

Growing Trees in Georgia

Russell Pohl and Stasia Kelly

Reforestation Chief, Georgia Forestry Commission (GFC), Dry Branch, GA
Communications Specialist, GFC, Atlanta, GA

Georgia has long been known for its lush and expansive pine forests. From Trenton to St. George, Clayton to Bainbridge, and everywhere in between, Georgia's 24 million acres of forest land reward residents and visitors alike with beauty and resources unlike any other State in the Nation—and the forests have been furnishing those gifts for a long, long time.

Early Forests

Pollen dating suggests that the pine-dominated forests of Georgia's coastal plain have been around for at least 5,000 years. Records from DeSoto's historic 16th century expedition describe open pine savannahs in north Florida and south Georgia that transition to hardwood forests in the upper piedmont region near the Georgia-South Carolina border. In the late 18th century, William Bartram, the famed botanist and naturalist, corroborated DeSoto's observations. He found pine-dominated grasslands in the lower and upper coastal plains, longleaf pine (*Pinus palustris* P. Mill.) on the drier sites, and loblolly pine (*Pinus taeda* L.) and hardwoods in the lower lands along streams and wet areas. In the piedmont, shortleaf pines (*Pinus echinata* P. Mill.) were dominant on the drier sites, and loblolly pines were associated with the more mesic sites.

Georgia's presettlement forests were shaped to a large extent by fire. Despite receiving 40 to 70 inches (1,020 mm) of rainfall each year, extended dry periods are not uncommon in Georgia, and wildfires are frequent. Studies of presettlement forests have suggested fire periodicity of 1 to 6 years in the southern part of the State. Farther north, the wildfire intervals may have been several times that long, but they still affected species composition. Fire shaped the vast pine savannahs, and the dominant tree through much of the State was longleaf pine, a fire-dependent species. Other pines and hardwoods played a relatively minor role, except in the wetter areas that, in general, were fire free.

Before the arrival of European settlers, the forests were strongly influenced by indigenous societies. Native Americans used fire for landclearing, hunting, warfare, and vegetation management. They practiced shifting agriculture by clearing a

small patch of forest, farming it, and then abandoning it after the soil's fertility was depleted. DeSoto's records describe large areas of agricultural development and large areas of uninhabited wilderness that once supported Native American populations.

Since European settlement, Georgia's forests have undergone major changes. Initially, coastal forests provided the materials for shipbuilding and repair, then construction materials for early settlements. As colonization moved inland, the forests were cleared for farming purposes. Over the years, lands were cleared, farmed, abandoned, reforested, and then cleared and farmed again multiple times. Landclearing practice peaked in the Southeast sometime after the Civil War and gradually declined through the remainder of the 19th century and into the next.

Although agricultural interests cleared portions of Georgia, it was not until the late 1800s that large-scale, commercial logging moved into the Southeast, harvesting much of the virgin timber. Whether for farming or logging, by the 1920s, most of the forests of Georgia had been cut at one time or another. By the 1950s, however, large tracts of agricultural land reverted back to forests and the numbers of acres in trees began to stabilize. Since that time, the total forest size has remained fairly constant at about 24 million acres.

Today, Georgia's forests make up 67 percent of the total land area of the State, which is fairly evenly split between hardwood and pine type forests. Of the forest land of Georgia, 45 percent is pine, most of which is plantation forests located in the lower portion of the State. Upland and lowland hardwood forests comprise an additional 41 percent of the total forest, with the remaining being either mixed pine-hardwood or nonstocked forests (figure 1).

Of the land classified as commercial forest land, about 56 percent is considered family-owned forests. Forest industry companies and other corporations own 34 percent of the forest land, and the remaining land is publicly owned (figure 2). Georgia has more privately owned forest acreage than any other State.

