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Annual Inventory Report for Pennsylvania's Forests: Results from the First Two Years

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Abstract

In 2000, the USDA Forest Service's Forest Inventory and Analysis (FIA) program implemented a new system for inventory and monitoring Pennsylvania's forest resources. The most salient feature of the new inventory process will be a nearly threefold improvement in timeliness. This report summarizes the results of the first 2 years of annual inventory measurements. The area of forest land in Pennsylvania has remained stable since a previous inventory in 1989. The Keystone State's forests continue to mature as larger trees and an increase in inventory volume were recorded. A separate study of tree seedlings revealed a general lack of regeneration in one-third to one-half of stands in which regeneration should be adequate.

The Authors

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Executive Summary

In 2000, the USDA Forest Service's Forest Inventory and Analysis (FIA) program implemented a new system for inventory and monitoring Pennsylvania's forest resources. The most salient benefit of the new inventory system will be a nearly threefold improvement in timeliness. Also, the extension of the sample to include a broader range of measurements will help analysts understand the relationships between resource change and underlying ecological variables.

According to the first two panels of inventory data, Pennsylvania has 16,649,800 acres of forest land (confidence interval of ± 266, 397 acres). This compares to the 1989 estimate of 16,704,400 forested acres (± 100,226 acres). These two confidence intervals overlap, so there is no discernable trend.

The distribution of forest land by forest-type group has been stable over the past decade, but that is likely given that Pennsylvania's forests have been maturing gradually over time. The distribution of the specific oak types also is relatively stable. The only trend that is evident is that red-maple forest types increased substantially, perhaps by as much as one-third. More detailed shifts in specific types are not discernable with only two panels of inventory data.

The distribution of forest land by stand-size class highlights a long-term trend that has been developing in Pennsylvania for some time—the gradual maturing of a tremendously diverse and valuable resource. This maturing is highlighted by a decrease in seedling-sapling stands and an increase in sawtimber stands. The decrease in the young seedling-sapling class is problematic because this trend has become long-term and negative. The situation bears close monitoring because of the impacts on young successional forest-dependant wildlife species. The other striking trend is the continued increase in sawtimber stands. This trend supports the conclusion that Pennsylvania's forests contain more timber today than at any time since the late 1800's.

The total sound-wood volume of live trees increased from 27.5 to 33.7 billion cubic feet, a 23-percent increase. This compares to a 10-percent increase in the volume of growing-stock trees. Increases occurred for both softwood and hardwood inventory volumes. Significant increases occurred for 8 of the 10 most abundant species (exceptions were sugar maple and eastern hemlock). It is important to note red maple's increasing share of the State's total volume. Currently, this species accounts for one-fifth of the volume of live trees. Red maple also contributed 60 percent of the increase in volume statewide.

The total volume of sawtimber increased from 72.8 billion board feet (International ¼-inch rule) in 1989 to 85.8 billion board feet in 2001, an increase of 18 percent. Increases were noted for both softwoods and hardwoods. Again, except for sugar maple and eastern hemlock, Pennsylvania's top 10 species had significant increases in sawtimber volume.

By every measure, the prospective regeneration picture in Pennsylvania is bleak based on the findings for the first panel of regeneration measurements. If commercial species were deemed acceptable for purposes of future management, one-third to one-half of the forest land likely would fail to regenerate without the additional stocking that comes from other sources following disturbance. The small number of samples used does not allow detailed comparisons of various forest types or other stand descriptors. Also, the analytical framework for evaluating regeneration is in review and may change slightly. However, it is appropriate based on available evidence to say that poor regeneration is common across Pennsylvania rather than specific to a particular owner or forest type.

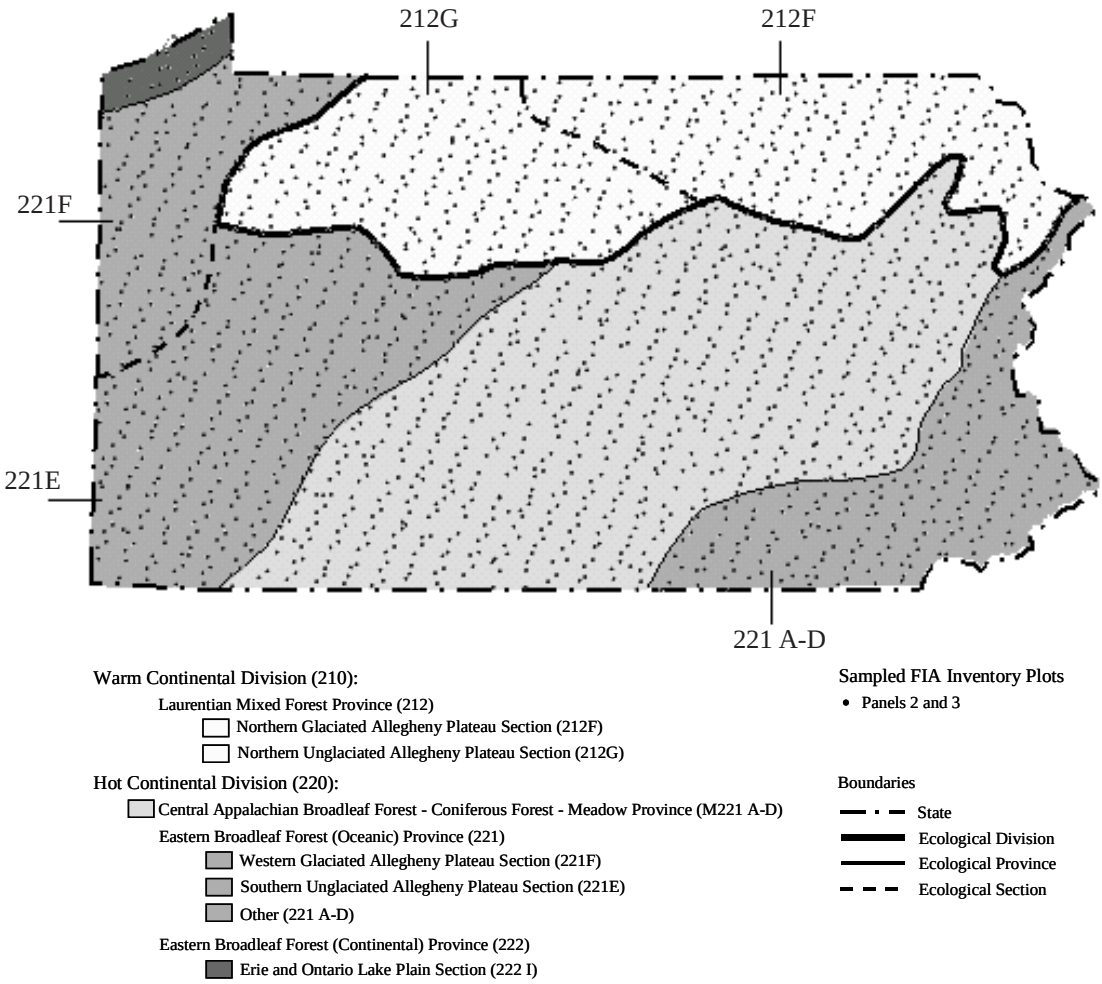

Figure 1.—Distribution of the first two panels of FIA sample locations in Pennsylvania by ecoregion and inventory panel (ecoregions and numerical designations are from Bailey 1995).

Annual Data: The Future of Forest Monitoring

The USDA Forest Service's, Forest Inventory and Analysis (FIA) program has been conducting forest inventories in Pennsylvania since the 1950's. Periodic reports on the status of and changes in forest conditions were completed for 1955 (Ferguson 1955), 1965 (Ferguson 1968), 1978 (Considine and Powell 1980), and 1989 (Alerich 1993). In 2000, FIA implemented a new system for inventorying and monitoring of Pennsylvania's forest resources. In the past, "periodic" inventories were conducted in the State every 10 to 15 years. As the value of the Keystone State's forested ecosystem continued to increase and questions concering the condition and health of this valuable resource mounted, it became clear that more timely data gathering and monitoring were needed. In conjunction with the Pennsylvania Bureau of Forestry, FIA has adapted an annual inventory system under which the length of the inventory cycle has been shortened to 5 years and measurements are collected continually across the State. This report covers the first 2 years of measurement.

Annual Inventory Design

The annual inventory system combines features of the periodic system with a new systematic grid of sample plots and incorporates measurements from the Forest Health Monitoring (FHM) program. The inventory consists of these three phases:

Phase 1. Traditionally, aerial photography or remote sensing is used to characterize the acreage of forest and nonforest. In Pennsylvania, satellite-based remote sensing will replace aerial photography. Phase 1 estimation will not begin until the third year of measurements is complete.

Phase 2. Field measurements are conducted at sample locations distributed systematically about every 3 miles across the landscape (Fig. 1). Sample locations are situated within individual cells of a hexagonal grid laid across the State. Each year, 20 percent of the sample locations are measured, that is, it takes 5 years to complete the inventory. Each year's sample is referred to as an

"inventory panel." The overall design is referred to as an "interpenetrating design" because within each inventory panel, no cell is adjacent to another. As a result, each panel provides an unbiased representation of conditions across the State. Until the implementation of Phase 1 procedures, each sample location is weighted according to the area of a single hexagonal cell, or about 6,000 acres of land. The new design also incorporates a change to a four-subplot cluster.[1] At each location, a suite of variables is measured that characterizes the land and trees associated with the sample.

Phase 3. On a limited number of Phase 2 locations, more extensive forest health measurements are conducted during a 10-week period in summer. The measurements are grouped into five general categories of indicators: crown conditions, vegetation diversity and structure, down woody debris, soil condition, and lichen communities. The intensity of the Phase 3 sample is one sample location per 95,000 acres of land.

To better address the issue of regeneration in the State, the Pennsylvania Bureau of Forestry is funding a study to quantify the composition, abundance, and quality of tree seedlings and other understory vegetation on Phase 2 sample plots. The Pennsylvania Regeneration Study (PRS) is part of a larger research initiative undertaken by the Pennsylvania Bureau of Forestry, two Northeastern Research Station silvicultural research labs, and the School of Forest Resources of The Pennsylvania State University. The northeastern FIA samples complement research at these cooperating institutions that are developing site- and species-specific stocking guidelines and management criteria. The PRS began the first year of data collection in 2001 following a one-year pilot study designed to evaluate techniques for measuring tree seedlings and other understory vegetation on FIA sample locations. All established tree seedlings at least 2 inches tall are being tallied by species, seedling source, and height class on a subset of sample locations measured during the leaf-on season (referred to as a subpanel). Other understory vegetation also is being measured. Along with other Phase 2 measurements, these samples will help scientists gauge the forest's regenerative capacity and the impact of other vegetation.

Under the annual inventory system, field crews within the State measure Phase 2 and 3 samples continually. Once the first 5 years of data are complete, a comprehensive report covering forest resources will be generated. Following that, each year's measurements will replace the oldest year's data to provide new estimates each year.

[1]Northeast field guide, field manual version 1.6. On file with the Northeastern Research Station, Forest Inventory and Analysis, 11 Campus Blvd., Suite 200, Newtown Square, PA 19073.

Limitations: Caution in Early Years of Implementation

While the new system is being implemented, several aspects of the inventory results will require careful scrutiny. Because of the interpenetrating design of the new sample grid, each year's inventory panel provides unbiased estimates of resource location. However, until the first 5 years of measurements are complete, sampling errors will be larger, making it more difficult to detect changes in inventory. The issue of sampling error is particularly acute for evaluating estimates for subregions of the State, for example, Ecological Sections. As a result, a table containing sampling errors accompanies each 2001 resource table in the Appendix. When analyzing the statistics for a change in conditions, one should examine the mean and confidence intervals of estimates. If confidence intervals do not overlap, there is sufficient evidence to suggest true resource change; if they overlap, resource change is questionable. The sampling errors were computed for the 67-percent level of confidence, or two chances in three. Note that 67-perent confidence intervals provide liberal bounds on the estimates.

During the early years of installation, several of the more commonly used land-base indicators of forest resource change will not be available. The Phase 1 forest/nonforest map will not be generated until the third year of the inventory cycle. Until then, estimates of land area are based on simple random sampling, that is, each sample location represents an equal area of forest. The Phase 1 sample will improve the accuracy of estimates by assigning a more representative number of acres to each sample location.

Analysis of certain plot-characterization variables will require scrutiny during the early years of implementation. An example is the analysis of changes in the distribution of forest land by forest-type group and stand-size class. The current algorithm for determining these variables has changed since 1989 and during the next several years will undergo modifications to comply with national standards and procedures. For this report, the 1989 sample data were recompiled with the current algorithm used by the northeastern FIA unit. A set of the revised 1989 tables is included in the Appendix. Estimates of the distribution of forest land by forest-type group are presented for only the two most recent inventory dates due to the vagaries associated with compilation procedures prior to 1989. For pre-1989 inventories, estimates of the distribution of forest land by stand-size class should be comparable because these compilation procedures are simpler than those for forest-type group. Estimates for older inventories were prorated to provide comparable statistics for graphical analysis; previous reports were for "timberland"

and contemporary analyses are for "forest land." Timberland represents that portion of forest land that is capable of producing more than 20 cubic feet per acre per year and that is not withdrawn from timber utilization. The more extensive land class, forest land, includes tracts of land that are at least 1 acre in size, at least 120 feet wide, and not developed for a nonforest land use.

Evaluation of long-term trends in the numbers of trees is based on trees measured on timberland because only trees on timberland were reported in older inventories. The distribution of live trees per acre of forest land is a valuable indicator of broad structural changes affecting the entire forest. However, these data are available only for the 1989 and 2001 inventories. Trends as far back as the 1965 inventory are available for growing-stock trees that are larger than 5.0 inches in diameter. This furthers limits one's ability to examine the entire forest structure because sapling, rough, rotten, and standing dead trees are excluded.

The components of inventory change—growth, removals, and mortality—are the primary indicators of flux and sustainability of forest land. However, estimates of these components will be of limited use during the early years of the annual inventory process. Two factors that affect the estimation of change components are the percentage of sample locations and trees that are remeasured. The hexagonal grid system used for the new annual inventory replaces the grid of stratified random locations used for the 1989 inventory. During the installation of the hexagonal grid, each cell was examined to determine whether it contained a previously measured FHM or FIA sample. About 55 percent of the hexagons contained previously measured samples. On remeasured sample locations, the new four-subplot cluster is centered over the 1/5th-acre sample design used in 1989. At individual sample locations, only trees on the central 1/20th-acre center subplot that is overlaid on the old 1/5th-acre design are being remeasured. As such, about 13 percent of the sample trees will be remeasured during the first 5-year cycle that began in 2000 and will be completed in 2004. This means that sampling errors will be particularly high for estimates of components of change. As each new measurement panel is completed during the second 5-year cycle that will be completed in 2009, sampling errors will be reduced dramatically.

Overall "net change" in inventory is a useful surrogate indicator of sustainability during the early years. Net change in inventory expressed in net cubic feet[2] and board feet[3] summarizes the effects of growth, removals, and mortality. Net growth is equal to gross growth minus mortality. Net change is equal to net growth minus removals. Positive changes in inventory volume reflect conditions such that net growth exceeds removals. Negative changes reflect situations in which removals exceed net growth—a key indication of unsustainable conditions in the near term. Change in inventory volume is a useful indicator of trends for the major species groups within Pennsylvania. Although only the 1989 and 2001 inventories are examined, it is important to note that examining more than two points in time is recommended. For example, evaluating three points in time may reveal that a positive net change followed a negative change of similar magnitude, supporting little overall change for the period examined.

Benefits: More Rapid and Complete Resource Analyses

Perhaps the most salient benefit of the new inventory system will be the nearly threefold improvement in timeliness. A complete, new inventory will be available in 3 years (the end of the first 5-year cycle) with updates on conditions available yearly thereafter. The installation of a single remeasured sample design across the State will greatly improve the quality of information on change in resource extent, status, and condition. The use of this national sample design will facilitate resource assessments that straddle traditional regional and state boundaries to include Pennsylvania's results within the Mid-Atlantic region, as well as national and international assessments.

The extension of the sample to include a broader range of measurements will help analysts understand the relationships between resource change and underlying ecological variables. In particular, the implementation of a suite of forest health variables (Phase 3) will foster a better understanding of conditions on Phase 2 plots. The results of the PRS will aid in evaluating forest composition over the longer term.

The hiring of permanent field crews is a significant advantage over the use of temporary crews. Under the new design, crew members will be visiting sample locations within their region year after year, enhancing their ability to locate samples, obtain permission from landowners, identify local species, evaluate tree quality, understand forest composition and management activities, and

[2]Net cubic-foot volume of the central stem of trees at least 5.0 inches in diameter at breast height from a 1-foot stump to a 4-inch top or a point where the stem breaks into limbs.

[3]Net board-foot volume of the central stem of softwood trees at least 9.0 inches in diameter and hardwood trees at least 11.0 inches in diameter from a 1-foot stump to a 7.0-inch top for softwoods and a 9.0-inch top for hardwoods or to a point above which a sawlog cannot be produced.

measure the forces affecting resource change in their region.

All of the improvements in the inventory system have been accompanied by technological improvements since the 1989 inventory, for example, the ability to conduct sophisticated geospatial analyses. Geographic Information Systems, improved database management systems, and satellite-based land-classification systems will provide map-based products, links to auxiliary datasets, and improved geospatial modeling. Of particular interest is the ability to portray resource statistics for geographic regions of interest, e.g., ecoregions, geophysical regions, climate zones, watersheds, pest outbreak zones, large disturbance areas, and congressional districts.

The Annual Inventory: Results From The First Two Years

Forest Land

Pennsylvania's landscape is characterized by a complex mix of land uses with forest land typically the residual land use, or the use for which there is no higher economic demand. Land use, physiography, climate, and pest/pathogens have intermingled in creating different forest conditions across the State. The result is a diverse mix of issues and concerns that is being addressed by the forest inventory. For example, alternate food sources for deer populations ease the pressure on forest regeneration in regions of the State where forests are mixed with agricultural land. In heavily forested regions, few sources of available food and high deer populations have obliterated tree seedlings in the forest understory over large areas.

A useful way to partition the State is by ecoregions (Bailey 1995) that supplement FIA inventory regions. Ecoregions often correspond with natural phenomena that forge forest composition, structure, and function. It is important to scale the analysis of forest land to an area that will yield a statistically reliable estimate of forest condition. Ecological Divisions, Provinces, and Sections of interest in Pennsylvania are shown in Figure 1. These ecoregions contain sufficient forested plots for a reasonable estimate of forest area. As new inventory panels are completed, more detailed resource statistics can be analyzed by ecoregion.

The northern tier of Pennsylvania contains the major boundary between the Warm and Hot Continental Divisions. The Laurentian Mixed Forest Province is separated into Glaciated and Unglaciated Sections. The Eastern Broadleaf Forest (Oceanic) Province comprises several Sections that were combined on the map. This Province is split in the middle by the Central Appalachian Broadleaf Forest – Coniferous Forest – Meadow Province (the Appalachian Mountains). A prominent feature of the Province and Section boundaries is the line of glaciation that weaves across the State's northern tier.

As shown in the tabulation that follows, the most recent inventory panels indicate that Pennsylvania has 16,649,800 acres of forest land (confidence interval of ± 266,397 acres). This compares to the 1989 estimate of 16,704,400 acres (± 100,226 acres). These two confidence intervals overlap, so there is no discernable trend.

Ecoregion	1989[a]	2001[a]
Warm Continental Division		
Laurentian Mixed Forest Prov.		
North. Glaciated Allegheny Plateau Section	2,411.6	2,447.8
North. Unglaciated Allegheny Plateau Section	3,113.7	3,244.4
Subtotal	5,525.3	5,692.2
Hot Continental Division		
East. Broadleaf Forest (Oceanic) Prov.		
Southern Unglaciated Allegheny Plateau Section	2,660.7	2,840.4
West. Glaciated Allegheny Plateau Section[b]	1,230.6	1,135.3
Other	836.5	728.9
Subtotal	4,727.8	4,704.6
Cen. Appalachian Broadleaf Forest/ Coniferous Forest/Meadow Prov.[c]	6,451.2	6,253.0
Total	16,704.4	16,649.8

[a]Sampling errors range from 8.5 percent to 0.6 percent.
[b]Includes 151,800 and 153,900 acres of the Erie and Ontario Lake Plain Section.
[c]See Bailey (1995).

Estimates below the State level have even larger sampling errors, though a general indication of prospective changes can be discerned by using large ecoregions. For example, the data suggest slight increases in forest land in the northern and some central regions, and decreases in the southwestern, southeastern, and portions of the central part of the State. It is interesting to contrast recent leveling of the forest-land base in Pennsylvania with the more violent changes that occurred earlier in the previous century (Fig. 2). The total area of forest land in the State has been relatively stable since the mid-1960's.

The forest types and groupings used by FIA are useful for tracking changes through time. In fact, FIA has used the same forest-type naming and grouping system over the

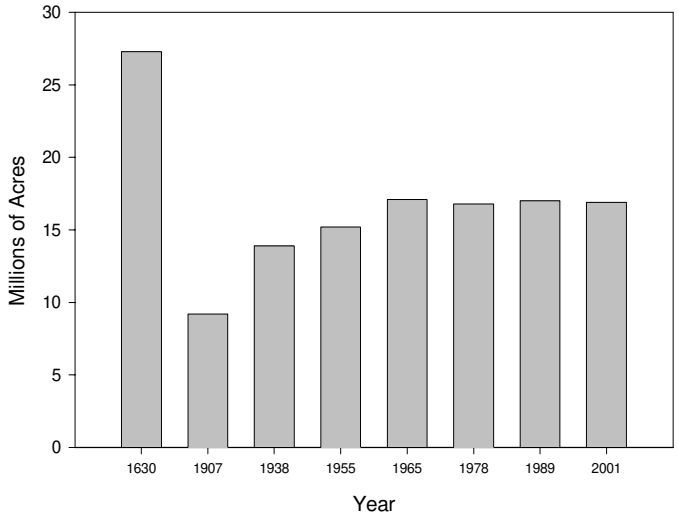

Figure 2.—Area of forest land, Pennsylvania, for selected years (estimates for years prior to 1995 from Smith and others 2001). Except the difference between 1989 and 2001, all differences between bars are statistically significant at 67-percent level.

