

# A Brief History of Reforestation and Restoration in Louisiana

Randy Rentz

*Reforestation Branch Chief, Louisiana Department of Agriculture and Forestry, Columbia, LA*

## Abstract

Louisiana is rich in culture, politics, and ecosystem diversity, all of which have affected forested timber lands and their use over time. Landscape diversity and historic land use changes have also played a significant role in shaping Louisiana forests. Native Americans participated in small agriculture production areas and burned areas for clearing, crop production, and wild game pursuit. European settlements began in the 1700s, and with them came land clearing and draining, levee building, and logging. By the 1930s, the State was almost completely clear-cut. Then, a few forward-looking people introduced forestry and the legislation to support its practice to the State. The works of these leaders—along with the assistance of the U.S. Department of Agriculture, Forest Service; the 1904 establishment of the Louisiana Department of Forestry; and the work of the Civilian Conservation Corps program—eventually changed the face of the Louisiana timber industry from one of “cut-and-run” practices to one of vibrant, sustainable forests. Today, environmental and man-made factors threaten millions of acres of forest land. Much work is being done to address these threats, but much still remains to be done.

## Introduction

Louisiana has a very diverse landscape, ranging from the rolling hills in the northwest to the marsh regions of the south. The highest elevation in the State is Driskill Mountain, with an elevation of 535 ft (163 m), and the lowest is 8 ft (2 m) below sea level in New Orleans. Forests are a vital part of Louisiana’s economy and provide material for a thriving woods product industry, as well as for recreation, wildlife, and environmental enhancement. Louisiana’s forests cover 14.0 million ac (5.7 million ha), about 50 percent of the State’s land area. Louisiana has 148,000 forest landowners. Private, nonindustrial landowners own 81 percent of this forest land; the forest products industry owns 10 percent; and the public owns 9 percent (Louisiana Forestry Association 2011). Trees are Louisiana’s No. 1 crop, with an economic

impact of \$3.0 to \$4.0 billion annually, peaking at \$5.4 billion in 1998. Total forest landowner income in 2010 was \$396.8 million compared with a high in 1998 of \$744.0 million (Louisiana Forestry Association 2011). Louisiana’s forests support approximately 180 primary and 750 secondary wood-using industries (The Nature Conservancy 2007). The forest industry is second only to oil and gas in the State.

Known as the sportsman’s paradise, in part because of the diversity of its ecosystems, Louisiana has 12 river basins containing a wide variety of bottomland hardwood forests. Among the river basins are rolling hills and bluffs that support upland hardwood-pine forests. These basins and their watersheds flow to the Gulf of Mexico and make up a system of Gulf coast marshes and prairies that comprise 40 percent of the lower 48 States’ coastal wetlands (USGS 2012). This area includes the great Atchafalaya River basin, one of the last great bottomland ecosystems. The Mississippi River Alluvial Valley alone makes up more than 12,000 mi<sup>2</sup> (31,080 ha<sup>2</sup>) of Louisiana’s surface area (figure 1).



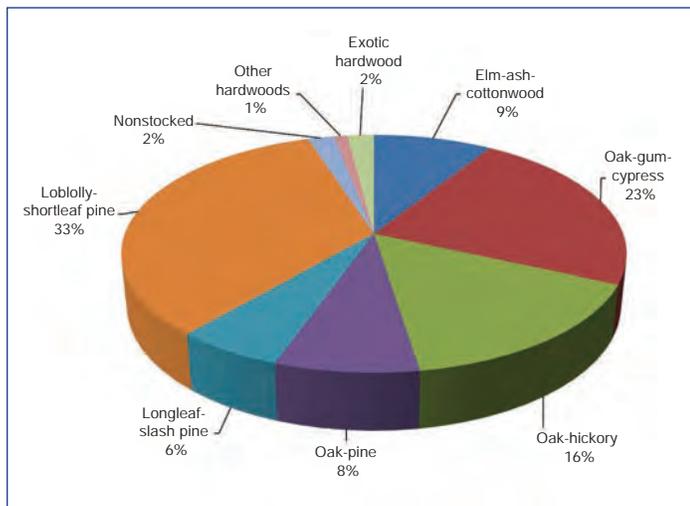
**Figure 1.** State of Louisiana map detailing the urban centers. (Map source: Louisiana Department of Forest and Agriculture, Landsat Image, 2002.)

## Louisiana's Forests

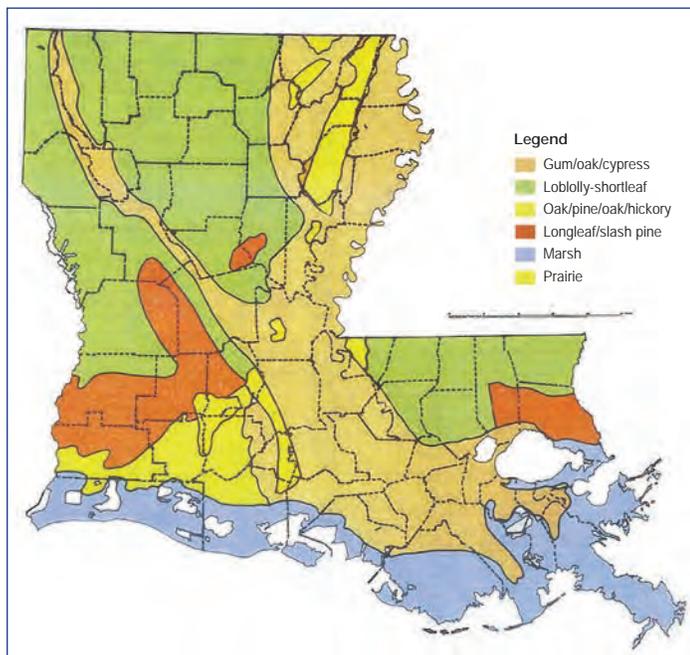
Louisiana forests are quite diverse because of the nature of its topography. Its forests are composed of a wide variety of upland and bottomland hardwood species, along with five pine species (figures 2 and 3).