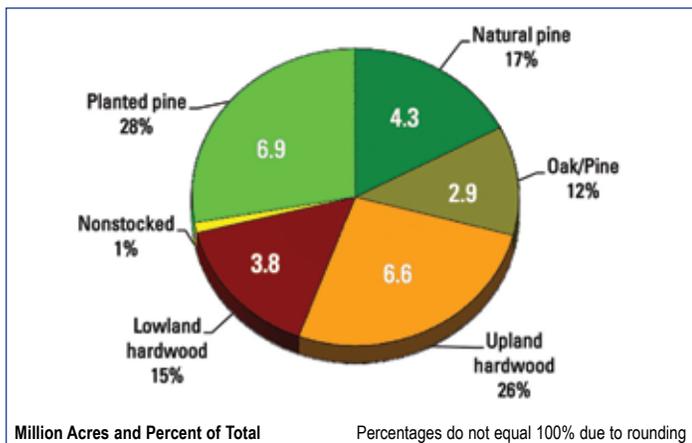


Figure 1. Area of forest land by forest type group for Georgia (Source: U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis and Georgia Forestry Commission, 2008).

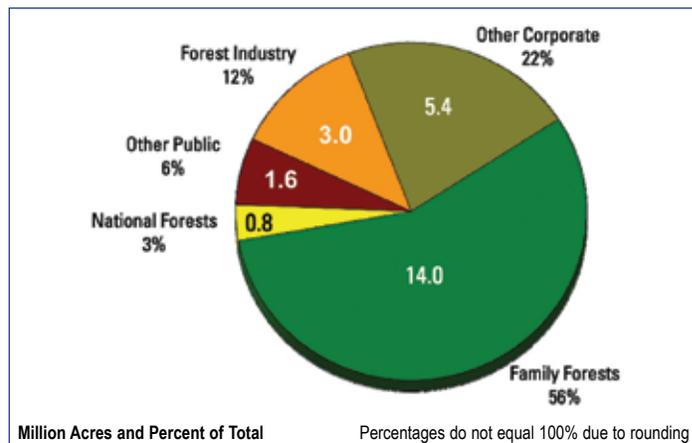


Figure 2. Ownership of forest land in Georgia (Source: U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis and Georgia Forestry Commission, 2008).

Regions

Six physiographic regions in Georgia are the (1) Southern Coastal Plain, (2) Southeastern Plains, (3) Piedmont, (4) Blue Ridge, (5) Ridge and Valley, and (6) Cumberland Plateau (figure 3).

Both the Southern Coastal Plain and the Southeastern Plains regions consist primarily of slash (*Pinus elliottii* Engelm.), loblolly, longleaf pines, and lowland hardwoods. Although not necessarily the most fertile, these two regions, in general,

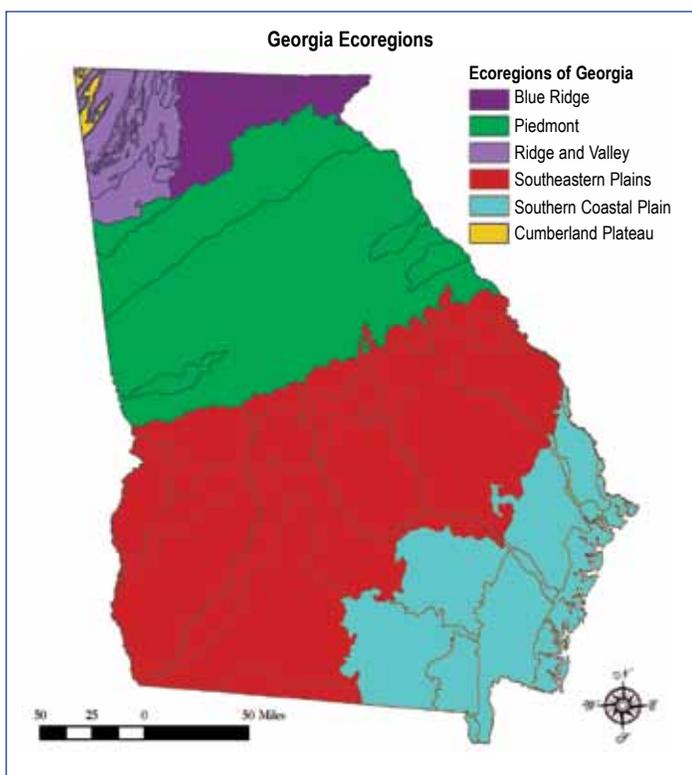


Figure 3. Physiographic regions of Georgia (Source: U.S. Environmental Protection Agency).

are the most productive portions of the State with respect to forestry. They are characterized by older stands in river bottoms with younger stands on the higher ground. Active forest management is commonplace and harvesting and replanting activities account for the younger stands.