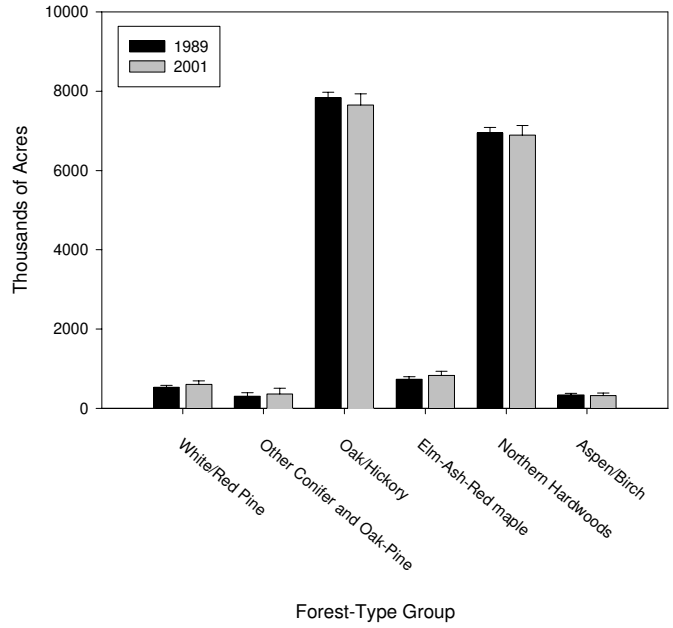

Figure 3.—Distribution of forest land in Pennsylvania by forest-type group, 1989 and 2001 (error bars reflect 67-percent confidence intervals).

years to ensure the best trend information possible. Although the goal has been to track forest types over decades, there are inherent difficulties. For example, because the data are not in digital form, we cannot use the new classification algorithms to reconfigure past inventory data to current standards. As a result, information on forest-type group is shown for only the 1989 and 2001 inventories (Fig. 3). It is clear that the distribution of forest land by forest-type group has been stable over the past decade, but this is likely because Pennsylvania's forests have been maturing gradually. At this level of data use, FIA inventories generally monitor only major disturbance events or other shifts in composition. Thus, no sweeping changes would be anticipated. The oak-hickory group decreased by 2 percent since 1989, but this change probably is smaller than would be expected. Also, the current acreage of oak-hickory probably is greater than in the 1978 inventory even though a precise estimate for that inventory is not reliable due to computational differences. The distribution of the specific oak types also seems relatively stable. The only other trend that is evident from forest-type information is that red maple types increased substantially, perhaps by as much as one-third. More detailed shifts in specific types cannot be discerned with only two panels of inventory data. It will be useful to examine the more detailed forest-type data generated by FIA as they become available.

As with forest-type groups, the distribution of forest land by stand-size class points out the gradual maturing of forest land (Fig. 4). This maturing has been marked by a decrease in seedling-sapling stands and an increase in sawtimber stands. Stand-size classes are not strictly defined by age but they are indicative of stages of stand development (successional stage). Seedling-sapling stands are young, early successional stands while sawtimber stands are older stands that are approaching financial maturity. The decrease in the seedling-sapling class is of concern because this is a long-term and negative trend. The situation bears close monitoring because of potential adverse impacts on a variety of wildlife species that are dependent on young successional stands. The trend of increasing sawtimber stands further supports the conclusion that Pennsylvania's forests contain more timber today than at any time since the late 1800's. It is interesting that this trend is concurrent with the unprecedented use of the State's forest land for recreation and other uses.

Numbers of Trees

The distribution of live trees by various measures is a valuable indicator of broad structural changes that are occurring in Pennsylvania's forests. Data on numbers of trees per acre should be examined without relating specific numbers to known silvicultural standards for various cover types because the FIA results represent averages for the entire State. As such, they should be reviewed for relative changes over time and within species and size classes.

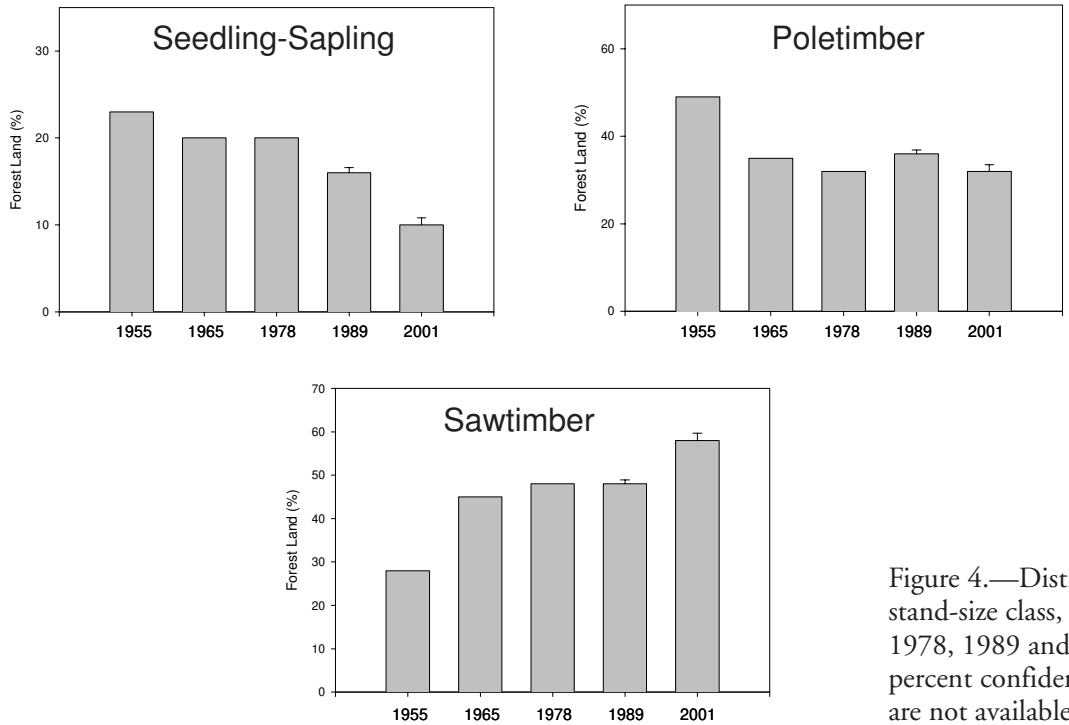

Figure 4.—Distribution of forest land by stand-size class, Pennsylvania, 1955, 1965, 1978, 1989 and 2001. Error bars reflect 67 percent confidence intervals. Sampling errors are not available for years prior to 1989.

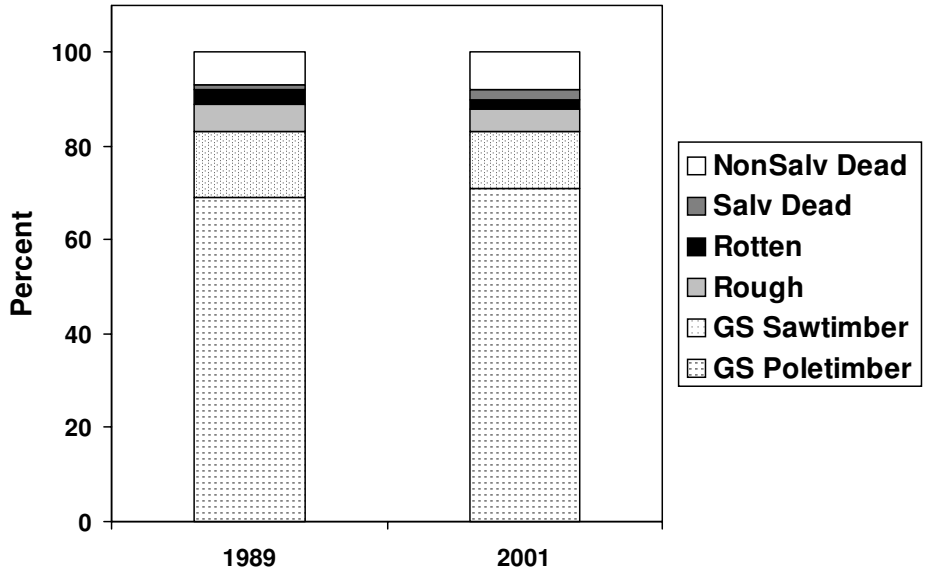

Figure 5.—Distribution of live and dead trees (5.0 inches and larger) by tree class and size class (poletimber and sawtimber), Pennsylvania, 1989 and 2001.

Figure 5 shows the breakdown of the total population of live and dead trees by tree class and for growing-stock poletimber[4] and sawtimber trees.[5] The distribution for the two points in time are similar except for a slight increase in the number of dead trees. In Figure 6, the broad changes in the numbers of growing-stock trees by diameter class (the stock table) are depicted for all previous inventories except the 1955 inventory. The sharp rotation of the stock table between 1965 and 1975 illustrates a dramatic shift toward larger trees. The stock table then continues to shift but at a slower rate. The most recent changes suggest a gradual but steady shift toward larger sawtimber-size trees, particularly in the larger classes. These most recent changes also are reflected in Figure 7, which shows the distribution of all live trees

[4]Growing-stock trees from 5.0 inches in diameter to 9.0 and 11.0 inches in diameter for softwood and hardwood species, respectively.

[5]Growing-stock trees at least 9.0 and 11.0 inches in diameter for softwood and hardwood species, respectively.

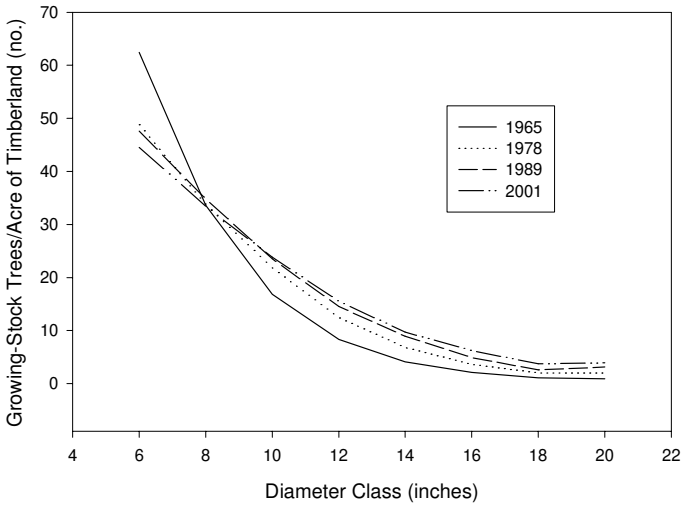

Figure 6.—Distribution of growing-stock trees (5.0 inches and larger) per acre of timberland, Pennsylvania, 1965, 1978, 1989, and 2001.

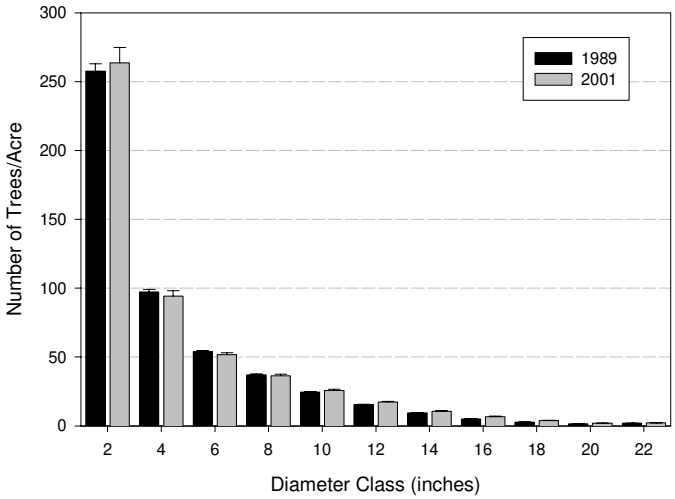

Figure 7.—Distribution of live trees (1.0 inch and larger) per acre of forest land in Pennsylvania by diameter class, 1989 and 2001. Error bars reflect 67-percent confidence intervals.

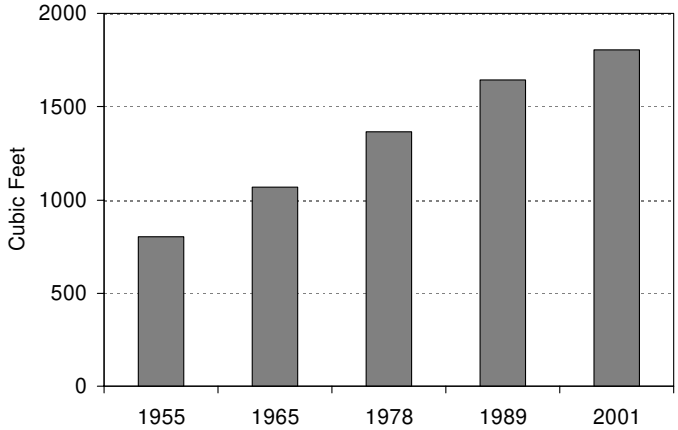

Figure 8.—Volume of growing stock per acre of timberland in Pennsylvania by inventory date, 1955, 1965, 1978, 1989, and 2001. All differences between bars are statistically significant at 67-percent level.

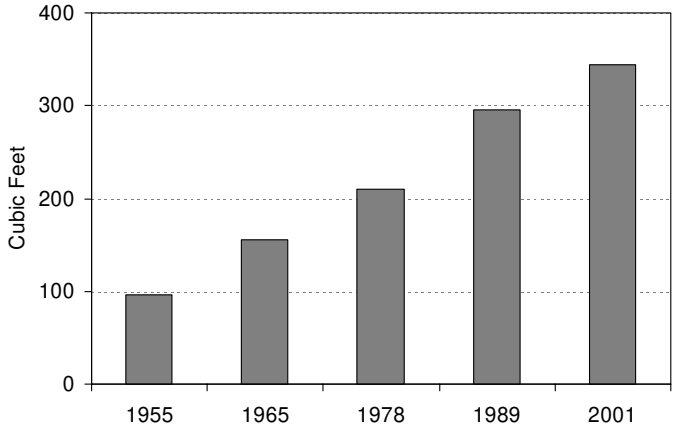

Figure 9.—Volume of red maple growing stock per acre of timberland in Pennsylvania by inventory date, 1955, 1965, 1978, 1989, and 2001. All differences between bars are statistically significant at 67-percent level.

down to the 2-inch diameter class. Note that the apparent increase in the number of trees in this class is not statistically significant.

Inventory Volume

As mentioned earlier, the depth of the analysis of change in volume will be limited during the early years of the annual inventory. Net change in inventory volume expressed in cubic and board feet for the top species will highlight the more salient trends. Overall, total inventory volume increased, as did the volume of live trees and growing stock. The total volume of live trees increased from 27.5 to 33.7 billion cubic feet, a 23-percent increase. This compares to a 10-percent increase in the volume of growing stock trees. Inventory volume increased for both softwoods and hardwoods. Changes in inventory are depicted in Figure 8, which illustrates changes in the total volume of growing-stock per acre since 1955. Long-term historical increases continue but at a slightly slower rate than in the past. The rapid increase in red maple volume per acre since 1955 is shown in Figure 9.

Examining the top 10 tree species in Pennsylvania offers additional insight into volume trends (Fig. 10). Based on the volume of live trees, they include red maple, black

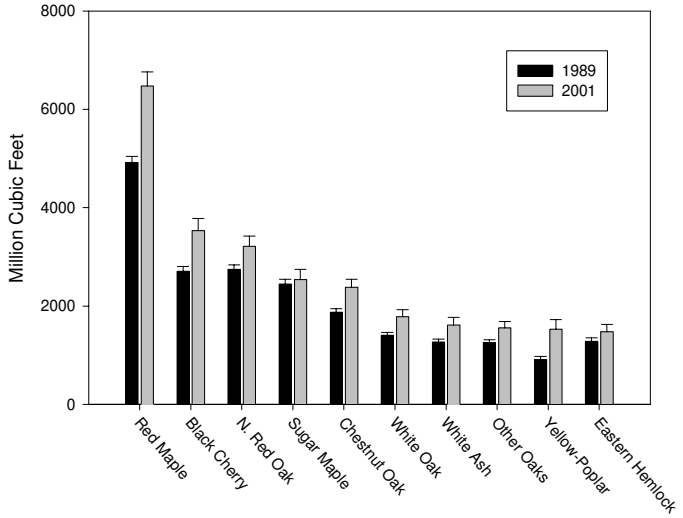

Figure 10.—Volume of live trees on forest land for the 10 most abundant species in Pennsylvania, 1989, and 2001. Error bars reflect 67-percent confidence intervals.

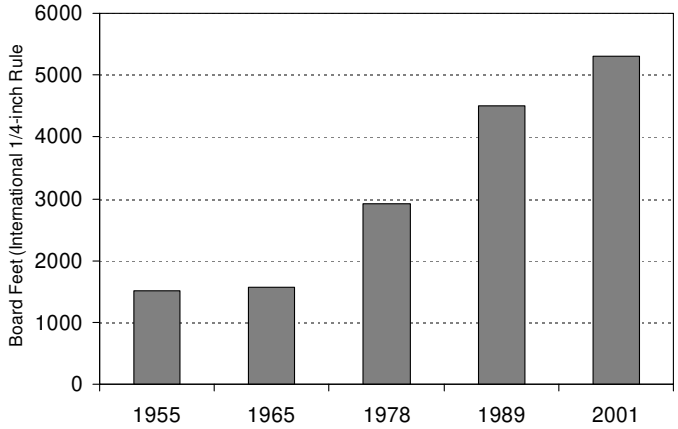

Figure 11.—Volume of sawtimber per acre of timberland in Pennsylvania by inventory date, 1955, 1965, 1978, 1989, and 2001. All differences between bars are statistically significant at 67-percent level.

cherry, northern red oak, sugar maple, chestnut oak, white oak, white ash, other oaks, yellow-poplar, and eastern hemlock. Currently, red maple makes up 20 percent of the total volume of live trees in the State and accounts for 60 percent of the increase in volume statewide. It is interesting that the top 5 tree species account for more than half of the inventory volume and the top 10 account for 75 percent of the total volume. Increases were significant for 8 of the top 10 species (exceptions were sugar maple and eastern hemlock).

The results for sawtimber volume also are positive. The total volume of sawtimber increased from 72.8 billion board feet (International ¼-inch rule) in 1989 to 85.8

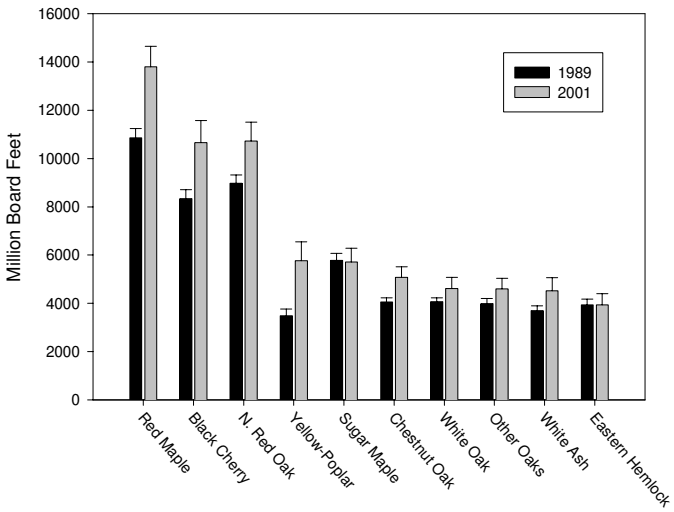

Figure 12.—Volume of sawtimber on forest land for the 10 most abundant species in Pennsylvania, 1989, and 2001. Error bars reflect 67-percent confidence intervals.

billion board feet in 2001, an increase of 18 percent. Increases were noted for both softwoods and hardwoods. The buildup in sawtimber volume over time is shown in Figure 11. Increases are clearly evident, but at a slower rate than in the two previous inventory periods. Again, except for sugar maple and hemlock, Pennsylvania's top 10 tree species increased in sawtimber volume (Fig.12). Yellow-poplar had the largest increase on a proportional basis (65 percent).

Understory Diversity and Abundance

Tree seedlings

Past studies have shown that advance regeneration often is absent in stands across Pennsylvania and that oak regeneration is especially rare. With over half the State's forest land in sawtimber stands, regeneration is the most pressing issue in discussions about the long-term sustainability of Pennsylvania's forested landscape. To date, only a single subpanel of regeneration measurements has been collected, though preliminary results suggest a slight improvement in regeneration since data collected during the 1980's.

It is difficult to fully interpret regeneration data due to a dearth of information from other studies reporting similar data for Mid-Atlantic States. A study of advance tree-seedling regeneration during the 1989 inventory revealed low regeneration levels (McWilliams and others 1995a). In this study, stands within the range of stocking where advance regeneration should be present (40 to 75 percent) were examined. The methods used differ from those used in the current study, so comparisons should be made with

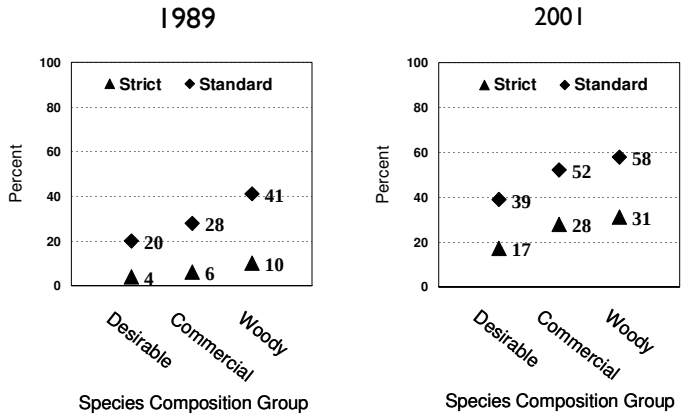

Figure 13.—Percentage of samples satisfying regeneration criteria by species composition grouping and regeneration criteria using seedlings only, Pennsylvania, 1989 and 2001. The sample data means are subject to sampling errors of 4.9 percent.

caution. Methods used for the study implemented in 2001 were tested in a pilot study conducted during the 2000 field season to determine the most efficient sampling procedure for Pennsylvania's forests (McWilliams and others 2002). Another study in 1990 focused on oak regeneration following disturbance. Results showed that regeneration occurs but that oaks are rare in the understory of heavily disturbed stands (McWilliams and others 1995b). Regeneration stocking generally improved following disturbance, primarily due to red maple, sweet birch, black cherry, and other species that were not apparent as advance regeneration but came from existing seed sources and seedbanks.

The 1989 and 2001 tree-seedling studies are compared in the two charts in Figure 13 that show the percentage of samples that met regeneration criteria for desirable, commercial, and woody species groups. The 1989 study region included counties that were measured during the summer window without spatial dispersion. Many of the samples were in mountainous ecoregions where regeneration was known to be less abundant. The 2001 study samples were distributed spatially across Pennsylvania by the same interpenetrating design used for the standard FIA sample grid. Also, previous estimates were analyzed by evaluating whether four of five regeneration plots met regeneration criteria. It is not possible to recreate this approach with the current four-microplot system. Using all forested sample conditions as the sample population should improve the reliability of the results. The most notable difference in results between the two studies is the more favorable abundance of tree seedlings in the understory in 2001. However, it is not known whether this difference is due to differences in study design or "real" change.

The analysis of regeneration levels depends on how species are divided among composition groups, assumptions related to requirements for regeneration stocking, and the tree sizes included in the analysis. Both standard and strict regeneration criteria were used to account for the diversity of conditions across Pennsylvania. Of the species groupings mentioned, desirable species reflect timber markets, commercial species are associated with custodial management, and all woody species reflect overall site occupancy. The comparison in Figure 13 was limited to seedlings only. The effect of including saplings and larger trees on the results is shown in Figure 14. Seedlings and saplings are the preferred sizes for representing regeneration status within the forest understory. Incorporating older trees, typically those within a higher forest canopy, affects the results but detracts from focusing on more important components of regeneration. Also, larger trees have only a minor impact on the analysis. Thus, in subsequent analyses, seedlings and saplings are used as the regeneration measure.

