November 2007

Forest Inventory & Analysis Factsheet

Tennessee 2004

Changes to the 1999 and 2004 Estimates

During the last several years, the U.S. Forest Service Forest Inventory and Analysis (FIA) program has experienced several changes as a result of the development of a nationally consistent database. In addition, estimation procedures have changed and strengthened over time. In some cases new methodologies reveal once unknown bias in historic estimates. That has been the case for both the 1999 and 2004 estimates previously released. For example, FIA has transitioned to the use of an automated stratification procedure that utilizes the National Land Cover Database (NLCD) to aid forest land and nonforest land area stratifcation in order to provide more accurate forest land area estimates. The estimates used here reflect the updated estimates for 1999 and 2004.

Forest Land Area

Tennessee's forests cover an estimated 13.78 million acres or 52% of the State. In 1999 forests covered an estimated 13.85 million acres, an increase of about 247,000 acres since 1989. Although it appears that there has been a loss of an estimated 66,000 acres of forest land since 1999, the estimate statistically represents no change and is better viewed as a "leveling off" of the historical trend of increasing forest land. Forest land in Tennessee has comprised about one-half of the State's 26 million acres of land since before 1961. Since 1961, Tennessee's forests have increased slightly, from an estimated low of 50% in the 1970s to an estimated 53% in the 1999 inventory. Ninety-six percent (13.3 million acres) of the forest land is considered available for timber production.

Area by land class *(thousand acres)*

Land class	1961	1971	1980	1989	1999	2004
Timberland	13,432.4	12,819.8	12,879.0	13,265.2	13,459.2	13,254.0
Other/reserved	263.5	316.5	429.5	337.3	390.3	530.1
Total forest	13,695.9	13,136.3	13,308.5	13,602.5	13,849.5	13,784.0
Nonforest land	12,826.2	13,338.6	13,141.6	12,844.5	12,511.4	12,504.2
Total land area	26,522.1	26,474.9	26,450.1	26,447.0	26,360.9	26,378.8
Percent forested	52%	50%	50%	51%	53%	52%

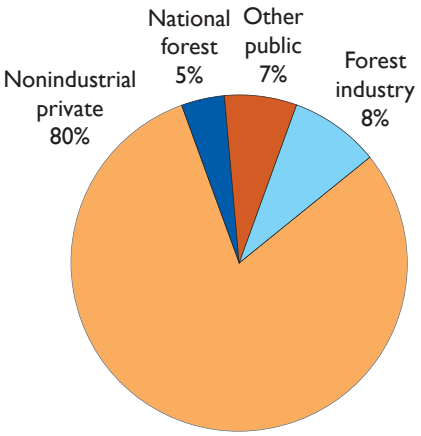
Total may not sum due to rounding.

Total land area estimate changed slightly over time due to improvements in measurement techniques and refinements in classification of small bodies of water and streams.

Ownership of Timberland

Tennessee timberland remains overwhelmingly in private ownership. Eighty percent of timberland in the State is owned by private individuals. Slightly more than one-tenth of Tennessee's timberland is publicly owned and administered, with 5% being managed by the U.S. Forest Service as national forests and 7% held by State, local, and other federal agencies. At the time of this inventory, an estimated 8% of Tennessee's forests were owned by forest industry. However, recent and ongoing divestments by forest industry will result in a significant amount of industry land being transferred to private ownerships.

