trouble finding buyers.

During the 1900's, drastic changes in transportation occurred in longleaf pine country. Waterways, the highways of the early settlers, had been gradually supplemented by roads cut through the wildernesses. Often they followed Indian and buffalo trails. In the Carolinas, herds of buffalo had wintered in the coastal provinces but returned to the Appalachian Mountains for summer grazing. Roads carved out well-marked passages through the forests and some became the route of early roads. Slow moving, canvas covered wagons traversed the one-track roads laden with merchandise. Mail and packages were delivered on horseback until stage coaches came into common use. Pioneers started to move through hogheads filled with tobacco and other product to be sold to market by slaves or mules.

When disasters, such as a lightning travel, wagoners brought along cooking supplies, tents, and other camping equipment. They would meet others at favorite campgrounds and enjoy an evening of music and tales around crackling fires before bedding down for the night.

In the early 1800's, rivers still provided the primary means of long distance transportation of naval stores, timber, and similar forest products. About that time, steamboats were built. Before they came, an inventor lost a fortune by attempting to build a boat on the Cape Fear River with horses operating a treadmill. Soon luxurious steamboats powered by rear-mounted paddle wheels were underway and ship whistles announcing their arrival at landings echoed through the pinewoods.

In 1835 the first railroad in North Carolina started at Wilmington and extended through the pine country through Weldon to the Virginia line. This new method of transportation would eventually constitute the backbone of the southern pine forest industry. In the early days, rails consisted of metal striping nailed to heart-pine timbers that were set on top of crossties. But the crossties were cause for many accidents and were soon replaced by iron rails moulded in a foundry. Passenger coaches were lighted with kerosene lamps and heated with rolls. These coaches in pine country were fired with lighthood collected from the forest. Without spark arrestors, locomotives often set woods fires. A newspaper editor remarked with some amusement that the most valuable crop for farmers in the poor sandhills was money collected from railroad companies for damages they claimed from these fires. Railroads had a serious effect on the trade of the city of Fayetteville. (The city, formed of two villages, Cross Creek and Campbellton, was named for the Marquis De Lafayette who visited there.) For years it had been the major trading center for farm and forest products coming from the west and for supplies needed by the backwoodsmen. But all efforts by the city fathers to get a railroad connection failed, and trade dried up when a second line was built to intersect the Wilmington-Weldon line at Goldsboro and run to Charlotte, bypassing them. After much hand scratching, a unique idea developed and was immediately acted upon. A series of plank roads were built radiating out from the city to attract trade. Plank roads drew heavily on the adjacent pine forests for material and created a temporary boom in the timber industry. First, the right-of-way was cleared and trenches were dug parallel to the route of travel. Then, 4 inch planks 4 feet long were laid in the trenches to provide a firm base for the road. On top of these planks hung 6 inch by 6 inch stringers were placed. Across these stringers 8 inch planks 8 feet long formed the roadbed. Finally, a blanket of sand was spread over the whole.

Completion of the roads had the desired effect. Soon, loaded wagons pouring into the city and bugles announcing the arrival of stage coaches gladden the hearts of tavern operators and merchants. Stage coaches, drawn by teams of horses galloping in 12-mile Pioneers, would race through hogheads filled with tobacco and other product to be sold to market by slaves or mules.

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In the 1970's, sentiment against longleaf pine began to fade away and gradually foresters became interested in favoring the species in their management. To encourage the trend, we participated in workshops, made individual contacts and conducted tours of the Experimental Forest. These activities were all aimed to transfer research findings into practice.

Lamar Besaly, supervisor of Kisatchie National Forest and a strong devotee of longleaf, invited me to conduct a workshop for his personnel. Response of the foresters was gratifying and spoke well for the future for longleaf. One nagging problem was destruction of seedlings by open range hogs.

Leon Cram, supervisor of Mississippi National Forests and another strong supporter of our longleaf pine research, gathered up his men and came to Brevort for a workshop. After an indoor session, most of the two days was spent on the Escambia. This group was also extremely supportive of the species.

The group of foresters from all national forests in the longleaf belt was also taken to select sites on the Escambia, Miller plantations, and Concholac National
Mooney Nalty, a booster of longleaf pine, hunted quail on his forest near Brewton, Alabama. Longleaf forest, prized for its beauty, are efficient producers of high-quality wood products on sandy land and furnish an ideal habitat for quail and other wildlife. To guide our research, we were given the advice of a technical committee. Members were T.E. Maki of North Carolina State; Claude Brown of the University of Georgia; Bonninghausen of the Florida Forest Service; Bigler Crow of Louisiana State University; Walter Beers of Buckeye Cellulose; Bob Allen of Clemson University; and Jim Sabin, assistant regional forester in Atlanta.