Moving north, the flatwoods and gentle slopes of the plains give way to the storied, red clay, rolling hills of the Piedmont region. Loblolly pine, pine-hardwood mix, and upland and lowland hardwood forests are dominant. Forest productivity tends to decline slightly in this region and the stand age-class increases. Commercial forestry is somewhat less important in this region, because much of the land usage is recreational, residential, and urban. Atlanta's sprawling cosmopolitan area dominates a substantial portion of the Piedmont.

The forests of the Ridge and Valley and the Cumberland Plateau regions are primarily upland hardwoods at the higher elevations, with loblolly and Virginia pines (*Pinus virginiana* P. Mill.) on the lower slopes and valley floors. The Blue Ridge region is characterized by upland hardwoods, with small amounts of white pine and hemlock in the narrow valleys and stream bottoms. The rugged terrain, coupled with large tracts of national forests in the Blue Ridge region, leads to some of the oldest stand age classes in the State. Forestry is noticeably less important across the northern tier of the State, although the forest's contribution to furniture, firewood, and specialty products is not insignificant.

The Forest Economy

The economic importance of forests to Georgia's economy cannot be overstated. In 2009, despite the recession, forestry generated total economic activity of more than \$27 billion.

The forest products industry accounted for more than 118,000 jobs with total compensation that exceeded \$5.6 billion. Only the food processing and the transportation equipment manufacturing industries were greater economic contributors than forestry in terms of wages and salaries, and only the food processing industry employed more people. The forest products industry generated \$472 million in tax revenue to the State budget. Of the State's 159 counties, 44 are considered to be at least moderately dependent on the forest products industry (Riall 2010).

Georgia boasts 146 primary forest products manufacturers: 83 sawmills, 6 veneer mills, 12 pulp mills, and 45 mills that produce other products from logs. According to 2007 mill production data, Georgia leads the other 13 Southern States in total round wood, pulpwood, composite panels, and posts and pilings production. Pulp and paper products, which continue to be the leading sector, account for 65 percent of the economic activity (Schiller and others 2009).

Forest-based recreational activities also contribute significantly to the State's economy. Georgia's forests attract more than 130,000 nonresident hunters annually, and the total economic effect of recreational fishing in Georgia is estimated to be \$1.5 billion. Harder to quantify, but no less real, are the contributions of Georgia's forests to clean water, clean air, urban cooling, and quality of life.

Although the traditional sectors of the forest economy remain strong, Georgia is also well positioned for future forest economic strength. The number of forested acres has fluctuated little in the past 50 years, but the productivity of those acres has increased dramatically. Today, Georgia's forests are producing 56 percent more wood annually than is being harvested, and the standing wood volume is 96 percent greater than it was in 1953 (figure 4).

Due in part to income tax credits for renewable energy generating facilities, Georgia is attracting new bioenergy production plants. Recent announcements tout the construction of 11 bioelectricity plants that will produce 700 megawatts of power. In southeast Georgia, the world's first cellulosic fuel factory is operating, converting nonmerchantable wood and harvest residues into ethanol and methanol. Ultimately, the plant will produce 100 million gallons each year from 1 million tons of biomass.

Carbon credits, too, may soon provide additional opportunities for Georgia landowners to manage healthy forests. Georgia's online Carbon Registry was recently introduced. Although the carbon market is still developing, the potential

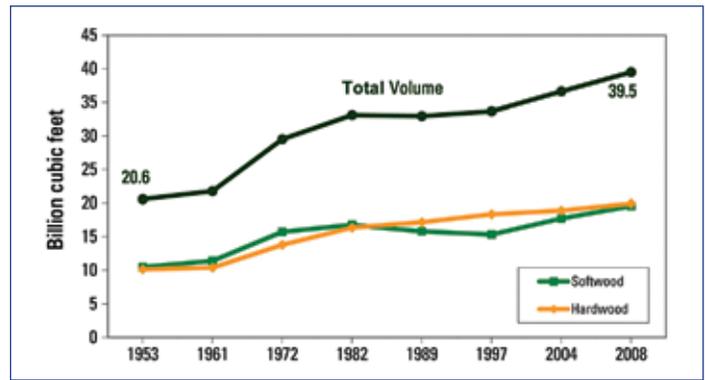


Figure 4. Standing hardwood and softwood volume of live trees in Georgia (Source: U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis and Georgia Forestry Commission, 2008).

value to landowners is tremendous. In 2008, Georgia's forests grew a net gain of 546 million cubic feet of green wood, sequestering approximately 15 million tons of carbon dioxide (CO₂). This tonnage offsets more than 8 percent of Georgia's CO₂ emissions for the year, with another 12 percent of annual emissions stored in products produced from harvested stands.