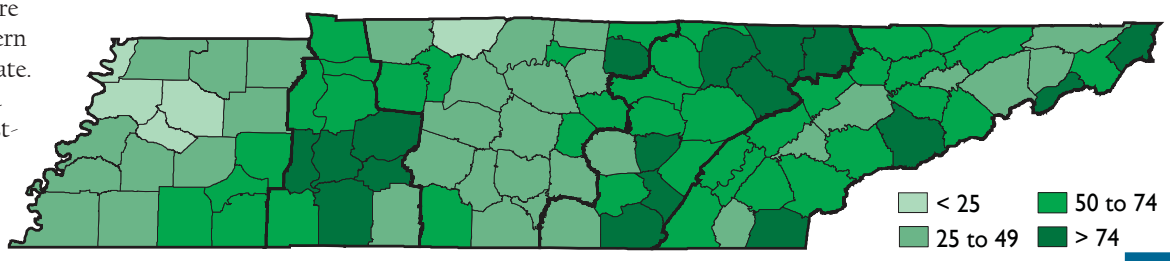
Ownership of timberland



Forest Distribution

Of 95 Tennessee counties, 56 are estimated to be >50% forested and 17 counties >75% forested. The Cumberland Plateau unit contains the greatest number of counties with 75% or more of the land forested. Five counties are estimated to be <25% forested and are mostly located in the heavily agriculture dominated western portion of the State. The Cumberland Plateau and West-Central Tennessee are the most forested areas within the State.

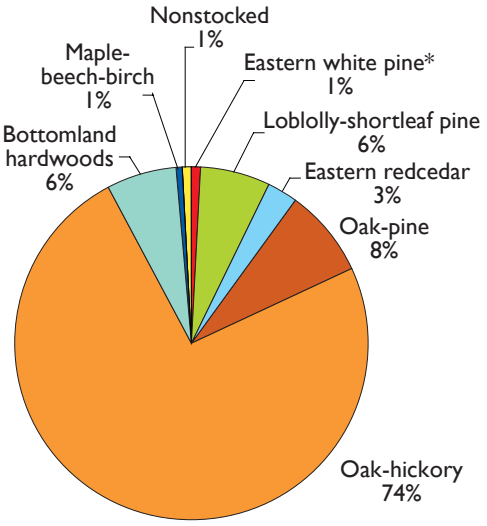
Percentage of land in forest by county



Forest Composition

The oak-hickory (*Quercus* spp.–*Carya* spp.) forest type accounts for an estimated 74% (9.9 million acres) of the timberland in Tennessee. The loblolly-shortleaf pine type accounts for only 6%, the majority of which is located in the eastern (302,000 acres) portion of the State. Mixed stands of the oak-pine type account for an estimated 8% of timberland in Tennessee. Bottomland hardwoods (elm-ash-cottonwood and oak-gum-cypress types), in West Tennessee, account for about 6% of the timberland. Eastern redcedar accounts for an estimated 3% of timberland and is predominately located in Central Tennessee (224,000 of 351,000 total estimated acres).

Composition of Tennessee timberland



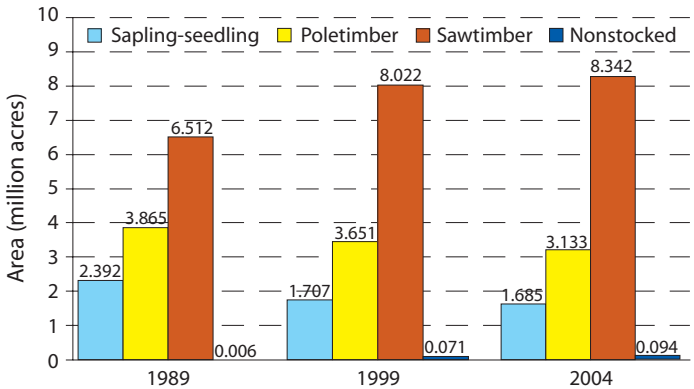
*Includes hemlock.

Between 1999 and 2004 the only significant changes in composition were a loss of an estimated 225,000 acres of the loblolly-shortleaf pine type and a gain of about 234,000 acres of oak-hickory.

Stand-Size Distribution

The number of acres in sawtimber has steadily increased since the 1989 inventory. An estimated 8.3 million acres of timberland are in sawtimber-size stands. Since 1989, timberland acreage has been constantly recruiting from small stand-size classes into larger classes. As a result, the number of acres in the sapling-seedling stand-size class decreased from an estimated 2.4 million acres to 1.7 million acres. Essentially, this represents a loss of habitat available to early successional fauna as the Tennessee forest resource ages.