When I retired from the Forest Service in December 1974, Jim Sabin hired me for consultation on regional longleaf pine problems. The work took most of 1975. I visited 24 ranger districts on 13 national forests in seven states. This included every national forest in the longleaf pine belt where an estimated 725,000 acres of the species was growing.

Purpose was to give on-the-ground advice and training on problems and to encourage more consideration of longleaf management problems. In my travels, I contacted 175 people in field sessions and dozens more at supervisors offices. Practically everyone, with a few notable dissidents, displayed a sincere interest in longleaf pine and were eager to learn. A broad spectrum of national forest people welcomed me: supervisors, staff men, foresters and wildlife and other specialists, technicians, and forest workers.

As a rule, two days were spent at each ranger district beginning with a get-acquainted conference to list longleaf pine problems and select field points to visit. Most of the time was spent on the forest formulating prescriptions, demonstrating techniques, working out solutions to silvicultural and management problems. We were in active demand by mariners to waterproof their sails. Near them were early woodsmen who sold their lumber and livestock, production of the longleaf pine forests, played a major role in survival of the early white man.

To produce naval stores, they gathered heartwood and stacked it in conical piles in specially prepared pits. The wood was then dug out with sand and set on fire. The combustion baked out the tar, which drained into barrels or into another clay-lined pit to be converted into pitch. Pitch was obtained from these oven-baked barrels. Sometimes huge duff out cacoes of Cypress logs were used to transport the barrels to seaport shipping points. Some of these barrels were large enough to hold 500 barrels of naval stores.

Tar has often been featured in the folklore of American farmers as a punishment for misdeeds or for other antisocial behavior, victims were tarred and feathered. The sticky black liquid was first smeared over the victims' bodies, which were then coated with goads of feathers. To add to the discomfort, the offenders were sometimes ridden on a rail snatched from a nearby fence.

Longleaf National forests were dubbed "Tarheels" because of their production of naval stores. A General during the Civil War, noting the tenacity of the Carolinians facing enemy fire, wished for the "tar on their heels" to hold off the troops.

William Bartram, in the latter part of the 18th Century, found that the European settlers in Carolina had not only survived threats but had established a firm foothold in the new land. He visited a Huguenot planter on Santee River who had crisscrossed his level bottomlands with dikes to grow valuable crops of rice. He enjoyed the hospitality of this man, as well as many others, who had built comfortable homes and mansions, some of brick, with large libraries and elaborately furnished. Procedures from rice and indigo crops, as well as from large herds of cattle and naval stores operations, had made this possible.

Some settlers were engaged in timbering operations. Selected trees for spars and large logs were harvested for export, small slaves cut the timber, skidded it to the riverbank with a big wheel rig pulled by oxen, shaped the material with a broad ax, and dumped it into the river. There, the logs were turned up into rafts and floated down to the seaport for export.

At Cross Creek, trading center for the Highland Scots, Bartram found a bustling village. Entrepeneurs selling livestock had built grist and sawmills, powered by water. It was a trading center for pioneers who brought cattle, naval stores, and finished products for transportation to Wilmington down nearby Cape Fear River. There were many skilled people in the village: blacksmiths, cooperers, carpenters, shoemakers, and the like. A comfortable tavern furnished accommodations for travelers.

Bartram's travels took him into Georgia, Florida, Alabama, and Mississippi as well as the Carolinas. In his journals, he reported that the culture developed by Carolina settlers had spread westward. Homes, farming, livestock, and timbering followed a similar pattern. He did find a difference in naval stores operations near Mobile, Alabama. Huge iron pots were used instead of clay-lined pits to convert tar to pitch.

Scottish-Irish and Huguenots not only established permanent homes in the forested land between Santee and Blackwater rivers, but also planned the rice fields that were later threatened. A tyrannical British government under King George III levied unfair taxes and in many other ways persecuted them until they were forced to tolerate.

In bitter resentment, they left their farms and enrolled in armed forces organized by the South Carolina Continental Government to repel British forces sent to quell the rebellion against the King's authority.

Francis Marion, the "Swamp Fox," pursued a relentless attack against Loyalists and the British during the Revolutionary War. After the War, he played a major role bringing into being the relationship between neighbors who had fought on opposite sides. Besides sponsoring legislation, he helped the wounded to renounce their previous loyalties and encouraged the rugged soldiers of his brigade to forgive them. In a final muster speech he said, "God has given us the victory. Let us show our gratitude to Heaven by refraining from cruelty to man."

