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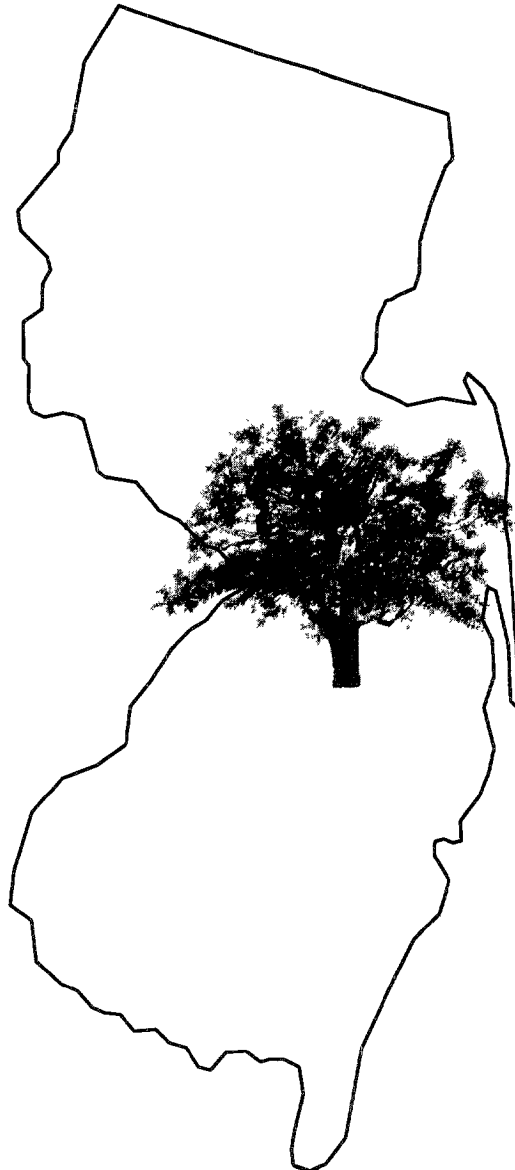
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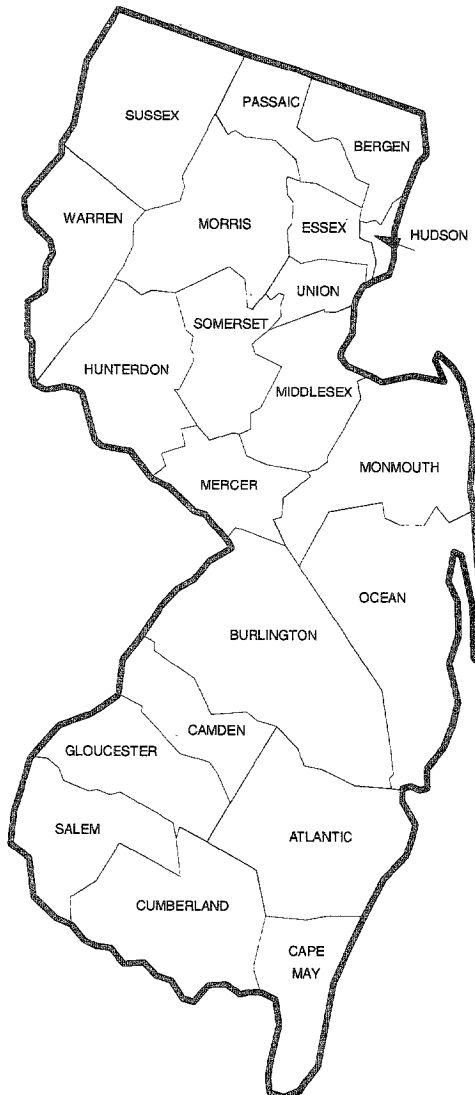
Forest Statistics for New Jersey: 1987 and 1999

Douglas M. Griffith
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Abstract

A statistical report on the fourth forest inventory of New Jersey conducted in 1998-99 by the Forest Inventory and Analysis Unit of the Northeastern Research Station. Statistics for forest area, numbers of trees, tree biomass, timber volume, growth, and change are displayed at the state and, where appropriate, the county level. The current inventory indicates that there are approximately 2.8 billion cubic feet of growing-stock volume on 1.9 million acres of timberland in New Jersey.



Acknowledgment

The Forest Inventory and Analysis Unit thanks the landowners of New Jersey and the New Jersey Department of Environmental Protection, Division of Parks and Forestry, for their cooperation and assistance during this inventory.

Forest Statistics for New Jersey: 1987 and 1999

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Highlights

Forest-Land Area

Forests cover 2.1 million acres or 44.9 percent of New Jersey. This is an increase of 143,900 acres since the previous forest inventory in 1987. Most of this increase is the result of a more inclusive definition of forest land. Small forested areas in rights of ways and in some urban areas that previously were classified as nonforest have been reclassified as forest. These reclassified areas are stocked with trees and at least an acre in size and more than 120 feet wide. There was no significant change in the area considered timberland. Timberland area represents 88 percent of total forest-land area.

(Thousands of acres at each inventory)

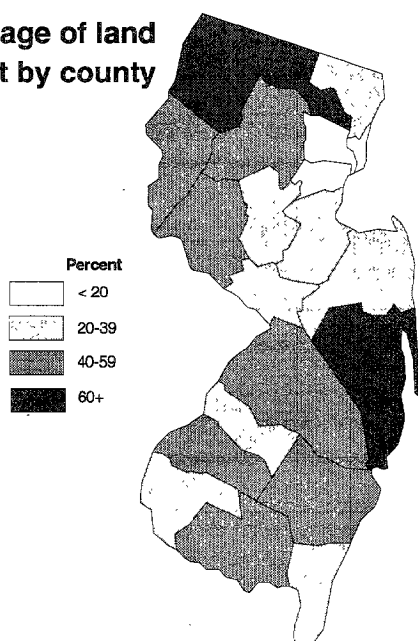
	1956	1972	1987**	1999
Timberland	2,120	1,857	1,874	1,876
Other forest land	109	71	114	256
Total forest land	2,229	1,928	1,988	2,132
Percent forested	46.3%	40.0%	41.9%	44.9%
Total land area*	4,814	4,820	4,748	4,748

* 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.

** Based on reprocessing of 1987 data.

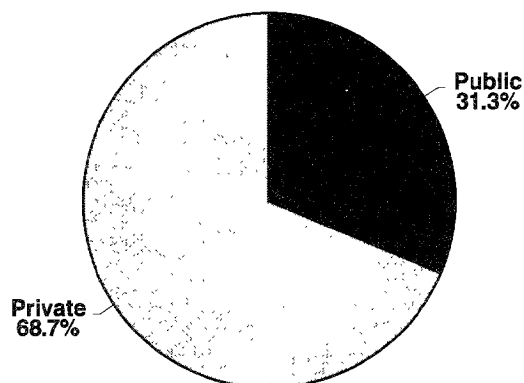
Sussex County is the most heavily forested county (68 percent).

Percentage of land in forest by county



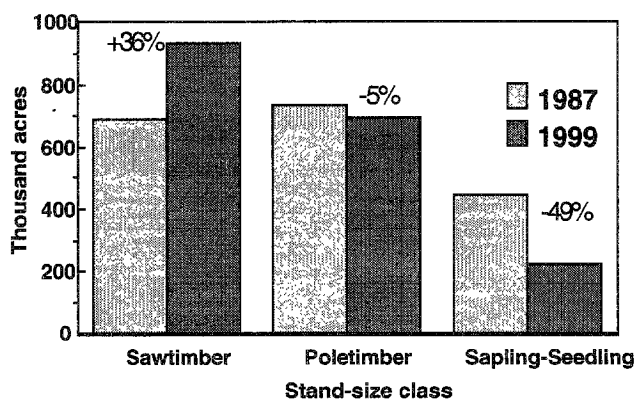
Nearly a third of timberland is in public ownerships, either state, county, municipal, or miscellaneous federal governments. Most forest land classified as Other is in public ownership.

Ownership of Timberland



Sawtimber-size stands increased by 36 percent since the previous inventory and now account for 50 percent of the timberland. Poletimber-size stands declined by 5 percent and now account for 37 percent of timberland. The area in sapling/seedling stands accounts for 12 percent of the timberland and has decreased by 49 percent. Huckleberry and blueberry were the most common shrubs in each stand-size class.

Timberland by stand-size class

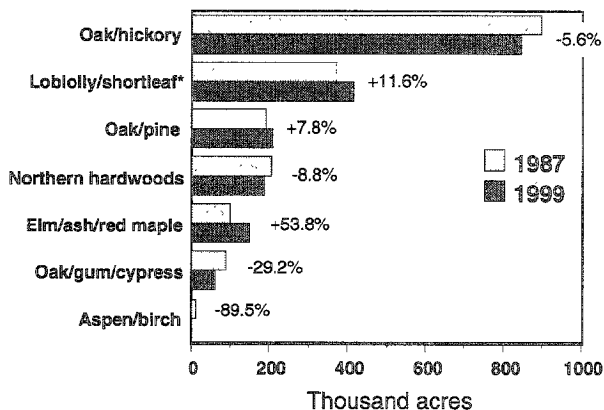


Area by Forest-Type Group

Oak/hickory is the dominant forest-type group, occupying 45 percent of the timberland, followed by the loblolly/shortleaf group (composed primarily of the pitch pine forest type), which occupies 22 percent of the timberland. Sixty-two percent of the oak/hickory stands are sawtimber size versus 29 percent of loblolly/shortleaf stands.