### Timber Regions

The northwest corner of the State originally supported shortleaf pine (*Pinus echinata* Mill), a variety of oaks (*Quercus* spp.), other hardwood species such as sweetgum (*Liquidambar styraciflua* L.), blackgum (*Nyssa sylvatica*



**Figure 2.** Relative abundance of Louisiana forest types; loblolly-shortleaf pine dominates with oak-gum-cypress a close second. (Data source: Oswalt and Johnson, 2012)



**Figure 3.** Geographic distribution of forest types in Louisiana. (Map source: Louisiana Department of Agriculture and Forestry, 2002)

Marsh), red maple (*Acer rubrum* L), and several varieties of hickories (*Carya* spp.). Most of the shortleaf pine in this region was replaced by loblolly pine (*P. taeda* L), partly because of loblolly pine's rapid growth and ability to reseed on denuded soils, along with extensive replanting efforts of the 1950s. The southwest and central portions of the State are considered the longleaf belt. In Louisiana, longleaf pine (*P. palustris* Mill.) historically occurred in the hilly region and on extensive flatland surfaces known as flatwoods. Today, this area consists of longleaf, slash (*P. elliotii* var. *elliotii* Little & Dorman), and loblolly pines. The many sloughs within the flatwoods area contain swamp blackgum (*N. biflora* Walt), water oak (*Q. nigra* L.), willow oak (*Q. phellos* L.), red maple, and green ash (*Fraxinus pennsylvanica* Marsh), along with baldcypress (*Taxodium distichum* [L.] Rich.) and tupelo gum (*N. aquatica* L.) on poorer drained areas. Spruce pine (*P. glabra* Walt.) occurs along the streams in the pine hills and on the higher parts of the Pearl River bottoms, with the most extensive stands occurring in parts of Livingston and Tangipahoa Parishes (Brown 1945).

### Bottomland Hardwoods and Cypress Regions

The Mississippi River floodplain, as well as the deltas and floodplains of the Pearl, Red, Sabine, and Atchafalaya Rivers, and many streams have hardwood forests with large acreages of baldcypress trees. These floodplains consist of lakes, backwater swamps, old stream channels, natural levees, and levee slopes. The soil varies from sand to heavy clays. A difference of only a few inches in elevation here is often more influential on the plant community than is a hundred feet in other areas.

Baldcypress swamps also contain tupelo gum, swamp red maple (*Acer rubrum* var. *drummondii*), green ash, pumpkin ash (*Fraxinus profunda* Bush), and black willow (*Salix nigra* Marsh). Large areas of poorly drained, but a little drier, soil support growth of overcup oak (*Quercus lyrata* Walt), bitter pecan (*Carya aquatica* [Michx. F.] Nutt.), green ash, willow oak (*Q. phellos* L), water oak, and hawthorns (*Crataegus* spp.).

The areas closest to the river channels that receive sand and silts with each flood support growth of cottonwood (*Populus deltoides* Bartr.), sycamore (*Platanus occidentalis* L.), sweetgum, black willow, hackberry (*Celtis laevigata* Willd.), honey locust (*Gleditsia triacanthos* L.), and water locust (*G. aquatica*).

The old natural levees support sweetgum, cherrybark oak (*Quercus pagoda* Raf.), cow oak (*Q. michauxii* Nutt.), nuttall oak (*Q. taxana* Buckley), shumard oak (*Q. shumardii* Buckley), water oak, American elm (*Ulmus americana* L.),

winged elm (*U. alata* Michx.), pecan (*Carya illinoensis* [Wangenh.] Koch.), and persimmon (*Diospyros virginiana* L.). The higher and poorly drained portions of the floodplain contain willow oak, winged elm, nuttall oak, cedar elm (*U. crassifolia* Nutt.), and green ash.

The margins of old stream courses and meanders of the Mississippi River support baldcypress, water locust, and water elm. The adjoining natural levees, only a few feet higher, have sweetgum, overcup, bitter pecan, persimmon, hackberry, and cherrybark oak. In the lower portion of the flood plain south of Baton Rouge, live oak (*Quercus virginiana* Mill.) is found in areas above the height of normal floods (Brown 1945).

Extensive levee building after the great flood of 1927, along with draining of lands for agriculture in the 1800s, shifted the hydrology in many of these areas. These changes in the landscape also shifted the plant species in the second-generation bottomland hardwood forest. Many areas once dominated by nuttall oak, overcup oak, and bitter pecan are now cherrybark oak, willow oak, water oak, and shumard oak.

## Upland Hardwoods

Many of the natural upland hardwood sites occur in small strips on bluffs above the floodplains. These sites include Chicot State Park, Grand Encore area in Natchitoches, and the west bank of the Ouachita River, just north and south of Columbia. Upland hardwoods also occur in areas of northwest Louisiana, which rise up out of stream bottoms into rolling hills. Tree species in these areas include white oak (*Quercus alba* L.), shumard oak, southern red oak (*Q. falcata* Michx.), post oak (*Q. stellata* Wang.), bitternut hickory (*Carya cordiformis* [Wang.] Koch.), shagbark hickory (*Carya ovata* Mill.), red maple, beech (*Fagus grandifolia* Ehrh.), black cherry (*Prunus serotina* Ehrh.), dogwood (*Cornus florida* L.), and red bud (*Cercis canadensis* L.) (Brown 1945).

## History of Louisiana Forests

Louisiana forests, much like the rest of the Nation's forests in the early years, were exploited. It took the hard work and dedication of many forward-looking people to save this great natural resource. They realized that with proper protection, management, and regeneration, these forests would be beneficial and productive for generations to come.