Since the war Francis Marion's role in keeping the Patriot cause alive while the Carolinians were dominated by the British has been widely acclaimed. For several years after capture of Charleston his brigade was the only force against the British in the Low Country.

Marion has been honored with many place names, in poems, and in history books. Parents have proudly named their children after him. One-hundred-fifty-years after the war, a National Forest in South Carolina was given his name during the Great Depression. The Francis Marion National Forest, which contains many acres of longleaf pine where the Swamp Fox and his men fought for freedom is a fitting memorial to them.

At the close of the Revolutionary War the great virgin forests remained largely unbroken except for a few trees cut for farmstead uses and selected large trees near streams harvested for export.

CHANGING TIMES

After the American Revolution, a new method of producing naval stores gradually replaced the pioneering process of boiling tar and pitch from heartwood collected on the forest floor. Gum was secured by tapping living trees. First a cavity was cut in the base of the tree about 10 inches above the ground with a special tool. This receptacle hacked into the truck, was designed to collect gum.

In early spring, the bark was smoothed above this cavity, called a box, and two strips in a V-fashion were cut into the wood through the bark with a hook blade tool called a hack. Soon gum would ooze out and flow down into the box. Then once each week, new strips were hacked above the first to keep gum flowing. In about three weeks, when boxes were full, a dipping crew came with the boxes, and removing the box, the transportation to Wilmington down nearby Cape Fear River. There were many skilled people in the village: blacksmiths, cooperers, carpenters, shoemakers, and the like. A comfortable tavern furnished accommodations for travelers.

Bartram's travels took him into Georgia, Florida, Alabama, and Mississippi as well as the Carolinas. In his journals, he reported that the culture developed by Carolina settlers had spread westward. Homes, farming, livestock, and timbering followed a similar pattern. He did find a difference in naval stores operations near Mobile, Alabama. Huge iron pots were used instead of clay-lined pits to convert tar to pitch.

Scottish-Irish and Huguenots had barely established
Ancient Old Bluff Church was built on the east bank of the Cape Fear River with timber from the surrounding virgin forest.

South Carolina lowlands and mosquitoes were not as troublesome. The fierce Tuscarora Indians had been driven out, and there were no Indians and Croats. So they probably had less contact with Indians.

Building of homes and planting of crops were similar but no doubt they planted more oaks. Highland Scots were inordinately fond of oaks.

Despite hardships suffered by the pioneers establishing a "beachhead" in the North Carolina and South Carolina wildernesses, they persistently built on and made them better lived in.

Cattle grazed unrestricted on open range, all fences had to be built to protect crops from them. Also, fence rows had to be kept clean and yards swept with dogwood brooms for protection from woods fires.

Hogs fed on acorns as they were forced to flee to the pine hills when spring floods covered the bottoms. There the hungry beasts subsisted on nutritious pine piny, parrots, and indigo corn.

Pioneers became superb horsemen while working cattle on the open range. At strategic locations, pens were built and cattle were driven into them for branding or ear marking, castration of bull calves, and steers for butchering or sale.

Without cattle and hogs on the open range, life for the early settlers would have been difficult. In addition to beef, pork, milk, cheese, and butter, they provided many other essentials: leather for boots, shoes, saddles, harnesses, whips, and shirts; tallow for candles; and many other items. Many of these early settlers were a continual pittance of healthy and debatable, if not unhealthy and dangerous.

The longleaf pines were not only an ideal range for the settlers' livestock but also furnished heartwood that could be used to make tar and pitch. These products

A written report was submitted for each ranger district and forwarded to the Stumps district. In addition to a general description of the district, including the acreage and character of longleaf pine stands, it listed recommended management, natural regeneration, direct seeding, planting, precommercial and commercial thinning, fire use, protection, and solutions to special problems.

Use of a two-cut shelterwood system was generally recommended for natural regeneration. Detailed information on stand age, size, and system was given as well as criteria for deciding between natural and artificial methods. In some places supplementary seeding of small areas in shelterwood stands on years of good seed crop was suggested. We did find an excellent catch of small seedlings in the Gauley district in Alabama on an area devastated by a tornado.

My planting recommendations generally followed my experience with T.R. Miller Company and other successful longleaf planting in Alabama, Mississippi, and North Carolina. Emphasis was put on complete site preparation, high-grade seedings from selected nurseries, extreme care in transplanting including cold storage, and maintaining the seedling at the proper depth. Crew training and supervision were stressed. Containerized planting was discussed, but I usually recommended postponing it until the following year. Two methods, tunneling and seedling, are suggested. In one method, the seedling is placed in the soil by a "Radio Horse," or may provide a means for thinning overstocked natural stands.