Area of timberland by forest-type group

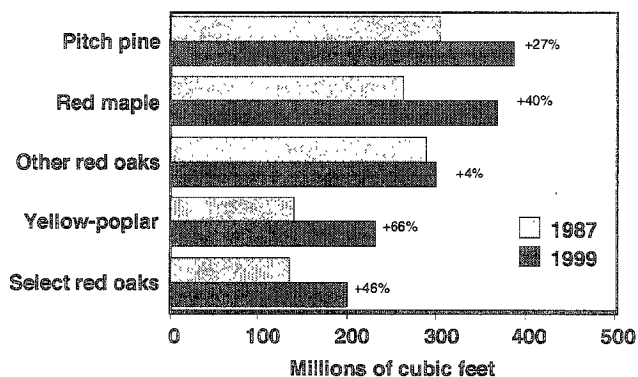
Forest-type group



* Includes the pitch pine forest type

1,493 cubic feet in 1999. Pitch pine continued to have the greatest volume, accounting for 13.8 percent of total volume. Red maple had the largest volume increase--105.4 million cubic feet or 40 percent.

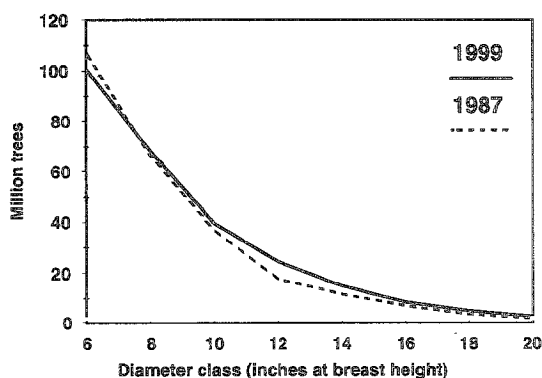
Change in growing-stock volume, top five species



Numbers of Trees Growing on Timberland

The total number of growing-stock trees at least a 5 inches in diameter at breast height has increased to 267.8 million. The number of trees in the 6-inch diameter class decreased while the number of trees in all diameter classes above the 6-inch class has increased. Pitch pine was the most numerous species in the 6-inch class and the select red oak species group (composed almost entirely of northern red oak) was the most numerous species group in the 16-, 18-, and 20-inch classes. Yellow-poplar was the most numerous species in trees more than 21 inches in diameter.

Number of growing-stock trees at each inventory



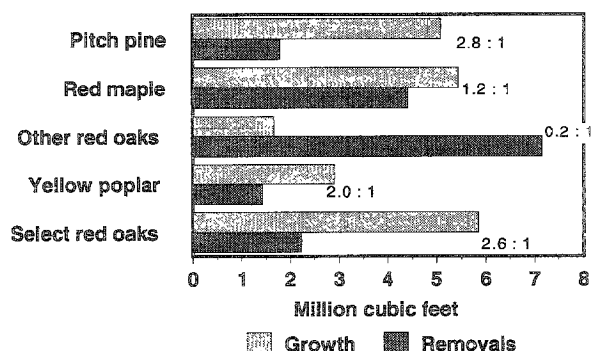
The volume in trees large enough to produce sawlogs increased by 43.6 percent to 8.1 billion board feet. Yellow-poplar has the largest board-foot volume.

Growth and Removals

On an annual basis, net growth of growing stock on New Jersey's timberland has averaged 55.1 million cubic feet of wood and the average annual harvest plus other removals has averaged 34.8 million cubic feet. The ratio of net growth to removals has averaged about 1.6 : 1 over the past inventory period.

On an annual basis, mortality has averaged 16.6 million cubic feet or 0.6 percent of the current inventory.

Average annual net growth and removals of growing-stock, top five species



Volume

The volume of growing-stock trees increased by 23.6 percent to 2.8 billion cubic feet. The average volume per acre increased from 1,208 cubic feet in 1987 to

Introduction

Under the authority of the McSweeney-McNary Forest Research Act of 1928 and subsequent acts, including the Renewable Resources Planning Act of 1974 and the Renewable Resources Research Act of 1978, the USDA Forest Service conducts periodic inventories of all states to provide up-to-date information on the forest resources of the Nation. The initial inventory of New Jersey's forest resources was conducted in 1955. Succeeding inventories were carried out in 1971 and 1987. This report presents forest-resource data from the fourth inventory, which was conducted in 1998-99. This inventory was a cooperative effort among the Northeastern Research Station, the New Jersey Department of Environmental Protection, Division of Parks and Forestry, and the landowners of New Jersey.

The Forest Inventory and Analysis Unit (FIA) of the Northeastern Research Station conducted the inventory on all lands, developed the resource tables, and prepared this report.

The sampling procedure used during the current inventory included the use of aerial photography, the remeasurement of a sample of ground plots established in earlier inventories, and the establishment of new ground plots. For New Jersey, this procedure required the photointerpretation and classification of 16,590 new photo points and 433 previously sampled ground-plot locations into land-use and cubic-foot volume classes. Then, 433 ground plots from the previous inventory were remeasured and 358 new ground plots were established. The data collected were summarized using the FINSYS computer system developed at the Northeastern Research Station.

The resurvey of New Jersey's forest resources entailed several associated studies and considerable analysis. Reports on New Jersey's private forest-land owners and its primary forest-products industry also will be available, and a report analyzing New Jersey's forest resource in greater detail is being prepared.

The forest area, numbers of trees, biomass, timber volume, growth, and change statistics in this report summarize the information collected (**see Index to Tables**). Other information or additional summaries may be developed.

For information about these, contact the **Forest Inventory and Analysis Unit, USDA Forest Service, 11 Campus Boulevard, Suite 200, Newtown Square, PA 19073 (Telephone: 610-557-4075; Fax: 610-557-4250).**

Web address: www.fs.fed.us/ne/fia

Reliability of the Estimates

The data in this report are based on a carefully designed sample of forest conditions throughout New Jersey. However, because the field crews did not measure every tree or every acre in the state, the data are estimates. The reliability of the estimating procedure can be judged by two important statistical measures: accuracy and precision. Accuracy refers to the success of estimating the true value; precision refers to the clustering of sample values about their own averages or to the variation among repeated samples. We are interested primarily in the accuracy of the inventory but in most cases we can only measure its precision.

Although accuracy cannot be measured exactly, it can be checked. Preliminary tables are sent to other agencies and to outside experts familiar with the forest conditions in New Jersey. If questions arise, the data are reviewed and reanalyzed to resolve differences. Great care is taken to minimize sources of procedural error through careful training of both field and office personnel, frequent inspection of field and office work, and application of the most reliable inventory methods.

Because of the care exercised in the inventory process, estimates of precision afford a reasonable measure of the inventory's adequacy. The precision of each estimate is described by its sampling error. Sampling errors are given with several tables in this report. The others are available upon request.

Here is an example of how the sampling error is used to indicate reliability. The estimate of timberland for New Jersey is 1,876,100 acres. The associated sampling error is 3.0 percent, or 56,283 acres. This means that if there are no errors in the procedure, we are 68 percent confident that the true number of acres is between 1,819,817 and 1,932,383 acres, or $1,876,100 \pm 56,283$ (one standard deviation). Similarly, we are 95 percent confident that the true number of acres is within $\pm$

112,566 acres (two standard deviations). County estimates are less precise. In New Jersey, for example, while the sampling error for timberland at the state level is 3.0 percent, the sampling error for Burlington County is 8.1 percent. In general, as the size of the sample decreases, the sampling error, expressed as a percentage of the estimate, increases. A high amount of variance within a county increases the sampling error.

For many of the tables in this report, both the last column and last row are labeled "SE." These figures are the sampling errors of the column and row totals. The last sampling error given (SE) is for the table total. To calculate the approximate sampling error (SE) for a table cell (ij), use the following formula (**this formula is reliable only for estimating sampling errors of individual cells in AREA tables**):

$$SE_{ij} = 1/P_{ij}((P_{ij}(1 - P_{ij}))/n)^{1/2}$$

where:

n = total number of sample plots of a population
 $P_{ij} = A_{ij} / A$
 A_{ij} = cell estimate
 A = total land area of a population
 ij = row(i) and column(j)

Any estimate with a sampling error of 50 percent or more is not significantly different from zero, and estimates with errors of 25 to 50 percent are suspect. Therefore, any estimates with errors exceeding 25 percent should be used with caution.

Comparison Between Inventories

To evaluate the condition of the forest resource, it is useful to compare the current estimates with those from the previous inventory. However, as a result of ongoing efforts to improve the efficiency of the inventory, we have made several changes in procedures and definitions since 1987. Because these changes make inappropriate the direct comparison of some of the current estimates with those published by DiGiovanni and Scott (1990), readers should use caution when comparing the data in this report with those in the 1987 report. In

this report, several tables containing 1987 data are provided to allow comparisons. The changes in methods and definitions follow.

To improve data consistency at the national level, a standard plot design is being used by all Forest Inventory projects in the country. The new plot design, a cluster of four 24-foot-radius points covering a 1/6-acre area, was established at this occasion at all selected plot locations, both new and previously measured. Field crews recorded different conditions on the plots if certain attributes (land use, forest type, stand origin, stand size, tree density, and/or owner) differed from those at plot center. They "mapped" these conditions by recording information that described the boundaries of the conditions. This mapping procedure is designed to reduce bias in the estimates. While mapping was used in the previous inventory, the variables that determined the mapped condition were different.

On all selected remeasured plot locations, a subsample of the trees that were recorded in the past were reconciled, and growth and removals estimates were calculated using these data. Condition mapping was ignored for calculations of estimates of change because this procedure was not used at the previous occasion.

Forest Inventory uses Bureau of Census estimates of total land area in a state or county as the basis for estimating land area by various classes. For the 1987 report, the 1980 Bureau of Census data were used; in 1999, the 1990 data were used. Between 1980 and 1990, the Bureau of Census changed its estimating procedures. It now can identify as inland water streams more than 200 feet wide and bodies of water 4.5 acres and larger in area. Previously, the minimum width was 660 feet for streams and the minimum area was 40 acres for bodies of water. This procedure results in a reduction in total land area. For comparison of land area between inventories, 1987 estimates of land area by class were recalculated using 1990 land-area values from the Bureau of Census.