## The Early Lumbering Era

The tremendous forest wealth of Louisiana was virtually untouched until the last two decades of the 19th century. The

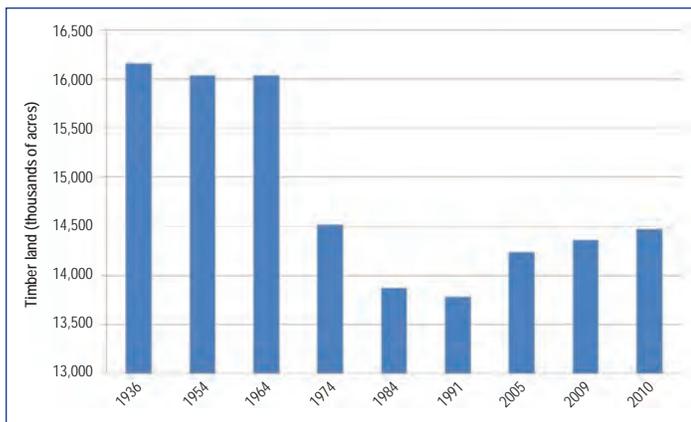
U.S. Decennial Census of 1880 estimated that Louisiana had more than 26.5 billion board feet of longleaf pine and more than 21.6 billion board feet of shortleaf pine (Burns 1968). Before 1880, small-scale lumbering had been confined to the mouths of a few streambanks and at New Orleans, where logs were floated down the Mississippi and across Lake Pontchartrain (Burns 1968). The first crude sawmill began production in 1716, and the first mechanized mill was established between 1803 and 1811 (Burns 1968). An 1809 newspaper advertisement placed by a steam-powered mill was seeking cypress logs. The 1810 census reported that Louisiana had only 34 sawmills (Burns 1968). Despite its continued growth, the New Orleans area reported only 11 sawmills by 1823, a relatively small number for that time (Burns 1968). The lack of fast and convenient transportation in Louisiana delayed intensive logging for some time. The 1880 census ranked Louisiana 30th in the Nation in lumber production, with only 175 sawmills (Burns 1968). As northern forests were depleted and the railroad system was established, however, lumber companies moved to the South's plentiful bounty of basically untouched timber lands. Louisiana was favorable because of its easily accessible terrain and large blocks of land available for purchase.

Mechanized logging and milling and the desire for large, speedy profits resulted in the clearing of enormous tracts of timber. Railroad spurs and mills dotted the landscape. The life expectancy of these mills, in general, was 20 years or less. As the lands were logged, they were sold off as junk, along with the mills. If not sold, these lands were abandoned and forgotten. In the rich alluvial valleys, farmers later turned this land into farms with row crops, such as cotton and sugar cane, or into pasture. In the poorer soils of the uplands, any lands that could not grow crops were left to regenerate naturally.

By 1914, Louisiana had become the greatest producer of lumber in the Nation. In 1899, Louisiana's production exceeded 1 billion board feet of lumber. That number doubled by 1904 and doubled again by 1916 (Burns 1968). The cutting necessary to produce so much lumber resulted in a total rout of the land. These lands remained idle for a generation, until forward-thinking foresters proved that the practice of forestry could be profitable (figure 4).

## The Rise of Forest Management

"In 1939, southwest Louisiana had the dubious honor of containing 'the largest area of clear-cut longleaf land west of the Mississippi River of more than 1 million acres'" (404,694 ha) (Burns 1968, citing Cruikshank 1939). Even



**Figure 4.** Change in timber land over time in Louisiana. Forested area has increased by 1.7 percent since 2005. (Data source: Oswalt and Johnson, 2012)

up to 1949, an estimated 43 percent of nonproductive forests were in the South, a result of severe logging practices and forest fires (Burns 1968).

Gifford Pinchot and Henry Graves are well-known pioneers who shaped the early years of forestry in the United States. In Louisiana, Henry Hardtner of Urania was instrumental in shaping the State's forestry profession. Hardtner's love of the pine forests and his desire to create a permanent mill with a sustainable timber base led him to put into practice the then-new ideas of reforestation, timber management, and sustained yield. From 1904 onward, he eagerly shared his knowledge with anyone who would listen and, eventually, became known as the Father of Forestry in Louisiana and the South. In 1913, Hardtner signed the first reforestation contract with the State; that date has been designated the birthdate of forestry in Louisiana and the South (Burns 1968). By 1954, the second forest survey showed the State's forest was growing at twice the rate it was being cut. This survey also showed the average volume per acre was higher in Louisiana than any other mid-South State (Burns 1968).

## The Work of the Civilian Conservation Corp

The Federal Government established the first Civilian Conservation Corps (CCC) camp in Louisiana in 1933. In all, 27 camps were built, of which 20 were placed under the State forester's direction. The State Forest Service used roads, firebreaks, and telephone lines built under this program. CCC workers reforested approximately 185,000 ac (74,870 ha) of cutover timber lands in Louisiana. Camp crews built 18 fire lookout towers and spent more than 72,000 worker-days fighting fires (LDAF 2010).