We prescribed thinning of commercial-sized stands from 1,000 to 1,500 stems per acre. A density of 60 square feet basal area per acre for younger stands was recommended; 70 square feet for old, and 85-90 square feet for 50-year-old stands, followed by an estimated 50 acres per stand of good longleaf pine sites by slash and loblolly pine was frequently observed. I recommended that many of these stands be converted to loblolly pine at the time of planting.

A small administrative test of containerized planting at the time of harvest cut.

Seven five districts in Alabama: Shoal Creek, Talladega, Oakmulgee, Tuskegee, and Conecuh, we estimated 133,000 acres in longleaf pine type.

Shoal Creek was near the northern limit of the longleaf pine zone. Much of it was on steep mountain slopes and slope depressions. It was too dry for longleaf because of the danger of forest fires of fall-fallenn timbers and other timbers. We estimated that 9,000 acres were suitable for longleaf, but there was no progress. Building, roads, logs, guns, powder, shot, flints, and the like

Oakmulgee was the locale for our Ebenezer shelterwood type of cutting. Stand conditions were similar to Talladega, with some mountains to deal with but considerable land - an estimated 45,000 acres - suitable for growing longleaf. A somewhat more undisturbed virgin/secondary forest estimated 25,000 acres or so. Prompt direct seeding of the cutover area with longleaf had established good seedling stands. In August, this project was the focus of attention by Charles Lyell, the British geologist, who speculated that the excellent longleaf pine resulted from control of competing vegetation.

Tuskegee was at a lower elevation than the three mountain districts, but usually longleaf occurred in narrow bands along the ridges. This topography facilitated the use of fire and other silvicultural practices. Also, there were open areas where seeding and planting had not been necessary. We estimated 3,000 acres suitable for longleaf pine management.

Conecuh was by far the best district for growing longleaf pine. It covered favorable coastal pine soils and a gentle terrain. We estimated 50,000 acres of potential longleaf land. Despite the fact the large portions had excellent habitat for second growth stands suitable for use of shelterwood, an unwanted amount of regeneration had been done by clearcutting and planting of slash pine. I strongly recommended against such planting. Future regeneration should concentrate on natural regeneration using a shelterwood system where adequate seed trees are available.

On five districts in Florida, Appalachian, Wakulla, Seminole, Lake George and Osceola, we estimated 88,000 acres of good longleaf land.

Appalachia had much of the area occupied by flatwoods, which were considered by the silviculturist to be unsuitable for longleaf pine. It was decided to test for conversion to longleaf, against longleaf, estimated only 10,000 acres suitable for the species. They had been usually successful in the past for no substitute was near the site of their regeneration will be done by that method. At the time, they were only 45,000 acres on an acreage plan, a federal estate plan, forest under a lease system. I suggested several measures to include the leases that would help coordinative grazing with timber management.

Wakulla District had some flatwoods areas but they were not as extensive as in the Appalachian. We estimated 55,000 acres suitable for longleaf pine. This district was the locale for the highly successful Lavender Forbes shelterwood test. Unfortunately, there was much drift back into the site of planting of slash pine. I recommended early harvest of the uncut pines and replanting with longleaf. A small administrative test of containerized planting was suggested.

Seminole, the most southerly district, had large areas where direct seedling and planting had failed. Due to severe predator pressure and droughty soils, I recommended direct seeding instead of planting. Improved site preparation methods were recommended.

Lake George District had two beautiful longleaf sites known locally as "longleaf pine islands" - sustained between thick stands of sand pine. Here was also a large lack of seeded and planted sites. Because of the severe predator pressure and nature of public relations, I recommended some modification of site preparation methods for planting. Oakmulgee District situation was similar.

There were well-stocked stands of longleaf with severe understorey palmetto competition. At the time, control of...
Bartram fortunately secured the blessing of several chiefs of the Catawbas, and was allowed full permission to travel through Indian country. Purpose of the meeting, held at Augusta, was for John Stuart, the Indian agent, to secure a treaty and sell to the Indians the land they would otherwise lose for a large tract of their land to white settlers.

The naturalist noted that coming of the white man had changed the lifestyle of the Indians. Traders brought axes, hoes, guns, and many other items that replaced their crude possessions. With metal cutting-tools they were able to cut wood more efficiently and to grow crops in the manner of the whites.

Lumber in their towns provided material for building structures, which replaced the crude huts of the earlier times. It was said that sheafs of corn, potatoes, tobacco, and other vegetables. Indian corn was first introduced to the Indians by the white man.