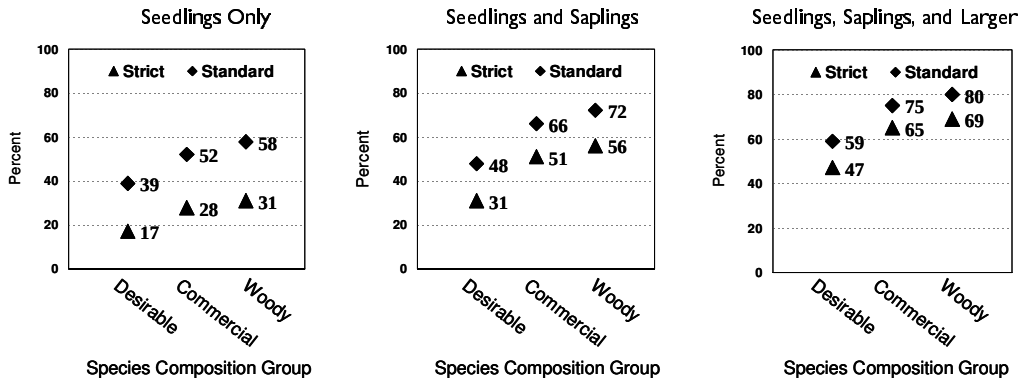

Figure 14.—Percentage of samples satisfying regeneration criteria by species composition grouping, regeneration criteria, and tree size, Pennsylvania, 2001. The sample data means are subject to sampling errors of 4.9 percent.

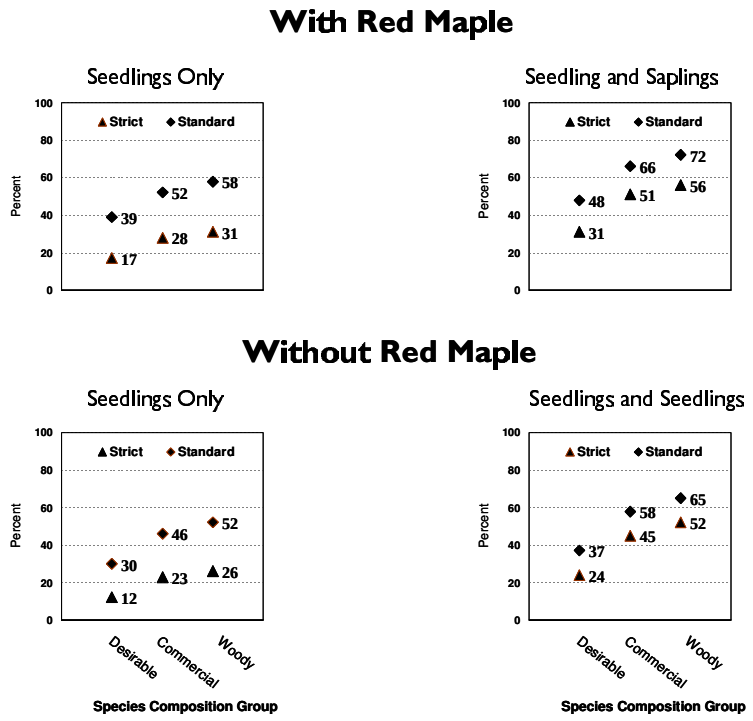

Figure 15.—Percentage of samples satisfying regeneration criteria by species composition grouping and regeneration criteria with and without red maple, Pennsylvania, 2001. The sample data means are subject to sampling errors of 4.9 percent.

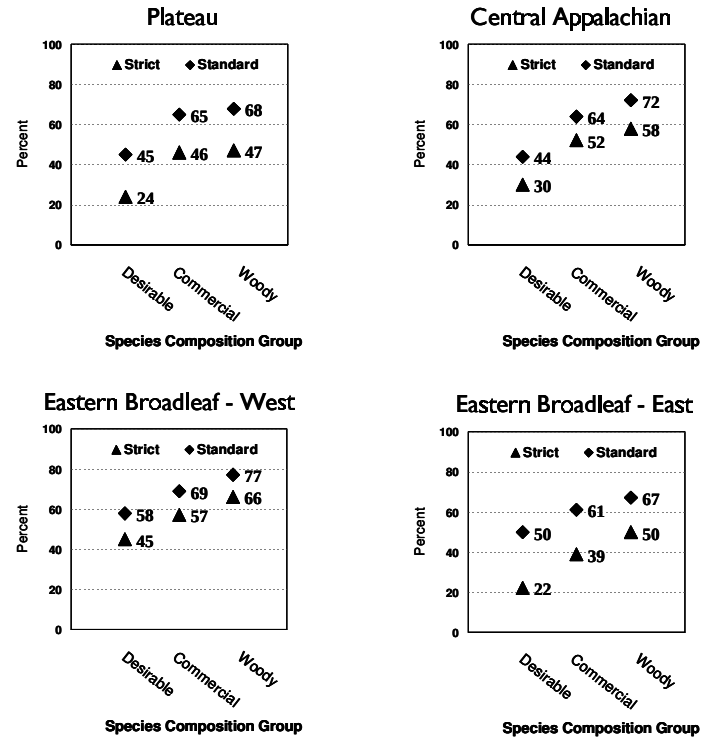

Figure 16.—Percentage of samples satisfying regeneration criteria by species composition grouping, regeneration criteria, and ecoregion using seedlings and saplings, Pennsylvania, 2001. The sample data means are subject to sampling errors of 4.9 percent.

The impact of red maple is of interest for additional evaluation of the study results. If red maple regeneration is heavily influencing regeneration-stocking levels, then removing the species from the analysis should reveal its impact. Results using seedlings only, and seedlings and saplings are illustrated in Figure 15. The impact of red maple is strong for both regeneration components and might partially explain differences in the 1989 and 2001 study results had the development of this species been accelerated between studies.

The results for larger ecoregions are shown in Figure 16. It would seem that the Plateau and eastern portions of the Eastern Broadleaf Forest Province have slightly lower

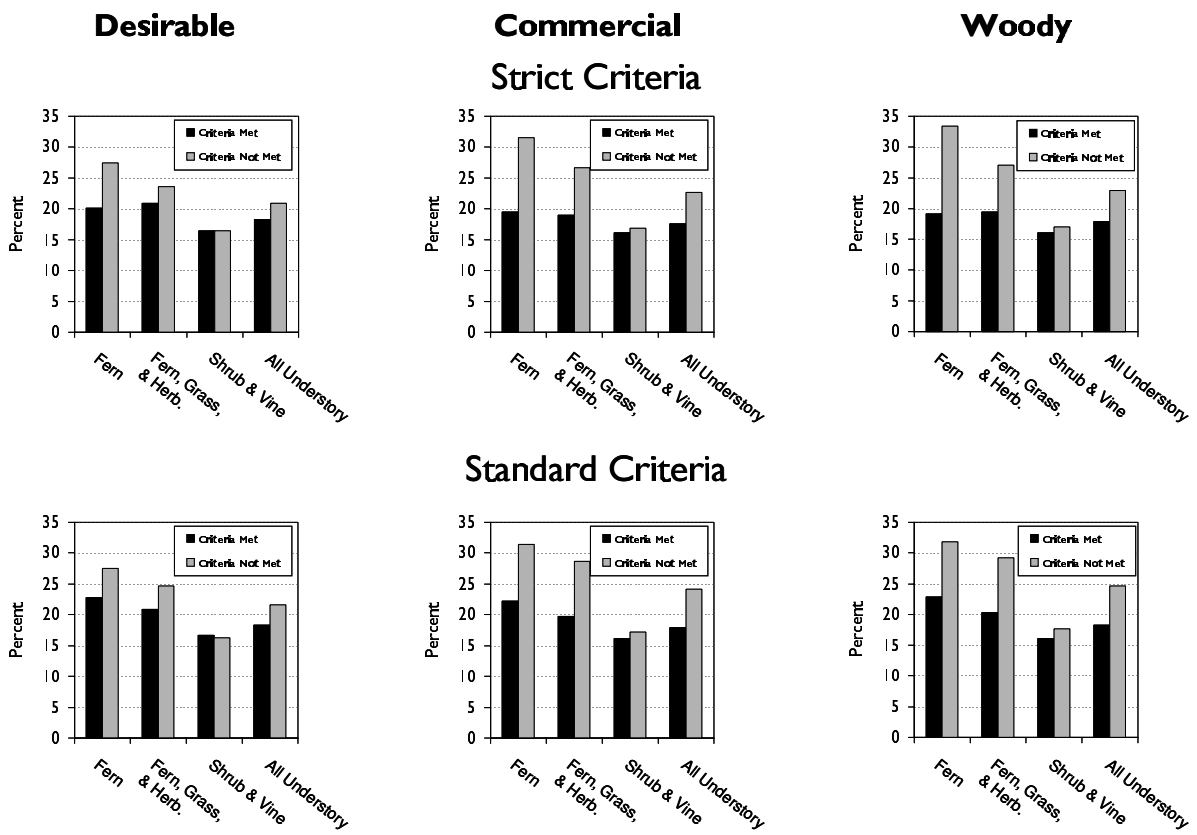

Figure 17.—Mean percent cover by regeneration criteria and understory vegetation component, Pennsylvania, 2001.

percentages of samples that met the regeneration criteria. Additional sample data are needed for detailed spatial analyses.

Because of the uncertainty surrounding the regenerative capacity of Pennsylvania's forests, it is difficult to formulate succinct statements concerning regeneration abundance and quality. The most fundamental findings are those for the three species-composition groups using the stocking of seedlings and saplings (Fig. 14). Put simply, the results suggest that under a general goal of managing for a desirable species mix, 32 to 48 percent of Pennsylvania's forest land supports favorable levels of advance regeneration. Under a more liberal goal of managing for commercial species, 51 to 66 percent meets regeneration criteria. Setting a goal of establishing any woody vegetation improves the results only slightly (56 to 72 percent).

By every measure, the regeneration picture in Pennsylvania is bleak based on the findings for the first panel of regeneration measurements. Even if commercial species were deemed acceptable, one-third to one-half of the forest land would likely fail to regenerate without the additional stocking from other sources following disturbance. The small number of samples used prevents detailed comparisons of forest types or other stand variables. Also, the analytical framework for evaluating regeneration is being reviewed and might be revised slightly. Still, on the basis of available evidence, we can state that poor regeneration is common across Pennsylvania rather than specific to a particular landowner or forest type.

Associated understory vegetation

Broad relationships between tree-seedling abundance and the occurrence of other understory vegetation are illustrated by examining the relative abundance of understory vegetation for the major species encountered in the samples. Figure 17 includes results for the major components of understory vegetation for sampled conditions that did and did not meet regeneration criteria. The samples that failed to meet the criteria had higher levels of associated understory occupying sample plots. Care is needed in interpreting the magnitude of

Samples that Met Regeneration Criteria

Criteria	Fern	Fern, Grass, and Herbs	Shrub and Vine	All Understory
Strict - Desirable	6.1	21.5	21.0	30.3
Standard - Desirable	10.8	32.5	31.5	45.5
Strict - Commercial	10.5	31.3	30.8	47.4
Standard - Commercial	15.2	41.6	39.9	61.4
Strict - Woody	10.8	34.7	34.2	52.3
Standard -Woody	16.6	45.7	43.0	66.7

Samples that Did Not Meet Regeneration Criteria

Criteria	Fern	Fern, Grass, and Herbs	Shrub and Vine	All Understory
Strict - Desirable	18.8	45.5	37.2	63.1
Standard - Desirable	14.2	34.5	26.7	47.9
Strict - Commercial	14.4	35.7	27.4	46.0
Standard - Commercial	9.8	25.4	18.3	32.0
Strict - Woody	14.2	32.3	24.0	41.1
Standard -Woody	8.3	21.3	15.2	26.7

Figure 18.—Percentage of understory vegetation samples with at least 30 percent cover by understory vegetation component and regeneration criteria, Pennsylvania, 2001.

understory cover for various vegetation components because they represent averages across the entire sample, i.e., a wide range of conditions. As a result, the relative differences are of prime interest. Differences between levels for samples that did and did not meet the regeneration criteria are most apparent for the fern, and for fern, grass, and other herbs combined.

Results of existing silvicultural research provide guidelines for evaluating what the study results reveal about relationships between tree-seedling abundance and the occurrence of other understory vegetation. These relationships, in turn, provide insight into the establishment and development of tree seedlings. It is difficult to apply guidelines intended for site- or stand-specific silvicultural prescriptions because of the numerous stand conditions encountered at FIA sample locations. However, it has been found that maple-beech-birch and mixed-oak stands under even-age management that have stocking of nontree vegetation that exceeds 30 percent are candidates for stand preparation treatments to remove vegetation that competes with tree seedlings (Marquis 1994). The strong relationship between samples that met regeneration criteria and levels of associated vegetation is shown in Figure 18.

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Table 1.--Land area by land class, Pennsylvania, 2001[abg]

(In thousands of acres)

Land class		SE
Rural timberland	16,043.0	1.7
Urban timberland[c]	152.6	27.9
Total timberland	16,195.6	1.7
Reserved forest[d]	385.1	19.2
Unproductive forest	69.2	42.4
Total forest land	16,649.8	1.6
Cropland	4,885.6	4.7
Pasture	1,142.9	10.5
Christmas tree plant.[e]	80.5	40.4
Noncensus water	111.4	26.2
Other	5,814.3	4.0
Total nonforest land	12,034.7	2.3
Total area[f]	28,684.6	.0
SE	.0	

[a] In this and other tables, a zero indicates that the data are negligible or the condition was not encountered in the sample.
[b] Rows and columns in all tables may not sum due to rounding.
[c] Urban timberland previously classified as urban forest land (not part of the timberland estimate).
[d] Reserve lands are estimated.
[e] Christmas tree plantations previously classified as forest land.
[f] Source: United States Department of Commerce, Bureau of Census, 1990.
[g] All estimates are derived from 40% (two panels) of the plots in this cycle.

Table 2.--Area of forest land by forest type, forest-type group, and stand-size class, Pennsylvania, 2001

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Red pine	7.5	26.1	.0	.0	33.7	53.3
White pine	145.5	25.2	40.5	.0	211.2	23.2
White pine/hemlock	16.4	.0	.0	3.7	20.1	77.7
Hemlock	262.9	30.3	.0	.0	293.2	21.7
Scotch pine	6.5	24.6	11.7	.0	42.8	41.6
White/red pine group	438.9	106.2	52.1	3.7	600.9	14.1
Red spruce	.0	11.1	.0	.0	11.1	100.0
White spruce	.0	14.8	.0	.0	14.8	100.0
Norway spruce	.0	15.5	.3	.0	15.8	98.2
Tamarack	7.0	.0	.0	.0	7.0	100.0
Larch plantation	.0	23.9	.0	.0	23.9	68.5
Spruce/fir group	7.0	65.3	.3	.0	72.6	41.3
Shortleaf pine	.0	.0	15.5	.0	15.5	100.0
Virginia pine	47.7	33.5	.0	.0	81.2	38.4
Pitch pine	45.6	.0	.0	.0	45.6	54.2
Table mountain pine	3.2	.0	.0	.0	3.2	100.0
Loblolly/shortleaf group	96.5	33.5	15.5	.0	145.5	29.3
Wh. pine/no.red oak/wh. ash	60.9	.0	2.5	.0	63.4	43.0
Virginia pine/oak	15.5	20.7	9.5	.0	45.7	52.0
Other oak/pine	15.0	15.1	.0	.0	30.1	70.7
Oak/pine group	91.3	35.8	12.0	.0	139.2	30.1
Post, black, or bear oak	64.0	.0	29.8	.0	93.9	33.2
Chestnut oak	527.4	512.5	18.5	.0	1,058.4	11.3
White oak/red oak/hickory	478.7	225.7	18.7	.0	723.1	13.8
White oak	201.3	102.0	.0	.0	303.4	20.9
Northern red oak	364.5	29.8	3.7	.0	398.0	18.4
Y-poplar/wh. oak/no.red oak	65.9	13.0	.0	.0	78.9	40.7
Black locust	53.9	68.0	76.4	9.0	207.4	22.4
Sweetgum/yellow-poplar	11.2	.0	.0	.0	11.2	100.0
Black walnut	48.9	18.5	26.5	.0	93.9	34.0
Yellow-poplar	102.1	32.3	3.7	6.0	144.1	28.3
Hawthorn/reverting field	.0	.0	64.9	11.6	76.6	37.4
Scarlet oak	3.7	23.2	.0	.0	26.9	62.7
Sassafras/persimmon	.0	6.8	.0	.0	6.8	100.0
Red maple/central hardwood	218.9	212.7	15.1	.0	446.7	17.3

Table 2.-continued

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Mixed central hardwoods	2,457.8	1,383.5	122.0	19.3	3,982.5	5.4
Oak/hickory group	4,598.5	2,628.1	379.4	45.9	7,651.9	3.5
Black ash/Amer. elm/red maple	109.5	50.5	42.9	14.8	217.7	24.0
Red maple(lowland)	.0	36.7	7.2	11.2	55.1	43.2
Red maple(upland)	197.8	123.3	60.9	.0	382.0	18.0
River birch/sycamore	39.0	.0	7.3	.0	46.3	48.8
Cottonwood	11.8	.0	.0	.0	11.8	100.0
Willow	26.4	.0	.0	.0	26.4	71.1
Sycamore/pecan/American elm	45.7	.0	.0	.0	45.7	51.5
American elm/green ash	5.6	24.6	14.0	.0	44.2	52.4
Elm/ash/red maple group	435.8	235.1	132.3	26.0	829.3	12.1
Sugar maple/beech/yellow birch	1,587.6	370.9	46.8	.0	2,005.3	7.7
Black cherry	442.0	433.7	292.1	22.6	1,190.5	9.9
Red maple/northern hardwoods	849.9	491.2	172.0	18.2	1,531.4	8.9
Pin cherry/reverting field	.0	79.8	141.9	.0	221.7	23.5
Mixed northern hardwoods	1,033.5	627.1	281.1	.0	1,941.7	8.0
Northern hardwoods group	3,913.1	2,002.7	934.0	40.8	6,890.6	3.5
Aspen	38.5	90.9	144.1	11.2	284.7	20.7
Paper birch	.0	15.1	.0	.0	15.1	79.0
Gray birch	.0	.0	20.1	.0	20.1	67.3
Aspen/birch group	38.5	106.0	164.2	11.2	319.9	19.2
All forest types	9,619.7	5,212.6	1,689.9	127.6	16,649.8	1.6
SE	2.9	4.5	8.3	28.8	1.6	

[a] In this and other tables containing forest type estimates, Northeastern Forest Inventory forest type calculations were used.

Table 2 (SE).--Area of forest land by forest type, forest-type group, and stand-size class, Pennsylvania, 2001

(Standard error as percentage of total)

Forest type	Stand-size class				All classes
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked	
Red pine	100.0	62.3	.0	.0	53.3
White pine	27.6	62.1	58.5	.0	23.2
White pine/hemlock	92.5	.0	.0	100.0	77.7
Hemlock	22.8	70.6	.0	.0	21.7
Scotch pine	71.6	60.1	74.9	.0	41.6
White/red pine group	16.8	32.3	48.4	100.0	14.1
Red spruce	.0	100.0	.0	.0	100.0
White spruce	.0	100.0	.0	.0	100.0
Norway spruce	.0	100.0	100.0	.0	98.2
Tamarack	100.0	.0	.0	.0	100.0
Larch plantation	.0	68.5	.0	.0	68.5
Spruce/fir group	100.0	44.6	100.0	.0	41.3
Shortleaf pine	.0	.0	100.0	.0	100.0
Virginia pine	51.3	57.7	.0	.0	38.4
Pitch pine	54.2	.0	.0	.0	54.2
Table mountain pine	100.0	.0	.0	.0	100.0
Loblolly/shortleaf group	36.1	57.7	100.0	.0	29.3
Wh. pine/no.red oak/wh. ash	44.6	.0	100.0	.0	43.0
Virginia pine/oak	100.0	74.1	100.0	.0	52.0
Other oak/pine	100.0	100.0	.0	.0	70.7
Oak/pine group	37.9	60.1	81.7	.0	30.1
Post, black, or bear oak	38.7	.0	63.7	.0	33.2
Chestnut oak	16.4	16.4	82.4	.0	11.3
White oak/red oak/hickory	17.1	25.0	81.9	.0	13.8
White oak	25.4	36.7	.0	.0	20.9
Northern red oak	19.5	59.4	100.0	.0	18.4
Y-poplar/wh. oak/no.red oak	44.6	100.0	.0	.0	40.7
Black locust	47.9	37.7	37.4	71.7	22.4
Sweetgum/yellow-poplar	100.0	.0	.0	.0	100.0
Black walnut	42.7	82.3	71.2	.0	34.0
Yellow-poplar	34.8	59.1	100.0	100.0	28.3
Hawthorn/reverting field	.0	.0	40.4	100.0	37.4
Scarlet oak	100.0	70.9	.0	.0	62.7
Sassafras/persimmon	.0	100.0	.0	.0	100.0
Red maple/central hardwood	25.1	25.1	100.0	.0	17.3

Table 2 (SE).-continued

(Standard error as percentage of total)

Forest type	Stand-size class				All classes
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked	
Mixed central hardwoods	7.2	9.8	32.8	80.2	5.4
Oak/hickory group	5.0	6.7	17.6	49.0	3.5
Black ash/Amer. elm/red maple	34.8	46.5	54.3	100.0	24.0
Red maple(lowland)	.0	55.9	63.2	100.0	43.2
Red maple(upland)	25.4	31.0	46.8	.0	18.0
River birch/sycamore	54.8	.0	100.0	.0	48.8
Cottonwood	100.0	.0	.0	.0	100.0
Willow	71.1	.0	.0	.0	71.1
Sycamore/pecan/American elm	51.5	.0	.0	.0	51.5
American elm/green ash	100.0	71.6	100.0	.0	52.4
Elm/ash/red maple group	17.1	22.2	30.4	71.4	12.1
Sugar maple/beech/yellow birch	8.8	19.1	49.9	.0	7.7
Black cherry	17.1	16.5	20.9	62.1	9.9
Red maple/northern hardwoods	12.2	16.5	27.1	65.9	8.9
Pin cherry/reverting field	.0	42.8	27.9	.0	23.5
Mixed northern hardwoods	11.3	14.4	21.6	.0	8.0
Northern hardwoods group	5.2	7.7	11.4	45.2	3.5
Aspen	57.5	36.5	29.9	74.4	20.7
Paper birch	.0	79.0	.0	.0	79.0
Gray birch	.0	.0	67.3	.0	67.3
Aspen/birch group	57.5	33.3	27.5	74.4	19.2
All forest types	2.9	4.5	8.3	28.8	1.6

[a] In this and other tables containing forest type estimates, Northeastern Forest Inventory forest type calculations were used.