## The Effect of Legislation

As early as 1904, it was recognized that legislation would be the key to preserving the State's forests. The following summarizes critical legislation that had a significant effect on forest management in Louisiana:

- Louisiana Act 113 of 1904 established a Department of Forestry to provide for forest preservation within the State, suppression and prevention of forest fires, reforestation of denuded lands, proper forestry instruction in public schools, and penalties for the violation of this act (LDAF 2010).
- Louisiana Act 172 of 1910 created a permanent conservation commission (Burns 1968).
- Louisiana Act 196 of 1910 created a conservation fund derived from a severance tax to be used partly for fire protection (Burns 1968).
- Louisiana Act 261 of 1910 strengthened the forestry act of 1904 by designating an ex-officio State forester and an appropriation of \$2,400 from the State severance tax. Act 261 is remembered today as the Timber Conservation Contract Act because of a provision in Section 13 that allowed an owner of denuded land worth \$5 or less per acre to enter into a reforestation contract with the State (Burns 1968).
- Louisiana Act 127 of 1912 created a Conservation Commission appointed by the Governor, and enumerated all previous legislation over which the commission had authority including Louisiana's first forestry bill, Act 113 of 1904 (Burns 1968).
- The 1911 Weeks Act passed by the Federal Government granted matching State funds for forest fire protection. Louisiana did not participate until 1915, when the Conservation Commission voted for \$2,000 to be matched by Federal dollars (Burns 1968).
- Louisiana Act 66 of 1916 amended Louisiana Act 127 of 1912 and created the Department of Conservation under control of the Commissioner of Conservation. Beginning in 1918, the forestry law of 1916 gave the Division of Forestry one-fifth of the severance tax on forest products (Burns 1968).
- In 1928, after the 1927 flood, the Federal Flood Control Act passed. This act placed flood control under the authority of the Federal Government. As a result, a system of levees was later constructed, under the authority of the U.S. Army Corps of Engineers (USACE), to harness the Mississippi River and its tributaries.

- Louisiana Act 179 of 1944 established the Forest Protection Acreage Tax. This funding source only accounts for approximately \$800.00 per year and is used for the purchase of supplies and equipment utilized for wildfire suppression (LDAF 2010).
- Louisiana Act 328 of 1944 was voted on by the citizens of Louisiana and passed on November 7, 1944. The act established that, whereas the Commissioner of Wildlife and Fisheries and Commissioner of Conservation would still be appointed by the Governor, a seven-member forestry commission would name the State forester, thus eliminating politics from the process (Burns 1968). This approach prevailed until the mid-1980s, when the independent authority of forestry was legislatively merged with the Louisiana Department of Agriculture. The new Louisiana Department of Agriculture and Forestry, headed by its publicly elected commissioner, thereafter shared in structuring Louisiana's forestry future (LDAF 2010).

## Seedling Production for Reforesting Louisiana's Lands

Until the 1920s, artificial forest regeneration was considered largely experimental. Many questioned whether tree planting could sustain a viable industry. By the 1930s, however, the amount of barren land was beginning to be a problem for Louisiana, and State and industry officials recognized that without regeneration an entire industry could be lost. The Louisiana Constitution provides for the Louisiana Forestry Commission to protect, conserve, and replenish the natural resources of the State.

### State Nurseries

Louisiana was a pioneer State in the South in establishing a nursery to produce seedlings for reforestation. The State's first nursery began operation in 1925 and was located at the Alexander State Forest, near Woodworth, LA. That year, the nursery produced and distributed more than 1 million seedlings throughout the State to landowners, schools, and organizations.

James Mixon (who later became the State forester), a graduate of Louisiana State University Forestry School, was assigned as State forest superintendent with responsibility for nursery operations in November 1940. Charles F. Delaney, who had directed the nursery operations since the program's inception, had died suddenly a few months earlier. By 1942, seedling production had increased to 10 million seedlings per year.

Thereafter, however, with the loss of CCC workers and the advent of World War II, seedling production declined. The nursery near Woodworth closed after the construction of two new State nurseries in 1947 and 1948 (Burns 1968).

By 1951, the two State nurseries, one in southwest Louisiana and one in northwest Louisiana, were producing 30 million seedlings annually. In 1953, the Southwest Nursery produced 34 million seedlings, leading the Nation in forest tree seedling production. To meet the demands created by the U.S. Department of Agriculture (USDA), Forest Service's Soil Bank Program, Louisiana constructed the Columbia Nursery in 1957, which helped boost production to a record high of 135 million seedlings in 1958. In 1959, the State built the Beauregard Nursery in the southwest corner of the State. As demand slowed, the Northwest Nursery closed in 1962. In 1965, the Southwest Nursery was put on standby and was later reopened in 1972 to produce hardwood seedlings (Louisiana Forestry Commission 1976). Closed again in 2002, the Southwest Nursery is now used as a scion bank for tree improvement.

Currently, the Louisiana Department of Agriculture and Forestry's Reforestation Division operates three seedling nurseries, which produce a combined average of 22 million advanced-generation seedlings each year. Most of these seedlings are bareroot loblolly, slash, longleaf, and spruce pine (figure 5). In addition, 500,000 containerized, improved longleaf pine are produced, an amount that is undergoing expansion in the upcoming season. In total, pine seedling production in Louisiana provides enough seedlings to replant approximately 33,000 ac (13,350 ha) of productive forest land each year. Annual hardwood production is about 4 million seedlings of 25 to 30 species (figure 6) and is enough to



**Figure 5.** The Louisiana Department of Agriculture and Forestry grows superior and advanced generation loblolly, slash, and longleaf pine. (Photo by Denise Bannette, Louisiana Department of Agriculture and Forestry, 2010)



**Figure 6.** Hardwood seedlings grown at the Louisiana Department of Agriculture and Forestry's nurseries are used in bottomland and upland plantings. (Photo by Doug Gillett, Louisiana Department of Agriculture and Forestry, 2008)

reforest approximately 15,000 ac (6,070 ha) per year. The 2 billionth tree grown at the State nurseries was planted at the Louisiana Tech School of Forestry in 1983. The 3 billionth tree will be grown in the 2013 through 2014 crop year.

## Private Nurseries

In 1946, Continental Can established Louisiana's first privately owned forest seedling nursery northeast of Jonesboro to assure stock for company lands. Leonard W. Bosch became nursery superintendent in 1965, and by 1970, the nursery produced 6 million seedlings annually (Bosch 1970). Bosch nurtured the nursery and fledgling seed orchard through years of change from Continental Can to Continental Forest Industries, and in 1986, he negotiated an agreement to purchase the operation (Bosch 2012). He grew seedlings there until 2004 when, because of his declining health, the nursery was closed. At its peak, Bosch Nursery produced 31 million seedlings, with an average of 18 to 20 million seedlings during each year of its operation (Bosch 2012). From 1995 through 2005, several private nurseries were established to meet seedling demands of Federal cost-share assistance programs. The State currently has three private forest nurseries that each produce between 2 and 4 million seedlings annually, primarily for restoration programs.