Bartram reported woods fires set by Indians as well as their use of lightwood for cooking and warming fires, and a few structures made of longleaf pine trees.

He was treated with courtesy wherever he went. The Indians helped him with his baggage, guided him through the wilderness, transported him in leather boats and rafts across wide streams, killed game, and provided fish for his food. Besides venison, bear steaks, hominy, and a wide variety of native food, he was probably fed the delicious meat of carri pigeon.

Hunters, equipped with a supply of lightwood splinters, bags, and clubs, located the pigeons roosting in large oak trees at night. Suddenly they would light splinters in a bush and a shower of birds would rise, landing, and the birds were plucked and the game was collected.

Bartram observed the importance of the Southern forest.

The „burning" Vernon District had many well-stocked longleaf stands with a clean understory-the result of many years of controlled burning. We estimated 44,000 acres of longleaf with 16,000 subject to military restrictions.

Kissatche had a more rugged terrain than the other Louisiana districts. Some of the land had been classified LM and was not available to commercial interests. Altogether, there were 20,000 acres of longleaf pine on the district.

In Louisiana, every district except Winn had severe cattle and hog damage to contend with. As elsewhere, much original longleaf type was now occupied by loblolly and shortleaf pines. Many efforts were made to control longleaf pine at the time of harvest cuts was recommended.

In Texas the two districts- Yellow Pine andAngelina- were smaller but included the same type on Angelina-30,000 acres versus 7,000. Some of the 40 year-old stands were also included in the seeded burning by Supervisor Bishop before the 1935 crop. A unique problem on the Angelina was severe pocket gopher damage.

Both districts in North Carolina were on the Francis Marion National Forest; however, soils were quite different on the two districts. Much of the Withite

Bartram fevered to the task of clearing the land for cultivation and it was not until late in the fall of 1762 that the clearing was complete.

Many of the stands of longleaf had been replaced with loblolly and shortleaf pines.

The Winn District had a high watertable that caused flooding when the stand was intact for clearcutting and it did not affect the seedlings. All seedlings in a Hatcher, Furrow seeded area died when water entered the deep furrows. Because such flooding was detrimental to seedlings we established a zone of protection in the preferred system where there was sufficient seed source.

The Grenn Springs tower, we inspected an excellent stand of longleaf that was still standing 10 years earlier. We had scaled part of the area for seedbed preparation. On this district, we were unable to do the extensive test of Dalapem or Simanze to determine the extent of planting.

A thicket in the Winn District was in the southern part of the area, where there was too much risk of frost-heaving of fall-germinated seedlings.

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Bartram fevered to the task of clearing the land for cultivation and it was not until late in the fall of 1762 that the clearing was complete.
Razorback hogs, a serious threat to longleaf pine seedlings, were introduced by DeSoto and other Spanish conquistadores.

William Bartram, famous Pennsylvania naturalist, explored the longleaf pine forests in the late 1700’s. His travels took him into the Carolinas, Georgia, Florida, Alabama, and Mississippi. He praised the open, airy nature of the virgin pineywoods in the sandy uplands that he liked so much better than the mosquito infested, dismal, cane brakes. During his trip he kept a detailed journal of the flora, fauna, and lifestyle of the Indians: Creeks, Choctaws, Seminoles, and others.

DeSoto died on the western leg of his trip and was buried in the Mississippi River by his men to prevent hostile Indians from desecrating his grave. In 1708 John Lawson, an English gentleman by birth, arrived at Charleston, South Carolina and made a trip through Indian country in the Carolinas. He wrote a detailed description of his observations and relations with Sewee, Santee, and Tuscarora tribes that he encountered in the Coastal Plains of South Carolina and North Carolina. The Indians treated him kindly, guided and hunted for him on his travels, welcomed him into their villages, honored, bedded, and fed him there. He was aghast to see the ravages that the white man’s social diseases and whiskey had wrought on the “savages,” especially their treatment of the women. Later, when he returned to North Carolina on a second trip he was captured, tortured, and killed by the Tuscaroras. Kidnapping of their children and taking them to England, presumably for education and conversion to the Christian religion, had incensed the Indians.

In 1886, as the last chapter in this “saga of longleaf pine” is being written, a new day has dawned. Prejudices against longleaf are fading away and there is a revival of interest in the species. Ed. Keer, a prolific writer on forestry subjects from Louisiana; William Voight, a native of longleaf pine forests of Georgia; Eley Frazer, 3rd president of F & W Foresty Services; and others have written articles describing the trend.