Table 3.--Area of timberland by forest type, forest-type group, and stand-size class, Pennsylvania, 2001

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Red pine	7.5	26.1	.0	.0	33.7	53.3
White pine	145.5	25.2	40.5	.0	211.2	23.2
White pine/hemlock	16.4	.0	.0	3.7	20.1	77.7
Hemlock	262.9	30.3	.0	.0	293.2	21.7
Scotch pine	6.5	24.6	11.7	.0	42.8	41.6
White/red pine group	438.9	106.2	52.1	3.7	600.9	14.1
Red spruce	.0	11.1	.0	.0	11.1	100.0
White spruce	.0	14.8	.0	.0	14.8	100.0
Norway spruce	.0	15.5	.3	.0	15.8	98.2
Tamarack	7.0	.0	.0	.0	7.0	100.0
Larch plantation	.0	23.9	.0	.0	23.9	68.5
Spruce/fir group	7.0	65.3	.3	.0	72.6	41.3
Shortleaf pine	.0	.0	15.5	.0	15.5	100.0
Virginia pine	47.7	33.5	.0	.0	81.2	38.4
Pitch pine	45.6	.0	.0	.0	45.6	54.2
Table mountain pine	3.2	.0	.0	.0	3.2	100.0
Loblolly/shortleaf group	96.5	33.5	15.5	.0	145.5	29.3
Wh. pine/no.red oak/wh. ash	60.9	.0	2.5	.0	63.4	43.0
Virginia pine/oak	15.5	20.7	9.5	.0	45.7	52.0
Other oak/pine	15.0	15.1	.0	.0	30.1	70.7
Oak/pine group	91.3	35.8	12.0	.0	139.2	30.1
Post, black, or bear oak	64.0	.0	29.8	.0	93.9	33.2
Chestnut oak	501.2	496.9	18.5	.0	1,016.6	11.5
White oak/red oak/hickory	451.6	225.7	18.7	.0	695.9	14.1
White oak	201.3	92.4	.0	.0	293.8	21.2
Northern red oak	334.7	29.8	3.7	.0	368.1	19.1
Y-poplar/wh. oak/no.red oak	65.9	13.0	.0	.0	78.9	40.7
Black locust	53.9	68.0	74.3	9.0	205.3	22.6
Black walnut	48.9	14.8	26.5	.0	90.2	35.2
Yellow-poplar	102.1	32.3	3.7	6.0	144.1	28.3
Hawthorn/reverting field	.0	.0	53.8	11.6	65.5	40.4
Scarlet oak	3.7	23.2	.0	.0	26.9	62.7
Sassafras/persimmon	.0	6.8	.0	.0	6.8	100.0
Red maple/central hardwood	218.9	212.7	15.1	.0	446.7	17.3
Mixed central hardwoods	2,399.0	1,353.2	122.0	4.5	3,878.6	5.5

Table 3.-continued

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Oak/hickory group	4,445.2	2,568.9	366.2	31.1	7,411.4	3.6
Black ash/Amer. elm/red maple	109.5	28.7	42.9	14.8	195.9	25.6
Red maple(lowland)	.0	36.7	3.5	.0	40.2	51.4
Red maple(upland)	182.3	123.3	60.9	.0	366.5	18.3
River birch/sycamore	39.0	.0	7.3	.0	46.3	48.8
Cottonwood	11.8	.0	.0	.0	11.8	100.0
Willow	26.4	.0	.0	.0	26.4	71.1
Sycamore/pecan/American elm	45.7	.0	.0	.0	45.7	51.5
American elm/green ash	5.6	24.6	14.0	.0	44.2	52.4
Elm/ash/red maple group	420.3	213.3	128.6	14.8	777.1	12.5
Sugar maple/beech/yellow birch	1,558.0	355.8	46.8	.0	1,960.6	7.8
Black cherry	442.0	433.7	277.3	22.6	1,175.7	10.0
Red maple/northern hardwoods	835.1	491.2	172.0	18.2	1,516.6	8.9
Pin cherry/reverting field	.0	76.1	141.9	.0	218.0	23.9
Mixed northern hardwoods	1,002.9	596.9	281.1	.0	1,880.9	8.2
Northern hardwoods group	3,838.0	1,953.7	919.2	40.8	6,751.7	3.6
Aspen	38.5	75.8	136.5	11.2	262.0	21.2
Paper birch	.0	15.1	.0	.0	15.1	79.0
Gray birch	.0	.0	20.1	.0	20.1	67.3
Aspen/birch group	38.5	90.8	156.6	11.2	297.2	19.6
All forest types	9,375.8	5,067.5	1,650.6	101.6	16,195.6	1.7
SE	3.0	4.6	8.4	31.2	1.7	

Table 3 (SE).--Area of timberland by forest type, forest-type group, and stand-size class, Pennsylvania, 2001

(Standard error as percentage of total)

Forest type	Stand-size class				All classes
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked	
Red pine	100.0	62.3	.0	.0	53.3
White pine	27.6	62.1	58.5	.0	23.2
White pine/hemlock	92.5	.0	.0	100.0	77.7
Hemlock	22.8	70.6	.0	.0	21.7
Scotch pine	71.6	60.1	74.9	.0	41.6
White/red pine group	16.8	32.3	48.4	100.0	14.1
Red spruce	.0	100.0	.0	.0	100.0
White spruce	.0	100.0	.0	.0	100.0
Norway spruce	.0	100.0	100.0	.0	98.2
Tamarack	100.0	.0	.0	.0	100.0
Larch plantation	.0	68.5	.0	.0	68.5
Spruce/fir group	100.0	44.6	100.0	.0	41.3
Shortleaf pine	.0	.0	100.0	.0	100.0
Virginia pine	51.3	57.7	.0	.0	38.4
Pitch pine	54.2	.0	.0	.0	54.2
Table mountain pine	100.0	.0	.0	.0	100.0
Loblolly/shortleaf group	36.1	57.7	100.0	.0	29.3
Wh. pine/no.red oak/wh. ash	44.6	.0	100.0	.0	43.0
Virginia pine/oak	100.0	74.1	100.0	.0	52.0
Other oak/pine	100.0	100.0	.0	.0	70.7
Oak/pine group	37.9	60.1	81.7	.0	30.1
Post, black, or bear oak	38.7	.0	63.7	.0	33.2
Chestnut oak	16.8	16.7	82.4	.0	11.5
White oak/red oak/hickory	17.6	25.0	81.9	.0	14.1
White oak	25.4	39.2	.0	.0	21.2
Northern red oak	20.3	59.4	100.0	.0	19.1
Y-poplar/wh. oak/no.red oak	44.6	100.0	.0	.0	40.7
Black locust	47.9	37.7	38.3	71.7	22.6
Black walnut	42.7	100.0	71.2	.0	35.2
Yellow-poplar	34.8	59.1	100.0	100.0	28.3
Hawthorn/reverting field	.0	.0	44.2	100.0	40.4
Scarlet oak	100.0	70.9	.0	.0	62.7
Sassafras/persimmon	.0	100.0	.0	.0	100.0
Red maple/central hardwood	25.1	25.1	100.0	.0	17.3
Mixed central hardwoods	7.3	9.9	32.8	100.0	5.5

Table 3 (SE).-continued

(Standard error as percentage of total)

Forest type	Stand-size class				All classes
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked	
Oak/hickory group	5.1	6.8	18.0	54.4	3.6
Black ash/Amer. elm/red maple	34.8	62.6	54.3	100.0	25.6
Red maple(lowland)	.0	55.9	75.4	.0	51.4
Red maple(upland)	26.2	31.0	46.8	.0	18.3
River birch/sycamore	54.8	.0	100.0	.0	48.8
Cottonwood	100.0	.0	.0	.0	100.0
Willow	71.1	.0	.0	.0	71.1
Sycamore/pecan/American elm	51.5	.0	.0	.0	51.5
American elm/green ash	100.0	71.6	100.0	.0	52.4
Elm/ash/red maple group	17.4	23.4	31.1	100.0	12.5
Sugar maple/beech/yellow birch	8.9	19.4	49.9	.0	7.8
Black cherry	17.1	16.5	21.4	62.1	10.0
Red maple/northern hardwoods	12.3	16.5	27.1	65.9	8.9
Pin cherry/reverting field	.0	44.6	27.9	.0	23.9
Mixed northern hardwoods	11.5	14.8	21.6	.0	8.2
Northern hardwoods group	5.2	7.8	11.4	45.2	3.6
Aspen	57.5	39.1	30.1	74.4	21.2
Paper birch	.0	79.0	.0	.0	79.0
Gray birch	.0	.0	67.3	.0	67.3
Aspen/birch group	57.5	35.1	27.6	74.4	19.6
All forest types	3.0	4.6	8.4	31.2	1.7

Table 4.--Area of timberland by forest-type group and stocking class of all live trees, Pennsylvania, 2001

(In thousands of acres)

Forest-type group	Stocking class					All classes	SE
	Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked		
White/red pine	3.7	55.8	176.1	284.7	80.6	600.9	14.1
Spruce/fir	.0	3.7	36.9	31.7	.3	72.6	41.3
Loblolly/shortleaf	.0	15.5	93.8	36.2	.0	145.5	29.3
Oak/pine	.0	22.6	13.6	99.3	3.7	139.2	30.1
Oak/hickory	31.1	417.7	2,620.3	4,104.0	238.3	7,411.4	3.6
Elm/ash/red maple	14.8	164.9	299.9	289.9	7.6	777.1	12.5
Northern hardwoods	40.8	602.7	2,354.5	3,396.5	357.2	6,751.7	3.6
Aspen/ birch	11.2	44.8	137.0	76.0	28.2	297.2	19.6
Total	101.6	1,327.7	5,732.1	8,318.3	715.9	16,195.6	1.7
SE	31.2	9.3	4.3	3.3	12.2	1.7	

Table 4 (SE).--Area of timberland by forest-type group and stocking class of all live trees, Pennsylvania, 2001

(Standard error as percentage of total)

Forest-type group	Stocking class					All classes
	Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked	
White/red pine	100.0	47.8	26.5	20.9	36.8	14.1
Spruce/fir	.0	100.0	60.4	62.3	100.0	41.3
Loblolly/shortleaf	.0	100.0	36.9	54.4	.0	29.3
Oak/pine	.0	75.4	100.0	35.9	100.0	30.1
Oak/hickory	54.4	17.2	6.9	5.3	20.9	3.6
Elm/ash/red maple	100.0	25.8	20.8	21.1	70.7	12.5
Northern hardwoods	45.2	14.1	7.1	5.7	17.8	3.6
Aspen/ birch	74.4	52.5	30.7	36.5	60.8	19.6
Total	31.2	9.3	4.3	3.3	12.2	1.7

Table 5.--Number of live trees (1.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 2001

(In thousands of trees)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	97,029	40,840	27,612	21,424	11,240	7,507	6,347
Virginia pine	13,795	6,889	6,463	6,854	5,842	1,939	1,020
Other yellow pines	15,911	10,110	7,617	4,762	3,926	3,009	911
Eastern hemlock	64,538	72,394	49,901	36,601	23,249	16,299	10,358
Other softwoods	11,269	11,223	12,460	8,159	4,093	1,553	179
Total softwoods	202,543	141,456	104,052	77,799	48,351	30,307	18,815
Red maple	786,742	384,115	224,022	140,422	89,739	55,986	29,521
Sugar maple	220,201	95,537	57,259	40,793	32,483	22,881	12,032
Yellow birch	27,101	15,759	12,070	11,195	6,628	4,166	1,535
Sweet birch	547,989	136,482	56,400	44,263	28,873	14,798	6,908
Hickory	56,906	29,504	16,977	14,449	10,505	6,964	4,669
Beech	314,253	63,028	34,065	19,695	15,426	8,123	5,144
White ash	146,379	42,908	29,741	20,072	15,976	11,840	8,934
Black walnut	10,156	11,407	3,807	3,513	2,727	1,816	899
Yellow-poplar	21,339	20,364	9,082	7,788	8,219	6,231	4,799
Blackgum	168,518	78,159	26,037	10,413	5,210	2,105	544
Aspen	34,661	16,757	8,552	5,964	3,902	2,093	1,350
Black cherry	411,411	158,472	69,803	40,859	30,701	22,835	16,723
Chestnut oak	34,231	25,940	37,736	49,843	40,896	28,687	16,829
Northern red oak	95,411	28,483	20,873	20,287	19,660	21,658	16,346
Select white oaks	27,151	19,061	24,631	26,432	21,855	14,436	10,382
Other oaks	44,007	12,387	15,901	15,641	13,322	12,357	9,141
Black locust	41,059	13,704	11,392	7,927	4,836	3,565	2,569
Basswood	13,608	2,219	3,346	3,540	3,898	2,966	2,805
Other hardwoods	221,701	68,470	27,465	21,644	15,030	11,019	5,672
Other noncomm hardwoods	965,725	203,880	68,622	24,453	10,950	3,989	1,903
Total hardwoods	4,188,549	1,426,639	757,780	529,195	380,838	258,516	158,705
All species	4,391,092	1,568,096	861,832	606,993	429,188	288,823	177,520
SE	4.2	4.1	2.7	2.7	2.7	2.9	3.4

Table 5.-continued

(In thousands of trees)

Species	Diameter class (inches at breast height)							
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes	SE
White and red pine	2,012	1,816	812	2,089	269	81,127	218,997	14.6
Virginia pine	187	89	0	0	0	22,393	43,077	28.0
Other yellow pines	541	89	179	0	0	21,035	47,056	27.4
Eastern hemlock	7,152	3,805	1,635	1,915	182	151,097	288,029	10.8
Other softwoods	89	0	0	93	0	26,626	49,118	25.0
Total softwoods	9,981	5,799	2,627	4,097	451	302,278	646,278	7.9
Red maple	19,174	9,589	4,436	4,344	270	577,504	1,748,361	5.2
Sugar maple	7,425	3,629	1,989	1,447	273	180,212	495,951	8.3
Yellow birch	536	272	89	182	0	36,672	79,532	16.9
Sweet birch	2,914	1,278	637	270	0	156,342	840,812	8.8
Hickory	1,001	1,624	362	544	0	57,095	143,505	10.0
Beech	4,144	2,620	1,176	1,170	0	91,563	468,844	9.0
White ash	6,970	2,796	1,082	1,089	540	99,041	288,329	9.5
Black walnut	625	181	179	90	0	13,838	35,401	22.9
Yellow-poplar	4,806	3,530	1,550	3,335	270	49,610	91,314	14.8
Blackgum	269	276	272	269	0	45,395	292,073	12.6
Aspen	271	91	0	0	0	22,223	73,641	24.6
Black cherry	12,051	7,891	4,441	3,622	270	209,196	779,079	8.9
Chestnut oak	10,123	4,836	1,457	2,097	271	192,777	252,948	8.6
Northern red oak	11,862	9,737	6,277	4,568	1,084	132,351	256,245	8.4
Select white oaks	5,591	3,626	1,992	2,005	361	111,312	157,524	9.5
Other oaks	6,266	4,160	2,179	2,169	271	81,409	137,802	9.4
Black locust	1,838	1,202	741	358	0	34,428	89,192	20.4
Basswood	1,804	724	182	93	269	19,629	35,456	20.8
Other hardwoods	4,341	1,538	550	907	178	88,346	378,517	11.9
Other noncomm hardwoods	272	361	0	183	0	110,732	1,280,337	6.9
Total hardwoods	102,284	59,962	29,591	28,746	4,057	2,309,675	7,924,863	2.9
All species	112,266	65,761	32,218	32,843	4,508	2,611,953	8,571,141	2.8
SE	3.9	4.6	6.2	6.5	14.2	2.1	2.8	

Table 5 (SE).--Number of live trees (1.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	23.3	24.6	15.4	16.7	16.4	19.1	18.5
Virginia pine	40.8	62.5	27.6	27.0	31.2	33.9	34.9
Other yellow pines	52.1	45.5	28.5	25.6	24.2	22.5	44.8
Eastern hemlock	18.8	18.0	11.3	10.6	11.9	11.5	13.3
Other softwoods	39.9	44.5	32.0	35.5	37.9	38.7	70.7
Total softwoods	14.4	13.0	8.5	8.3	8.8	8.5	10.0
Red maple	8.6	7.8	4.3	4.4	5.2	5.7	7.6
Sugar maple	13.2	13.3	7.5	7.7	8.9	10.8	11.8
Yellow birch	32.3	31.7	14.9	15.8	15.0	18.2	25.5
Sweet birch	11.2	13.2	9.5	10.4	9.8	10.7	15.5
Hickory	16.6	20.2	12.2	12.9	12.5	16.2	15.4
Beech	10.7	15.8	9.9	11.3	11.2	13.8	15.9
White ash	13.5	18.1	10.5	11.3	10.0	11.3	13.2
Black walnut	33.3	42.5	23.8	27.0	23.3	27.4	34.5
Yellow-poplar	30.8	32.1	19.8	19.8	16.8	17.4	19.1
Blackgum	15.6	17.0	12.0	15.2	16.8	26.3	40.8
Aspen	36.9	39.3	19.3	20.7	24.6	28.0	30.4
Black cherry	14.0	13.0	9.5	7.9	8.5	9.2	11.3
Chestnut oak	31.4	26.2	11.0	9.2	8.9	8.6	10.3
Northern red oak	17.2	22.9	9.4	9.5	10.2	9.8	9.4
Select white oaks	25.7	31.3	12.5	10.8	10.1	10.6	12.9
Other oaks	20.5	32.7	13.4	11.7	10.9	10.5	11.8
Black locust	38.6	33.2	16.5	17.3	18.1	19.5	22.9
Basswood	42.9	100.0	24.1	21.1	19.7	24.1	23.3
Other hardwoods	15.8	17.6	11.3	10.3	11.3	12.2	14.9
Other noncomm hardwoods	8.0	10.2	7.4	9.4	11.1	18.0	22.8
Total hardwoods	4.3	4.2	2.7	2.7	2.8	3.0	3.5
All species	4.2	4.1	2.7	2.7	2.7	2.9	3.4

Table 5 (SE).-continued

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)						
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes
White and red pine	27.8	24.4	36.7	24.8	57.7	12.6	14.6
Virginia pine	100.0	100.0	.0	.0	.0	25.4	28.0
Other yellow pines	47.0	100.0	70.7	.0	.0	20.5	27.4
Eastern hemlock	15.7	19.1	23.5	23.7	70.7	9.1	10.8
Other softwoods	100.0	.0	.0	100.0	.0	31.1	25.0
Total softwoods	13.0	14.9	19.0	16.9	44.7	6.9	7.9
Red maple	8.3	10.8	18.3	15.9	57.7	3.5	5.2
Sugar maple	13.4	18.1	23.1	27.9	57.7	6.7	8.3
Yellow birch	40.7	57.5	100.0	70.7	.0	11.4	16.9
Sweet birch	19.6	28.6	37.8	57.7	.0	7.9	8.8
Hickory	30.1	23.5	50.0	40.8	.0	9.5	10.0
Beech	17.1	23.0	27.6	27.6	.0	8.6	9.0
White ash	15.1	22.4	31.0	31.1	40.8	7.5	9.5
Black walnut	42.7	70.7	70.7	100.0	.0	16.6	22.9
Yellow-poplar	18.6	19.5	26.9	20.9	57.7	11.8	14.8
Blackgum	57.7	57.7	57.8	57.7	.0	10.9	12.6
Aspen	74.5	100.0	.0	.0	.0	15.9	24.6
Black cherry	10.8	12.5	16.1	17.6	57.7	5.8	8.9
Chestnut oak	11.9	15.2	24.9	27.7	57.7	7.1	8.6
Northern red oak	10.2	11.5	13.2	16.3	28.8	5.9	8.4
Select white oaks	14.7	17.5	22.0	23.9	50.0	7.9	9.5
Other oaks	14.1	16.2	22.7	22.7	57.7	7.1	9.4
Black locust	28.1	33.4	39.5	61.1	.0	13.1	20.4
Basswood	23.2	39.4	70.7	100.0	57.7	13.8	20.8
Other hardwoods	16.5	24.2	40.8	34.8	70.6	7.9	11.9
Other noncomm hardwoods	57.7	49.9	.0	70.7	.0	6.7	6.9
Total hardwoods	4.0	4.8	6.4	7.0	15.0	2.1	2.9
All species	3.9	4.6	6.2	6.5	14.2	2.1	2.8

Table 6.--Number of live trees (1.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 2001

(In thousands of trees)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	97,029	40,840	27,518	21,333	11,149	7,507	6,257
Virginia pine	13,795	6,889	6,463	6,764	5,842	1,939	1,020
Other yellow pines	15,911	10,110	7,617	4,762	3,926	3,009	911
Eastern hemlock	63,404	68,991	48,810	35,417	22,794	15,571	10,176
Other softwoods	11,269	11,223	12,460	8,069	4,093	1,553	179
Total softwoods	201,408	138,053	102,868	76,344	47,804	29,579	18,543
Red maple	784,443	384,115	219,073	136,042	87,384	55,002	28,427
Sugar maple	219,090	92,207	56,635	40,072	31,859	22,792	11,854
Yellow birch	25,990	15,759	11,529	10,652	6,269	3,714	1,354
Sweet birch	545,740	135,353	52,225	40,884	27,324	14,335	6,544
Hickory	55,744	26,112	16,247	13,806	10,050	6,601	4,389
Beech	306,455	57,427	31,828	18,175	14,619	7,677	4,787
White ash	145,270	42,908	29,377	19,800	15,794	11,662	8,578
Black walnut	9,035	11,407	3,447	3,243	2,637	1,536	899
Yellow-poplar	21,339	20,364	9,082	7,788	8,219	6,231	4,799
Blackgum	167,353	78,159	25,476	10,040	5,117	2,105	544
Aspen	34,661	16,757	8,461	5,782	3,809	2,093	1,350
Black cherry	406,973	157,362	69,442	40,323	30,429	22,389	16,455
Chestnut oak	34,231	25,940	37,361	49,017	39,431	27,495	16,553
Northern red oak	93,167	26,253	20,694	19,841	19,388	21,115	15,804
Select white oaks	27,151	19,061	24,267	26,151	20,939	14,068	10,291
Other oaks	42,898	12,387	15,809	15,456	12,858	12,175	8,954
Black locust	41,059	13,704	11,205	7,838	4,653	3,471	2,569
Basswood	13,608	2,219	3,346	3,362	3,720	2,877	2,716
Other hardwoods	212,735	62,878	26,025	21,014	14,847	10,750	5,402
Other noncomm hardwoods	946,793	203,880	67,361	24,181	10,771	3,900	1,903
Total hardwoods	4,133,737	1,404,257	738,890	513,469	370,117	251,990	154,173
All species	4,335,145	1,542,310	841,758	589,813	417,921	281,569	172,716
SE	4.2	4.1	2.7	2.7	2.8	2.9	3.5

Table 6.-continued

(In thousands of trees)