Stocking is a quantitative expression of live tree stand density that may be expressed in absolute terms, such as basal area per acre, volume per acre, or number of trees per acre; or in relative terms, such as a percent of a previously defined standard (Arner et al. 2000).¹ For the 1987 inventory statistics, the stocking value of a tree was calculated using the basal area of the tree as

a percent of 75 square feet per acre, which is the basal area standard for full use of the site (Forest Survey Handbook 1967).² Basal-area stocking may well describe current timber volume, but it is inadequate to describe stand composition in a multiresource inventory in that it neither adequately measures present site utilization nor describes small-diameter stands. For the statistics in this publication, stocking is calculated using relative density, which represents site occupancy based on normal yield tables. Basal area is diameter-dependent only, whereas relative density reflects species composition, stage of development, and the social position of the trees present. A relative measure of stand density is a useful tool for interpreting findings of extensive inventories, such as those performed by Forest Inventory and Analysis, where a wide variety of stands is sampled. A procedure using relative density to calculate stocking was developed and accepted as a standard to be used by all FIA projects in the country.

Stand size is a classification (sapling/seedling, poletimber, sawtimber, or nonstocked) of forest land based on the size of the trees that dominate an area, and forest type is a classification of forest land based on the species found in the area. Stand size and forest type are both calculated based on stocking of all live trees, and, therefore, are affected by the change in the procedure to calculate stocking. To allow comparisons, this report includes several 1987 area tables showing estimates of area timberland by stand-size class and forest type and forest-type group that are calculated based on relative density. There also are tables that show estimates of timberland area by forest type and stand size for both 1987 and 1999, where stocking is based on the basal area of all live trees.

Forest type is a classification of forest land based on species that form a plurality of live-tree stocking. Prior to 1995, basal area was used to determine plurality of live-tree stocking. Currently, the forest type classification is based on stocking values calculated using relative density. There have been minor refinements with respect to how several species (e.g., red maple and beech) are allocated to local types since the previous inventory and a programming error that affected the white pine type was corrected.

Sixty-three percent of the plots that were visited during the 1987 inventory were remeasured in 1998-99. The estimates of average annual change are derived from this set of data. These estimates afford an opportunity to look at components of change in the overall volume from occasion to occasion or from plot to plot.

The tables showing 1987 information are from the plots that were selected at the prior inventory to produce an estimate of the area and volume. This dataset has been reprocessed using current procedures to produce a new estimate of the area and volume of the 1987 inventory.

Because the tables of estimates for average annual change only contain a portion of the plots from the 1987 survey, inconsistencies in trends may result when the recalculated estimates of 1987 are compared with the average annual change estimates between the 1987 and 1999 tables.

Sampling errors have been included to indicate the precision of the data calculated. In addition to the traditional data gathered to estimate forest area and tree volumes, information was collected to describe forest wildlife habitat and forest-tree biomass.

¹ Arner, Stanford L. et al. 2000. **National Algorithms for Determining Stocking Class, Stand Size Class, and Forest Type for Forest Inventory and Analysis Plots.** Unpublished document on file at Northeastern Research Station Forest Inventory and Analysis, 11 Campus Boulevard, Suite 200, Newtown Square, PA 19073.

² Anonymous. 1967. **Forest Survey Handbook.** Unpublished document on file at Northeastern Research Station Forest Inventory and Analysis, 11 Campus Boulevard, Suite 200, Newtown Square, PA 19073.

Definitions of Terms

Acceptable tree. (a) Live sawtimber trees that do not qualify as preferred trees but are not cull trees. (b) Live poletimber trees that prospectively will not qualify as preferred trees, but are not now or prospectively cull trees.

Accretion. The estimated net growth on growing-stock trees that were measured during the previous inventory (divided by the number of growing seasons between surveys to produce average annual accretion). It does not include the growth on trees that were cut during the period, nor those trees that died.

Basal-area class. A classification of forest land based on basal area (cross-sectional area of a tree stem at breast height in square feet per acre) of all live trees of all sizes.

Board foot. A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent. International 1/4 inch rule is used as the USDA Forest Service standard log rule in the eastern United States.

Board-foot stand-volume class. A classification of forest land based on net board-foot volume of sawtimber trees per acre.

Bog/marsh/swamp. Land that has less than 10.0 percent stocking with live trees and which characteristically supports low, generally herbaceous or shrubby vegetation, and which is intermittently covered with water during all seasons; includes tidal areas that are covered with brackish water during high tides.

Commercial species. Tree species currently or prospectively suitable for industrial wood products; excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac.

Condition. A classification of a land area based on land use, forest type, stand origin, and stand size (see definitions).

County and municipal lands. Lands owned by counties and local public agencies or municipalities or leased to them for 50 years or more.

Cropland. Land that currently supports agricultural crops including silage and feed grains, bare farm

fields resulting from cultivation or harvest, and maintained orchards.

Cubic-foot stand-volume class. A classification of forest land based on net cubic-foot volume of all live trees per acre.

Cull decrement. The net volume of rough or rotten trees in the previous inventory that are classified as growing-stock trees in current inventory (divided by the number of growing seasons between surveys to produce average annual cull decrement).

Cull tree. A rough tree or a rotten tree.

Cull increment. The net volume of growing-stock trees in the previous inventory that are classified as rough or rotten trees in the current inventory (divided by the number of growing seasons between surveys to produce average annual cull increment).

Diameter at breast height (d.b.h.). The diameter outside bark of a standing tree measured at 4-1/2 feet above the ground.

Dry ton. A unit of measure of dry weight equivalent to 2,000 pounds or 907.1848 kilograms.

Dry ton stand-volume class. A classification of forest land based on net dry weight of the aboveground components of all live trees per unit area; usually expressed in dry tons per acre.

Dry weight. The weight of wood and bark as it would be if it had been oven-dried; usually expressed in pounds or tons.

Farmer-owned lands. Lands owned by farm operators, whether part of the farmstead or not; excludes land leased by farm operators from nonfarm owners.

Federal lands. Lands (other than National Forests) administered by Federal agencies.

Forest industry lands. Lands owned by companies or individuals that operate primary wood-using plants.

Forest land. Land that is at least 10 percent stocked with trees of any size, or that formerly had such tree cover and is not currently developed for a nonforest use. The minimum area for classification of forest land is one acre. The components that

make up forest land are timberland and all noncommercial forest land (see definitions).

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

Forest-type group. A classification of forest land based on the species forming a plurality of live-tree stocking. A combination of forest types that share closely associated species or site requirements are combined into the following major forest-type groups (the descriptions apply to forests in this state):

a. White/red pine. Forests in which eastern white pine, red pine, or eastern hemlock, singly or in combination, make up the plurality of the stocking; common associates include red maple, oak, sugar maple, and aspen.

b. Spruce/fir. Forests in which red, white, black, or Norway spruces, balsam fir, northern white-cedar, tamarack, or planted larch, singly or in combination, make up a plurality of the stocking; common associates include white pine, red maple, yellow birch, and aspens.

c. Hard pine (also called loblolly/shortleaf pine). Forests in which eastern redcedar or pitch pine, singly or in combination, make up a plurality of the stocking; common associates include white pine, paper birch, sugar maple, and basswood.

d. Oak/pine. Forests in which hardwoods (usually hickory or upland oaks) make up a plurality of the stocking and in which pines or eastern redcedar contribute 25 to 50 percent of the stocking.

e. Oak/hickory. Forests in which upland oaks, hickory, yellow-poplar, black locust, sweetgum, or red maple (when associated with central hardwoods), singly or in combination, make up a plurality of the stocking and in which pines or eastern redcedar make up less than 25 percent of the stocking; common associates include white ash, sugar maple, and hemlock.

f. Oak/gum/cypress. Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, make up a plurality of the stocking and in which pines make up less than 25 percent of the stocking; common associates include

cottonwood, willow, ash, elm, hackberry, and maple.

g. Elm/ash/red maple (also called elm /ash / cottonwood). Forests in which elm, willow, cottonwood, or red maple (when growing on wet sites), singly or in combination, make up a plurality of the stocking; common associates include white ash, sugar maple, aspens, and oaks.

h. Northern hardwoods (also called maple/ beech/birch). Forests in which sugar maple, beech, yellow birch, black cherry, or red maple (when associated with northern hardwoods), singly or in combination, make up a plurality of the stocking; common associates include white ash, eastern hemlock, basswood, aspens, and red oak.

i. Aspen/birch. Forests in which aspen, paper birch, or gray birch, singly or in combination, make up a plurality of the stocking; common associates include red maple, white pine, red oaks, and white ash.

Gross growth. The sum of accretion and ingrowth.

Growing-stock trees. Live trees of commercial species classified as sawtimber, poletimber, saplings, or seedlings; that is, all live trees of commercial species except rough and rotten trees.

Growing-stock volume. Net volume, in cubic feet, of growing-stock trees 5.0 inches d.b.h. and larger from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. Net volume equals gross volume less deduction for cull.

Hard hardwoods. Hardwood species with an average specific gravity of greater than 0.50.

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Harvested cropland. All lands from which crops were harvested or hay was cut; all land in orchards, citrus groves, vineyards, and nursery and greenhouse products.

Idle farmland. Former cropland or pasture that has not been tended for within the last 2 years and has less than 10 percent stocking with live trees

(established seedlings or larger trees), regardless of species.

Improved/maintained pasture. Land that is currently used and maintained for grazing (not including grazed cropland).