Why has this change occurred? Our exhibitions during the 1960’s and 1970’s undoubtedly played a role, but there is a more important reason. Success has been conclusively demonstrated for regeneration practices, and there has been a significant increase in knowledge of the growth potential of the species and the important role of genetics. A better understanding of longleaf has built the confidence of many people.

A reliable natural regeneration system has been rigorously tested. Where properly applied on suitable sites, a shelterwood system has proven reliable. Failures are generally due to providing too few seed trees, inadequate competition control, failure to coordinate burns with seed crops, or other unwise practices.

Natural regeneration provides an attractive low-cost system while site and stand conditions are suitable, and it meets the financial and other requirements of the landowner.

During the last 20 years the dismal failure of longleaf pine plantations has been reversed. Now successes have become the rule. Significant improvements in the forest are being made by the pigners, and saplings are producing better stock—some introducing mycorrhiza into seedbeds. Grade one or better seedlings are used. Seedlings are handled with great care from the nursery bed to the planting site—often with cold storage protection all the way. Particular care is given to site preparation, including a drastic reduction of competition and elimination of all sources of brownspot infection. Seedlings are correctly planted, usually with machines, at the proper depth.

Even pulp mill forests, formerly reluctant to plant longleaf pine, are consistently successful in the right species of plants in their planting programs.

Containerized seedlings are showing superior growth and survival under adverse conditions. Use of them promises to be the wave of the future for special situations.

Direct seeding, after dramatic success on large cutover tracts, particularly in Louisiana, is now used on a more limited scale because of seed cost, squirrel predation, and unsuitable sites. But it still is a viable practice to seed spoilbanks, or for quick reforestation of disaster areas.

Since the 1930’s, fire use in longleaf pine forests has gradually developed into the land management aspects of the forest. Reprints of the article were widely circulated among southern foresters. A revised version was published in the Christmas issue of the Southern Lumberman.

By the early 1990’s, our “battle to save the longleaf” had achieved some significant victories. The impending doom of the forest in the 1970’s had been averted and the tide that had been turning since the 1950’s and 1960’s had slowed down to a trickle.
THE VIRGIN FOREST

Open and parklike, the virgin longleaf pine forest dominated some 60 million acres of the prehistoric south. When United States Forest Service's Southern Region, has organized an ambitious technology transfer program for the species. Species is a range in Mississippi when it was visited his district in 1975 during my regional consultation project. Like many Mississippi people, he was eager to learn and was sincerely interested in promoting longleaf pines. In 1982 when he assumed his present position, he came to Brevont to discuss the status of longleaf pine and agreed to encourage management of the species. Roger has come through with flying colors. His program is aimed not only to stop the decline in longleaf acreage but to actually increase it. He has recruited a large group of knowledgeable people to help, has money to do the job, and has secured the approval of his superiors and the director of the Southern Station. Projects are extremely bright for success.

In view of Dennigton's goal one many ask: How much acreage should be devoted to longleaf pines? Obviously, much of the original 60 million acres should remain in present uses such as agriculture. Also, other pines that replaced longleaf should continue to occupy a portion because of site quality and landowner objectives. But in my travels I have observed many sites where longleaf pine would definitely be an excellent choice. In many cases I have recommended a conversion to longleaf pine when the final harvest cut is made. It doesn't add to the existing acreage that could be best devoted to growing longleaf. I am convinced, however, that those using the longleaf site and forest type should not be left out of line.

Five years' research from management of a longleaf pine forest for one of my clients suggests a desirable pattern for nonindustrial private landowners and communities as well. Eighty per cent of the life of a longleaf growth forest was in longleaf pine with the remainder in slash pine-hardwood bottoms. Understocked, the forest had a destitute mix of sawnwood merchantable product. Site for longleaf pine average: index about 70 feet height for the tallest trees at 50 years. Soils in the uplands are well drained and resistant to damping-off longleaf. The covers provide cover for game and make gopher breaks.

A financial analysis of the growth potential of site 70 longleaf pine indicate a dollar return of 15 percent annually on the investment in 15 years. The forest growth in a forest of 100-acre compartmented during the 10-year period from age 50 to 80. In the next 10 years, the return would drop to 7 percent. So a 60-year rotation was selected for management.

The forest was divided into 50 to 100 acre compartments bounded by roads, branch bottoms, and property lines. Within each compartments slopes, skill and pine stands will be grown on the uplands; uneven aged slash-hardwood stands in the bottoms.