Species	Diameter class (inches at breast height)							
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes	SE
White and red pine	2,012	1,816	812	2,089	269	80,762	218,632	14.6
Virginia pine	187	89	0	0	0	22,303	42,987	28.1
Other yellow pines	541	89	179	0	0	21,035	47,056	27.4
Eastern hemlock	7,152	3,805	1,635	1,915	182	147,457	279,852	11.0
Other softwoods	89	0	0	93	0	26,536	49,028	25.1
Total softwoods	9,981	5,799	2,627	4,097	451	298,094	637,555	8.0
Red maple	18,991	9,135	4,343	4,162	270	562,830	1,731,388	5.3
Sugar maple	7,247	3,629	1,989	1,447	273	177,799	489,096	8.4
Yellow birch	536	272	89	182	0	34,597	76,347	17.5
Sweet birch	2,638	1,278	546	270	0	146,045	827,139	8.9
Hickory	1,001	1,624	362	544	0	54,625	136,480	10.2
Beech	4,055	2,531	1,176	1,170	0	86,017	449,899	9.1
White ash	6,787	2,796	1,082	996	540	97,411	285,590	9.6
Black walnut	625	181	179	90	0	12,837	33,280	23.7
Yellow-poplar	4,806	3,530	1,550	3,335	270	49,610	91,314	14.8
Blackgum	269	276	272	180	0	44,278	289,791	12.7
Aspen	271	91	0	0	0	21,857	73,275	24.7
Black cherry	12,051	7,801	4,441	3,622	270	207,225	771,561	9.0
Chestnut oak	9,758	4,656	1,457	2,097	180	188,006	248,177	8.8
Northern red oak	11,406	9,373	5,821	4,568	995	129,005	248,426	8.6
Select white oaks	5,411	3,439	1,899	1,912	361	108,737	154,949	9.6
Other oaks	5,990	4,160	2,179	2,169	271	80,023	135,307	9.5
Black locust	1,838	1,202	741	358	0	33,875	88,639	20.5
Basswood	1,715	724	182	93	269	19,006	34,833	21.1
Other hardwoods	3,803	1,449	550	817	178	84,836	360,449	11.8
Other noncomm hardwoods	272	361	0	183	0	108,931	1,259,605	7.0
Total hardwoods	99,471	58,510	28,857	28,197	3,877	2,247,551	7,785,545	3.0
All species	109,453	64,309	31,484	32,294	4,327	2,545,645	8,423,100	2.8
SE	3.9	4.7	6.3	6.6	14.5	2.1	2.8	

Table 6 (SE).--Number of live trees (1.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	23.3	24.6	15.5	16.8	16.5	19.1	18.7
Virginia pine	40.8	62.5	27.6	27.3	31.2	33.9	34.9
Other yellow pines	52.1	45.5	28.5	25.6	24.2	22.5	44.8
Eastern hemlock	19.1	18.3	11.5	10.9	12.0	11.7	13.5
Other softwoods	39.9	44.5	32.0	35.9	37.9	38.7	70.7
Total softwoods	14.4	13.1	8.6	8.5	8.9	8.6	10.1
Red maple	8.6	7.8	4.4	4.5	5.3	5.8	7.7
Sugar maple	13.3	13.5	7.5	7.8	8.9	10.8	12.0
Yellow birch	33.4	31.7	15.4	16.2	15.5	18.5	27.3
Sweet birch	11.2	13.3	9.5	10.4	10.0	10.8	15.9
Hickory	16.8	21.6	12.6	13.3	12.9	16.8	15.7
Beech	10.9	16.4	9.8	11.1	11.4	13.8	16.0
White ash	13.5	18.1	10.6	11.4	10.1	11.4	13.1
Black walnut	35.3	42.5	24.1	28.1	23.9	26.8	34.5
Yellow-poplar	30.8	32.1	19.8	19.8	16.8	17.4	19.1
Blackgum	15.7	17.0	12.2	15.5	17.1	26.3	40.8
Aspen	36.9	39.3	19.5	21.1	25.1	28.0	30.4
Black cherry	14.1	13.1	9.5	8.0	8.5	9.2	11.5
Chestnut oak	31.4	26.2	11.1	9.3	9.1	8.7	10.4
Northern red oak	17.6	24.1	9.5	9.6	10.3	10.0	9.6
Select white oaks	25.7	31.3	12.7	10.9	10.0	10.6	13.0
Other oaks	20.9	32.7	13.4	11.9	11.1	10.6	11.9
Black locust	38.6	33.2	16.7	17.5	18.7	19.8	22.9
Basswood	42.9	100.0	24.1	21.6	20.1	24.6	23.9
Other hardwoods	15.9	17.7	11.1	10.4	11.4	12.4	15.2
Other noncomm hardwoods	8.1	10.2	7.5	9.5	11.2	18.3	22.8
Total hardwoods	4.4	4.3	2.8	2.8	2.8	3.0	3.6
All species	4.2	4.1	2.7	2.7	2.8	2.9	3.5

Table 6 (SE).-continued

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)						
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes
White and red pine	27.8	24.4	36.7	24.8	57.7	12.7	14.6
Virginia pine	100.0	100.0	.0	.0	.0	25.5	28.1
Other yellow pines	47.0	100.0	70.7	.0	.0	20.5	27.4
Eastern hemlock	15.7	19.1	23.5	23.7	70.7	9.3	11.0
Other softwoods	100.0	.0	.0	100.0	.0	31.2	25.1
Total softwoods	13.0	14.9	19.0	16.9	44.7	6.9	8.0
Red maple	8.4	11.1	18.5	16.3	57.7	3.6	5.3
Sugar maple	13.5	18.1	23.1	27.9	57.7	6.7	8.4
Yellow birch	40.7	57.5	100.0	70.7	.0	11.6	17.5
Sweet birch	20.3	28.6	40.8	57.7	.0	7.9	8.9
Hickory	30.1	23.5	50.0	40.8	.0	9.8	10.2
Beech	17.3	23.5	27.6	27.6	.0	8.3	9.1
White ash	15.4	22.4	31.0	32.7	40.8	7.5	9.6
Black walnut	42.7	70.7	70.7	100.0	.0	17.0	23.7
Yellow-poplar	18.6	19.5	26.9	20.9	57.7	11.8	14.8
Blackgum	57.7	57.7	57.8	70.7	.0	11.1	12.7
Aspen	74.5	100.0	.0	.0	.0	16.1	24.7
Black cherry	10.8	12.6	16.1	17.6	57.7	5.9	9.0
Chestnut oak	12.0	15.5	24.9	27.7	70.7	7.2	8.8
Northern red oak	10.3	11.8	13.7	16.3	30.1	5.9	8.6
Select white oaks	14.8	18.0	22.6	24.6	50.0	7.9	9.6
Other oaks	14.6	16.2	22.7	22.7	57.7	7.2	9.5
Black locust	28.1	33.4	39.5	61.1	.0	13.3	20.5
Basswood	23.9	39.4	70.7	100.0	57.7	13.9	21.1
Other hardwoods	15.9	24.9	40.8	37.0	70.6	7.9	11.8
Other noncomm hardwoods	57.7	49.9	.0	70.7	.0	6.7	7.0
Total hardwoods	4.0	4.9	6.5	7.1	15.4	2.2	3.0
All species	3.9	4.7	6.3	6.6	14.5	2.1	2.8

Table 7.--Number of trees (5.0+ inches d.b.h.) on timberland by species and tree class, Pennsylvania, 2001

(In thousands of trees)

Species	Tree class						All classes	SE
	All growing stock	Rough cull	Rotten cull	All live	Salvable dead	Nonsalvable dead		
White and red pine	77,245	3,337	180	80,762	1,731	7,627	90,120	12.4
Virginia pine	21,103	830	369	22,303	1,016	2,296	25,615	25.0
Other yellow pines	18,500	1,993	542	21,035	545	4,331	25,912	18.5
Eastern hemlock	132,675	13,696	1,087	147,457	2,183	6,779	156,420	9.3
Other softwoods	25,366	1,170	0	26,536	356	2,062	28,954	30.3
Total softwoods	274,888	21,028	2,178	298,094	5,831	23,096	327,021	6.8
Red maple	524,233	17,105	21,493	562,830	2,724	25,728	591,282	3.6
Sugar maple	168,456	3,713	5,629	177,799	361	17,879	196,039	6.6
Yellow birch	31,700	1,261	1,636	34,597	1,121	4,182	39,901	11.2
Sweet birch	140,483	2,553	3,009	146,045	2,188	9,002	157,235	7.8
Hickory	52,809	723	1,092	54,625	269	725	55,619	9.8
Beech	76,642	3,072	6,303	86,017	361	10,916	97,294	8.1
White ash	91,550	3,158	2,703	97,411	2,084	3,877	103,372	7.4
Black walnut	11,558	913	367	12,837	0	720	13,557	16.8
Yellow-poplar	48,529	447	633	49,610	630	1,903	52,143	11.9
Blackgum	40,378	1,901	1,999	44,278	93	362	44,734	11.0
Aspen	21,410	178	268	21,857	271	2,166	24,294	15.8
Black cherry	187,454	11,432	8,340	207,225	2,079	19,332	228,636	5.7
Chestnut oak	178,180	3,909	5,917	188,006	1,443	22,986	212,435	7.0
Northern red oak	126,558	903	1,544	129,005	829	15,046	144,880	6.0
Select white oaks	105,570	1,903	1,264	108,737	1,088	10,312	120,138	7.8
Other oaks	77,213	1,353	1,457	80,023	825	6,664	87,512	7.1
Black locust	24,835	1,442	7,598	33,875	827	11,556	46,259	12.2
Basswood	17,568	631	807	19,006	91	812	19,909	13.8
Other hardwoods	77,361	4,492	2,983	84,836	2,603	16,787	104,226	7.6
Other noncomm hardwoods	0	95,845	13,086	108,931	2,436	26,284	137,651	6.3
Total hardwoods	2,002,488	156,934	88,129	2,247,551	22,324	207,240	2,477,116	2.2
All species	2,277,376	177,962	90,307	2,545,645	28,155	230,336	2,804,137	2.1
SE	2.2	4.6	6.0	2.1	7.6	3.7	2.1	

Table 7 (SE).--Number of trees (5.0+ inches d.b.h.) on timberland by species and tree class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Tree class						All classes
	All growing stock	Rough cull	Rotten cull	All live	Salvable dead	Nonsalvable dead	
White and red pine	12.9	25.1	70.7	12.7	35.1	16.3	12.4
Virginia pine	25.8	40.0	49.9	25.5	37.1	33.0	25.0
Other yellow pines	20.7	37.0	47.1	20.5	52.5	24.6	18.5
Eastern hemlock	9.7	14.6	31.1	9.3	25.5	18.0	9.3
Other softwoods	32.2	38.4	.0	31.2	79.1	41.7	30.3
Total softwoods	7.2	11.3	21.9	6.9	17.1	10.3	6.8
Red maple	3.7	9.3	8.7	3.6	20.4	8.1	3.6
Sugar maple	6.7	18.5	17.0	6.7	61.3	13.1	6.6
Yellow birch	11.8	28.5	26.0	11.6	28.8	20.0	11.2
Sweet birch	8.0	24.1	23.1	7.9	23.4	14.4	7.8
Hickory	9.9	35.3	28.8	9.8	57.7	35.3	9.8
Beech	8.4	23.7	18.4	8.3	50.0	16.0	8.1
White ash	7.8	18.2	21.9	7.5	25.6	19.7	7.4
Black walnut	17.6	34.7	49.9	17.0	.0	43.2	16.8
Yellow-poplar	11.9	44.6	37.7	11.8	37.7	30.2	11.9
Blackgum	10.9	42.1	23.9	11.1	100.0	50.0	11.0
Aspen	16.3	100.0	57.7	16.1	57.7	26.2	15.8
Black cherry	6.1	12.5	15.8	5.9	24.9	10.6	5.7
Chestnut oak	7.3	17.6	20.8	7.2	28.9	10.7	7.0
Northern red oak	6.0	31.5	24.1	5.9	40.1	13.8	6.0
Select white oaks	7.9	22.7	42.5	7.9	31.1	13.0	7.8
Other oaks	7.3	27.3	30.4	7.2	36.9	16.4	7.1
Black locust	13.7	27.7	29.7	13.3	39.9	15.8	12.2
Basswood	14.3	55.1	42.8	13.9	100.0	42.7	13.8
Other hardwoods	8.2	17.2	23.5	7.9	22.5	12.7	7.6
Other noncomm hardwoods	.0	7.0	12.0	6.7	26.4	9.1	6.3
Total hardwoods	2.3	4.9	6.0	2.2	8.2	4.0	2.2
All species	2.2	4.6	6.0	2.1	7.6	3.7	2.1

Table 8.--Number of growing-stock trees (5.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 2001

(In thousands of trees)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	27,071	20,707	10,062	7,236	5,444	2,012	1,816	721	1,907	269	77,245	12.9
Virginia pine	5,909	6,764	5,290	1,939	926	187	89	0	0	0	21,103	25.8
Other yellow pines	6,803	4,491	3,196	2,558	730	541	0	179	0	0	18,500	20.7
Eastern hemlock	47,544	35,054	17,902	12,406	8,067	5,978	2,991	1,181	1,462	91	132,675	9.7
Other softwoods	11,743	8,069	3,731	1,462	179	89	0	0	93	0	25,366	32.2
Total softwoods	99,069	75,085	40,181	25,600	15,347	8,807	4,896	2,081	3,462	360	274,888	7.2
Red maple	202,194	127,983	83,939	48,945	26,626	17,997	8,322	4,156	3,800	270	524,233	3.7
Sugar maple	53,102	38,791	30,961	20,794	10,861	7,154	3,356	1,900	1,265	273	168,456	6.7
Yellow birch	10,894	10,289	6,085	2,538	1,175	358	272	0	91	0	31,700	11.8
Sweet birch	51,039	40,254	26,597	12,961	5,812	1,996	1,098	546	180	0	140,483	8.0
Hickory	15,522	13,170	9,961	6,327	4,389	1,001	1,533	362	544	0	52,809	9.9
Beech	28,578	16,550	13,622	6,601	3,800	3,249	2,261	1,085	897	0	76,642	8.4
White ash	27,744	18,812	14,985	10,851	8,220	6,334	2,706	903	905	89	91,550	7.8
Black walnut	3,263	3,153	2,450	986	629	625	181	179	90	0	11,558	17.6
Yellow-poplar	8,723	7,788	8,040	6,047	4,710	4,716	3,440	1,550	3,335	180	48,529	11.9
Blackgum	23,206	9,131	4,849	1,923	453	269	187	272	89	0	40,378	10.9
Aspen	8,193	5,782	3,720	2,003	1,350	271	91	0	0	0	21,410	16.3
Black cherry	61,929	36,714	27,792	19,185	14,917	11,327	7,347	4,351	3,622	270	187,454	6.1
Chestnut oak	35,091	47,745	38,247	25,593	15,456	8,201	4,388	1,366	1,913	180	178,180	7.3
Northern red oak	19,700	19,393	19,208	20,750	15,713	11,219	9,373	5,821	4,385	995	126,558	6.0
Select white oaks	23,181	25,516	20,939	13,436	10,200	5,322	3,439	1,629	1,547	361	105,570	7.9
Other oaks	15,001	15,272	12,675	11,533	8,507	5,717	3,981	2,088	2,169	271	77,213	7.3
Black locust	8,577	6,371	3,469	2,002	1,656	1,198	829	554	180	0	24,835	13.7
Basswood	2,630	3,180	3,630	2,784	2,627	1,626	635	182	93	180	17,568	14.3
Other hardwoods	22,677	19,133	14,217	9,940	5,043	3,444	1,449	550	817	89	77,361	8.2
Total hardwoods	621,245	465,027	345,387	225,200	142,145	92,021	54,889	27,493	25,923	3,158	2,002,488	2.3
All species	720,315	540,112	385,568	250,801	157,492	100,827	59,785	29,574	29,385	3,518	2,277,376	2.2
SE	2.9	2.8	2.8	3.1	3.7	4.1	4.8	6.5	7.0	15.8	2.2	

Table 8 (SE).--Number of growing-stock trees (5.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)										All classes
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
White and red pine	15.4	17.0	17.4	19.6	20.1	27.8	24.4	39.4	25.5	57.7	12.9
Virginia pine	27.1	27.3	33.2	33.9	37.1	100.0	100.0	.0	.0	.0	25.8
Other yellow pines	30.5	25.8	26.5	22.5	43.4	47.0	.0	70.7	.0	.0	20.7
Eastern hemlock	11.7	10.9	13.7	12.5	14.3	16.9	22.3	27.7	27.9	100.0	9.7
Other softwoods	32.8	35.9	41.0	38.7	70.7	100.0	.0	.0	100.0	.0	32.2
Total softwoods	8.6	8.5	9.9	9.0	10.8	13.6	16.3	21.6	18.4	50.0	7.2
Red maple	4.5	4.7	5.4	6.2	8.0	8.6	11.7	19.1	17.3	57.7	3.7
Sugar maple	7.6	7.9	9.0	11.3	12.4	13.6	18.7	23.7	30.3	57.7	6.7
Yellow birch	15.8	16.1	15.9	21.2	29.6	49.9	57.5	.0	100.0	.0	11.8
Sweet birch	9.6	10.5	10.0	11.1	17.0	23.0	31.2	40.8	70.7	.0	8.0
Hickory	12.4	13.6	13.0	17.4	15.7	30.1	24.1	50.0	40.8	.0	9.9
Beech	10.2	11.4	11.8	14.5	17.5	18.2	25.5	28.8	31.5	.0	8.4
White ash	11.1	11.9	10.3	11.7	13.3	16.2	22.9	34.5	34.5	100.0	7.8
Black walnut	24.9	28.5	25.1	30.0	42.7	42.7	70.7	70.7	100.0	.0	17.6
Yellow-poplar	20.2	19.8	17.1	17.7	19.4	18.8	19.9	26.9	20.9	70.7	11.9
Blackgum	12.2	14.9	17.2	25.5	44.7	57.7	70.7	57.8	100.0	.0	10.9
Aspen	19.8	21.1	25.6	28.9	30.4	74.5	100.0	.0	.0	.0	16.3
Black cherry	10.2	8.4	8.7	9.8	12.1	11.2	13.0	16.3	17.6	57.7	6.1
Chestnut oak	11.4	9.4	9.1	8.9	10.7	13.3	15.9	25.7	28.8	70.7	7.3
Northern red oak	9.7	9.7	10.4	10.0	9.6	10.4	11.8	13.7	16.8	30.1	6.0
Select white oaks	12.8	11.1	10.0	11.0	13.1	15.0	18.0	24.6	26.8	50.0	7.9
Other oaks	13.9	11.9	11.2	11.0	12.2	15.0	16.7	23.3	22.7	57.7	7.3
Black locust	17.7	19.7	20.5	24.6	27.0	33.3	36.8	47.2	70.7	.0	13.7
Basswood	24.5	22.2	20.5	25.2	24.4	24.6	37.7	70.7	100.0	70.7	14.3
Other hardwoods	12.2	10.6	11.7	13.1	15.9	16.4	24.9	40.8	37.0	100.0	8.2
Total hardwoods	3.0	2.9	2.9	3.2	3.8	4.2	5.0	6.7	7.6	16.7	2.3
All species	2.9	2.8	2.8	3.1	3.7	4.1	4.8	6.5	7.0	15.8	2.2

Table 9.--Net volume of trees (5.0+ inches d.b.h.) on timberland by class of timber and species group, Pennsylvania, 2001

(In millions of cubic feet)

Class of timber	Species group				All species	SE
	Pines	Other softwoods	Soft hardwoods	Hard hardwoods		
Growing-stock trees:						
Sawtimber size:						
Sawlog portion	808.9	983.3	7,249.0	7,372.4	16,413.7	3.0
Upper stem	99.1	120.1	1,656.0	1,702.4	3,577.6	2.9
Total sawtimber size	908.0	1,103.4	8,905.0	9,074.8	19,991.3	3.0
Poletimber size	304.2	385.1	4,287.1	4,228.6	9,204.9	2.6
Total growing-stock trees	1,212.2	1,488.5	13,192.2	13,303.4	29,196.3	2.5
Rough trees:						
Sawtimber size	40.3	239.5	302.8	213.3	795.9	7.5
Poletimber size	4.7	1.9	242.0	141.8	390.4	6.3
Total rough trees	45.0	241.4	544.8	355.1	1,186.3	5.6
Rotten trees:						
Sawtimber size	3.2	3.4	84.9	116.6	208.0	9.4
Poletimber size	.2	.2	22.0	21.1	43.5	12.3
Total rotten trees	3.3	3.6	106.9	137.7	251.5	8.3
Salvable dead[a] trees:						
Sawtimber size	3.8	4.1	17.6	31.3	56.8	23.0
Poletimber size	5.9	3.9	28.1	24.8	62.7	12.3
Total salvable dead trees	9.7	8.0	45.7	56.1	119.5	13.1
All classes	1,270.3	1,741.5	13,889.5	13,852.3	30,753.6	2.5
SE	10.7	9.4	3.4	3.1	2.5	

[a] Includes noncommercial species.

Table 9 (SE).--Net volume of trees (5.0+ inches d.b.h.) on timberland by class of timber and species group, Pennsylvania, 2001

(Standard error as percentage of total)

Class of timber	Species group				All species
	Pines	Other softwoods	Soft hardwoods	Hard hardwoods	
Growing-stock trees:					
Sawtimber size:					
Sawlog portion	11.8	11.0	4.5	3.8	3.0
Upper stem	11.9	10.6	4.2	3.6	2.9
Total sawtimber size	11.8	10.9	4.4	3.8	3.0
Poletimber size	14.6	11.3	3.4	3.6	2.6
Total growing-stock trees	10.8	9.9	3.5	3.2	2.5
Rough trees:					
Sawtimber size	24.0	16.9	10.9	10.9	7.5
Poletimber size	33.8	30.0	8.5	8.9	6.3
Total rough trees	22.1	16.8	7.6	7.6	5.6
Rotten trees:					
Sawtimber size	61.4	48.4	16.0	12.1	9.4
Poletimber size	93.2	96.4	14.5	18.6	12.3
Total rotten trees	58.4	46.0	13.4	10.9	8.3
Salvable dead[a] trees:					
Sawtimber size	50.0	51.8	36.3	35.4	23.0
Poletimber size	35.8	44.8	18.2	19.4	12.3
Total salvable dead trees	29.2	36.0	18.4	22.1	13.1
All classes	10.7	9.4	3.4	3.1	2.5

[a] Includes noncommercial species.