Rigorous slash and loblolly tree improvement programs, coupled with enhanced forest management techniques, have made impressive strides. It is estimated that cooperative tree breeding programs in Georgia and across the Southeast are improving forest productivity by close to 1 percent per year. Competition control, fertility enhancement, and other plantation management tools can be even more effective. It appears that Georgia's forests have nearly limitless potential to supply renewable products and services far into the future.

Georgia's State Forestry Agency

The Georgia Forestry Commission traces its roots back to the 1921 Forestry Act, which provided for a State Board of Forestry. Initially, the board was largely advisory, providing reports to the General Assembly. By 1925, it had evolved into the Georgia Forestry Department. With partial funding from the Clark-McNary Act and an acreage fee paid by local timber protection organizations, the Georgia Forestry Department entered into cooperative forest fire protection agreements with the USDA Forest Service. Although wildfire prevention and education remained the primary efforts of the department, the State's first nursery crop was grown in 1929 with the cooperation of the University of Georgia, School of Forestry. Reorganization of State agencies in 1937 saw the Georgia Forestry Department become a division of the Department of Natural Resources. In 1949, the organization adopted its current status as the Georgia Forestry Commission (GFC), an independent agency reporting directly to the Governor's office.

Today, the GFC is a dynamic State agency with a mission to *provide leadership, service, and education in the protection and conservation of Georgia's forest resources*. The GFC employs 545 full-time personnel and an additional 137 part-time employees at 113 facilities across the State. It is organized into four departments: Fire Protection, Forest Utilization, Forest Management, and Reforestation.

The GFC's primary responsibility is statewide wildfire management on all forest land and on 3 million acres of open land. The agency has 330 tractor and plow units and 150 wildland engines at its disposal. The State averages more than 7,000 wildfires per year that burn 42,000 acres annually. Debris burning accounts for more than one-half of the fires, followed by arson and other human activity. Lightning is responsible for about 4 percent of annual wildfires in Georgia. Of the organization's legislatively appropriated budget, 80 percent is directed at fire suppression and prevention. The GFC also administers community-based mitigation programs and a prescribed-burning program to lessen the threat of wildfire to forests and communities.

The Forest Utilization Department's mission is to increase the economic viability of forest ownership and forest management by developing markets for forest resources. The department's four staff members provide information, resource monitoring, and technical assistance. Areas of emphasis include standing volume inventory, utilization rates, sustainability projections, Georgia's Carbon Sequestration Registry, Directory of Forest Products Companies in Georgia, bio-fuels, and economic development.

The Forest Management Department provides information and technical assistance to Georgia's private forest landowners to enhance their woodlands for economical, social, and

environmental benefits. The service is delivered to private landowners by professional foresters, some of whom are assigned counties and deal directly with the public. Other foresters help implement and deliver regional and statewide programs, including water quality, forest stewardship and legacy, urban and wildland-urban interface, forest health, cost-share programs, and forest inventory and analysis. By statute, the GFC is authorized to take action pertaining to the nurture and culture of Georgia's forests; to monitor and suppress forest insect and disease outbreaks; and, by authority granted by the Georgia Environmental Protection Division, to monitor and investigate water quality issues pertaining to silvicultural activities.

The Reforestation Department is charged with providing high-quality, genetically improved, and regionally adapted, bare-root seedlings to Georgia landowners. To fulfill this directive, the department operates the Flint River Nursery (Byromville, GA), two seed orchards, and a seed processing and conditioning plant. The nursery offers about 15 million bare-root seedlings for sale to Georgia landowners each season (figure 5). Species include slash, loblolly, longleaf, shortleaf, and Virginia pines and a variety of hardwoods and other coniferous species. The orchards provide most of the seeds for nursery production, but some species may be supplemented by wild collections. A robust breeding and testing program, conducted in cooperation with the North Carolina State University Tree Improvement Cooperative and the Cooperative Forest Genetics Research Program, improves the growth, form, and disease resistance of all loblolly and slash pine seedlings sold from the GFC nursery. All departmental operations are accomplished without State appropriations. Revenue generated from seedling sales, seed sales, and other services must provide all departmental expenses each year.