Camping during the first 10-year cycle is controlled by two methods. Volume removed in logs and poles (mostly trees 9.1 inches diameter at breast height) below 40% of the total acreage on the forest. Assembly of natural pine stands is limited to less than the estimated growth in board feet on the entire forest during the period. Acreage regenerated to longleaf pine is eight to 10 percent of the total acreage on the forest. Aim is to eventually develop ages ranging from 10 to 60 years. Unfortunately, most

THE INDIANS

The story of the first man to enter the longleaf pine forest is lost in centuries of unrecorded history. Since the soil of the Great Plains is underlain by the native prairie marsh, the deeper soil layers, it is possible that the forest floors were the major source of food for the earliest human inhabitants. We do know something of the activities of the Indians in the forest from journals of the first European explorers.

Because of primitive cutting tools Indians had to use fire to fell large trees.

Longleaf forests provided many of the necessities of life for woodland Indians of the southeast. Heartwood furnished fuel for warming and cooking fires. The burning fires provided the necessary smoke, or "chimney," for the pottery-making industries of the center of the wigwam or lodge, and the smoke escaped through a hole in the roof. Smoke that collected on walls was scraped off and used as a binder in the construction of crude shelter and for other ceremonial painting. Lighterwood splinters illuminated the way on night excursions. Small trees and bark from the pineyards were used to construct corn cribs, lodges, and other aboriginal structures. Many village streets were paved with pine bark.

Deer furnished Indians with food, shelter, clothing, and deerskins became an important item of trade after the white man arrived. The longleaf pines provided an ideal locale for hunting the plentiful deer, which, when threatened by enemies, would hide in the narrow branch bottoms that penetrated the open woods. Hunters soon learned to drive deer from their hiding places with fire, making death traps of the dense canes and hardwood bottoms. While their companions set the fire hunters hid behind tree trunks in open woods and killed the deer as they rushed out to escape the flames.

When the Indians' hunting fires were not extinguished, flames spread throughout the uplands until stopped by a stream or by rain. These fires often blackened streams when ashes washed into them.

In addition, wood products were important in many aspects of Indian ceremonial life, including funerals. Mohawks blackened their faces with soot mixed with bear oil. The corpse was laid out in the sun on a pole frame, covered with pine bark, and treated with various mixtures. As soon as the flesh was cooked, it was removed and burned. The bones were then cleaned, oiled, and preserved.
DEDICATION
This book is dedicated to a future for longleaf pine, one of the finest forests that the world has ever known.

ACKNOWLEDGEMENT
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Also, thanks to the authors of the publications listed in the selected Bibliography for material used in this publication.

stands are around 60-years-old and conversion to younger age classes is needed. Too rapid a conversion, however, would be undesirable. It would interrupt a sustained cash flow and be undesirable from the esthetic and game standpoint, besides creating an unbalanced age-class distribution.

Because of understocked nature of the forest, all cutting during the first 10 years is for the purpose of regenerating sparse stands. Those with better stocking will be left to grow.

To avoid the expenditure of large amounts of capital for regeneration, a shelterwood system is prescribed where stand and ground conditions are suitable. Besides reducing costs, growth on the seed trees would provide an additional volume of high-quality material to be harvested in the early years of management.

Before cutting, a survey is made in each compartment to determine if there are enough seed trees for a shelterwood system. If so, a seed cut is prescribed to begin the regeneration process. If the seed source is deficient, the compartment is scheduled for clearcutting and planting.

The thick middistory of unmerchantable material was a serious barrier to regeneration. Fortunately, a contractor was found to chip the unmerchantable material for fuel wood to be used by a nearby pulp mill. The job is done before logging with little damage to merchantable trees at no cost to the landowner. Chipping not only eliminated the need for windrows in planting operations, but site-prep costs were also reduced. In natural stands, chipping made prescribed burning much more effective and facilitated marking and logging. Game habitats were improved by the operation.

Well-timed seedbed burns before the 1983 cone crop in shelterwood stands established fully stocked stands of longleaf pine seedlings on 379 acres. Also, 430 acres have been planted successfully during the 5 years where the site was prepared properly. When seed trees are removed in the shelterwood stands, we will have 986 acres of well-stocked seedling stands free to grow.

During the 5 years, gross returns to the landowner have averaged about $25 per acre per year. Revenue was derived from stumpage sales of pine poles, logs, pulpwood, posts, hardwood logs and pulpwood. Cutting less than growth, we now have more and better timber than before management began, and the forest has contributed materially to the landowner and the general economy.

This tract clearly shows the economic benefits of managing second-growth longleaf pine forests. High-grade wood products can be produced, substantial dollar returns obtained, employment for forest workers furnished, and the woods will abound with quail, deer, turkey, and other game thriving in an ideal habitat.