Table 10.--Sound volume of live trees (5.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 2001

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	80.7	132.3	124.4	133.9	146.1	72.6	83.4	42.0	155.5	46.9	1,017.9	12.7
Virginia pine	17.9	45.7	58.0	31.3	19.1	5.6	3.7	.0	.0	.0	181.2	28.3
Other yellow pines	15.8	26.3	31.7	38.9	15.8	18.1	.0	9.0	.0	.0	155.6	19.7
Eastern hemlock	124.4	206.9	193.7	216.1	202.5	197.4	134.8	66.5	119.9	11.9	1,474.1	10.2
Other softwoods	29.4	48.7	40.5	24.8	4.5	2.8	.0	.0	9.2	.0	159.8	31.6
Total softwoods	268.1	459.8	448.3	444.9	388.0	296.5	221.9	117.6	284.7	58.9	2,988.6	7.2
Red maple	539.4	910.9	1,122.3	1,082.2	872.8	753.1	479.5	287.8	358.0	70.2	6,476.2	4.4
Sugar maple	165.4	295.9	451.5	476.9	354.7	312.2	180.3	131.9	118.8	49.3	2,537.1	8.2
Yellow birch	33.2	73.4	78.3	56.1	36.5	12.3	13.6	.0	5.4	.0	308.9	12.5
Sweet birch	154.0	315.4	348.9	262.8	173.7	86.5	55.6	33.1	16.4	.0	1,446.5	8.0
Hickory	38.0	95.0	148.2	148.5	151.4	42.3	88.7	23.3	50.4	.0	785.8	10.2
Beech	76.8	128.3	194.0	161.1	128.9	140.4	128.8	76.1	91.8	.0	1,126.1	9.9
White ash	80.4	129.6	211.7	247.2	292.7	289.7	165.0	71.0	111.8	12.7	1,611.6	9.6
Black walnut	8.3	19.2	29.1	23.5	17.7	23.4	8.8	12.8	6.3	.0	149.0	18.9
Yellow-poplar	25.1	55.2	115.6	142.0	172.0	231.4	221.7	133.8	389.8	42.8	1,529.4	12.5
Blackgum	50.1	50.4	47.4	36.2	12.9	10.2	8.4	16.9	15.7	.0	248.2	12.4
Aspen	24.2	40.1	47.5	41.9	40.0	9.4	4.0	.0	.0	.0	207.1	17.9
Black cherry	177.6	263.8	382.8	452.4	505.4	535.9	444.5	334.7	384.4	53.3	3,534.8	6.9
Chestnut oak	90.0	282.3	414.5	462.3	384.1	283.1	196.5	73.4	146.6	45.3	2,378.1	7.0
Northern red oak	52.7	134.2	232.6	413.1	453.8	442.5	488.0	399.8	405.3	193.7	3,215.6	6.4
Select white oaks	64.4	164.9	252.6	262.8	295.6	212.3	180.2	108.0	151.0	86.7	1,778.4	8.1
Other oaks	39.3	98.2	159.0	227.9	239.0	229.4	195.0	132.9	186.6	47.5	1,554.9	8.1
Black locust	21.9	38.7	37.7	32.7	41.1	41.4	33.2	32.1	13.2	.0	292.0	17.7
Basswood	7.3	26.3	55.8	70.2	96.3	79.8	39.3	13.3	8.1	23.3	419.8	15.6
Other hardwoods	67.1	128.3	177.6	206.3	158.7	166.5	83.7	36.2	82.9	17.6	1,124.8	9.3
Total hardwoods	1,715.0	3,250.2	4,507.2	4,806.4	4,427.2	3,901.8	3,014.8	1,917.0	2,542.4	642.3	30,724.3	2.6
All species	1,983.1	3,710.0	4,955.4	5,251.3	4,815.2	4,198.3	3,236.7	2,034.6	2,827.1	701.2	33,712.9	2.5
SE	3.1	2.9	2.9	3.2	3.7	4.2	4.9	6.6	7.3	16.2	2.5	

Table 10 (SE).--Sound volume of live trees (5.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)										All classes
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
White and red pine	18.0	20.3	17.9	21.2	20.3	28.2	24.7	39.3	25.3	61.7	12.7
Virginia pine	29.4	28.5	33.0	34.3	37.1	100.0	100.0	.0	.0	.0	28.3
Other yellow pines	28.2	27.6	26.4	23.0	43.7	46.8	.0	71.0	.0	.0	19.7
Eastern hemlock	12.2	11.5	14.5	12.5	14.5	17.4	22.8	27.9	28.3	100.0	10.2
Other softwoods	32.2	37.2	39.2	38.5	71.1	100.0	.0	.0	100.0	.0	31.6
Total softwoods	9.3	9.4	10.1	9.5	11.1	13.9	16.7	21.8	18.4	53.2	7.2
Red maple	4.8	4.8	5.6	6.3	8.0	8.7	11.4	18.9	17.7	61.9	4.4
Sugar maple	8.4	8.2	9.8	11.8	12.9	14.1	19.0	24.1	31.2	58.7	8.2
Yellow birch	15.6	16.8	15.7	21.0	29.3	50.2	58.1	.0	100.0	.0	12.5
Sweet birch	10.9	10.9	10.2	11.2	16.7	22.7	31.4	39.2	71.3	.0	8.0
Hickory	13.1	14.9	13.3	17.7	15.8	30.3	24.4	50.7	41.9	.0	10.2
Beech	12.5	12.9	12.0	14.9	17.4	18.2	26.1	29.9	33.0	.0	9.9
White ash	11.8	11.6	10.7	12.4	14.2	16.4	23.7	34.7	34.6	100.0	9.6
Black walnut	25.3	27.2	24.8	32.8	43.8	43.7	70.8	70.9	100.0	.0	18.9
Yellow-poplar	23.1	20.7	17.7	18.3	20.3	19.0	19.9	27.6	21.2	71.6	12.5
Blackgum	12.2	15.1	17.5	26.4	45.2	57.8	70.8	58.5	71.3	.0	12.4
Aspen	21.3	20.8	25.4	29.5	30.4	73.1	100.0	.0	.0	.0	17.9
Black cherry	11.4	8.8	9.0	9.9	12.1	11.7	13.3	16.7	18.5	58.2	6.9
Chestnut oak	11.3	9.2	8.7	8.7	10.7	13.5	15.9	26.0	29.9	58.0	7.0
Northern red oak	10.2	9.8	10.5	9.8	9.7	10.6	12.0	13.2	17.2	29.5	6.4
Select white oaks	12.9	11.0	10.1	11.3	13.1	15.2	18.1	24.0	26.4	52.6	8.1
Other oaks	14.1	12.1	11.6	11.1	12.4	15.0	16.9	23.1	23.2	57.7	8.1
Black locust	19.7	20.9	21.0	25.0	28.6	34.3	39.4	48.2	71.8	.0	17.7
Basswood	26.1	21.4	20.8	25.2	24.9	24.0	38.2	71.0	100.0	74.9	15.6
Other hardwoods	14.9	11.1	12.4	13.7	16.1	17.7	24.6	40.9	39.3	100.0	9.3
Total hardwoods	3.2	3.0	3.0	3.3	3.9	4.3	5.1	6.8	7.8	17.0	2.6
All species	3.1	2.9	2.9	3.2	3.7	4.2	4.9	6.6	7.3	16.2	2.5

Table 11.--Net volume of growing-stock trees on timberland by species and forest-type group, Pennsylvania, 2001

(In millions of cubic feet)

Species	Forest-type group									Total	SE
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch		
White and red pine	368.0	1.4	5.9	78.1	214.7	.0	3.9	225.1	11.4	908.6	12.9
Virginia pine	.0	8.1	92.8	21.7	18.6	.0	3.4	22.4	.3	167.2	28.6
Other yellow pines	29.5	.4	31.0	18.1	35.3	.0	4.5	16.2	1.5	136.4	19.6
Eastern hemlock	452.9	.0	.0	10.2	151.9	.0	2.8	714.5	5.3	1,337.7	10.4
Other softwoods	9.6	93.2	.8	.0	25.4	.0	.7	18.8	2.3	150.8	32.0
Total softwoods	860.0	103.1	130.4	128.1	445.9	.0	15.4	997.0	20.8	2,700.7	7.3
Red maple	94.2	.6	6.1	22.9	2,240.6	.0	525.7	2,664.4	10.2	5,564.8	4.4
Sugar maple	20.2	.0	2.3	.8	198.2	.0	18.5	1,966.2	.1	2,206.4	8.2
Yellow birch	24.7	.0	.0	.0	17.0	.0	2.4	210.5	.0	254.6	12.4
Sweet birch	32.6	.0	.0	1.4	350.7	.0	7.5	849.1	2.2	1,243.6	8.0
Hickory	2.4	.0	.0	4.4	510.6	.0	15.0	139.1	4.0	675.5	10.5
Beech	1.5	.0	.0	1.2	194.0	.0	.8	733.7	.0	931.1	9.9
White ash	20.2	2.1	3.8	5.0	326.4	.0	71.6	965.7	5.7	1,400.5	9.7
Black walnut	1.6	.0	2.2	.0	94.8	.0	9.5	13.5	.0	121.6	19.2
Yellow-poplar	29.8	.0	.0	.0	1,006.1	.0	.6	360.0	2.5	1,398.9	12.4
Blackgum	.0	.0	.7	.0	174.5	.0	.8	42.2	.0	218.2	12.5
Aspen	17.2	5.7	.0	.5	33.5	.0	14.6	75.8	40.7	188.1	18.4
Black cherry	74.6	8.0	3.3	5.4	478.7	.0	95.3	2,407.1	19.6	3,091.8	7.0
Chestnut oak	7.0	.0	.0	26.8	1,873.6	.0	2.2	108.2	3.4	2,021.2	7.1
Northern red oak	12.0	.0	1.5	30.6	2,286.7	.0	5.9	399.7	2.2	2,738.7	6.5
Select white oaks	20.5	.0	.0	13.4	1,347.3	.0	13.9	100.1	2.7	1,497.9	8.0
Other oaks	7.5	.0	2.2	5.5	1,241.4	.0	4.9	84.8	3.4	1,349.8	8.2
Black locust	3.6	.0	.0	1.8	187.5	.0	20.6	42.5	2.2	258.2	17.6
Basswood	2.4	.0	.0	.0	34.5	.0	.0	325.8	1.6	364.4	15.8
Other hardwoods	14.5	2.2	1.7	6.6	355.6	.0	206.9	306.2	76.4	970.1	9.1
Total hardwoods	386.7	18.5	23.6	126.3	12,951.8	.0	1,016.8	11,794.8	177.0	26,495.6	2.6
All species	1,246.6	121.7	154.1	254.5	13,397.8	.0	1,032.1	12,791.7	197.8	29,196.3	2.5
SE	16.3	46.2	35.2	32.5	4.4	.0	17.4	4.7	25.9	2.5	

Table 11 (SE).--Net volume of growing-stock trees on timberland by species and forest-type group, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Forest-type group									Total
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch	
White and red pine	25.4	71.2	63.3	42.6	16.6	.0	93.4	23.2	53.0	12.9
Virginia pine	.0	100.0	46.6	65.0	33.2	.0	73.2	53.6	100.0	28.6
Other yellow pines	44.2	75.1	52.5	70.7	24.0	.0	81.6	41.0	76.4	19.6
Eastern hemlock	23.0	.0	.0	89.8	22.5	.0	100.0	12.5	89.7	10.4
Other softwoods	60.1	48.1	100.0	.0	50.1	.0	80.7	56.3	61.4	32.0
Total softwoods	16.5	47.4	37.2	35.0	12.1	.0	42.2	10.8	39.6	7.3
Red maple	28.5	100.0	68.2	49.5	6.9	.0	22.4	7.0	40.5	4.4
Sugar maple	58.1	.0	90.5	73.8	18.9	.0	66.1	9.0	100.0	8.2
Yellow birch	44.9	.0	.0	.0	36.4	.0	80.1	13.8	.0	12.4
Sweet birch	51.5	.0	.0	100.0	11.3	.0	52.3	10.9	54.1	8.0
Hickory	100.0	.0	.0	71.4	13.0	.0	56.7	17.7	100.0	10.5
Beech	100.0	.0	.0	72.4	20.7	.0	79.4	11.4	.0	9.9
White ash	75.0	100.0	100.0	84.8	16.1	.0	61.0	12.3	63.0	9.7
Black walnut	100.0	.0	100.0	.0	22.9	.0	72.2	34.2	.0	19.2
Yellow-poplar	77.0	.0	.0	.0	15.5	.0	83.4	21.2	100.0	12.4
Blackgum	.0	.0	77.7	.0	13.9	.0	80.5	29.7	.0	12.5
Aspen	44.5	100.0	.0	100.0	56.1	.0	93.4	23.0	40.3	18.4
Black cherry	43.4	65.3	56.1	48.1	11.9	.0	33.0	8.6	52.2	7.0
Chestnut oak	75.1	.0	.0	65.9	7.6	.0	100.0	22.3	82.3	7.1
Northern red oak	55.3	.0	72.0	46.2	7.6	.0	68.9	14.0	77.6	6.5
Select white oaks	52.4	.0	.0	79.4	8.7	.0	84.0	19.7	96.1	8.0
Other oaks	97.8	.0	55.0	63.4	8.8	.0	82.4	20.5	74.9	8.2
Black locust	88.2	.0	.0	90.3	22.9	.0	56.2	24.1	63.4	17.6
Basswood	100.0	.0	.0	.0	33.6	.0	.0	17.3	100.0	15.8
Other hardwoods	45.3	100.0	62.2	70.0	13.5	.0	28.0	13.2	32.4	9.1
Total hardwoods	21.4	75.3	39.4	33.4	4.5	.0	17.4	4.7	26.4	2.6
All species	16.3	46.2	35.2	32.5	4.4	.0	17.4	4.7	25.9	2.5

Table 12.--Net volume of growing-stock trees on timberland by species and diameter class, Pennsylvania, 2001

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	78.0	126.4	114.3	120.3	130.4	63.5	67.4	36.5	136.0	35.8	908.6	12.9
Virginia pine	17.5	43.1	53.6	28.4	16.5	5.3	2.9	.0	.0	.0	167.2	28.6
Other yellow pines	14.7	24.5	28.5	34.4	13.3	14.9	.0	6.2	.0	.0	136.4	19.6
Eastern hemlock	118.7	192.5	180.9	188.9	183.1	179.3	120.5	60.0	101.8	11.9	1,337.7	10.4
Other softwoods	27.7	46.1	38.4	22.6	4.4	2.5	.0	.0	9.2	.0	150.8	32.0
Total softwoods	256.6	432.6	415.6	394.4	347.6	265.4	190.7	102.8	247.1	47.7	2,700.7	7.3
Red maple	500.3	815.7	992.4	939.6	739.5	636.5	386.9	238.2	270.7	44.8	5,564.8	4.4
Sugar maple	155.9	270.1	402.0	419.2	308.9	255.4	152.5	106.4	98.5	37.6	2,206.4	8.2
Yellow birch	29.9	64.0	67.6	41.7	28.3	9.6	9.7	.0	3.7	.0	254.6	12.4
Sweet birch	137.7	274.5	307.7	227.4	141.6	65.7	48.6	25.9	14.4	.0	1,243.6	8.0
Hickory	34.9	86.9	130.9	125.2	126.3	36.6	74.9	19.5	40.2	.0	675.5	10.5
Beech	67.4	105.1	165.3	132.9	102.3	114.8	105.8	61.2	76.4	.0	931.1	9.9
White ash	74.4	119.2	190.9	218.9	251.1	249.5	144.4	61.8	80.5	9.8	1,400.5	9.7
Black walnut	6.7	16.4	24.9	15.7	14.7	19.9	7.5	10.9	5.0	.0	121.6	19.2
Yellow-poplar	24.6	53.4	110.6	132.4	158.8	215.0	203.7	120.8	342.3	37.3	1,398.9	12.4
Blackgum	46.8	44.7	42.1	32.6	11.7	9.0	7.8	14.9	8.5	.0	218.2	12.5
Aspen	23.2	36.3	43.5	37.4	35.2	8.5	4.0	.0	.0	.0	188.1	18.4
Black cherry	166.1	238.4	345.0	397.7	440.5	473.1	376.9	292.3	317.7	44.2	3,091.8	7.0
Chestnut oak	84.7	256.9	363.0	393.2	329.4	229.7	160.8	59.4	119.7	24.4	2,021.2	7.1
Northern red oak	50.8	122.6	212.4	362.9	394.8	376.3	417.3	325.2	340.7	135.8	2,738.7	6.5
Select white oaks	60.6	151.5	218.9	227.2	257.7	174.7	144.7	86.4	110.1	66.2	1,497.9	8.0
Other oaks	37.2	91.1	139.8	200.4	206.0	193.1	170.2	115.2	156.9	39.9	1,349.8	8.2
Black locust	20.5	35.7	33.8	29.2	36.5	37.0	28.8	26.2	10.5	.0	258.2	17.6
Basswood	7.1	22.8	49.4	62.8	84.7	67.8	33.0	11.5	6.2	19.1	364.4	15.8
Other hardwoods	61.6	117.7	161.8	181.2	136.9	125.9	73.1	32.5	64.6	14.8	970.1	9.1
Total hardwoods	1,590.7	2,923.0	4,002.1	4,177.6	3,805.0	3,298.1	2,550.7	1,607.9	2,066.7	473.8	26,495.6	2.6
All species	1,847.3	3,355.6	4,417.7	4,572.1	4,152.6	3,563.5	2,741.4	1,710.7	2,313.8	521.5	29,196.3	2.5
SE	3.2	3.0	3.0	3.2	3.8	4.3	5.1	6.7	7.4	16.5	2.5	

Table 12 (SE).--Net volume of growing-stock trees on timberland by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)										All classes
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
White and red pine	18.4	20.8	18.3	21.8	20.7	29.0	25.4	40.3	25.8	59.2	12.9
Virginia pine	29.7	28.8	33.2	34.1	37.3	100.0	100.0	.0	.0	.0	28.6
Other yellow pines	27.3	27.4	26.4	23.5	45.1	47.1	.0	72.0	.0	.0	19.6
Eastern hemlock	12.6	11.8	14.7	12.7	14.9	17.6	23.2	28.3	28.7	100.0	10.4
Other softwoods	32.0	37.9	38.8	38.8	71.0	100.0	.0	.0	100.0	.0	32.0
Total softwoods	9.5	9.7	10.3	9.7	11.4	14.2	17.1	22.2	18.7	51.0	7.3
Red maple	4.8	4.9	5.7	6.4	8.2	8.8	11.8	18.8	18.5	62.0	4.4
Sugar maple	8.4	8.3	9.8	11.8	13.0	14.3	19.3	24.4	30.6	57.9	8.2
Yellow birch	16.2	17.1	16.2	21.2	31.5	50.7	58.8	.0	100.0	.0	12.4
Sweet birch	11.0	10.8	10.5	11.4	17.3	24.0	31.7	42.6	71.1	.0	8.0
Hickory	13.6	15.5	13.7	18.6	16.1	30.5	24.8	50.8	42.8	.0	10.5
Beech	12.1	12.1	12.2	15.1	18.0	18.7	27.0	30.4	33.8	.0	9.9
White ash	11.9	11.8	10.9	12.7	14.4	16.9	23.5	34.9	37.7	100.0	9.7
Black walnut	25.0	28.1	25.1	30.4	44.1	43.5	71.3	71.6	100.0	.0	19.2
Yellow-poplar	23.4	21.1	17.7	18.4	20.5	19.1	20.0	27.7	20.9	71.8	12.4
Blackgum	12.4	15.3	17.7	27.1	45.3	58.1	71.0	59.1	100.0	.0	12.5
Aspen	21.6	21.4	26.2	31.0	30.4	73.5	100.0	.0	.0	.0	18.4
Black cherry	11.6	8.9	9.1	10.1	12.4	11.7	13.7	16.7	18.6	57.9	7.0
Chestnut oak	11.4	9.3	8.9	8.9	11.0	13.8	16.3	26.4	29.8	71.6	7.1
Northern red oak	10.2	9.9	10.7	10.0	9.8	10.8	12.1	13.8	17.3	31.4	6.5
Select white oaks	13.2	11.1	10.0	11.5	13.3	15.4	18.9	24.8	27.4	51.6	8.0
Other oaks	14.2	12.1	11.8	11.4	12.5	15.6	16.8	23.1	23.3	57.7	8.2
Black locust	19.8	21.3	21.5	25.3	28.6	34.4	38.9	48.2	74.6	.0	17.6
Basswood	26.2	22.0	21.4	25.8	25.9	24.8	38.8	72.1	100.0	76.1	15.8
Other hardwoods	15.5	11.2	12.6	13.9	16.4	16.8	25.2	40.9	41.9	100.0	9.1
Total hardwoods	3.3	3.1	3.1	3.4	4.0	4.5	5.3	6.9	8.0	17.4	2.6
All species	3.2	3.0	3.0	3.2	3.8	4.3	5.1	6.7	7.4	16.5	2.5

Table 13.--Net volume of sawtimber trees on timberland by species and forest-type group, Pennsylvania, 2001

(In millions of board feet)

Species	Forest-type group									Total	SE
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch		
White and red pine	1,234.8	3.1	23.5	303.4	604.1	.0	16.5	921.7	26.7	3,133.8	14.4
Virginia pine	.0	7.7	220.8	42.4	40.6	.0	5.6	52.1	.0	369.2	32.9
Other yellow pines	36.1	.0	89.7	65.9	127.3	.0	17.7	34.9	3.5	375.1	22.2
Eastern hemlock	1,346.5	.0	.0	31.9	426.2	.0	10.6	2,122.7	.0	3,937.9	11.6
Other softwoods	10.5	156.8	.0	.0	45.1	.0	.0	71.2	.0	283.6	33.3
Total softwoods	2,628.0	167.6	334.0	443.6	1,243.3	.0	50.5	3,202.6	30.1	8,099.6	8.2
Red maple	251.0	.0	.0	38.3	4,360.5	.0	1,614.2	7,530.9	3.7	13,798.5	6.2
Sugar maple	53.0	.0	.0	.0	353.5	.0	31.5	5,279.8	.0	5,717.8	10.0
Yellow birch	20.7	.0	.0	.0	18.1	.0	8.2	310.5	.0	357.4	19.1
Sweet birch	50.6	.0	.0	.0	531.3	.0	20.8	1,558.4	.0	2,161.1	11.1
Hickory	.0	.0	.0	6.3	1,304.5	.0	48.1	440.2	.0	1,799.2	12.1
Beech	.0	.0	.0	.0	613.7	.0	.0	2,057.0	.0	2,670.7	13.2
White ash	59.2	6.0	8.1	18.0	970.8	.0	228.3	3,220.0	7.6	4,518.0	12.6
Black walnut	.0	.0	4.0	.0	232.5	.0	39.5	14.3	.0	290.3	25.8
Yellow-poplar	133.7	.0	.0	.0	4,110.1	.0	.0	1,519.8	6.2	5,769.8	13.6
Blackgum	.0	.0	.0	.0	288.7	.0	.0	63.4	.0	352.1	26.0
Aspen	39.8	16.9	.0	.0	49.5	.0	36.4	144.3	71.2	358.2	24.1
Black cherry	214.0	7.5	.0	.0	1,279.8	.0	407.2	8,671.6	71.9	10,652.0	8.6
Chestnut oak	10.3	.0	.0	64.1	4,714.9	.0	.0	280.0	4.9	5,074.1	8.6
Northern red oak	47.2	.0	.0	100.6	8,587.3	.0	21.2	1,519.4	3.6	10,279.3	7.3
Select white oaks	75.9	.0	.0	11.4	4,141.2	.0	44.1	340.2	3.5	4,616.3	9.9
Other oaks	35.9	.0	.0	15.7	4,289.3	.0	11.0	242.9	7.3	4,602.2	9.5
Black locust	.0	.0	.0	7.6	490.9	.0	63.1	67.6	.0	629.1	23.2
Basswood	6.6	.0	.0	.0	69.1	.0	.0	1,211.3	.0	1,286.9	17.6
Other hardwoods	44.8	4.2	.0	15.7	948.0	.0	681.2	932.8	162.6	2,789.3	11.7
Total hardwoods	1,042.6	34.7	12.1	277.6	37,353.8	.0	3,254.9	35,404.3	342.4	77,722.3	3.3
All species	3,670.5	202.2	346.1	721.2	38,597.1	.0	3,305.3	38,606.8	372.5	85,821.9	3.2
SE	17.8	47.2	38.0	34.6	5.3	.0	20.6	5.5	34.4	3.2	