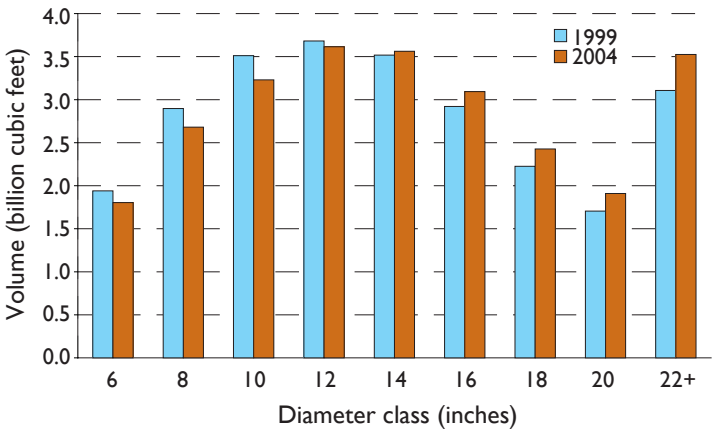
Area of timberland by stand size



Tree Volume

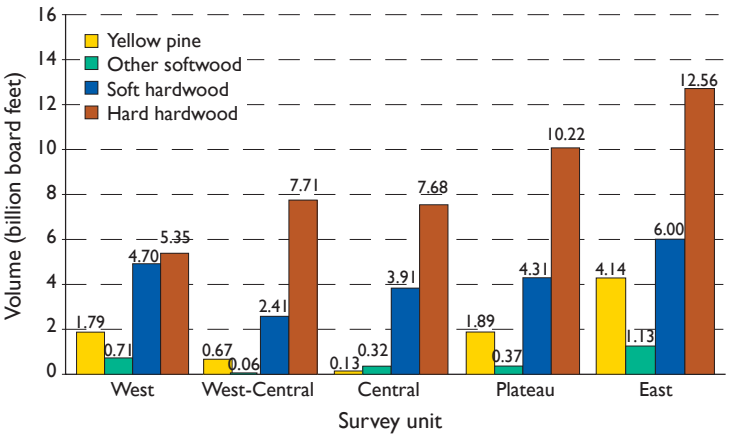
All live tree volume has increased from 25.5 billion cubic feet following the 1999 inventory to 25.9 billion cubic feet in 2004. All live tree volume trends from 1999 to 2004 indicate a similar trend as that indicated by stand-size class. From the 1999 inventory to 2004, live tree volume is recruiting from smaller diameter classes into larger classes. The peak in the distribution is shifting to larger diameter classes, indicating an aging forest resource. The second peak at the tail of the distribution is a result of clumping all live tree volume greater than or equal to the 22-inch diameter class.

Volume of all live trees on timberland, by diameter class and survey



Sawtimber in the State of Tennessee is significantly dominated by hardwood species. Eighty-five percent of the estimated total sawtimber in the State are hardwood species, whereas 15% are softwood. As such, the vast majority of timber and nontimber products from Tennessee forests continue to be of hardwood stand origin.