## Federal Nurseries

In 1921, the USDA Forest Service established the Southern and Appalachian Forest Experiment Stations at New Orleans, LA, and Asheville, NC, respectively. In 1924, the New Orleans station hired Phillip C. Wakely, a recent graduate of Cornell University (where he attended the first 4-year school

of forestry in the United States). Over the years, Wakely made great strides in reforestation research. His research programs developed seed, seedling, and tree-planting technology still in use today (Willis 2005). In 1964, James Barnett took the reins from Phil Wakely. Barnett's work on improved seedling growth potentials and the growth of longleaf pine out of the grass stage, along with the production of containerized longleaf, helped pave the way in the effort to reestablish longleaf pine within its natural range (Willis 2005).

In August 1933, the USDA Forest Service selected an abandoned farm in an open stand of young longleaf pine as a site for the Catahoula Nursery, later known as Stuart Nursery. CCC workers from a nearby camp provided labor, except for building construction. In March 1934, the USDA Forest Service sowed 14.0 ac (5.7 ha) to longleaf, slash, and shortleaf pine. The Stuart Nursery produced 8,887,000 seedlings in 1934, which were planted on the Kisatchie National Forest, the DeSoto National Forest, and in Alabama, Arkansas, Florida, and Texas (USDA Forest Service 1935). The Stuart Nursery remained in operation until 1962 when it was converted into a seed orchard and designated as the Stuart Genetic Resource Management Area.

## Tree Improvement

The predecessor of the Louisiana Department of Agriculture and Forestry, the Louisiana Office of Forestry, began tree improvement in 1963 and in 1969 became one of the charter members of the Western Gulf Forest Tree Improvement Program. Today, the Louisiana Department of Agriculture and Forestry maintains an extensive tree improvement program. This program, through selective tree breeding, produces seed native to Louisiana and the surrounding region with excellent disease resistance and superior growth aspects.

The main species included in the tree improvement program are loblolly, slash, and longleaf pines for the following reasons:

- Loblolly pine is the most widely grown tree in Louisiana.
- Slash pine is grown in the southern region of the State.
- Longleaf pine was part of the State's original virgin forests and is the focus in a new planting initiative.

In 2000, work began on a new hardwood orchard. The orchard currently consists of improved cherrybark oak, water oak, nuttall oak, sweetgum, green ash, willow oak, sycamore, and baldcypress. The baldcypress orchard includes salt-resistant cypress for the coastal region.

## Regeneration and Conservation

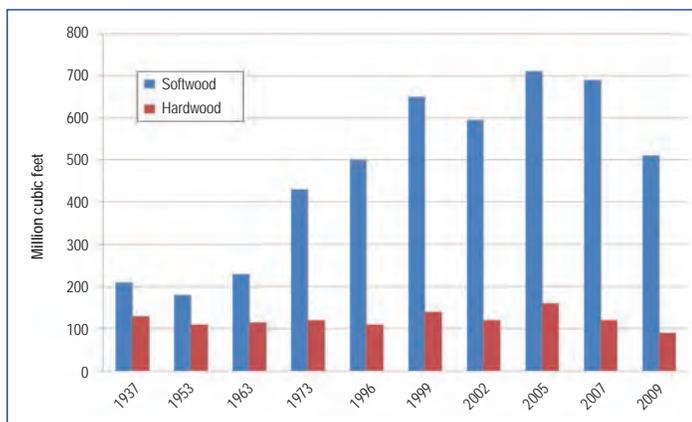
More than 120 million pine and hardwood seedlings are planted each year in Louisiana. Industry is responsible for much of the planting, whether it is on their lands or private land under their management programs. The days of cut-and-run forest practices are gone; the timber industry is a major player in replenishing and managing a sustainable-yield forest. In addition, several State and Federal programs have resulted in significant tree planting during the past several decades.

### State Programs

Louisiana initiated the Louisiana Forest Productivity Program in 1998, in response to concerns about possible future timber shortages. To be eligible for the program, landowners must own a minimum of 5 contiguous ac (2 ha) suitable for growing commercially valuable timber species. Landowners may receive 50 percent of the reforestation costs and timber stand improvement, up to \$10,000 per year (LDAF 2012a). Since 1998, this program has been responsible for planting more than 35,000 ac (14,164 ha) (Aronstein 2012) leading to increased timber output (figure 7).

The Woodland Assistance Program provides technical support and planning for all facets of forest management on private land (LDAF 2012a).

The Forest Stewardship Program assists private forest landowners in more actively managing forest resources; maintaining forest productivity and health; and increasing social, economic, and environmental benefits of forest lands. This program encourages increased coordination on the part of Federal, State, and private land agencies to assist private, nonindustrial forest landowners (LDAF 2012a).



**Figure 7.** Hardwood and softwood timber product output over time in Louisiana. (Data source: Oswald and Johnson, 2012)

In 1967, the Louisiana Department of Wildlife and Fisheries (LDWF) started restoring and establishing wildlife management areas (WMAs) across the State. To date, more than 22,000 ac (8,900 ha) of mostly wetland restoration has taken place (Dupuy 2012). LDWF owns the largest system of conservation lands in Louisiana, managing nearly 953,000 ac (38,445 ha) of fee title land within 61 WMAs and 5 refuges (The Nature Conservancy 2007). In addition, partners own 1.2 million ac (485,633 ha). Of those nearly 2.2 million ac (890,328 ha), 1.7 million ac (687,980 ha) are forested and under varying levels of forest management (The Nature Conservancy 2007).

