

# Highlights of the 2003 Kentucky Forest Inventory

## Forestland Area

Kentucky's forests cover 11.9 million acres or 47 percent of the State. This is a decrease of 769,000 acres, a 3 percent net loss, since the previous forest inventory in 1988. Ninety-seven percent of the forest land is considered available for timber production. The remaining forest land area is unproductive forestland and reserved forestland where timber removals are prohibited by law.

Area by land class (thousands of acres)

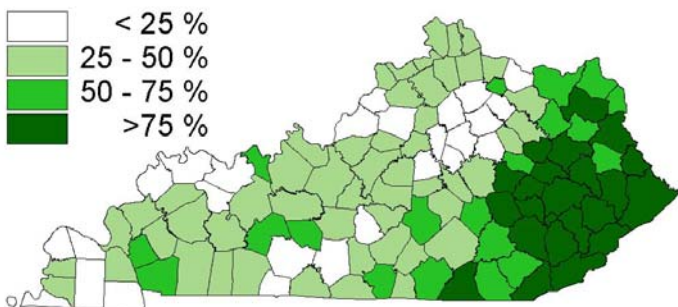
Land Class	1949	1963	1975	1988	2003
Timberland	11,446	11,713	11,902	12,347	11,624
Other/reserved	51	142	259	352	306
Total forest land	11,497	11,855	12,161	12,699	11,930
Total land area*	25,513	25,512	25,504	25,388	25,426
Percent forested	45%	46%	48%	50%	47%

\* Estimates of the total land area have changed because of new measurement techniques and refinements in the classification of small bodies of water and streams.

## Forest Distribution

The Cumberland Plateau and the Appalachians in the eastern portion of the state is the most heavily forested. The central and western portions of the state, although less densely forested, account for 50 percent of the total forestland area.

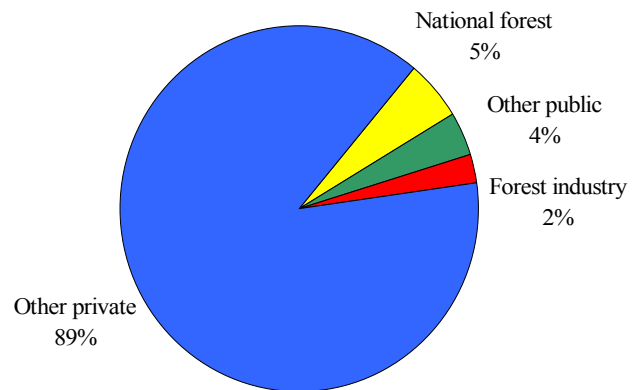
Percentage of land in forest by county



## Ownership of the Forest

Private landholders are the dominant owners of Kentucky's timberland. Nine percent is public land, administered by local, state or federal agencies. Slightly more than half of the public land is managed by the US Forest Service. Forest industry accounts for the remaining 2 percent of timberland.

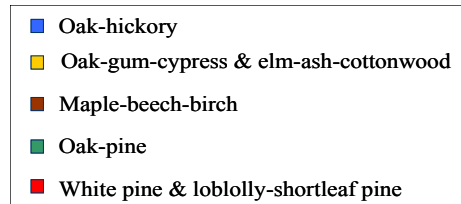
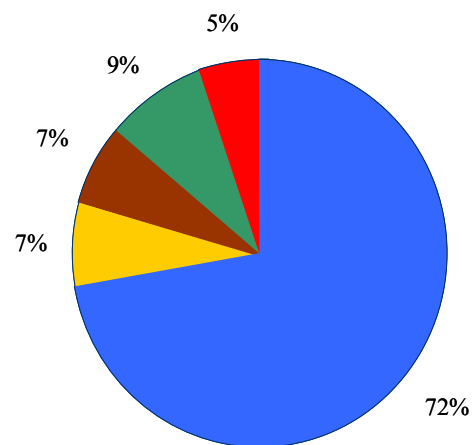
Ownership of timberland