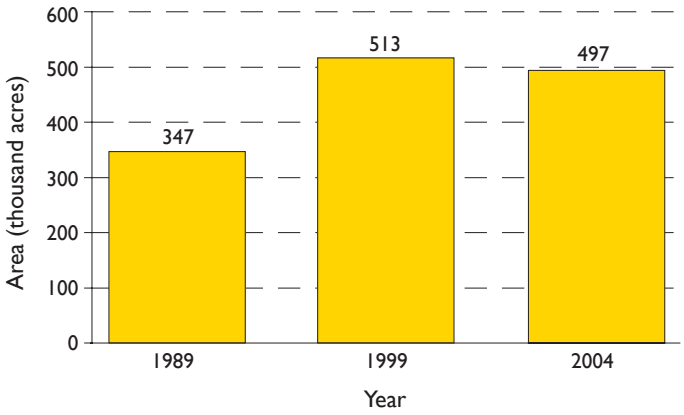
Volume of sawtimber on timberland



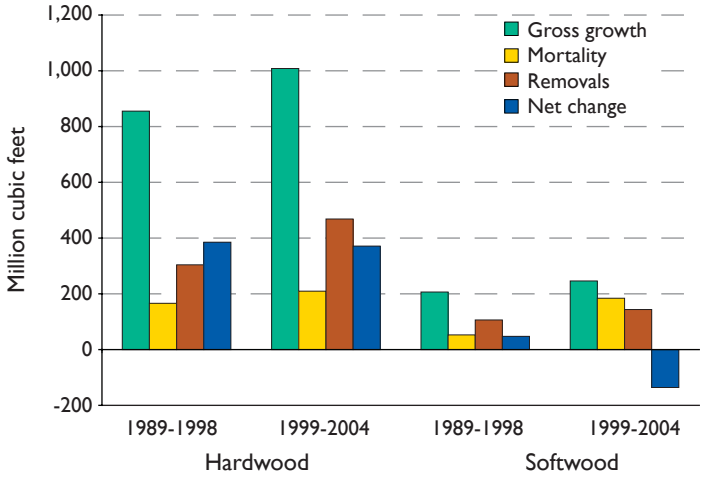
Stand Origin

An estimated 497,000 acres of timberland originated from planted stands. This represents a decrease from an estimated 513,000 acres following the 1999 inventory. For the most part, Tennessee has experienced a decrease in the number of acres planted in pine following the 1999-2001 Southern pine beetle (SPB) outbreak.

Area of planted timberland



Growth, removals, and mortality of all live trees on timberland

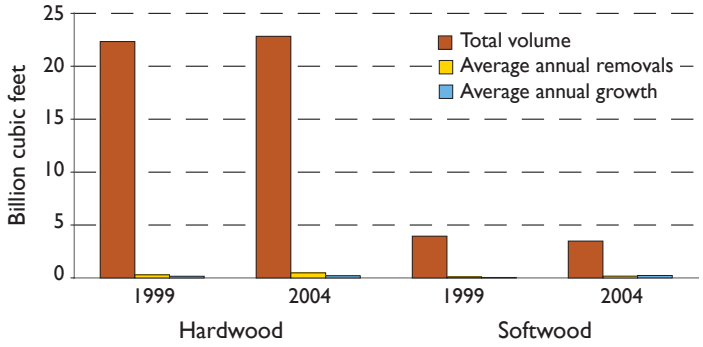


Note: Net growth = gross growth - mortality

Growth, Removals, and Mortality

The estimate of average annual net growth increased from about 843 million cubic feet during the period between 1989 and 1998 to about 848 million cubic feet during the period between 1999 and 2004. Hardwood average annual net growth increased from about 690 million cubic feet to about 809 million cubic feet over the same time periods, whereas average annual softwood net growth decreased from 154 million to 38 million cubic feet. The decrease in softwood growth appears to be driven by the recent SPB outbreak. Net growth-to-removal ratios remain positive for hardwoods (1.8 million cubic feet of growth for every 1 million cubic feet removed) and have become negative for softwoods, again most likely due to the recent SPB activity. Concomitantly, average annual mortality, while remaining about the level for hardwoods, increased for softwoods in the State. In addition, removals and mortality remains a very small portion of the total volume of all live trees.

Average annual removals and mortality and total volume of all live trees



Statistical Reliability

A measure of reliability of inventory statistics is provided by sampling errors. These errors mean that the chances are two out of three that the true population value is within the limits indicated by a confidence interval. Sampling errors in percent and associated confidence intervals around the sample estimates for timberland area and inventory volumes are presented in the following table.

Statistical Reliability for Tennessee, 2004

Item	Sample estimate and confidence interval			Sampling error
				percent
Timberland *(1,000 acres)*	13,254.0	±	98.1	0.74
All live *(Mft³)*				
Inventory	25,903.0	±	391.1	1.51
Growing stock *(Mft³)*				
Inventory	22,572.0	±	363.4	1.61
Sawtimber *(M fbm)*				
Inventory	76,068.0	±	1,643.1	2.16

FIA inventories supported by full complement of sample plots are designed to achieve reliable statistics at the survey unit and State levels. Sampling errors increases as the area or volume considered decreases in magnitude. Sampling errors and associated confidence intervals are often unacceptably high for small components of the total resource. Statistical confidence may be computed for any subdivision of State totals using the following formula.