But there are other important intangibles that gladden the hearts of those who love the culture of the land. Who can describe the beauty of a blanket of grass penetrated by snow white pine buds searching for the sun; of the thrill of a quail hunt through a parklike forest cooled by a resinous breeze? Rustling turpentine cups and arrowheads buried in the sand, ancient churches built of heartpine, magnificent southern mansions, and old logging photos are reminders of centuries of human drama enacted on the forest stage. The historical attraction of longleaf pine is important to many people.

Then there is the challenge of salvaging our forest heritage, battered and bruised by man, but dependent on him for salvation.

The most serious threat to a future for longleaf pine has not been a lack of technology but the attitude of people. There were those who championed a cause that seemed destined to be lost; however most seemed bent on destroying the forest.

Now public opinion seems to be changing, and there is real hope for the future. The magnificent virgin forests are just a fond memory. But as long as trees grow and winds blow, the gentle breezes will ripple the longstraw crowns creating the sweetest music this side of the Mason-Dixon line.
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PREFACE

The land of the longleaf pine is a giant stage, stretching across the lower South, where centuries of human drama have been enacted. Indians enjoyed a compatible home in these woods until defeated and evicted by whites. Spanish Conquistadores trampled the pinywoods in search of gold. Finding none, they were soon discouraged and left. Later, Scotch, Irish and other Europeans came seeking freedom from oppression and built permanent homes. Lumbermen, turpentiners, foresters, and many others have played a significant role in the drama.

There have been times of great rejoicing and prosperity, but also grim times with little hope for the future. Fortunes have been made and lost. Red, white, and black men have sweated, bled, and died under the longstraw crowns. Like many Southerners, longleaf pine forests have played an important role in my life. Tales of my early ancestors have wedded me to them. I spend much of my youth, college days, and professional forestry career in them.

Because of my association with the land, people, history, and management of the forest, this story is written from a personal viewpoint. It has, of course, been fleshed out with gleanings from the publications listed in my selected bibliography and information supplied by others.

My objective is to provide a story for the enjoyment and enlightenment of people who love or can be encouraged to love longleaf pine. Among them are those whose lives have been affected by longleaf or who have ancestors of forest lore.

Those who have enjoyed hunting quail and other game in the piny forest; foresters who have tackled the demanding task of managing the species; those who have battled to save this splendid natural resource from extinction; anyone who has a personal relationship with longleaf pine.

There are many others, among them lovers of history, folklore, and folkways of the South. Longleaf pine people are as typical of the South as "gals and grayys." Also, conservationists anywhere might profit from reading this story.

Basically, I have another more important purpose for this book. Longleaf pine forests have weathered two crises that threatened their extinction. In the late 1800s lumbermen moved in and ruthlessly clearcut most of the virgin timber with no thought of regeneration. Except for a few tracts conservatively cut by far-sighted lumbermen and land that was diverted to agriculture, millions of acres lay bare and bleaching in the sun. Forest workers, unemployed, were left in hopeless poverty.

Largely without the help of man, a second forest arose from the ashes and debris of the virgin timber. But again destroyers moved in. By 1960 it appeared likely that it would be completely gone by the mid-seventies with no hope of renewal. Clearcutting followed by heavy site-preparation guaranteed its elimination. Objective of the destroyers was to replant the land with slash or loblolly pines that could be managed easier -- requiring less skill.

Alarmed, lovers of longleaf pine took aggressive action to prevent its demise as an important commercial forest. The dangerous trend was slowed down and about 4 million acres were saved -- a paltry remnant of the original 60 million acres of virgin timber.

But a new day has dawned. Unfounded prejudices against longleaf have gradually faded away and there is renewed interest in growing the species. It is my belief that this story will help accelerate this desirable trend.
CONTENTS

PREFACE .......................................................... 1
DEDICATION ......................................................... 2
ACKNOWLEDGEMENTS ............................................. 2
THE VIRGIN FOREST ............................................ 3
THE INDIANS ...................................................... 3
THE PIONEERS .................................................... 5
CHANGING TIMES ................................................. 7
BOOM TIMES ....................................................... 10
THE GREAT DEPRESSION ....................................... 13
FOREST FIRE HERESY ......................................... 16
THE SECOND FOREST ............................................ 18
WORLD WAR II ................................................... 20
POSTWAR PARADOX .............................................. 21
STEMMING THE TIDE ............................................. 26
A PLACE IN THE SUN ........................................... 33
SELECTED BIBLIOGRAPHY ..................................... 36

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