Indian lands. (a) Lands held in trust by the United States or States for Indian tribes or individual Indians. (b) Lands owned in fee by Indian tribes whether subject to Federal or State restrictions against alienation or not.

Industrial and commercial land. Supply yards, parking lots, factories, etc.

Ingrowth. The estimated net volume of growing-stock trees that became 5.0 inches d.b.h. or larger during the period between inventories (divided by the number of growing seasons between surveys to produce average annual ingrowth). Also, the estimated net volume of growing-stock trees 5.0 inches d.b.h. and larger that are growing on land that was reclassified from noncommercial forest land or nonforest land to timberland.

International 1/4-inch rule. A log rule or formula for estimating the board-foot volume of logs. The mathematical formula is:

$$\text{Board-foot volume} = (0.22D^2 - 0.71D)(0.904762)$$

for 4-foot sections, where D=diameter inside bark at the small end of the log section. This rule is used as the USDA Forest Service standard log rule in the Eastern United States.

Land area. (a) Bureau of Census: The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 200 feet wide; and lakes, reservoirs, and ponds less than 4.5 acres in area. (b) Forest Inventory and Analysis: same as (a) except that the minimum width of streams, etc. is 120 feet, and the minimum size of lakes, etc. is 1 acre.

Land use. A classification of land that indicates the primary use at the time of inventory. Major categories are forest land and nonforest land (see definitions).

Merchantable stem. The main stem of the tree between a 1-foot stump height and a 4-inch top

diameter (outside the bark), including the wood and bark.

Mining and waste land. Surface mining, gravel pits, dumps.

Miscellaneous private lands. Privately owned lands other than forest industry and farmer-owned lands.

Mortality. The estimated net volume of growing-stock trees at the previous inventory that died from natural causes before the current inventory (divided by the number of growing seasons between surveys to produce average annual mortality).

National Forest lands. Federal lands legally designated as National Forests or purchase units and other lands administered as part of the National Forest System by the USDA Forest Service.

Net change. The difference between the current and previous inventory estimates of growing-stock volume (divided by the number of growing seasons between surveys to produce average annual net change). Components of net change are ingrowth plus accretion, minus mortality, minus cull increment, plus cull decrement, minus removals.

Net dry weight. The dry weight of woody material less the weight of all unsound (rotten) material.

Net growth. The change, resulting from natural causes, in growing-stock volume during the period between surveys (divided by the number of growing seasons to produce average annual net growth). Components of net growth are ingrowth plus accretion, minus mortality, minus cull increment, plus cull decrement.

Noncensus water. Streams/rivers between 120 feet and 200 feet in width, and bodies of water between 1 and 4.5 acres in size. The Bureau of the Census classifies such water as land.

Noncommercial forest land. Reserved productive forest land, Christmas tree plantations, other forest land, and other reserved forest land (see definitions).

Noncommercial species. Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land. Land that has never supported forests, or land formerly forested but now in nonforest use such as cropland, pasture, residential areas, marshes, swamps, highways, industrial or commercial sites, or noncensus water.

Nonsalvable dead tree. A dead tree with most or all of its bark missing that is at least 5.0 inches d.b.h. and is at least 4.5 feet tall.

Nonstocked area. A stand-size class of forest land that is less than 10 percent stocked with live trees.

Other cropland. Includes cropland used for cover crops and soil improvement (legumes).

Other farmland. All nonforest land on a farm excluding cropland, pasture, and idle farmland; includes farm lanes, stock pens, and farmsteads.

Other forest land. Forest land that is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions, because of adverse site conditions (formerly known as unproductive forest land).

Other reserved forest land. Forest land that is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions, because of adverse site conditions, and is protected through statute or administrative designation.

Ownership class. A classification of forest land based on ownership and nature of business or control of decisionmaking for the land. It encompasses all types of legal entities having ownership interest in the land, whether public or private.

Pasture land. Includes any pasture land other than cropland and woodland pasture. It can include lands that have had lime fertilizer or seed applied, or that had been improved by irrigation, drainage, or control of weeds and brush.

Pastured cropland. Includes rotation pasture and grazing land that would have been used for crops without additional improvement.

Pastured timberland. Land that is partially developed, maintained, or managed for pasture and grazing, but which continues to meet the definition of timberland.

Poletimber stand. A stand-size class of forest land that is at least 10 percent stocked with live trees of which half or more of such stocking is in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.

Poletimber tree. A live tree of commercial species meeting regional specifications of soundness and form and at least 5.0 inches in d.b.h., but smaller than a sawtimber tree.

Preferred tree. A high-quality tree, from a lumber viewpoint, that would be favored in cultural operations. General characteristics include grade 1 butt log (if sawtimber size), good form, good vigor, and freedom from serious damage.

Recreation site. Parks, campgrounds, playing fields, tracks, etc.

Relative stand density. A stocking classification procedure that reflects species, stage of development, and the characteristics of the trees present in a stand.

Removals. The net growing-stock volume harvested or killed in logging, cultural operations (such as timber stand improvement) or land clearing, and the net growing-stock volume neither harvested nor killed but growing on land that was reclassified from timberland to noncommercial forest land or nonforest land during the period between surveys. This volume is divided by the number of growing seasons to produce average annual removals.

Reserved productive forest land. Forest land sufficiently productive to qualify as timberland but withdrawn from timber utilization through statute or administrative designation; land exclusively used for Christmas tree production.

Rights-of-way. Highways, pipelines, powerlines, canals.

Rotten tree. A live tree of commercial species that does not contain at least one 12-foot sawlog or two noncontiguous sawlogs, each 8 feet or longer, now or prospectively, and does not meet regional specifications for freedom from defect primarily because of rot; that is, more than 50 percent of the cull volume in the tree is rotten.

Rough tree. (a) The same as a rotten tree except that a rough tree does not meet regional specifications for freedom from defect primarily because of roughness or poor form; also (b) a live tree of noncommercial species.

Salvable dead tree. A tree at least 5.0 inches d.b.h. that has died recently and still has intact bark; may be standing, fallen, windthrown, knocked down, or broken off.

Sampling error. A measure of the reliability of an estimate, expressed as a percentage of the estimate. The sampling errors given in this report correspond to one standard error and are calculated as the square root of the variance, divided by the estimate, and multiplied by 100. Indicated in statistical tables as "SE".

Sapling. All live trees 1.0 through 4.9 inches d.b.h.

Sapling/seedling stand. A stand-size class of forest land that is at least 10 percent stocked with live trees of which half or more of such stocking is in saplings or seedlings or both.

Sawlog. A log meeting regional standards of diameter, length, and freedom from defect, including a minimum 8-foot length and a minimum top diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods. (See specifications under Tree-Grade Classification.)

Sawlog portion. That part of the bole of a sawtimber tree between the stump and the sawlog top.

Sawlog top. The point on the bole of a sawtimber tree above which a sawlog cannot be produced. The minimum sawlog top is 7.0 inches diameter outside bark (d.o.b.) for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand. A stand-size class of forest land that is at least 10 percent stocked with live trees of which half or more of such stocking is in poletimber or sawtimber trees or both, and in which the stocking of sawtimber is at least equal to that of poletimber.

Sawtimber tree. A live tree of commercial species at least 9.0 inches d.b.h. for softwoods or 11.0 inches for hardwoods, containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

Sawtimber volume. Net volume in board feet, by the International 1/4-inch rule, of sawlogs in sawtimber trees. Net volume equals gross volume less deductions for rot, sweep, and other defects that affect use for lumber.

SE. See Sampling error.

Seedling. A live tree less than 1.0 inch d.b.h. and at least 1 foot tall.

Single-family house. House sheltering one family and immediately adjacent managed land.

Snag. Standing dead tree with most or all of its bark missing that is at least 5.0 inches d.b.h. and at least 4.5 feet tall (does not include salvable dead).

Soft hardwoods. Hardwood species with an average specific gravity of 0.50 or less.

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

Stand. A group of forest trees growing on forest land.

Stand origin. An indication of how the measured stand originated: 100 percent natural, 100 percent artificial, or a combination of both.

Stand-size class. A classification of forest land based on the size class (that is, seedlings, saplings, poletimber, or sawtimber) of the stocking of all live trees in the area.

Standard cord. A unit of measure for stacked bolts of wood, encompassing 128 cubic feet of wood, bark, and air space. Fuelwood cord estimates can be derived from cubic-foot estimates of growing stock by applying an average factor of 80 cubic feet of solid wood per cord. For pulpwood, a conversion of 85 cubic feet of solid wood per cord is used because pulpwood is more uniform.

State lands. Lands owned by the state or leased to the state for 50 years or more.

Stocking. The degree of occupancy of land by trees relative to the growth potential utilized by a site. It is expressed as a percent of the "normal" value presented in yield tables and stocking guides. Two categories of stocking are used in this report: all live trees and growing-stock trees. The

relationships between the classes and the percentage of the stocking standard are: nonstocked (0 to 9); poorly stocked (10 to 34); moderately stocked (35 to 59); fully stocked (60 to 100); and overstocked (greater than 100).

Strip mine. Area devoid of vegetation due to current or recent general excavation.

Stump. The main stem of a tree from ground level to 1 foot above ground level, including the wood and bark.

Timberland. Forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization (formerly known as commercial forest land).

Timber products. Roundwood (round timber) products and manufacturing plant by-products harvested from growing-stock trees on timberland; from other sources, such as cull trees, salvable dead trees, limbs, tops, and saplings; and from trees on noncommercial forest and nonforest lands.

Timber removals. The growing-stock or sawtimber volume of trees removed from the inventory for roundwood products, plus logging residues, volume destroyed during land clearing, and volume of standing trees on land that was reclassified from timberland to noncommercial forest land.