$$SE_s = SE_t \ , \ \frac{\sqrt{X_t}}{\sqrt{X_s}}$$

where

SE_s = sampling error for subdivision of State total

SE_t = sampling error for State total

X_s = sum of values for the variable of interest (area or volume) for subdivision of State

X_t = total area or volume for State

For example, the estimate of sampling error for area of loblolly-shortleaf pine on timberland is computed as:

$$SE_s = 0.74 \ \frac{\sqrt{13{,}254.0}}{\sqrt{844.5}} = 2.93.$$

Thus, the sampling error is 2.93%, and the resulting confidence interval of one standard error (two times out of three) for area of loblolly-shortleaf pine on timberland is 844.5 ± 24.74 thousand acres. To achieve the 95% confidence interval, the standard error is multiplied by 1.96 or 844.5 ± 48.49 thousand acres (24.74 thousand acres * 1.96 = 48.49).

Sampling errors obtained from this method are only approximations of reliability because this process assumes constant variance across all subdivisions of totals.

Precautions

Traditional users of FIA data are accustomed to highly variable accuracy of small subsets of population totals. All FIA published reports devote a chapter that explains sampling error and provide cautions about the reliability of subpopulations such as county level statistics. Therefore, when summarizing statistics, it is strongly recommended that users beware of any subdivision below the survey unit level. Users should familiarize themselves with procedures to compute sampling error as outlined above.

Definition of Terms

D.b.h. Tree diameter in inches (outside bark) at breast height (4.5 feet aboveground level).

Forest land. Land at least 10% stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. The minimum area considered for classification is 1 acre. Forested strips must be at least 120 feet wide.

Forest industry. Companies or individuals operating primary wood-using plants.

Forest type. A classification of forest land based on the species forming a plurality of live tree stocking.

Growing-stock trees. Live trees that contain at least one 12-foot or two 8-foot logs in the saw-log portion, either currently or potentially if too small to qualify as a saw log. The log(s) must meet dimension and merchantability standards to qualify. Trees must have one-third of the gross board foot volume in sound wood, either currently or potentially.

Growing-stock volume. The cubic-foot volume of sound wood in growing-stock trees at least 5.0 inches d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem.

Hardwoods. Dicotyledonous trees, usually broadleaf and deciduous.

Nonforest land. Land that either has never supported forests or land formerly forested that has been developed for other uses, including cultural, agricultural, etc.

Other forest land. Forest land that is incapable of producing 20 cubic feet of wood volume per acre annually under natural conditions due to adverse site conditions such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.

Other private. Land owned by individuals and corporations, including individual and corporate farms, where the owner does not own a primary wood-using plant. This land is often referred to as nonindustrial private forest land (NIPF).

Poletimber. Softwood species 5.0 to 8.9 inches d.b.h. and hardwoods 5.0 to 10.9 inches d.b.h.

Reserved forest land. Public forest land capable of producing 20 cubic feet of wood volume per acre annually, but is withdrawn from timber utilization through statute or administrative regulation.

Saplings. Trees 1.0 to 4.9 inches d.b.h.

Sawtimber. Softwood species 9.0 inches d.b.h and larger and hardwoods 11.0 inches d.b.h. and larger.

Seedlings. Trees < 1.0 inch d.b.h. and >1 foot tall for hardwoods, > 6 inches tall for softwoods.

Softwoods. Coniferous trees, usually evergreen, having leaves that are needles or scalelike.

Stand origin. A classification of forest stands describing their means of origin.

Planted. Planted or artificially seeded.

Natural. No evidence of artificial regeneration.

Stand-size class. A classification of forest land based on the diameter class distribution of live trees in the stand.

Timberland. Forest land capable of producing 20 cubic feet of wood volume per acre annually and not withdrawn from timber utilization.

Tree. Woody plants having one erect perennial stem or trunk at least 3 inches d.b.h., a more or less definitely formed crown of foliage, and a height of at least 13 feet at maturity.

Tree grade. A classification of the saw-log portion of sawtimber trees based on the grade of the butt log or the ability to produce at least one 12-foot log or two 8-foot logs in the upper section of the saw-log portion. Tree grade is an indicator of quality; grade 1 is the best quality.

Volume. The amount of sound wood in live trees at least 5.0 inches d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem.

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