## Forest Type Composition

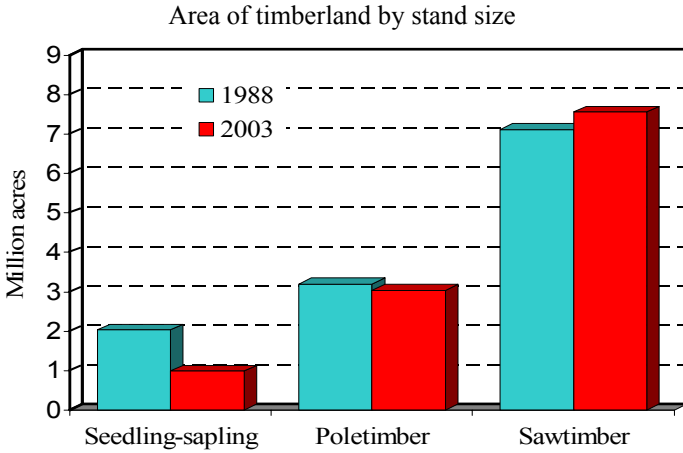
Oak-hickory is the predominant forest type in the state, covering 8.4 million acres (72 percent of the timberland).

Area of timberland by forest type group



### Stand Size Distribution

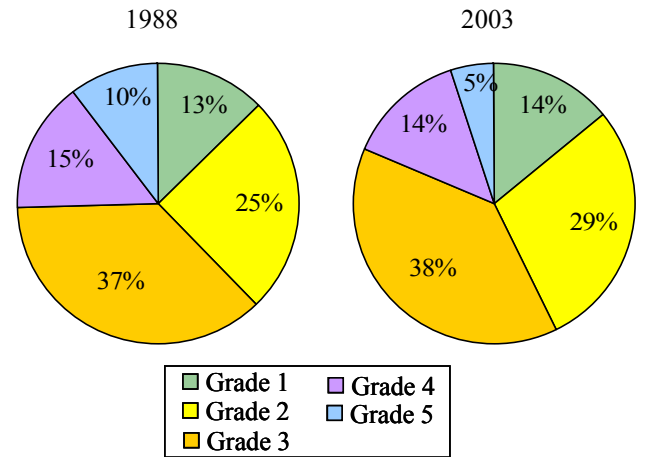
There has been a 6 percent increase in the number of acres in sawtimber size stands on Kentucky's timberland. Sawtimber stands cover 65 percent of the timberland in the state. The number of acres of poletimber stands declined by 5 percent, while the acres of sapling-seedling stands declined by half.



### Hardwood Tree Grade Distribution

The percentage of board foot volume in tree grades 1 and 2 increased by 5 percent since 1988. The percentage of board foot volume in the lower quality grades 4 and 5 declined from 25 to 19 percent.

Percentage of hardwood growing stock board foot volume by tree grade

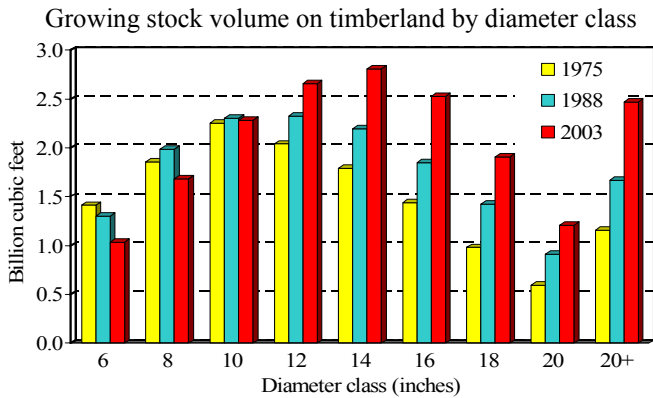


### Tree Volume

In spite of the reduction in forest area, growing stock volume on timberland has increased from 16.0 billion cubic feet in 1988 to 18.6 billion cubic feet in 2003. The volume in sawtimber size trees increased from 45.8 to 62.0 billion board feet.