Figure 5. The State's Flint River Nursery produces millions of bare-root seedlings annually. On the **left** is a bed of slash pine seedlings and on the **right** are cherrybark oak seedlings.

Tree Planting

The first large-scale tree planting efforts in Georgia began in the 1920s. Initial efforts to reforest cutover land and over-worked agricultural fields were modest. Seedling production was less than 500,000 but trended slowly upward throughout the 1930s. Predictably, tree planting dropped during the early 1940s. After World War II, production again began to climb, hitting a peak during the Soil Bank program from 1958 through 1961. After a rapid decline, tree planting again inched upward toward an extended high during the Conservation Reserve Program of the 1980s and 1990s. Since the turn of the 21st century, the number of acres planted each year in Georgia has again declined and remains at about 230,000 acres per year (figure 6).

Loblolly and slash pines are by far the most frequently planted trees in Georgia. They are the two most commercially important species and are well suited for plantation forestry. Both pines are consistent and prolific cone producers. Their seeds are relatively easy to extract, clean, and store. The seeds have simple stratification requirements and germinate in high percentages. The seedlings grow uniformly and are amenable to management. Both species can be grown inexpensively in containers or in bare-root nursery beds. In a single season they are hardy enough for machine-lifting from nursery beds, yet small enough to be produced in large numbers. Under the proper circumstances, the seedlings can withstand lengthy storage and transportation, and they can be planted rapidly by machine or by hand with excellent results. Over the years, these two species have accounted for more than 90 percent of the trees planted in Georgia.

In recent years, the number of longleaf pine trees planted in Georgia has steadily increased. Federal cost-share money is partially responsible for the increase, but species and ecotype restoration objectives among landowner groups, such as the Longleaf Alliance and Tall Timbers, have done a great deal to

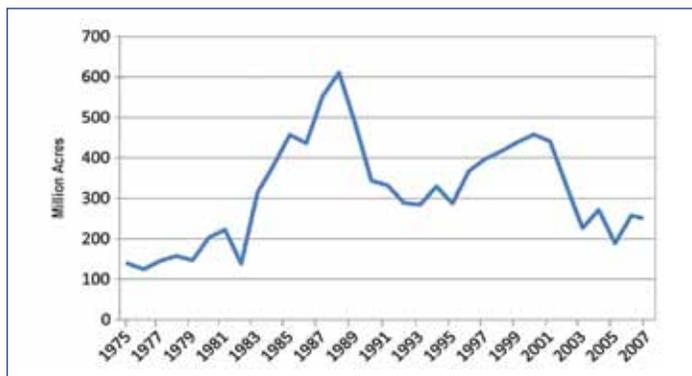


Figure 6. Acres of trees planted in Georgia, 1975–2007 (Source: Georgia Forestry Commission data).

encourage interest in this tree. From 2008 through 2009, 54 million longleaf pines were produced in Georgia nurseries, almost doubling the production of each of the previous two seasons.

Hardwoods, primarily oaks, and other nonpine species account for approximately 1 percent of the State’s seedling production in any given year. For the most part, hardwoods are planted for wildlife habitat and mast production. Mitigation plantings and restoration projects are also common.

Seven major bare-root nurseries and a similar number of container production facilities operate in Georgia. Smaller operations move in and out of production as demand fluctuates. Annual production from all nurseries has been falling in the past several years, but these facilities still produce about 50 percent more seedlings than are needed to meet in-state planting requirements. Many of the nurseries in Georgia produce the seedlings for planting in adjacent States and across the region. Container facilities grow primarily longleaf pines, but increasingly, the best genetic materials from slash and loblolly pine breeding programs are also being grown in containers.

Challenges

Several important trends in forest ownership are likely to affect Georgia’s forests and tree planting efforts in the future. First, the acreage that the forest industry in Georgia owns has shifted dramatically to “other corporate” ownerships during the past two decades. To a large degree, the vertically oriented forest industry companies have divested their forest landholdings in the State. Timber investment management organizations (TIMOs) and real estate investment trusts (REITs) have increased their share of forest acreage considerably. Exactly how the shorter investment horizons of TIMOs and REITs will alter forest management and tree planting in Georgia has yet to be determined. It is evident, however, that although TIMOs and REITs have been supportive of tree improvement and seed orchards, they are less likely to invest in the facilities necessary to advance these programs. As a result, fewer organizations are sharing the responsibilities of seed production and genetic improvement.