Top. The wood and bark of a tree above the merchantable height (or above the point on the stem 4.0 inches in diameter outside bark); generally includes the uppermost stem, branches, and twigs of the tree, but not the foliage.

Tract/multiple family housing. Multiple individual residential units or attached units (e.g., apartment buildings and condominiums) and immediately adjacent managed land.

Transportation right-of-way. Land associated with highways and railroads.

Tree class. A classification of the quality or condition of trees for sawlog production. Tree class for

sawtimber trees is based on their current condition. Tree class for poletimber trees is a prospective determination--a forecast of their potential quality when they reach sawtimber size (11.0 inches d.b.h. for hardwoods, 9.0 inches d.b.h. for softwoods).

Tree grade. A classification of sawtimber quality based on guidelines for tree grades for hardwoods, white pine, and southern pine. (Note: Red pine was graded using the guidelines for southern pine. All specifications are shown under Tree-Grade Classification.)

Trees. Woody plants that have well-developed stems and that usually are more than 12 feet tall at maturity.

Unproductive forest land. See Other forest land.

Upper-stem portion. That part of the main stem or fork of a sawtimber tree above the sawlog top to a diameter of 4.0 inches outside bark, or to the point where the main stem or fork breaks into limbs.

Urban timberland. Forest land sufficiently productive to qualify as timberland that is completely surrounded by or nearly surrounded by urban development (not parks), whether commercial, industrial, or residential.

Utility right-of-way. Land associated with pipeline or electric transmission lines; identified only if vegetative cover differs from adjacent land use.

Veneer log or bolt. A roundwood product from which veneer is sliced or sawn that usually meets certain minimum standards of diameter, length, and defect.

Volume suitable for pulpwood. The sound volume (only rotten cull excluded) of growing-stock and rough trees.

Windbreak/hedgerow. Linear areas, less than 120 feet in width, with predominantly tree and/or shrub vegetation.

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Tree Species of New Jersey (as encountered on field plots)

Scientific name ***	Common name(s)	Occurrence**
Softwoods		
<i>Chamaecyparis thyoides</i> (L.) B.S.P	Atlantic white-cedar	c
<i>Juniperus virginiana</i> L.	eastern redcedar	c
<i>Picea abies</i> (L.) Karst.	Norway spruce	r
<i>Picea rubens</i> Sarg.	red spruce	vr
<i>Pinus echinata</i> Mill.	shortleaf pine	r
<i>Pinus rigida</i> Mill.	pitch pine	vc
<i>Pinus strobus</i> L.	eastern white pine	r
<i>Pinus sylvestris</i> L.	Scotch pine	vr
<i>Pinus virginiana</i> Mill.	Virginia pine	c
<i>Tsuga canadensis</i> (L.) Carr.	eastern hemlock	r
Hardwoods		
<i>Acer negundo</i> L.*	boxelder	r
<i>Acer pensylvanicum</i> L. *	striped maple	vr
<i>Acer rubrum</i> L.	red maple	vc
<i>Acer saccharinum</i> L.	silver maple	r
<i>Acer saccharum</i> Marsh.	sugar maple	c
<i>Acer spicatum</i> Lam.*	mountain maple	vr
<i>Acer platanoides</i> L.	Norway maple	r
<i>Ailanthus altissima</i> (Mill.) Swingle*	ailanthus	r
<i>Amelanchier</i> sp. Medic.*	serviceberry	r
<i>Betula alleghaniensis</i> Britton	yellow birch	r
<i>Betula lenta</i> L.	sweet birch	c
<i>Betula nigra</i> L.	river birch	r
<i>Betula papyrifera</i> Marsh.	paper birch	vr
<i>Betula populifolia</i> Marsh.*	gray birch	r
<i>Carpinus caroliniana</i> Walt.	American hornbeam	r
<i>Carya cordiformis</i> (Wangenh.) K. Koch	bitternut hickory	r
<i>Carya glabra</i> (Mill.) Sweet	pignut hickory	c
<i>Carya ovata</i> (Mill.) K. Koch	shagbark hickory	r
<i>Carya tomentosa</i> (Poir.) Nutt.	mockernut hickory	r
<i>Castanea dentata</i> (Marsh.) Borkh.	American chestnut	vr
<i>Catalpa</i> sp. Scop.*	catalpa	vr
<i>Celtis occidentalis</i> L.	hackberry	vr
<i>Cornus florida</i> L.*	flowering dogwood	r
<i>Diospyros virginiana</i> L.	common persimmon	vr
<i>Fagus grandifolia</i> Ehrh.	American beech	c
<i>Fraxinus americana</i> L.	white ash	c
<i>Fraxinus nigra</i> Marsh.	black ash	vr
<i>Fraxinus pennsylvanica</i> Marsh.	green ash	r
<i>Ilex opaca</i> Ait.	American holly	c
<i>Juglans nigra</i> L.	black walnut	r
<i>Liquidambar styraciflua</i> L.	sweetgum	c
<i>Liriodendron tulipifera</i> L.	yellow-poplar	c
<i>Maclura pomifera</i> (Raf.) Schneid.*	Osage-orange	vr
<i>Magnolia</i> sp. L.	magnolia	vr
<i>Magnolia acuminata</i> L.	cucumbertree	vr
<i>Magnolia virginiana</i> L.	sweetbay	vr
<i>Malus</i> sp. Mill.*	apple	r
<i>Morus</i> sp. L.*	mulberry	r
<i>Nyssa sylvatica</i> Marsh.	blackgum	c

Continued

Tree Species of New Jersey (continued)

Scientific name ***	Common name(s)	Occurrence**
<i>Ostrya virginiana</i> (Mill.) K. Koch*	eastern hophornbeam	r
<i>Oxydendrum arboreum</i> (L.) DC.*	sourwood	vr
<i>Paulownia tomentosa</i> (Thunb.) Sieb. & Zucc.	Paulownia	vr
<i>Platanus occidentalis</i> L.	sycamore	r
<i>Populus deltoides</i> Bartr. ex Marsh.	eastern cottonwood	vr
<i>Populus grandidentata</i> Michx.	bigtooth aspen	r
<i>Populus tremuloides</i> Michx.	quaking aspen	r
<i>Prunus</i> sp. L.*	cherry, plum	vr
<i>Prunus pensylvanica</i> L. f. *	pin cherry	r
<i>Prunus serotina</i> Ehrh.	black cherry	c
<i>Prunus virginiana</i> L. *	chokecherry	vr
<i>Quercus alba</i> L.	white oak	vc
<i>Quercus bicolor</i> Willd.	swamp white oak	r
<i>Quercus coccinea</i> Muenchh.	scarlet oak	c
<i>Quercus falcata</i> var. <i>falcata</i> Michx.	southern red oak	r
<i>Quercus macrocarpa</i> Michx.	bur oak	vr
<i>Quercus marilandica</i> Muenchh.*	blackjack oak	vr
<i>Quercus palustris</i> Muenchh.	pin oak	r
<i>Quercus phellos</i> L.	willow oak	vr
<i>Quercus prinus</i> L.	chestnut oak	c
<i>Quercus rubra</i> L.	northern red oak	c
<i>Quercus stellata</i> Wangenh.	post oak	r
<i>Quercus velutina</i> Lam.	black oak	c
<i>Robinia pseudoacacia</i> L.	black locust	r
<i>Salix</i> sp. L. *	willow	vr
<i>Salix nigra</i> Marsh.	black willow	r
<i>Sassafras albidum</i> (Nutt.) Nees.*	sassafras	c
<i>Tilia americana</i> L.	American basswood	r
<i>Ulmus americana</i> L.	American elm	r
<i>Ulmus rubra</i> Muhl	slippery elm	r

*** Names according to: Little, Elbert L., Jr. 1979. Checklist of United States Trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S Department of Agriculture. 375 p.

** Occurrence is based on the proportion of the species among all live trees 5.0 inches d.b.h. or larger encountered on forest survey field plots: vr = very rare (<0.05%), r = rare (0.05 to 0.49%), c = common (0.5 to 4.9%), and vc = very common (>5.0%).

* Noncommercial species.

Species Groups of New Jersey

Species group	Scientific name	Common name
Atlantic white-cedar	<i>Chamaecyparis thyoides</i>	Atlantic white-cedar
Shortleaf pine	<i>Pinus echinata</i>	shortleaf pine
Pitch pine	<i>Pinus rigida</i>	pitch pine
Virginia pine	<i>Pinus virginiana</i>	Virginia pine
Other pine	<i>Pinus strobus</i> <i>Pinus sylvestris</i>	eastern white pine Scotch pine
Other softwoods	<i>Juniperus virginiana</i> <i>Picea abies</i> <i>Picea rubens</i> <i>Thuja occidentalis</i> <i>Tsuga canadensis</i>	eastern redcedar Norway spruce red spruce northern white-cedar eastern hemlock
Sugar maple	<i>Acer saccharum</i>	sugar maple
Red maple	<i>Acer rubrum</i> <i>Acer saccharinum</i>	red maple silver maple
Hickory	<i>Caraya sp.</i> <i>Carya cordiformis</i> <i>Carya glabra</i> <i>Carya ovata</i> <i>Carya tomentosa</i>	hickory bitternut hickory pignut hickory shagbark hickory mockernut hickory
Beech	<i>Fagus grandifolia</i>	American beech
Ash	<i>Fraxinus sp.</i> <i>Fraxinus americana</i> <i>Fraxinus nigra</i> <i>Fraxinus pennsylvanica</i>	ash white ash black ash green ash
Sweetgum	<i>Liquidambar styraciflua</i>	sweetgum
Yellow-poplar	<i>Liriodendron tulipifera</i>	yellow-poplar
Blackgum	<i>Nyssa sylvatica</i>	blackgum
Black cherry	<i>Prunus serotina</i>	black cherry
Select white oaks	<i>Quercus alba</i> <i>Quercus bicolor</i> <i>Quercus macrocarpa</i>	white oak swamp white oak bur oak
Select red oaks	<i>Quercus rubra</i> <i>Quercus shumardi</i>	northern red oak Shumard oak
Other red oaks	<i>Quercus coccinea</i> <i>Quercus falcata</i> var. <i>falcata</i> <i>Quercus palustris</i> <i>Quercus phellos</i> <i>Quercus velutina</i>	scarlet oak southern red oak pin oak willow oak black oak