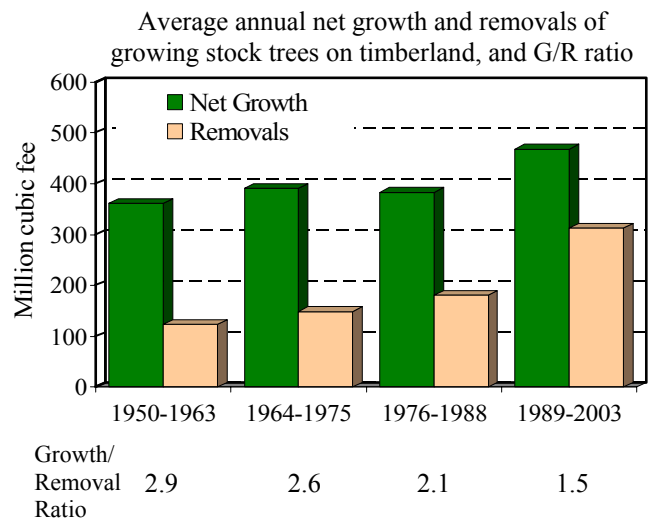
### Volume Distribution by Diameter Class

The increase in volume is due to the growth on trees 12 inches and greater in diameter.



### Growth, Removals and Mortality

The net growth of Kentucky's growing stock volume averaged 468.5 million cubic feet yearly since 1988. Net growth accounts for mortality, which averaged 182.7 million cubic feet annually or 1.0 percent of the current inventory. Timber removals averaged 311.8 million cubic feet annually. The growth to removal ratio is 1.5.



## Statistical Reliability Kentucky 2003 FIA Data

A measure of reliability of inventory statistics is provided by sampling errors. These sampling 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.

Item	Sample estimate and confidence interval	Sampling error (Percent)
<b>Timberland (1,000 acres)</b>	11,623.9 ± 50.4	0.43
<b>All live (million cubic ft)</b>		
Inventory	21,584.6 ± 371.2	1.72
<b>Growing stock (million cubic ft)</b>		
Inventory	18,582.3 ± 360.4	1.94
Net annual growth	468.1 ± 14.1	3.02
Annual removals	311.8 ± 25.8	8.26
Annual mortality	182.7 ± 13.0	7.12
<b>Sawtimber (million board ft)</b>		
Inventory	62,034.8 ± 1,856.3	2.99

FIA inventories supported by the full complement of sample plots are designed to achieve reliable statistics at the survey unit and State levels. Sampling error 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.

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

For example, the estimate of sampling error for the area of timberland owned by forest industry is computed as:

$$SE_s = 0.43 \frac{\sqrt{11,623.9}}{\sqrt{285.1}} = 2.75$$

Thus, the sampling error is 2.75 percent, and the resulting confidence interval of one standard error (two times out of three) for area of timberland owned by forest industry is  $285.1 \pm 7.8$  thousand acres. To achieve the ninety-five percent confidence interval, the standard error is multiplied by 1.96 or  $285.1 \pm 15.4$  thousand acres.

### Precautions

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

### Definitions of Terms

**Average annual gross growth.** Average annual increase in volume of trees 5.0 inches d.b.h. and larger in the absence of cutting and mortality. Gross growth includes survivor growth, ingrowth, growth on ingrowth, growth on removals before removal, and growth on mortality before death.

**Average annual mortality.** Average annual volume of trees 5.0 inches d.b.h. and larger that died from natural causes during the intersurvey period.

**Average annual net growth.** Average annual net change in volume of trees 5.0 inches d.b.h. and larger in the absence of removals during the intersurvey period. Average annual net growth is equal to Average annual gross growth minus average annual mortality.

**Average annual removals.** Average annual volume of trees 5.0 inches d.b.h. and larger removed from the inventory by harvesting, cultural operations, (such as timber-stand improvement), land clearing, or changes in land use during the intersurvey period.

**Average net annual change.** Increase or decrease in volume of live trees at least 5.0 inches d.b.h. Net annual change is equal to net annual growth minus average annual removals.

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

**Forest land.** Land at least 10 percent 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 base 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 sawlog portion, either currently or potentially if too small to qualify as a sawlog. 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.

**Growth to removal ratio.** Comparison of the amount of growth volume to the amount of volume removed by human activity, including harvesting, land clearing, or changes in land use during the intersurvey period. The growth to removal ratio is equal to the average net annual growth divided by average net annual removals. If the ratio is greater than one, then wood volume is being added to the inventory. If it is less than one, then the inventory is decreasing.

**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 less than 1.0 inch d.b.h. and greater than 1 foot tall for hardwoods, greater than 6 inches tall for softwoods.

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

**Stand age.** The average age of dominant and codominant trees in the stand.

**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 sawlog 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 sawlog portion. Tree grade is an indicator quality; grade 1 is the best quality.

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

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