The Louisiana Forestry Association facilitates the State's American Tree Farm System. The first tree farm under this program was approved for the Urania Lumber Company in 1951. It was fitting as the first location because Urania is considered the "Cradle of Reforestation" in the South because of Henry Hardtner's pioneering replanting program. Today, about 2,000 tree farms in the State total 1.5 million ac (607,041 ha) (Louisiana Forestry Association 2010a).

### Federal Programs

A host of talented individuals who had their eyes on the future of the timber industry and the future of the country as a whole greatly influenced reforestation on Federal lands. In 1892, George W. Vanderbilt hired Gifford Pinchot as a forester for his Biltmore Estate near Asheville, NC, creating the first example of practical forest management on a large scale in the Nation (Pennsylvania Historical and Museum Commission 2012). In 1915, Louisiana's Henry Hardtner partnered with Samuel T. Dana of the USDA Forest Service. The two saw a need for forestry research and established large research plots on Hardtner's own reserve land in Urania, LA. In 1917, Yale University School of Forestry began sending graduating classes to Urania for 3 months of practical training on Hardtner's land (Willis 2005).

USDA Forest Service lands in Louisiana total 2,044,000 ac (827,195 ha). The Kisatchie National Forest is the State's only national forest and has played a pivotal role in the reforestation of Louisiana lands. When the largest sawmill west of the Mississippi River, the Gulf Lumber Company, closed in 1927, the USDA Forest Service was able to purchase some of its land, which later became part of the Kisatchie National Forest. During its first 30 years, the Kisatchie National Forest was limited in its purchases because of the depressed economy and a tight Federal budget. In 1979 and 1980, however, it led all other national forests of the

South in revenue produced per acre (USDA Forest Service 2012). The Kisatchie National Forest is now home to some of the best natural longleaf pine habitat in the country.

Since 1998, the U.S. Fish and Wildlife Service (USFWS) has reforested or restored 41,000 ac (16,600 ha) of National Wildlife Refuge land in Louisiana in the lower Mississippi valley and Red River valley (Shelton and Meredith 2011). The USFWS owns and manages 24 refuges in Louisiana that encompass nearly 560,000 ac (226,600 ha), of which more than 50 percent is dominated by forest cover (The Nature Conservancy 2007). The USFWS, along with its partners, has done much work throughout this region in securing and replanting corridors and in connecting fractured timber tracts for wildlife and water quality.

The Forest Legacy Program of the USDA Forest Service, in partnership with States, supports efforts to protect environmentally sensitive forest lands. The program is voluntary and focuses on the acquisition of partial interest in privately owned forest lands (The Nature Conservancy 2007).

Federal cost-share assistance programs include the Forestry Incentive Program, the Conservation Reserve Program, the Wetlands Reserve Program, the Stewardship Incentive Program, the Environmental Quality Incentive Program, and the Wildlife Habitat Program. These programs have been responsible for the planting of hundreds of thousands of acres in Louisiana. Most of these plantings have taken place in the Red River and lower Mississippi River Alluvial Valley and have resulted in many acres of marginal croplands converted back to forest lands to the benefit of wildlife, recreation, water quality, and the environment. Louisiana's once-great bottomland hardwood ecosystem is slowly recovering because of these programs.

## Challenges for Louisiana's Forests

Maintaining a healthy, vigorous forest requires hard work and dedication from public, private, and government entities to overcome the many challenges facing today's forests. In the following text, a few of the most significant challenges facing Louisiana's forests are addressed. There are many others such as insect, disease, and invasive species that must constantly be addressed as well.

### Wildfire

From the early days of forest regeneration in Louisiana, the one most significant and constant challenge has been wildfire. The first State forester, R.D. Forbes, recognized the need for fire patrol, fire prevention, and public education. He proposed

using spark arrestors on locomotive engines and advocated promoting public awareness of fire prevention using posters and lectures (LDAF 2010). In 1922 and 1923, two fire towers were constructed in Louisiana—the first on Great Southern Lumber Company land near Bogalusa and the second near Urania. By 1949, the State had 56 fire towers. By the late 1980s, the State replaced most of the fire towers with planes used for wildfire detection and support of ground crews. In 1925, newly appointed State Forester Billy Hine recognized the need for fire suppression personnel. Within 2 years, Hine hired 136 cooperative patrol staff members, 16 parish rangers, and 5 administrative staff members (LDAF 2010).

The acting State forester in 1942, Massey H. Anderson, stated, "Several large pulp and paper mills are now located in the State. Their raw products are entirely young, second growth timber. All of these wood-using industries are operating on the output of only partially productive forest land. If we can make our forest areas produce more wood products, through forest fire protection and wise management practices, more industry will be attracted to the State, giving permanency to our communities and increasingly larger payrolls" (Burns 1968). By the 1980s, the Office of Forestry employed 293 wildland firefighters, equaling approximately 129,246 ac (52,403 ha) of protection by a 2-person firefighting crew (LDAF 2010).

Education, along with mechanization and new forms of fire detection, has progressed generation to generation and resulted in major improvements in wildfire suppression. Even still, approximately 46,000 ac (18,615 ha) are destroyed in Louisiana annually by wildfire (LDAF 2010). Because of State budget constraints, the number of firefighters has been significantly reduced in the past 5 years, from 293 firefighters in the 1980s to 103 firefighters today (LDAF 2012b). This decrease in personnel, along with the extension of fire season because of recent drought situations within the State, could prove to be quite challenging in the future.

### Urban Sprawl

Much of Louisiana's population is concentrated in the southern part of the State, which is also geographically the lowest elevation in the State. When populations shift from urban to rural in this area, they expand to higher, less flood-prone lands. This shift results in loss of timber lands and fragmentation of large timber blocks. It also increases the chance of wildfire and creates a much more difficult situation for fire suppression. Much of the forests' environmental, economic, and recreational benefits are lost as these large tracts are fragmented into smaller suburban and urban homesteads. In many cases, drainage and natural flow of waterways are

changed to accommodate urban sprawl, adding to the problem of wetland loss within a very sensitive ecosystem.