Continued

Species Groups of New Jersey (continued)

Species group	Scientific name	Common name
Other white oaks	<i>Quercus</i> sp.	oak
	<i>Quercus prinus</i>	chestnut oak
	<i>Quercus stellata</i>	post oak
Other hardwoods	<i>Acer negundo</i>	boxelder
	<i>Acer pensylvanicum</i>	striped maple
	<i>Acer spicatum</i>	mountain maple
	<i>Acer platanoides</i>	Norway maple
	<i>Ailanthus altissima</i>	ailanthus
	<i>Amelanchier</i> sp.	serviceberry
	<i>Betula alleghaniensis</i>	yellow birch
	<i>Betula lenta</i>	sweet birch
	<i>Betula nigra</i>	river birch
	<i>Betula papyrifera</i>	paper birch
	<i>Betula populifolia</i>	gray birch
	<i>Carpinus caroliniana</i>	American hornbeam
	<i>Castanea dentate</i>	American chestnut
	<i>Catalpa</i> sp.	catalpa
	<i>Celtis occidentalis</i>	hackberry
	<i>Cornus florida</i>	flowering dogwood
	<i>Crataegus</i> sp.	Hawthorn
	<i>Diospyros virginiana</i>	common persimmon
	<i>Ilex opaca</i>	American holly
	<i>Juglans cinerea</i>	butternut
	<i>Juglans nigra</i>	black walnut
	<i>Maclura pomifera</i>	Osage-orange
	<i>Magnolia</i> sp.	magnolia
	<i>Magnolia acuminata</i>	cucumbertree
	<i>Magnolia virginiana</i>	sweetbay
	<i>Malus</i> sp.	apple
	<i>Morus</i> sp.	mulberry
	<i>Ostrya virginiana</i>	eastern hophornbeam
	<i>Oxydendron arboreum</i>	sourwood
	<i>Paulownia tomentosa</i>	Paulownia
	<i>Platanus deltoides</i>	sycamore
	<i>Populus deltoides</i>	eastern cottonwood
	<i>Populus grandidentata</i>	bigtooth aspen
	<i>Populus tremuloides</i>	quaking aspen
	<i>Prunus pensylvanica</i>	pin cherry
	<i>Prunus</i> sp.	cherry
	<i>Prunus virginiana</i>	chokecherry
	<i>Quercus ilicifolia</i>	bear oak
	<i>Quercus marilandica</i>	blackjack oak
	<i>Robinia pseudoacacia</i>	black locust
	<i>Salix</i> sp.	willow
	<i>Salix nigra</i>	black willow
	<i>Sassafras albidum</i>	sassafras
	<i>Tilia americana</i>	American basswood
	<i>Ulmus americana</i>	American elm
	<i>Ulmus rubra</i>	slippery elm
		unknown or not listed tree

Tree-Grade Classification

HARDWOOD TREE GRADES

GRADING FACTOR	TREE GRADE 1	TREE GRADE 2	TREE GRADE 3
Length of grading zone (feet)	Butt 16	Butt 16	Butt 16
Length of grading section ^a (feet)	Best 12	Best 12	Best 12
Minimum DBH (inches)	16 ^b	13	11
Minimum diameter inside bark at top of grading section (inches)	13 ^b 16 20	11 ^c 12	8
Clear cuttings on 3rd best face ^d			
minimum length (feet)	7 5 3	3 3	2
number on face (maximum)	2	2 3	unlimited
yield in face length (minimum)	5/6	4/6	3/6
Cull deduction, including crook and sweep but excluding shake, maximum within grading section (%)	9	9 ^e	50

^a Whenever a 14- or 16-foot section of the butt 16-foot log is better than the best 12-foot section, the grade of the longer section will become the grade of the tree. This longer section, when used, is the basis for determining the grading factors, such as diameter and cull deduction.

^b In basswood and ash, diameter inside bark at the top of the grading section may be 12 inches and DBH may be 15 inches.

^c Grade 2 trees can be 10 inches diameter inside bark at the top of the grading section if otherwise meeting surface requirements for small grade 1's.

^d A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth of the surface of the grading section as divided lengthwise.

^e Fifteen percent crook and sweep, or 40 percent total cull deduction are permitted in grade 2 if size and surface of grading section qualify as grade 1. If rot shortens the required clear cuttings to the extent of dropping the butt log to grade 2, do not drop the tree's grade to 3 unless the cull deduction for rot is greater than 40 percent.

TIE AND TIMBER GRADE

GRADE FACTORS	SPECIFICATIONS
Position in tree	Butts and uppers
Scaling Diameter (inches)	8 inches d.i.b. and larger
Length, without trim (feet)	12 feet and larger
Clear cuttings	no requirements: not graded on cutting basis
Maximum sweep allowance	One-fourth d.i.b. of small end for half logs, and one-half d.i.b. for logs sixteen feet long
Sound surface defects permitted Single knots	Any number, if none has an average collar ^a diameter that is more than one third of the log diameter at the point of occurrence
Sound surface defects permitted Whorled knots	Any number, provided the sum of the collar diameters does not exceed one third the log diameter at the point of occurrence
Sound surface defects permitted Knots	Any number not exceeding knot specifications, if they do not extend more than 3 inches into the contained tie or timber
Unsound surface defects permitted ^b	Any number and size if they do not extend into contained tie or timber. If they extend into the contained tie or timber, they shall not exceed size, number, and depth of limits for sound defects.

^a Knot collar is the average of the vertical and horizontal diameters of the limb, or knot swelling, as measured flush with the surface of the log.

^b Interior defects are not visible in standing trees. They are considered in grading cut logs. No interior defects are permitted except one shake not more than one-third the width of the contained tie or timber, and one split not more than 5 inches long.

EASTERN WHITE PINE TREE GRADE SPECIFICATIONS

GRADING FACTOR	TREE GRADE 1	TREE GRADE 2	TREE GRADE 3	TREE GRADE 4
(1) Minimum DBH (inches)	9	9	9	9
(2) Maximum weevil injury in butt 16 ft section (number)	None	None	2 injuries	No limit
(3) Minimum face requirements on butt 16 ft section	Two full length or four 50% length good faces ¹ (In addition, knots on balance of faces shall not exceed size limitations for grade 2 sections)	NO GOOD FACES REQUIRED. Maximum diameter of knots on three best faces: SOUND RED KNOTS not to exceed 1/6 of scaling dia. or 3 inch maximum ² DEAD OR BLACK KNOTS , including overgrown knots, not to exceed 1/12 scaling dia. and 1-1/2 inch max.	NO GOOD FACES REQUIRED. Maximum diameter of knots on three best faces: SOUND RED KNOTS not to exceed 1/3 of scaling diameter or 5 inch maximum ² DEAD OR BLACK KNOTS , including overgrown knots, not to exceed 1/6 scaling dia. and 2-1/2 inch max.	Includes all trees not qualifying for grade 3 or better and judged to have at least 1/3 of their gross volume in sound wood suitable for manufacture into standard lumber
(4) Maximum sweep or crook in butt 16 ft section (percent)	20	30	40	No limit
(5) Maximum total scaling deduction in butt 16 ft. section (percent)	50	50	50	No limit

After the tentative grade of the section is established from face examination, the section will be reduced one grade whenever the following defects are evident:

CONKS, PUNK KNOTS, AND PINE BORER DAMAGE ON THE SURFACE OF THE SECTION³ Degrade one grade if present on one face. Degrade two grades if present on two faces. Degrade three grades if present on three or four faces.

(7) If the final grade of the grading section is 1, 2, or 3, examine the tree for weevil injuries in the merchantable stem *above* 16 ft. If the total apparent weevil injuries exceed three, degrade the tree one grade below the section grade³. Otherwise the tree grade equals the final section grade.

¹ Trees under 16 inches DBH require four full length good faces.

² Scaling diameter is estimated at the top of the 16-foot grading section.

³ No tree will be designated below Grade 4 unless net tree scale is less than one-third of gross tree scale.

SOUTHERN PINE TREE GRADES

Grade 1 - trees with 3 or 4 clear faces on the 16-foot grading section.

Grade 2 - trees with 1 or 2 clear faces on the 16-foot grading section.

Grade 3 - trees with no clear faces on the 16-foot grading section.

After the tentative grade is established, the tree will be reduced one grade for each of the following:

(1) **Sweep.** Degrade any tentative Grade 1 or 2 tree one grade if sweep in the lower 12 feet of the grading section amounts to 3 or more inches and equals or exceeds one-fourth the diameter at breast height.

(2) **Heart rot.** Degrade any tentative Grade 1 or 2 tree one grade if conks, punk knots, or other evidence of advanced heart rot is found anywhere on the tree stem.

NOTE: No tree can be degraded below Grade 3, provided the total scaling deductions for sweep and/or rot do not exceed two-thirds the gross scale of the tree. Trees with total scaling deductions in excess of two-thirds are classified as cull.

A face is one-fourth the circumference of the 16-foot grading section and extends the full length of the grading section. Clear faces are those free from knots measuring more than 1/2 inch in diameter, overgrown knots of any size, and holes more than 1/4 inch in diameter. Faces may be rotated, if necessary, to obtain the maximum number of clear faces on the grading section.