Table 13 (SE).--Net volume of sawtimber trees on timberland by species and forest-type group, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Forest-type group									Total
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch	
White and red pine	27.8	100.0	71.2	45.6	20.1	.0	100.0	25.6	78.4	14.4
Virginia pine	.0	100.0	50.8	78.7	44.6	.0	100.0	52.0	.0	32.9
Other yellow pines	53.2	.0	52.7	79.5	27.0	.0	83.2	47.8	100.0	22.2
Eastern hemlock	24.2	.0	.0	100.0	28.6	.0	100.0	14.4	.0	11.6
Other softwoods	65.8	48.3	.0	.0	60.9	.0	.0	68.9	.0	33.3
Total softwoods	18.0	48.2	38.8	38.0	14.4	.0	49.9	12.6	70.3	8.2
Red maple	33.7	.0	.0	55.0	10.4	.0	27.2	8.7	100.0	6.2
Sugar maple	74.5	.0	.0	.0	28.6	.0	90.2	10.7	.0	10.0
Yellow birch	57.8	.0	.0	.0	58.5	.0	100.0	21.3	.0	19.1
Sweet birch	100.0	.0	.0	.0	16.3	.0	73.0	14.2	.0	11.1
Hickory	.0	.0	.0	100.0	15.0	.0	58.1	21.4	.0	12.1
Beech	.0	.0	.0	.0	22.6	.0	.0	15.9	.0	13.2
White ash	77.5	100.0	100.0	100.0	20.9	.0	67.2	15.8	100.0	12.6
Black walnut	.0	.0	100.0	.0	29.2	.0	77.7	59.3	.0	25.8
Yellow-poplar	79.0	.0	.0	.0	17.0	.0	.0	22.7	100.0	13.6
Blackgum	.0	.0	.0	.0	30.4	.0	.0	42.9	.0	26.0
Aspen	59.7	100.0	.0	.0	71.3	.0	100.0	33.8	57.5	24.1
Black cherry	54.3	100.0	.0	.0	15.5	.0	40.8	10.2	59.9	8.6
Chestnut oak	76.1	.0	.0	64.4	9.2	.0	.0	25.2	100.0	8.6
Northern red oak	61.8	.0	.0	51.4	8.4	.0	72.3	16.1	100.0	7.3
Select white oaks	53.7	.0	.0	71.5	10.9	.0	82.5	23.6	100.0	9.9
Other oaks	100.0	.0	.0	75.9	10.1	.0	100.0	25.2	100.0	9.5
Black locust	.0	.0	.0	100.0	27.7	.0	78.6	34.6	.0	23.2
Basswood	100.0	.0	.0	.0	48.2	.0	.0	18.5	.0	17.6
Other hardwoods	69.0	100.0	.0	100.0	16.8	.0	34.0	16.4	46.7	11.7
Total hardwoods	26.5	100.0	74.6	37.3	5.3	.0	20.7	5.6	35.4	3.3
All species	17.8	47.2	38.0	34.6	5.3	.0	20.6	5.5	34.4	3.2

Table 14.--Net volume of sawtimber trees on timberland by species and diameter class, Pennsylvania, 2001

(In millions of board feet)

Species	Diameter class (inches at breast height)								All classes	SE
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	387.5	497.3	588.5	292.8	319.1	173.3	725.4	150.0	3,133.8	14.4
Virginia pine	169.2	103.2	61.6	20.8	14.4	.0	.0	.0	369.2	32.9
Other yellow pines	93.1	126.6	55.4	67.4	.0	32.5	.0	.0	375.1	22.2
Eastern hemlock	530.8	671.1	703.0	743.4	491.8	257.5	477.5	62.7	3,937.9	11.6
Other softwoods	124.6	84.9	17.1	10.5	.0	.0	46.5	.0	283.6	33.3
Total softwoods	1,305.3	1,483.1	1,425.7	1,135.0	825.3	463.2	1,249.3	212.7	8,099.6	8.2
Red maple	.0	3,535.7	3,055.8	2,808.9	1,716.1	1,138.7	1,236.0	307.2	13,798.5	6.2
Sugar maple	.0	1,582.1	1,250.9	1,098.1	680.8	476.7	452.2	177.0	5,717.8	10.0
Yellow birch	.0	161.0	110.4	36.3	34.2	.0	15.5	.0	357.4	19.1
Sweet birch	.0	897.5	605.9	269.9	211.2	107.8	68.8	.0	2,161.1	11.1
Hickory	.0	481.2	542.4	162.3	344.2	81.2	187.9	.0	1,799.2	12.1
Beech	.0	536.6	455.0	507.6	492.6	280.3	398.6	.0	2,670.7	13.2
White ash	.0	863.9	1,080.0	1,123.8	691.5	308.5	393.2	57.2	4,518.0	12.6
Black walnut	.0	56.2	60.2	73.0	32.8	49.6	18.5	.0	290.3	25.8
Yellow-poplar	.0	499.2	672.7	998.9	994.6	591.0	1,803.3	210.1	5,769.8	13.6
Blackgum	.0	110.6	45.6	36.6	35.9	72.3	51.1	.0	352.1	26.0
Aspen	.0	156.1	150.7	37.6	13.7	.0	.0	.0	358.2	24.1
Black cherry	.0	1,498.6	1,847.6	2,142.9	1,768.1	1,452.2	1,699.4	243.1	10,652.0	8.6
Chestnut oak	.0	1,431.6	1,220.2	913.7	650.1	233.8	517.9	106.8	5,074.1	8.6
Northern red oak	.0	1,372.9	1,595.6	1,589.1	1,885.4	1,502.7	1,616.2	717.3	10,279.3	7.3
Select white oaks	.0	884.4	1,092.1	763.8	635.4	383.9	476.4	380.4	4,616.3	9.9
Other oaks	.0	744.1	858.8	795.2	745.4	527.3	736.4	195.0	4,602.2	9.5
Black locust	.0	99.1	128.6	124.6	115.1	111.4	50.4	.0	629.1	23.2
Basswood	.0	235.7	368.8	314.1	155.0	55.1	25.4	132.9	1,286.9	17.6
Other hardwoods	.0	718.5	604.9	564.6	359.4	136.7	314.0	91.2	2,789.3	11.7
Total hardwoods	.0	15,865.1	15,746.2	14,361.0	11,561.6	7,509.1	10,061.2	2,618.1	77,722.3	3.3
All species	1,305.3	17,348.2	17,171.9	15,495.9	12,386.9	7,972.4	11,310.5	2,830.8	85,821.9	3.2
SE	10.3	3.3	3.9	4.4	5.2	6.8	7.6	17.2	3.2	

Table 14 (SE).--Net volume of sawtimber trees on timberland by species and diameter class, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Diameter class (inches at breast height)								All classes
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
White and red pine	18.7	23.2	21.4	30.2	25.4	41.8	26.1	58.1	14.4
Virginia pine	32.7	34.7	37.5	100.0	100.0	.0	.0	.0	32.9
Other yellow pines	26.3	24.0	46.0	47.3	.0	71.4	.0	.0	22.2
Eastern hemlock	14.6	13.1	15.0	17.4	22.7	28.9	28.6	100.0	11.6
Other softwoods	38.1	38.9	71.2	100.0	.0	.0	100.0	.0	33.3
Total softwoods	10.3	10.4	11.8	14.2	16.7	22.9	19.0	50.5	8.2
Red maple	.0	6.4	8.4	8.9	11.9	18.9	18.6	65.6	6.2
Sugar maple	.0	12.0	13.1	15.0	19.2	24.7	32.7	58.8	10.0
Yellow birch	.0	21.3	32.3	52.2	62.6	.0	100.0	.0	19.1
Sweet birch	.0	11.6	18.1	25.5	32.0	42.7	70.8	.0	11.1
Hickory	.0	17.7	16.3	30.9	25.3	51.3	42.7	.0	12.1
Beech	.0	15.4	18.2	19.4	25.9	30.8	34.0	.0	13.2
White ash	.0	12.8	14.9	17.2	24.6	35.0	38.1	100.0	12.6
Black walnut	.0	30.7	45.3	45.0	72.6	71.6	100.0	.0	25.8
Yellow-poplar	.0	18.0	20.6	19.4	19.9	27.8	21.3	70.8	13.6
Blackgum	.0	26.6	45.6	58.2	70.7	60.1	100.0	.0	26.0
Aspen	.0	30.0	31.0	72.3	100.0	.0	.0	.0	24.1
Black cherry	.0	10.2	12.5	12.1	14.0	16.9	18.8	57.7	8.6
Chestnut oak	.0	9.0	11.1	13.9	16.5	27.1	30.7	71.0	8.6
Northern red oak	.0	10.3	10.0	10.9	12.3	14.0	17.7	32.6	7.3
Select white oaks	.0	11.7	13.5	15.8	19.2	24.7	28.0	54.7	9.9
Other oaks	.0	11.6	12.5	15.7	17.0	23.4	23.4	58.8	9.5
Black locust	.0	26.1	28.9	33.8	37.8	47.1	79.9	.0	23.2
Basswood	.0	26.2	25.7	25.0	39.6	72.5	100.0	73.6	17.6
Other hardwoods	.0	14.6	16.3	17.0	25.2	40.9	41.1	100.0	11.7
Total hardwoods	.0	3.4	4.0	4.6	5.4	7.0	8.2	18.2	3.3
All species	10.3	3.3	3.9	4.4	5.2	6.8	7.6	17.2	3.2

Table 15.--Sound biomass[a] of trees on forest land by species and component, Pennsylvania, 2001

(In thousands of dry tons)

Species	Component									All classes	SE
	Main stem	Branches	Foliage	Stumps/ roots	Growing stock	Cull	All live	Salvable dead	Saplings		
White and red pine	14,632	2,783	1,835	4,997	24,247	1,431	25,679	154	2,193	28,025	11.4
Virginia pine	3,078	575	414	1,041	5,108	261	5,369	85	314	5,768	26.0
Other yellow pines	2,891	545	383	986	4,805	702	5,507	37	616	6,160	18.9
Eastern hemlock	23,899	4,501	3,049	8,105	39,553	7,989	47,543	291	3,312	51,145	9.0
Other softwoods	2,701	507	372	918	4,499	192	4,691	51	541	5,282	28.7
Total softwoods	47,201	8,912	6,054	16,046	78,213	10,576	88,789	617	6,974	96,381	6.4
Red maple	128,148	15,557	4,403	39,118	187,226	10,597	197,823	455	18,940	217,218	3.8
Sugar maple	65,095	7,840	2,209	19,731	94,876	4,366	99,241	47	4,705	103,994	7.3
Yellow birch	7,203	904	269	2,249	10,625	1,471	12,096	287	749	13,132	11.7
Sweet birch	35,890	4,423	1,302	11,023	52,638	3,342	55,980	397	7,585	63,963	7.0
Hickory	20,543	2,423	677	6,113	29,756	605	30,361	272	1,323	31,957	9.5
Beech	27,585	3,413	960	8,592	40,551	4,316	44,868	41	3,826	48,735	8.6
White ash	33,635	3,948	1,089	9,981	48,654	4,499	53,152	327	2,365	55,844	8.0
Black walnut	3,366	398	112	1,000	4,876	495	5,372	0	503	5,875	17.3
Yellow-poplar	23,879	2,603	647	6,726	33,856	645	34,501	74	911	35,486	12.0
Blackgum	7,135	892	265	2,218	10,510	779	11,289	2	3,653	14,944	10.6
Aspen	4,344	532	157	1,324	6,357	62	6,419	29	813	7,262	16.2
Black cherry	72,876	8,415	2,248	21,416	104,955	6,497	111,451	335	7,993	119,779	6.0
Chestnut oak	71,727	8,380	2,309	21,196	103,613	5,656	109,269	421	1,118	110,808	6.8
Northern red oak	100,408	11,075	2,776	28,552	142,810	1,799	144,609	191	1,459	146,259	6.5
Select white oaks	46,453	5,268	1,397	13,434	66,551	2,783	69,334	160	901	70,395	8.2
Other oaks	40,585	4,600	1,199	11,769	58,153	1,462	59,615	396	733	60,745	7.8
Black locust	7,482	952	260	2,412	11,105	3,099	14,205	119	713	15,036	15.3
Basswood	8,309	983	261	2,505	12,057	620	12,677	4	198	12,879	14.8
Other hardwoods	24,725	2,928	808	7,403	35,864	2,469	38,334	335	3,524	42,193	8.6
Other noncomm hardwoods	0	0	0	0	0	21,985	21,985	0	11,664	33,649	6.2
Total hardwoods	729,388	85,533	23,349	216,765	1,055,035	77,549	1,132,584	3,893	73,677	1,210,154	2.3
All species	776,589	94,445	29,403	232,811	1,133,248	88,125	1,221,373	4,509	80,651	1,306,534	2.2
SE	2.4	2.3	2.4	2.3	2.3	4.4	2.3	11.7	3.7	2.2	

[a] Dead tree and sapling biomass is aboveground tree biomass.

Table 15 (SE).--Sound biomass[a] of trees on forest land by species and component, Pennsylvania, 2001

(Standard error as percentage of total)

Species	Component									All classes
	Main stem	Branches	Foliage	Stumps/ roots	Growing stock	Cull	All live	Salvable dead	Saplings	
White and red pine	12.2	12.2	12.1	12.2	12.2	27.5	11.9	35.9	21.7	11.4
Virginia pine	27.7	27.7	27.2	27.6	27.7	43.5	27.1	46.1	58.8	26.0
Other yellow pines	19.7	19.8	19.6	19.8	19.7	36.9	20.0	59.6	44.6	18.9
Eastern hemlock	9.8	9.7	9.5	9.7	9.7	15.2	9.2	41.7	17.3	9.0
Other softwoods	31.8	31.7	32.0	31.7	31.8	43.0	30.9	73.8	39.9	28.7
Total softwoods	6.8	6.8	6.8	6.8	6.8	12.4	6.5	23.7	12.1	6.4
Red maple	4.2	4.1	3.9	4.1	4.1	9.4	4.0	27.4	7.2	3.8
Sugar maple	7.6	7.5	7.3	7.5	7.6	16.1	7.5	68.8	11.4	7.3
Yellow birch	12.1	11.9	11.7	11.9	12.0	26.7	12.1	48.8	27.7	11.7
Sweet birch	7.8	7.7	7.7	7.8	7.8	20.9	7.6	33.2	11.4	7.0
Hickory	10.0	9.8	9.6	9.8	9.9	40.4	9.8	69.8	17.0	9.5
Beech	9.1	8.9	8.7	9.0	9.0	20.6	8.9	58.4	11.9	8.6
White ash	8.7	8.4	8.1	8.5	8.6	23.9	8.3	33.3	16.0	8.0
Black walnut	18.6	18.1	17.5	18.2	18.4	33.5	17.7	.0	39.7	17.3
Yellow-poplar	12.2	12.0	11.7	12.0	12.1	51.3	12.1	67.2	29.4	12.0
Blackgum	11.9	11.4	11.0	11.6	11.7	31.6	11.6	100.0	14.7	10.6
Aspen	17.4	17.2	17.0	17.2	17.3	54.1	17.2	70.9	34.5	16.2
Black cherry	6.6	6.4	6.2	6.5	6.5	12.8	6.3	42.1	11.8	6.0
Chestnut oak	7.0	6.8	6.7	6.9	6.9	17.2	6.8	43.6	24.4	6.8
Northern red oak	6.6	6.5	6.2	6.5	6.6	34.2	6.6	59.0	18.4	6.5
Select white oaks	8.5	8.1	7.7	8.2	8.4	36.1	8.3	46.9	26.2	8.2
Other oaks	8.1	7.8	7.5	7.9	8.0	26.5	7.9	62.8	24.7	7.8
Black locust	17.9	16.8	15.9	17.0	17.6	21.6	15.8	53.8	26.7	15.3
Basswood	15.3	15.2	14.8	15.3	15.2	53.0	14.9	100.0	48.5	14.8
Other hardwoods	9.0	8.7	8.3	8.8	8.9	35.5	9.1	26.8	15.3	8.6
Other noncomm hardwoods	.0	.0	.0	.0	.0	7.6	7.6	.0	8.0	6.2
Total hardwoods	2.5	2.4	2.3	2.4	2.4	4.7	2.4	13.0	3.8	2.3
All species	2.4	2.3	2.4	2.3	2.3	4.4	2.3	11.7	3.7	2.2

[a] Dead tree and sapling biomass is aboveground tree biomass.

Table 1.--Land area by land class, Pennsylvania, 1989[ab]

(In thousands of acres)

Land class		SE
Rural timberland	16,031.2	.7
Urban timberland[c]	141.2	18.5
Total timberland	16,172.4	.7
Reserved forest[d]	448.3	10.8
Unproductive forest	83.6	25.2
Total forest land	16,704.4	.6
Cropland	4,924.3	2.5
Pasture	1,362.4	5.9
Christmas tree plant.[e]	67.5	28.7
Noncensus water	81.9	25.8
Other	5,544.2	2.4
Total nonforest land	11,980.2	.8
Total area[f]	28,684.5	.0
SE	.0	

[a] In this and other tables, a zero indicates that the data are negligible or the condition was not encountered in the sample.
[b] Rows and columns in all tables may not sum due to rounding.
[c] Urban timberland previously classified as urban forest land (not part of the timberland estimate).
[d] Reserve lands are estimated.
[e] Christmas tree plantations previously classified as forest land.
[f] Source: United States Department of Commerce, Bureau of Census, 1990.

Table 2.--Area of forest land by forest type, forest-type group, and stand-size class, Pennsylvania, 1989

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Jack pine	.0	5.6	.0	.0	5.6	100.0
Red pine	15.3	20.1	5.6	.0	41.1	34.9
White pine	50.4	16.1	36.5	6.6	109.6	22.4
White pine/hemlock	46.2	5.9	.0	.0	52.1	31.8
Hemlock	249.8	16.2	.0	.0	266.0	13.8
Scotch pine	9.9	38.4	5.5	.0	53.8	31.8
White/red pine group	371.7	102.4	47.7	6.6	528.3	9.7
White spruce	.0	11.8	.0	.0	11.8	70.8
Norway spruce	.0	16.3	.0	.0	16.3	57.8
Tamarack	.0	.0	11.0	.0	11.0	70.7
Spruce/fir group	.0	28.2	11.0	.0	39.2	37.9
Virginia pine	43.6	22.5	5.2	.0	71.3	26.0
Eastern redcedar	5.9	.0	6.0	.0	11.9	70.7
Pitch pine	10.6	11.2	.0	.0	21.8	48.8
Loblolly/shortleaf group	60.1	33.7	11.2	.0	105.0	21.9
Wh. pine/no.red oak/wh. ash	45.0	10.6	5.5	.0	61.1	29.8
Eastern redcedar/hardwood	.0	.0	17.2	.0	17.2	57.8
Virginia pine/oak	14.7	21.2	5.2	.0	41.1	35.5
Other oak/pine	10.4	34.0	.0	.0	44.4	35.4
Oak/pine group	70.1	65.8	27.9	.0	163.8	18.2
Post, black, or bear oak	65.2	.0	22.3	.0	87.6	25.1
Chestnut oak	297.0	393.3	50.8	.0	741.1	8.2
White oak/red oak/hickory	414.9	221.5	16.5	.0	652.8	9.0
White oak	97.7	166.7	11.3	.0	275.7	14.0
Northern red oak	282.2	75.9	10.1	.0	368.2	11.6
Y-poplar/wh. oak/no.red oak	45.1	5.1	.0	.0	50.2	32.6
Black locust	5.6	44.9	26.7	16.4	93.6	24.1
Black walnut	.0	22.8	.0	.0	22.8	47.1
Yellow-poplar	27.9	10.5	11.5	.0	49.8	33.4
Hawthorn/reverting field	.0	6.5	77.0	5.5	89.0	25.1
Scarlet oak	29.1	16.7	.0	.0	45.8	35.6
Sassafras/persimmon	.0	27.8	43.3	.0	71.1	27.8
Red maple/central hardwood	110.3	254.1	50.4	.0	414.8	11.4
Mixed central hardwoods	2,458.0	1,819.9	593.3	.0	4,871.1	2.7

Table 2.-continued

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Oak/hickory group	3,833.0	3,065.8	913.0	21.9	7,833.7	1.8
Sweetbay/swamp tupelo/red mple	.0	5.4	.0	.0	5.4	100.0
Oak/gum/cypress group	.0	5.4	.0	.0	5.4	100.0
Black ash/Amer. elm/red maple	101.7	47.7	73.3	5.6	228.3	15.3
Red maple(lowland)	.0	15.7	17.3	.0	33.0	41.2
Red maple(upland)	96.7	97.8	50.2	21.5	266.3	14.2
River birch/sycamore	43.5	11.4	5.4	.0	60.3	30.2
Cottonwood	.0	11.1	.0	.0	11.1	71.0
Willow	11.0	5.3	66.9	.0	83.3	23.7
Sycamore/pecan/American elm	17.1	.0	.0	.0	17.1	57.8
American elm/green ash	6.1	22.0	5.6	.0	33.7	40.9
Elm/ash/red maple group	276.1	210.9	218.8	27.1	733.0	8.4
Sugar maple/beech/yellow birch	1,783.6	655.0	128.5	9.9	2,577.1	3.8
Black cherry	238.4	314.5	385.7	5.6	944.2	7.1
Red maple/northern hardwoods	529.8	600.5	193.1	.0	1,323.5	6.0
Pin cherry/reverting field	5.7	26.8	168.7	10.4	211.6	15.8
Mixed northern hardwoods	763.8	689.9	433.6	5.8	1,893.0	5.1
Northern hardwoods group	3,321.2	2,286.7	1,309.6	31.7	6,949.3	2.0
Aspen	14.6	196.5	76.3	.0	287.3	13.7
Paper birch	.0	16.4	.0	.0	16.4	56.7
Gray birch	.0	.0	32.6	.0	32.6	40.7
Aspen/birch group	14.6	212.9	108.8	.0	336.3	12.6
Indeterminate	.0	.0	.0	10.4	10.4	71.2
All forest types	7,946.8	6,011.8	2,648.0	97.8	16,704.4	.6
SE	1.8	2.4	3.9	23.6	.6	

[a] In this and other tables containing forest type estimates, Northeastern Forest Inventory forest type calculations were used.