## Wetlands Loss

Louisiana has a long history of levee building from early settlers and local governments to the USACE. These systems were built to protect people and property from floods but have proven over time to create new challenges. Diversion of the natural flow and flushing of river systems has disrupted much of the natural hydrology of Louisiana's wetlands and swamps. The building of flood control structures, forced drainage projects, canals, and navigation channels—along with naturally occurring forces—have added to this disruption. Tremendous acreage that once had seasonal wet and dry spells is now permanently flooded with fresh or salt water. Coastal land is sinking while gulf waters are rising (Torbett 2010). Much of the land that was once a healthy, thriving wetland forest is dead or dying because of stagnated swamps and salt-water intrusion. The harnessing of the Mississippi River and the digging of a checkerboard of canals have allowed more and more salt-water intrusion, devastating the cypress tupelo swamps of south Louisiana (figure 8).



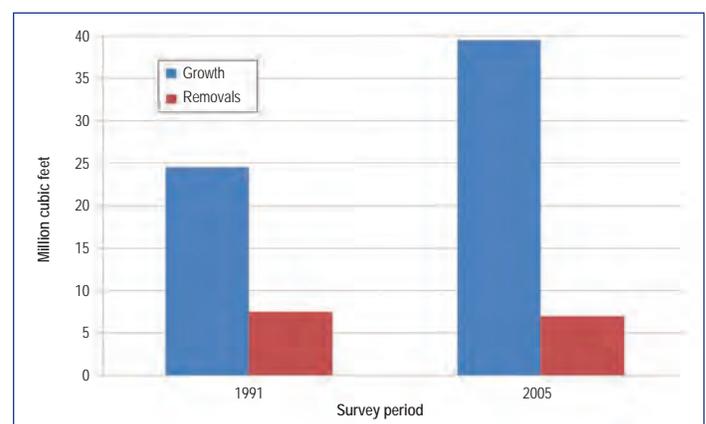
**Figure 8.** Baldcypress, which grows throughout Louisiana, has been greatly affected by rising waters and salinity. This species is important in restoration and regeneration efforts. (Photo by Denise Barnette, Louisiana Department of Agriculture and Forestry, 2013)

Louisiana coastal regions are being lost at an alarming rate of 25 to 35 mi<sup>2</sup> (65 to 91 km<sup>2</sup>) per year. This loss represents 80 percent of the coastal wetland loss in the entire continental United States (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Mitigating this wetland loss must be a priority not only for Louisiana but also for the Nation. Families and businesses are being displaced and valuable infrastructure is being lost. The Breaux Act in 1990 and the Coastal 2050 initiative in 1997 paved the way for a solution to this problem. Since then, many individuals, local communities, and government agencies have done much work to help alleviate wetlands loss. Several things caused this problem, therefore, several things must be done to alleviate it. One important step is to aggressively reforest as much area as possible. If wetlands loss is not addressed quickly, one of the great wetland and bottomland hardwood ecosystems in the world will be lost, along with an entire culture and, for many, a way of life.

## Baldcypress

Although less than 2 percent of the trees harvested in Louisiana are baldcypress (figure 9), a discussion of tree planting in the State would not be complete without including this important species. Baldcypress grows from one end of Louisiana to the other. Its wood quality characteristics have made it popular for more than 200 years for use in construction, boat building, and cabinet and furniture making. It is an important tree to the wood industry and for restoration efforts across the State.

Reforestation within the coastal region is difficult because of the many human-made canals throughout the landscape that have brought saltwater further inland, eroding the viability of standing timber, and preventing natural regeneration



**Figure 9.** Cypress net growth compared with removals in Louisiana. (Data source: Louisiana Forestry Association 2010b; data from USDA Forest Service)

(Tompkins 2007). Sea level rise also results in gradual increases in flooding and salinity in coastal forested wetlands. Studies have shown that baldcypress is one of the most tolerant species of long flood durations and relatively deep flooding. Recent studies have also shown baldcypress to be tolerant of flooding with low-salinity water (Coastal Wetland Forest Conservation and Use Science Working Group 2005). Increases in the severity and length of flooding in coastal areas have reduced the productivity of the cypress-tupelo swamps. Baldcypress, however, is still a very important timber tree, and it is important that work continues in the regeneration and management of this tree. If baldcypress is limited only to restoration and not utilized for its economic value, there will be less planting of it, and, accordingly, less environmental gain. Appropriately managed, this tree can be good for the environment as well as the economy of the State.

## Future Outlook

Louisiana's forests provide a sustainable yield of wood products, along with recreation, wildlife habitat, environmental benefits, and water quality. The future of the timber industry and forest restoration efforts in Louisiana is bright. An increased awareness of proper land use practices and partnerships among private landowners, State agencies, Federal agencies, and commercial entities has evolved into a dynamic forest cover throughout the State.

Tree planting in Louisiana includes not only planting in intensely managed yield forests but also planting to benefit wildlife habitat, restore wetlands, improve urban settings, and enhance recreation. Planting of more native species is increasing, and biodiversity within plantings is becoming the norm in restoration projects.

The combination of dedicated State, Federal, private, and commercial entities working together for the economic and environmental well-being of the State has restored Louisiana from its devastated landscape of the 1940s. Louisiana is again green and growing, although much work remains. Forests are a renewable resource and, when managed properly, have a strong, positive economic and environmental impact in Louisiana.

## REFERENCES

Aronstein, P. 2012. Forestry Program Director, Louisiana Department of Agriculture and Forestry. Personal e-mail to the author. (August 2012).