One-log trees are graded by using the Southern Pine Log Grades. This is recommended because the entire merchantable volume of the tree is contained in the graded section. The log grading system gives a more accurate prediction of the lumber grade-yields for such trees than would the tree grading system.

SPRUCE, FIR, CEDAR, TAMARACK, AND HEMLOCK LOGS

Minimum Merchantability Specifications for Grade One Logs				
D.I.B. ¹	LENGTH ²	TOTAL DEDUCTION	SWEEP PERMITTED	OTHER REQUIREMENTS
6" - 12"	12' - 16' in 2 foot multiples	50 %	25 %	Sound knots not over 2" in diameter permitted. Shake permitted up to 20 % of gross scale if not combined with other serious defect.
13"+	12' - 16' in 2 foot multiples	50 %	25 %	Sound knots not over 3" in diameter permitted. Shake permitted up to 20 % of gross scale if not combined with other serious defect.

¹ ...at small end of log.

² ...without trim.

TREE GRADE 5 (ALL SPECIES)

Any tree which does not make tree grade 1,2, or 3 (or 4) but is still a merchantable tree.

Metric Equivalents

1 acre = 4,046.86 square meters
 1 acre = 0.404686 hectares
 1,000 acres = 404.686 hectares
 1,000,000 acres = 404,686 hectares
 1 board foot = 0.00348 cubic meters
 1 board foot = 3,480 cubic centimeters
 1,000 board feet = 3.48 cubic meters
 1,000,000 board feet = 3,480 cubic meters
 1 cubic foot = 0.028317 cubic meters
 1,000 cubic feet = 28.317 cubic meters
 1,000,000 cubic feet = 28,317 cubic meters
 1 cord (wood, bark, and air space) = 3.6246 cubic meters
 1 cord (solid wood, pulpwood) = 2.4069 cubic meters
 1 cord (solid wood, other than pulpwood) = 2.2654 cubic meters
 1,000 cords (pulpwood) = 2,406.9 cubic meters
 1,000 cords (other products) = 2,265.4 cubic meters
 1 inch = 2.54 centimeters or 0.0254 meters
 1 foot = 30.48 centimeters or 0.3048 meters
 1 mile = 1.609 kilometers
 1 square foot = 929.03 square centimeters
 1 square foot = 0.0929 square meters
 1 square foot per acre basal area = 0.229568 square meters per hectare
 1 cubic foot per acre = 0.0699 cubic meters per hectare
 1 ton = 907.1848 kilograms
 1,000 tons = 907.1848 metric tons
 Breast height = 1.4 meters above ground level

Although 1,000 board feet are theoretically equivalent to 2.36 cubic meters, this is true only when a board foot is actually a piece of wood with a volume 1/12 of a cubic foot. The International 1/4-inch log rule is used by the USDA Forest Service in the East to estimate the product potential in board feet. The reliability of the estimate obtained by conversion will vary with the size of the log measure. The conversion given here, 3.48 cubic meters, is based on the cubic volume of a log 16 feet long and 15 inches in diameter inside bark (d.i.b.) at the small end. This conversion could be used for average comparisons when accuracy of 10 percent is acceptable. Because the board foot unit is not a true measure of wood volume and because products other than dimension lumber are becoming important, this unit may eventually be phased out and replaced by the cubic meter.

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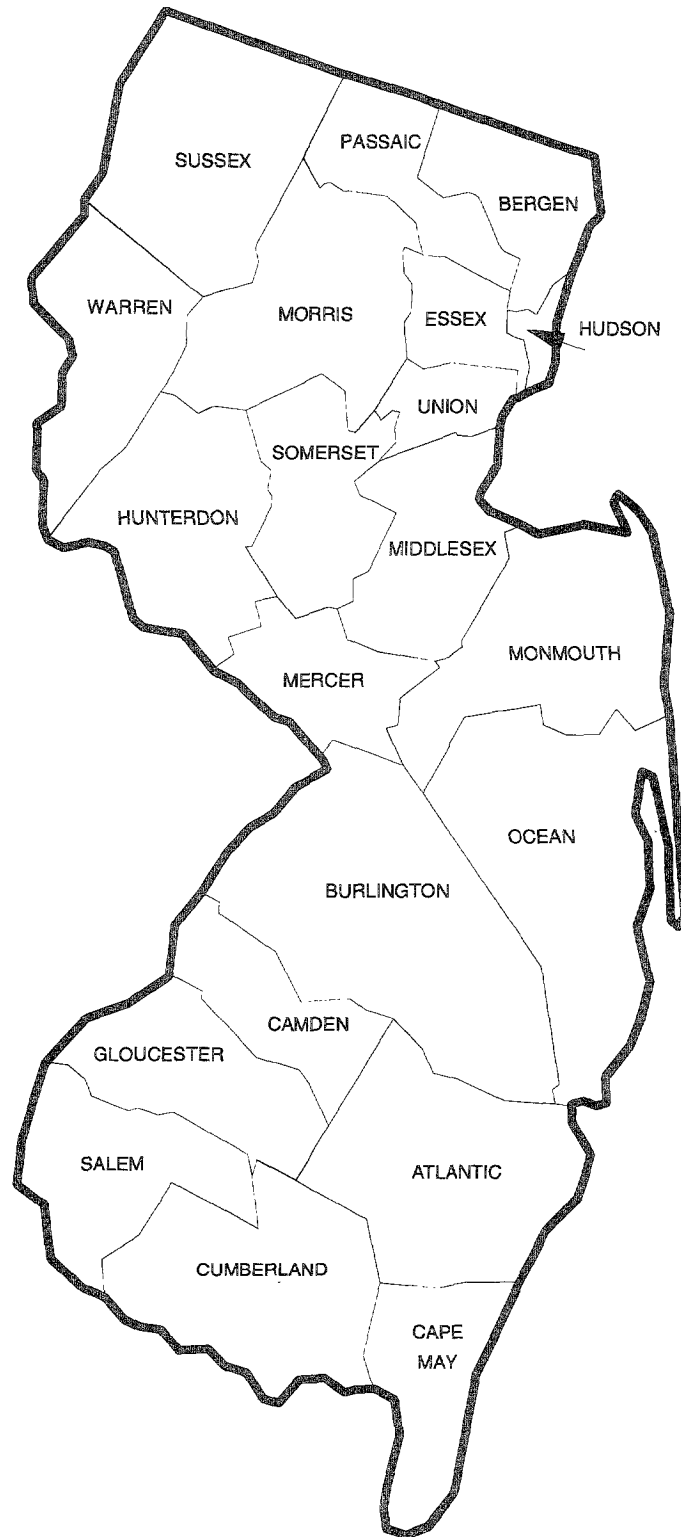


Table 1. Land area by land class, New Jersey, 1987 and 1999^a

(In thousands of acres)				
Land class	1999		1987	
	Area	Percent	Area	Percent
Timberland:				
Rural	1,732.9	36.5	1,834.6	38.9
Urban	143.2	3.0	39.2	.8
Total timberland	1,876.1	39.5	1,873.8	39.5
Forested land:				
Productive reserved	160.0	3.4	114.5	2.4
Other forest land ^c	96.1	2.0	0	0
Total forest land	2,132.2	44.9	1,988.3	41.9
Nonforest land:				
Cropland	616.3	13.0	657.9	13.9
Pasture	68.4	1.4	63.0	1.3
Other	1,899.3	40.0	1,985.4	41.8
Noncensus water	31.9	.7	53.4	1.1
Total nonforest land	2,615.9	55.1	2,759.7	58.1
Total land area ^d	4,748.1 ^b	100.0	4,748.1 ^b	100.0

^a In this and other tables, a zero indicates that the data are negligible or the condition was not encountered in the sample. A dash indicates that the condition is not possible under current Forest Service definitions.

^b Rows and columns in all tables may not sum due to rounding.

^c "Other forest land" formerly known as unproductive forest land.

^d Source: 1990 United States Department of Commerce, Bureau of Census.

Table 2. Area of timberland by forest type, forest-type group, and stand-size class, New Jersey, 1987

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Shortleaf pine	6.1	.0	.0	.0	6.1	100.0
Virginia pine	.0	.0	6.1	.0	6.1	100.0
Eastern redcedar	.0	14.8	22.2	.0	37.0	39.1
Pitch pine	70.1	132.7	119.8	.0	322.6	10.9
Loblolly/shortleaf group	76.2	147.5	148.1	.0	371.8	10.0
Eastern redcedar/hardwood	7.6	.0	34.9	.0	42.5	72.0
Shortleaf pine/oak	.0	.0	8.0	.0	8.0	100.0
Virginia pine/oak	.0	.0	7.3	.0	7.3	100.0
Other oak/pine	29.8	71.9	33.2	.0	134.8	21.0
Oak/pine group	37.3	71.9	83.4	.0	192.6	22.4
Post, black, or bear oak	6.3	63.0	31.7	.0	101.0	35.9
Chestnut oak	29.5	15.4	.0	.0	44.9	41.1
White oak/red oak/hickory	35.8	26.2	.0	.0	62.0	35.7
White oak	32.3	67.0	24.8	.0	124.1	23.7
Northern red oak	15.6	6.2	.0	.0	21.8	58.1
Sweetgum/yellow-poplar	7.4	20.0	.0	.0	27.3	47.8
Black walnut	8.0	.0	.0	.0	8.0	100.0
Yellow-poplar	4.8	.0	.0	.0	4.8	100.0
Scarlet oak	6.6	18.5	15.3	.0	40.4	40.3
Sassafras/persimmon	.0	.0	39.6	.0	39.6	8.6
Red maple/central hardwood	.0	8.2	20.8	.0	29.0	50.5
Mixed central hardwoods	233.7	122.6	38.5	.0	394.9	12.3
Oak/hickory group	380.0	347.2	170.7	.0	898.0	7.3
Sweetgm/nuttall oak/willow oak	6.1	.0	.0	.0	6.1	100.0
Atlantic white cedar	6.5	25.8	7.8	.0	40.0	39.2
Sweetbay/swamp tupelo/red mple	26.9	18.0	.0	.0	44.9	34.0
Oak/gum/cypress group	39.5	43.8	7.8	.0	91.1	25.0
Black ash/Amer. elm/red maple	8.9	20.2	.0	.0	29.1	50.5
Red maple(lowland)	20.0	18.3	10.1	7.5	55.9	36.0
Red maple(upland)	.0	6.9	.0	.0	6.9	100.0
River birch/sycamore	7.4	.0	.0	.0	7.4	100.0
Elm/ash/red maple group	36.3	45.4	10.1	7.5	99.2	26.8
Sugar maple/beech/yellow birch	34.5	7.6	.0	.0	42.1	41.0
Black Cherry	.0	.0	6.9	.0	6.9	100.0
Red maple/northern hardwoods	18.3	26.9	.0	.0	45.3	47.0
Mixed northern hardwoods	58.5	36.8	16.3	.0	111.5	27.2
Northern hardwoods group	111.3	71.3	23.1	.0	205.7	17.6
Aspen	.0	7.7	.0	.0	7.7	100.0
Gray birch	7.7	.0	.0	.0	7.7	100.0
Aspen/birch group	7.7	7.7	.0	.0	15.3	70.7
All forest types	688.3	734.8	443.3	7.5	1,873.8	3.1
SE	8.0	8.9	11.8	100.0	3.1	