Second, the size of family-owned forest tracts has been declining noticeably in the past two decades. Although the total number of acres in this ownership category has remained fairly constant since the 1970s, the tract size has decreased dramatically. Currently, close to 75 percent of the forest landowners in Georgia now own parcels that have fewer than 20 acres (figure 7). Forest management on parcels of this size

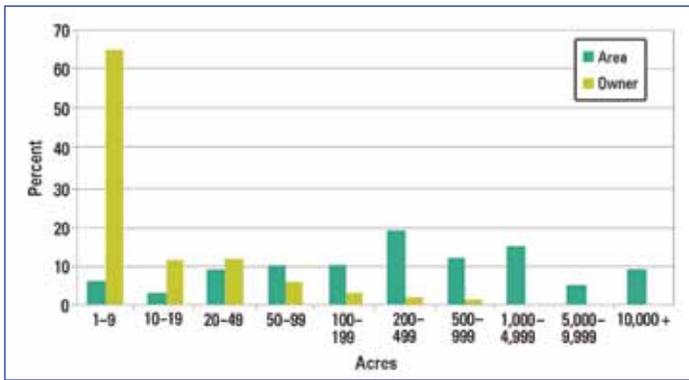


Figure 7. Percentage of forest land by tract size and owner (Source: U.S. Department of Agriculture, Forest Service, National Woodland Owner Survey, 2006).

certainly limits commercial production, but is likely to also affect the size and scope of wildlife management and ecotype restoration projects.

Third, urban land comprises about 9 percent of the State, with wildland-urban interface areas contributing an additional 9 percent. Between 1990 and 2000, the urban component of Georgia's land base grew by 32.7 percent. By 2050, this acreage will comprise 14.3 percent of the total land area of Georgia (Nowak and Walton 2005). In the first 5 years of the 21st century, the total canopy cover decreased by nearly 400,000 acres and the State added 106 acres per day of impervious surfaces. Urbanization and development will have tremendous effects on the forests of tomorrow.

Lastly, for more than 60 years, the GFC has played a major role in affecting the forests of the State. From genetic development and nursery production to landowner advice on tree planting through harvesting, fire prevention and suppression, and the marketing and utilization of wood products, the forests of Georgia have been a priority of State Government. Increasingly, the role of the State Government in forestry is being questioned and, increasingly, is being diminished. Furthermore, State funding for natural resources, in general, and for forestry, in particular, has steadily declined during the past 10 to 15 years. Ultimately, this challenge may prove to have the largest effect on tree planting and the future of forestry in Georgia.

We Grow Trees

Although Georgia's forests face a host of challenges, they have historically shown remarkable resiliency. The GFC and its committed stakeholders believe that with the wise use of knowledge and resources, Georgia can attain its vision of *healthy, sustainable forests providing clean air, clean water, and abundant products for future generations*. Georgia does one thing like no other place: we grow trees!

Several recently produced, comprehensive reports address the condition and sustainability of Georgia's forests and strategies for their conservation. Those reports are available at <http://www.GaTrees.org>, the Georgia Forestry Commission Web site. The site also provides wide-ranging information about Georgia forestry, the GFC, and the agency's myriad services.

REFERENCES

- NOTE: Much of the information contained in this article is from GFC data as described in "Statewide Forest Resources Assessment and Strategy" available online at <http://www.gfc.state.ga.us/ForestManagement/GAForestResourceAssessmentStrategy.cfm>.
- Nowak, D.J.; Walton J.T. 2005. Projected urban growth and its estimated impact on the U.S. forest resource (2000–2050). *Journal of Forestry*. 103(8): 383–389.
- Riall, B.W. 2010. Economic benefits of the forestry industry in Georgia: 2009. Enterprise Innovation Institute Report. Georgia Institute of Technology. 21 p.
- Schiller, J.R.; McClure, N.; Willard, R.A. 2009. Georgia's timber industry—an assessment of timber product output and use, 2007. Resour. Bull. SRS-161. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 35 p.