Bosch, D. 2012. Wife of Bosch, L., late proprietor of Bosch Nursery. Personal conversation with the author. (August 2012).

Bosch, L. 1970. Management results on a fine sandy loam soil. In: Proceedings, Southeastern Nurserymen's Conference—1970. Cadiz, KY: U.S. Department of Agriculture, Forest Service: 72–74. <http://www.rngr.net/publications/proceedings/1970/management-results-on-a-fine-sandy-loam-soil/>. (September 2012).

Brown, C.A. 1945. Louisiana trees and shrubs. Louisiana Forestry Commission Bulletin No. 1. Baton Rouge: Claiborne Publishing Division: 7–10.

Burns, A.C. 1968. A history of the Louisiana Forestry Commission. Natchitoches, LA: Northwestern State College. 120 p.

Coastal Wetland Forest Conservation and Use Science Working Group. 2005. Conservation, protection and utilization of Louisiana coastal wetland forests. Final report to the Governor of Louisiana. 40 p.

Cruikshank, J.W. 1939. Forest resources of southwest Louisiana Forest survey. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 43 p.

Dupuy, M. 2012. Wildlife Forester, Louisiana Department of Wildlife and Fisheries. Personal conversation with the author. (October 2012).

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coast 2050: toward a sustainable coastal Louisiana. Baton Rouge: Louisiana Department of Natural Resources. 1 p.

Louisiana Department of Agriculture and Forestry (LDAF). 2002. Louisiana forest types. Baton Rouge: Office of Forestry Publication A/OF-93-33 (R.12/02).

Louisiana Department of Agriculture and Forestry (LDAF). 2010. Louisiana statewide forest resource assessment and strategy: a comprehensive analysis of forest-related conditions, trends, threats, opportunities, and management strategies. Baton Rouge: Office of Forestry. 136 p. <http://webshare.ldaf.state.la.us/gis/State%20Assessment/Louisiana%20Statewide%20Forest%20Resource%20Assessment%20and%20Strategy.pdf>. (August 2012).

Louisiana Department of Agriculture and Forestry (LDAF). 2012a. LDAF Web site: Forestry—Forest management. <http://www.ldaf.louisiana.gov/portal/Offices/Forestry/ForestManagement/tabid/134/Default.aspx>. (September 2012).

Louisiana Department of Agriculture and Forestry (LDAF). 2012b. LDAF Web site: Forestry—Forestry protection. <http://www.ldaf.louisiana.gov/portal/Offices/Forestry/ForestProtection/tabid/135/Default.aspx>. (December 2012).

- Louisiana Forestry Association. 2010a. American tree farm system. <http://www.laforestry.com/site/AmericanTreeFarmProgram.aspx>. (October 2012).
- Louisiana Forestry Association. 2010b. Cypress issues: cypress net growth compared with removals in Louisiana. <http://www.laforestry.com/site/ForestFacts/Cypress.aspx>. (October 2012).
- Louisiana Forestry Association. 2011. 2011 Louisiana forestry facts. <http://www.laforestry.com/site/Portals/0/documents/2011%20Forest%20Facts.pdf>. (October 2012).
- Louisiana Forestry Commission. 1976. Seed and nursery practices. Baton Rouge, LA: Office of the State Forester.
- Oswalt, S.N.; Johnson, T.G. 2012. Louisiana: 2010 forest inventory and analysis factsheet. e-Science Update SRS-050. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 5 p.
- Pennsylvania Historical and Museum Commission. 2012. Governor Gifford Pinchot. [http://www.portal.state.pa.us/portal/server.pt/community/1879-1951/4284/gifford\\_pinchot/469112](http://www.portal.state.pa.us/portal/server.pt/community/1879-1951/4284/gifford_pinchot/469112). (December 2012).
- Shelton, S.; Meredith, J. 2011. Louisiana: re-planting forests, reducing CO2 and saving wildlife. Washington, DC: U.S. Fish and Wildlife Service. <http://www.fws.gov/news/blog/index.cfm/2011/4/27/Louisiana-Replanting-Forests-Reducing-CO2-and-Saving-Wildlife>. (September 2012).
- The Nature Conservancy. 2007. Louisiana forest legacy program: assessment of need. Report. Baton Rouge: Louisiana Department of Agriculture and Forestry. 115 p. <http://www.ladaf.state.la.us/portal/Portals/0/FOR/for%20mgmt/legacy/laforestaonassessmentofneed.pdf>. (March 2013).
- Tompkins, J. 2007. The truth about cypress in Louisiana. *Forest & People*. Second quarter: 4-5.
- Torbett, M. 2010. The real problem with cypress: too much water causes cypress problem. Alexandria, LA: Louisiana Forestry Association. <http://www.laforestry.com/site/ForestFacts/Cypress.aspx>. (October 2012).
- U.S. Department of Agriculture (USDA), Forest Service. 1935. Illustrated summary of Stuart Forest practice and research report. Durham, NC: Library and Archives, Forest History Society. 175 p. [http://www.foresthistory.org/ead/illustrated\\_Summary\\_Stuart\\_Forest.html](http://www.foresthistory.org/ead/illustrated_Summary_Stuart_Forest.html). (September 2012).
- U.S. Department of Agriculture (USDA), Forest Service. 2012. History and culture: history of the Kisatchie. <http://fs.usda.gov/main/kisatchie/learning/history-culture>. (October 2012).
- U.S. Geological Survey (USGS). 2012. Major ecosystems and regions of the Acadian-Pontchartrain NAWQA. Baton Rouge: U.S. Geological Survey. <http://la.water.usgs.gov/nawqa/ecology.htm#ecoregions>. (December 2012).
- Willis, J.M. 2005. Reforestation was started by early visionaries. Dodson, LA: *The Piney Woods Journal*. 1 p. <http://www.thepineywoods.com/Reforest05.htm>. (August 2012).