Table 3. Area of timberland by forest type, forest-type group, and stand-size class, New Jersey, 1999

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Norway spruce	.0	.0	.0	.0	.0	100.0
Spruce/fir group	.0	.0	.0	.0	.0	100.0
Shortleaf pine	6.1	.0	3.0	.0	9.1	74.6
Virginia pine	9.6	.0	.5	.0	10.0	63.0
Eastern redcedar	6.0	13.5	39.2	8.7	67.3	26.8
Pitch pine	99.8	198.5	30.2	.0	328.5	11.2
Loblolly/shortleaf group	121.5	212.0	72.9	8.7	415.0	9.8
Eastern redcedar/hardwood	10.0	6.0	.0	.0	16.0	58.5
Other oak/pine	51.5	119.1	21.0	.0	191.6	15.1
Oak/pine group	61.5	125.0	21.0	.0	207.6	14.6
Post, black, or bear oak	12.8	10.6	10.9	.0	34.3	38.3
Chestnut oak	19.4	3.7	.0	.0	23.1	46.6
White oak/red oak/hickory	44.0	6.1	.0	.0	50.1	29.9
White oak	20.9	32.8	.0	.0	53.7	31.4
Northern red oak	22.6	.0	.0	.0	22.6	41.6
Y-poplar/wh. oak/no.red oak	7.3	.0	.0	.0	7.3	81.8
Black locust	.0	.0	6.4	.0	6.4	72.0
Sweetgum/yellow-poplar	19.9	8.3	12.5	.0	40.7	29.6
Black walnut	.0	2.5	.0	.0	2.5	70.7
Yellow-poplar	5.6	.0	7.2	.0	12.8	57.8
Hawthorn/reverting field	.0	.3	2.6	6.0	8.9	46.4
Scarlet oak	15.8	46.5	.0	.0	62.3	29.3
Sassafras/persimmon	4.6	.0	5.5	.0	10.0	71.0
Red maple/central hardwood	26.2	5.9	1.5	.0	33.6	38.6
Mixed central hardwoods	325.4	110.7	38.3	4.5	478.9	9.6
Oak/hickory group	524.4	227.4	84.9	10.5	847.3	6.3
Atlantic white cedar	11.4	19.1	1.5	.0	32.0	38.4
Sweetbay/swamp tupelo/red mple	15.1	13.8	3.6	.0	32.5	38.6
Oak/gum/cypress group	26.5	32.9	5.2	.0	64.5	26.2
Black ash/Amer. elm/red maple	26.2	19.8	.0	.0	46.0	33.1
Red maple(lowland)	24.8	20.9	10.4	.0	56.2	30.1
Red maple(upland)	11.9	7.6	6.0	1.4	26.9	37.8
River birch/sycamore	10.6	.0	.0	.0	10.6	69.5
Willow	8.2	3.2	.0	.0	11.4	58.2
American elm/green ash	.0	1.5	.0	.0	1.5	100.0
Elm/ash/red maple group	81.8	53.0	16.4	1.4	152.6	17.2
Sugar maple/beech/yellow birch	34.2	.0	.0	.0	34.2	38.5
Black Cherry	.0	.0	10.3	.0	10.3	64.8
Red maple/northern hardwoods	14.0	10.7	1.5	.0	26.2	42.0
Pin cherry/reverting field	4.9	.0	.2	.0	5.1	96.1
Mixed northern hardwoods	66.1	34.1	11.6	.0	111.8	20.8
Northern hardwoods group	119.1	44.8	23.6	.0	187.5	15.2
Aspen	.0	1.6	.0	.0	1.6	100.0
Aspen/birch group	.0	1.6	.0	.0	1.6	100.0
All forest types	934.9	696.7	223.9	20.6	1,876.1	3.0
SE	5.5	7.0	14.5	41.4	3.0	

Table 4. Area of timberland by forest-type group and ownership class, New Jersey, 1999

(In thousands of acres)						
Forest-type group	Ownership class				All classes	SE
	National Forest	Other public	Forest industry	Other private		
Spruce/fir	.0	.0	.0	.0	.0	100.0
Loblolly/shortleaf	.0	229.5	.0	185.5	415.0	9.8
Oak/pine	.0	43.3	.0	164.3	207.6	14.6
Oak/hickory	.0	211.3	.0	635.9	847.3	6.3
Oak/gum/cypress	.0	27.9	.0	36.6	64.5	26.2
Elm/ash/red maple	.0	22.0	.0	130.6	152.6	17.2
Northern hardwoods	.0	53.8	.0	133.7	187.5	15.2
Aspen/birch	.0	.0	.0	1.6	1.6	100.0
Total, all groups	.0	587.9	.0	1,288.2	1,876.1	3.0
SE	.0	8.3	.0	4.5	3.0	

Table 5. Area of timberland by ownership and stand-size classes, New Jersey, 1999

(In thousands of acres)						
Ownership class	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Other federal	18.4	22.5	11.8	1.5	54.2	31.0
State	138.7	119.4	20.6	1.4	280.1	12.9
County and municipal	37.7	9.4	11.7	.0	58.7	29.8
State Forest	70.7	104.1	20.0	.0	194.9	15.7
Total public	265.6	255.3	64.0	2.9	587.9	8.3
Farmer	9.4	28.0	.0	4.5	41.9	34.0
Misc. : corporate	171.4	136.1	50.9	4.5	362.9	11.3
: individual	411.3	239.7	90.0	8.7	749.7	7.0
: other	77.1	37.7	18.9	.0	133.7	19.6
Total private	669.3	441.4	159.9	17.7	1,288.2	4.5
Total, all ownerships	934.9	696.7	223.9	20.6	1,876.1	3.0
SE	5.5	7.0	14.5	41.4	3.0	

Table 6. Area of timberland by forest-type group and cubic-foot stand-volume class, New Jersey, 1999

(In thousands of acres)

Forest-type group	Stand-volume class (cubic feet per acre)						All classes	SE
	0-499	500-999	1000-1499	1500-1999	2000-2499	2500+		
Spruce/fir	.0	.0	.0	.0	.0	.0	.0	100.0
Loblolly/shortleaf	131.3	135.5	83.9	49.9	14.4	.0	415.0	9.8
Oak/pine	25.7	93.5	57.0	22.4	4.1	4.8	207.6	14.6
Oak/hickory	117.8	150.8	119.5	155.1	78.7	225.4	847.3	6.3
Oak/gum/cypress	8.1	9.3	12.1	4.5	10.0	20.4	64.5	26.2
Elm/ash/red maple	34.4	22.3	26.5	18.6	23.3	27.6	152.6	17.2
Northern hardwoods	30.8	20.5	20.4	26.3	40.7	48.9	187.5	15.2
Aspen/birch	.0	.0	1.6	.0	.0	.0	1.6	100.0
Total, all groups	348.1	431.8	321.0	276.9	171.2	327.0	1,876.1	3.0
SE	11.2	9.7	11.8	12.9	16.4	11.4	3.0	

Table 7. Area of timberland by forest-type group and board-foot stand-volume class, New Jersey, 1999

(In thousands of acres)

Forest-type group	Stand-volume class (board feet per acre)						All classes	SE
	0-1999	2000-3999	4000-5999	6000-7999	8000-9999	10000+		
Spruce/fir	.0	.0	.0	.0	.0	.0	.0	100.0
Loblolly/shortleaf	266.3	104.6	28.9	15.3	.0	.0	415.0	9.8
Oak/pine	130.0	47.7	20.9	4.1	.8	4.0	207.6	14.6
Oak/hickory	286.1	103.4	116.4	76.9	100.0	164.4	847.3	6.3
Oak/gum/cypress	23.3	9.2	16.3	4.3	.0	11.4	64.5	26.2
Elm/ash/red maple	61.5	25.1	28.6	9.0	10.7	17.6	152.6	17.2
Northern hardwoods	58.7	27.9	28.2	20.9	18.4	33.4	187.5	15.2
Aspen/birch	1.6	.0	.0	.0	.0	.0	1.6	100.0
Total, all groups	827.4	317.9	239.4	130.5	130.0	230.8	1,876.1	3.0
SE	6.4	12.1	14.4	19.2	19.2	14.0	3.0	