Table 3.--Area of timberland by forest type, forest-type group, and stand-size class, Pennsylvania, 1989

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Jack pine	.0	5.6	.0	.0	5.6	100.0
Red pine	15.3	20.1	5.6	.0	41.1	34.9
White pine	50.4	16.1	32.0	.0	98.4	23.6
White pine/hemlock	46.2	5.9	.0	.0	52.1	31.8
Hemlock	249.8	16.2	.0	.0	266.0	13.8
Scotch pine	9.9	38.4	5.5	.0	53.8	31.8
White/red pine group	371.7	102.4	43.1	.0	517.1	9.8
White spruce	.0	5.6	.0	.0	5.6	100.0
Norway spruce	.0	11.3	.0	.0	11.3	70.7
Tamarack	.0	.0	11.0	.0	11.0	70.7
Spruce/fir group	.0	16.9	11.0	.0	27.9	44.7
Virginia pine	43.6	22.5	5.2	.0	71.3	26.0
Eastern redcedar	5.9	.0	6.0	.0	11.9	70.7
Pitch pine	10.6	11.2	.0	.0	21.8	48.8
Loblolly/shortleaf group	60.1	33.7	11.2	.0	105.0	21.9
Wh. pine/no.red oak/wh. ash	45.0	10.6	5.5	.0	61.1	29.8
Eastern redcedar/hardwood	.0	.0	11.1	.0	11.1	70.7
Virginia pine/oak	14.7	21.2	5.2	.0	41.1	35.5
Other oak/pine	10.4	34.0	.0	.0	44.4	35.4
Oak/pine group	70.1	65.8	21.8	.0	157.7	18.5
Post, black, or bear oak	65.2	.0	22.3	.0	87.6	25.1
Chestnut oak	280.9	370.4	45.2	.0	696.4	8.5
White oak/red oak/hickory	386.5	216.1	11.6	.0	614.2	9.3
White oak	97.7	166.7	5.5	.0	269.9	14.1
Northern red oak	265.3	75.9	10.1	.0	351.3	11.9
Y-poplar/wh. oak/no.red oak	45.1	5.1	.0	.0	50.2	32.6
Black locust	5.6	44.9	26.7	16.4	93.6	24.1
Black walnut	.0	22.8	.0	.0	22.8	47.1
Yellow-poplar	22.5	10.5	11.5	.0	44.4	35.4
Hawthorn/reverting field	.0	6.5	72.4	5.5	84.5	25.8
Scarlet oak	29.1	16.7	.0	.0	45.8	35.6
Sassafras/persimmon	.0	27.8	43.3	.0	71.1	27.8
Red maple/central hardwood	110.3	248.7	50.4	.0	409.4	11.5
Mixed central hardwoods	2,397.5	1,765.3	572.3	.0	4,735.1	2.8

Table 3.-continued

(In thousands of acres)

Forest type	Stand-size class				All classes	SE
	Saw-timber	Pole-timber	Sapling and seedling	Non-stocked		
Oak/hickory group	3,705.7	2,977.4	871.3	21.9	7,576.3	1.8
Black ash/Amer. elm/red maple	96.6	47.7	61.4	5.6	211.2	15.9
Red maple(lowland)	.0	15.7	12.2	.0	27.8	45.1
Red maple(upland)	96.7	97.8	50.2	16.0	260.8	14.4
River birch/sycamore	43.5	5.6	.0	.0	49.1	33.4
Cottonwood	.0	11.1	.0	.0	11.1	71.0
Willow	11.0	5.3	61.4	.0	77.7	24.4
Sycamore/pecan/American elm	17.1	.0	.0	.0	17.1	57.8
American elm/green ash	6.1	22.0	5.6	.0	33.7	40.9
Elm/ash/red maple group	271.0	205.1	190.7	21.5	688.4	8.6
Sugar maple/beech/yellow birch	1,739.3	616.7	128.5	9.9	2,494.4	3.9
Black cherry	232.4	314.5	379.9	5.6	932.4	7.2
Red maple/northern hardwoods	519.2	583.9	187.5	.0	1,290.6	6.1
Pin cherry/reverting field	5.7	26.8	168.7	10.4	211.6	15.8
Mixed northern hardwoods	748.5	668.0	433.6	5.8	1,855.8	5.2
Northern hardwoods group	3,245.0	2,209.9	1,298.3	31.7	6,784.9	2.1
Aspen	14.6	196.5	70.6	.0	281.7	13.8
Paper birch	.0	16.4	.0	.0	16.4	56.7
Gray birch	.0	.0	17.0	.0	17.0	57.8
Aspen/birch group	14.6	212.9	87.6	.0	315.1	13.0
All forest types	7,738.1	5,824.2	2,534.9	75.2	16,172.4	.7
SE	1.8	2.5	4.0	26.7	.7	

Table 4.--Area of timberland by forest-type group and stocking class of all live trees, Pennsylvania, 1989

(In thousands of acres)

Forest-type group	Stocking class					All classes	SE
	Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked		
White/red pine	.0	42.3	121.9	237.3	115.6	517.1	9.8
Spruce/fir	.0	5.5	11.1	11.3	.0	27.9	44.7
Loblolly/shortleaf	.0	11.1	22.0	66.7	5.2	105.0	21.9
Oak/pine	.0	11.3	46.8	94.0	5.5	157.7	18.5
Oak/hickory	21.9	295.0	1,913.3	4,799.9	546.2	7,576.3	1.8
Elm/ash/red maple	21.5	66.8	267.6	304.5	28.0	688.4	8.6
Northern hardwoods	31.7	232.2	1,628.4	4,193.9	698.7	6,784.9	2.1
Aspen/ birch	.0	5.3	106.7	167.9	35.3	315.1	13.0
Total	75.2	669.6	4,117.6	9,875.5	1,434.6	16,172.4	.7
SE	26.7	8.8	3.2	1.6	5.8	.7	

Table 5.--Number of live trees (1.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 1989

(In thousands of trees)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	74,270	33,195	23,678	17,103	11,107	7,047	4,062
Virginia pine	10,272	11,099	6,751	4,690	3,356	1,624	522
Other yellow pines	2,588	8,940	9,974	7,916	4,715	2,381	1,308
Eastern hemlock	117,260	74,067	47,583	32,959	19,532	13,554	8,462
Other softwoods	26,140	18,766	9,356	4,413	1,958	705	476
Total softwoods	230,531	146,067	97,342	67,081	40,669	25,312	14,830
Red maple	856,478	406,538	215,302	131,174	78,817	45,421	26,794
Sugar maple	258,050	118,261	64,901	53,553	34,774	20,704	13,151
Yellow birch	31,715	16,506	12,514	10,674	5,740	3,265	1,769
Sweet birch	251,169	86,519	52,291	39,842	23,232	10,937	4,881
Hickory	71,867	31,776	17,598	15,348	11,673	6,729	3,846
Beech	325,890	79,851	41,227	23,435	14,032	9,397	5,944
White ash	151,523	47,330	27,746	19,044	16,013	11,163	7,087
Black walnut	5,669	5,003	4,383	3,264	1,452	1,275	902
Yellow-poplar	31,401	12,307	8,353	5,891	5,140	4,935	4,229
Blackgum	148,641	56,157	19,515	6,411	2,605	1,321	555
Aspen	39,993	18,582	13,791	9,031	4,361	1,959	484
Black cherry	434,772	120,136	62,390	43,575	30,967	22,771	14,513
Chestnut oak	47,721	45,972	51,488	51,657	40,825	24,441	13,328
Northern red oak	97,299	37,986	31,903	31,208	26,923	23,364	16,217
Select white oaks	38,172	27,825	29,952	27,546	21,969	15,000	9,178
Other oaks	44,277	26,398	16,805	15,871	15,129	11,215	8,237
Black locust	38,729	14,442	12,288	8,492	5,551	2,541	1,581
Basswood	7,490	2,913	5,981	6,299	4,762	3,501	2,442
Other hardwoods	269,691	81,321	37,458	27,207	18,239	10,795	5,389
Other noncomm hardwoods	920,627	240,943	79,085	24,194	8,439	2,930	1,233
Total hardwoods	4,071,174	1,476,769	804,972	553,717	370,643	233,665	141,761
All species	4,301,705	1,622,837	902,313	620,799	411,312	258,977	156,592
SE	2.1	2.1	1.6	1.4	1.4	1.4	1.6

Table 5.-continued

(In thousands of trees)

Species	Diameter class (inches at breast height)							
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes	
White and red pine	2,085	1,499	1,057	1,396	156	69,191	176,655	9.4
Virginia pine	67	13	0	17	0	17,039	38,410	22.0
Other yellow pines	454	119	59	16	0	26,941	38,469	14.7
Eastern hemlock	4,497	2,584	1,301	1,755	102	132,329	323,656	6.8
Other softwoods	56	33	9	14	0	17,023	61,930	16.4
Total softwoods	7,158	4,249	2,426	3,198	258	262,523	639,121	4.9
Red maple	12,641	6,387	3,004	3,404	408	523,352	1,786,369	2.8
Sugar maple	6,594	3,377	1,653	1,939	341	200,989	577,301	4.2
Yellow birch	588	310	54	92	20	35,027	83,248	9.1
Sweet birch	1,875	764	317	243	16	134,397	472,084	5.5
Hickory	1,909	759	457	276	38	58,634	162,277	6.3
Beech	4,260	2,046	1,592	1,796	195	103,925	509,666	5.5
White ash	4,215	2,001	1,395	1,284	174	90,121	288,975	6.1
Black walnut	463	240	94	114	5	12,192	22,863	15.7
Yellow-poplar	3,211	2,170	1,436	1,339	198	36,902	80,610	12.3
Blackgum	357	165	86	110	12	31,138	235,936	8.3
Aspen	205	49	12	0	0	29,892	88,467	13.4
Black cherry	8,933	4,758	2,556	2,605	277	193,346	748,254	5.0
Chestnut oak	7,502	3,256	1,565	1,467	60	195,589	289,281	4.9
Northern red oak	11,162	7,403	4,238	5,307	770	158,495	293,780	4.5
Select white oaks	4,505	2,551	1,468	1,709	297	114,177	180,174	5.9
Other oaks	5,239	3,019	1,728	1,964	245	79,453	150,128	6.7
Black locust	847	322	203	224	5	32,055	85,226	10.4
Basswood	1,030	499	283	285	45	25,129	35,532	11.7
Other hardwoods	2,506	1,454	700	970	220	104,939	455,951	5.8
Other noncomm hardwoods	499	330	118	172	34	117,034	1,278,604	3.8
Total hardwoods	78,542	41,861	22,962	25,299	3,361	2,276,784	7,824,728	1.4
All species	85,699	46,110	25,389	28,497	3,619	2,539,307	8,463,848	1.4
SE	1.9	2.3	2.7	2.8	5.1	1.0	1.4	

Table 6.--Number of live trees (1.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 1989

(In thousands of trees)

Species	Diameter class (inches at breast height)						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
White and red pine	73,298	32,882	23,506	16,889	11,013	6,974	4,008
Virginia pine	10,272	11,099	6,751	4,690	3,356	1,624	522
Other yellow pines	2,588	8,940	9,755	7,754	4,655	2,319	1,308
Eastern hemlock	116,261	72,101	46,949	32,490	19,313	13,377	8,440
Other softwoods	21,293	16,975	7,855	3,934	1,822	683	476
Total softwoods	223,712	141,997	94,816	65,757	40,159	24,977	14,753
Red maple	830,285	390,560	209,112	127,538	76,431	44,091	26,001
Sugar maple	249,803	116,231	63,348	52,086	33,914	20,241	12,762
Yellow birch	30,713	15,155	11,815	10,054	5,328	3,125	1,573
Sweet birch	245,019	83,882	49,816	37,576	22,131	10,477	4,779
Hickory	71,183	31,776	17,026	14,989	11,323	6,351	3,625
Beech	313,699	74,564	39,507	22,365	13,470	9,182	5,730
White ash	148,543	46,679	27,369	18,761	15,450	10,889	6,800
Black walnut	5,669	5,003	4,359	3,264	1,452	1,275	866
Yellow-poplar	31,401	12,307	8,224	5,803	5,020	4,753	4,066
Blackgum	146,639	54,721	19,130	6,388	2,542	1,235	555
Aspen	39,691	18,582	13,660	8,917	4,361	1,959	467
Black cherry	432,745	118,447	62,115	42,827	30,472	22,180	14,145
Chestnut oak	46,713	42,667	50,175	49,607	38,906	23,021	12,711
Northern red oak	95,611	37,299	30,908	30,255	26,229	22,393	15,183
Select white oaks	34,726	26,150	29,734	27,015	21,515	14,813	8,996
Other oaks	44,277	26,398	16,633	15,423	14,899	10,934	8,022
Black locust	38,729	14,096	12,263	8,314	5,484	2,463	1,581
Basswood	7,490	2,913	5,709	5,995	4,477	3,386	2,317
Other hardwoods	264,961	79,720	36,986	26,553	17,689	10,332	5,154
Other noncomm hardwoods	901,741	233,189	78,161	23,662	8,262	2,882	1,215
Total hardwoods	3,979,636	1,430,338	786,051	537,393	359,355	225,982	136,548
All species	4,203,348	1,572,334	880,867	603,150	399,514	250,959	151,301
SE	2.2	2.2	1.6	1.5	1.4	1.5	1.6

Table 6.-continued

(In thousands of trees)

Species	Diameter class (inches at breast height)							
	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	Total 5.0+	All classes	
White and red pine	2,054	1,459	1,019	1,367	143	68,433	174,613	9.5
Virginia pine	67	13	0	17	0	17,039	38,410	22.0
Other yellow pines	454	119	59	16	0	26,439	37,967	14.9
Eastern hemlock	4,497	2,534	1,290	1,739	102	130,731	319,093	6.9
Other softwoods	56	33	9	14	0	14,882	53,150	16.8
Total softwoods	7,127	4,158	2,378	3,153	245	257,524	623,233	5.0
Red maple	12,245	6,307	2,933	3,345	404	508,408	1,729,253	2.8
Sugar maple	6,483	3,291	1,618	1,906	334	195,984	562,018	4.3
Yellow birch	555	310	54	92	20	32,928	78,795	9.2
Sweet birch	1,794	749	293	243	16	127,873	456,775	5.6
Hickory	1,811	679	442	268	38	56,553	159,512	6.4
Beech	4,198	2,003	1,578	1,737	188	99,959	488,222	5.7
White ash	4,102	1,885	1,317	1,194	166	87,932	283,155	6.2
Black walnut	463	240	94	105	5	12,123	22,794	15.8
Yellow-poplar	3,008	2,082	1,330	1,253	189	35,727	79,436	12.5
Blackgum	329	141	86	99	12	30,518	231,879	8.4
Aspen	205	49	12	0	0	29,629	87,902	13.5
Black cherry	8,684	4,536	2,517	2,479	259	190,213	741,405	5.1
Chestnut oak	7,157	3,161	1,508	1,383	60	187,689	277,069	5.1
Northern red oak	10,776	7,040	4,041	5,037	734	152,598	285,507	4.6
Select white oaks	4,345	2,504	1,412	1,659	287	112,280	173,156	5.7
Other oaks	5,060	2,925	1,635	1,929	245	77,705	148,380	6.8
Black locust	819	322	192	224	5	31,666	84,491	10.4
Basswood	969	459	270	265	39	23,886	34,289	12.1
Other hardwoods	2,321	1,386	700	944	220	102,285	446,965	5.9
Other noncomm hardwoods	499	330	118	172	30	115,331	1,250,260	3.9
Total hardwoods	75,824	40,398	22,153	24,334	3,251	2,211,289	7,621,262	1.5
All species	82,951	44,556	24,531	27,488	3,495	2,468,813	8,244,495	1.4
SE	2.0	2.4	2.7	2.9	5.2	1.0	1.4	

Table 7.--Number of trees (5.0+ inches d.b.h.) on timberland by species and tree class, Pennsylvania, 1989

(In thousands of trees)

Species	Tree class						All classes	SE
	All growing stock	Rough cull	Rotten cull	All live	Salvable dead	Nonsalvable dead		
White and red pine	66,288	1,828	317	68,433	1,764	7,267	77,465	10.1
Virginia pine	16,513	526	0	17,039	590	1,930	19,560	17.7
Other yellow pines	25,557	764	117	26,439	1,244	5,897	33,580	14.0
Eastern hemlock	126,270	3,702	758	130,731	2,616	4,069	137,416	5.4
Other softwoods	14,124	731	28	14,882	440	258	15,580	18.7
Total softwoods	248,752	7,551	1,221	257,524	6,654	19,422	283,600	4.5
Red maple	487,380	12,637	8,391	508,408	6,592	21,889	536,889	2.4
Sugar maple	189,305	3,911	2,768	195,984	2,852	7,922	206,758	4.0
Yellow birch	31,385	963	579	32,928	1,197	5,245	39,370	7.9
Sweet birch	124,412	2,273	1,189	127,873	3,118	9,731	140,722	4.9
Hickory	55,517	545	491	56,553	1,801	2,160	60,514	6.5
Beech	94,721	1,968	3,271	99,959	1,426	5,241	106,626	5.2
White ash	84,051	2,421	1,461	87,932	3,486	2,805	94,224	4.8
Black walnut	11,503	384	235	12,123	316	311	12,750	13.7
Yellow-poplar	34,890	180	657	35,727	319	445	36,491	8.0
Blackgum	28,753	1,035	730	30,518	0	561	31,079	7.7
Aspen	29,160	339	130	29,629	1,576	5,121	36,327	11.1
Black cherry	179,129	8,664	2,420	190,213	3,760	14,494	208,467	3.8
Chestnut oak	182,071	4,041	1,577	187,689	6,482	45,615	239,786	4.0
Northern red oak	149,939	1,687	971	152,598	4,048	18,018	174,663	3.7
Select white oaks	110,105	1,366	809	112,280	4,587	18,936	135,803	4.7
Other oaks	75,827	869	1,008	77,705	3,613	13,365	94,683	5.0
Black locust	25,400	3,249	3,017	31,666	2,289	13,401	47,357	8.9
Basswood	23,103	487	295	23,886	582	1,369	25,836	9.7
Other hardwoods	97,612	3,429	1,244	102,285	4,571	15,322	122,177	5.0
Other noncomm hardwoods	0	107,553	7,777	115,331	5,522	22,573	143,426	4.5
Total hardwoods	2,014,265	158,001	39,022	2,211,289	58,136	224,524	2,493,950	1.0
All species	2,263,018	165,553	40,242	2,468,813	64,791	243,946	2,777,550	1.0
SE	1.1	3.4	5.4	1.0	3.8	2.5	1.0	

Table 8.--Number of growing-stock trees (5.0+ inches d.b.h.) on timberland by species and diameter class, Pennsylvania, 1989

(In thousands of trees)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	22,808	16,687	10,326	6,808	3,958	1,961	1,348	973	1,293	124	66,288	10.7
Virginia pine	6,369	4,690	3,290	1,578	489	67	13	0	17	0	16,513	18.1
Other yellow pines	9,471	7,715	4,268	2,207	1,248	454	119	59	16	0	25,557	14.5
Eastern hemlock	45,746	31,977	17,611	12,817	8,314	4,349	2,520	1,215	1,637	84	126,270	5.5
Other softwoods	7,440	3,827	1,631	655	476	56	21	9	7	0	14,124	19.1
Total softwoods	91,834	64,897	37,127	24,065	14,486	6,887	4,021	2,257	2,970	208	248,752	4.6
Red maple	200,793	123,552	74,919	40,750	24,307	11,501	5,727	2,693	2,861	277	487,380	2.4
Sugar maple	61,021	50,989	33,045	19,549	12,095	6,171	3,103	1,472	1,640	222	189,305	4.0
Yellow birch	11,541	9,659	5,191	2,734	1,396	520	252	31	55	5	31,385	8.5
Sweet birch	48,581	37,204	21,790	9,617	4,408	1,656	668	245	225	16	124,412	5.1
Hickory	16,732	14,866	11,058	6,221	3,513	1,731	679	429	253	33	55,517	6.7
Beech	38,370	21,334	13,011	8,404	5,233	3,819	1,815	1,314	1,325	95	94,721	5.3
White ash	25,888	18,170	14,901	10,436	6,539	3,865	1,811	1,242	1,070	128	84,051	4.9
Black walnut	4,233	3,086	1,416	1,107	831	430	229	94	73	5	11,503	14.3
Yellow-poplar	7,833	5,559	4,958	4,708	4,066	2,958	2,067	1,317	1,246	176	34,890	8.0
Blackgum	18,062	6,066	2,379	1,141	534	298	101	76	90	5	28,753	8.1
Aspen	13,373	8,855	4,304	1,928	434	205	49	12	0	0	29,160	11.8
Black cherry	57,879	40,058	29,434	20,714	13,503	8,284	4,378	2,376	2,291	213	179,129	4.0
Chestnut oak	48,850	48,498	38,484	21,875	12,083	6,740	2,944	1,389	1,163	44	182,071	4.3
Northern red oak	30,111	29,711	26,137	21,857	14,990	10,622	6,919	4,019	4,877	696	149,939	3.8
Select white oaks	28,881	26,514	21,419	14,472	8,955	4,243	2,477	1,359	1,557	226	110,105	4.9
Other oaks	16,026	14,944	14,666	10,700	7,909	5,017	2,883	1,613	1,859	210	75,827	5.0
Black locust	9,941	6,808	4,551	1,817	1,180	592	241	118	151	0	25,400	10.5
Basswood	5,450	5,876	4,355	3,318	2,222	969	433	238	214	28	23,103	10.1
Other hardwoods	34,323	25,905	17,392	9,884	4,967	2,172	1,319	639	827	185	97,612	5.4
Total hardwoods	677,890	497,657	343,412	211,233	129,164	71,793	38,096	20,679	21,779	2,564	2,014,265	1.1
All species	769,724	562,554	380,539	235,297	143,650	78,680	42,117	22,936	24,749	2,772	2,263,018	1.1
SE	1.7	1.6	1.5	1.5	1.7	2.0	2.4	2.8	3.0	5.7	1.1	

Table 9.--Net volume of live trees (5.0+ inches d.b.h.) on timberland by class of timber and species group, Pennsylvania, 1989

(In millions of cubic feet)

Class of timber	Species group				All species	SE
	Pines	Other softwoods	Soft hardwoods	Hard hardwoods		
Growing-stock trees:						
Sawtimber size:						
Total sawtimber size	825.4	1,016.1	6,943.2	8,240.0	17,024.7	1.3
Poletimber size	276.6	334.8	4,329.0	4,623.5	9,563.9	1.2
Total growing-stock trees	1,102.0	1,351.0	11,272.2	12,863.5	26,588.6	1.0
Rough trees:						
Sawtimber size	27.8	31.9	238.4	194.8	492.9	4.1
Poletimber size	2.2	3.3	217.3	186.0	408.7	4.2
Total rough trees	30.0	35.2	455.7	380.8	901.7	3.1
Rotten trees:						
Sawtimber size	1.6	4.1	57.2	83.5	146.5	4.8
Poletimber size	.1	.1	10.3	9.2	19.7	6.4
Total rotten trees	1.7	4.2	67.5	92.7	166.1	4.3
All classes	1,133.7	1,390.4	11,795.3	13,337.1	27,656.4	1.0
SE	6.8	5.2	1.7	1.4	1.0	

[a] Includes noncommercial species.

Table 10.--Sound volume of live trees (5.0+ inches d.b.h.) on forest land by species and diameter class, Pennsylvania, 1989

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	68.6	98.8	125.1	118.1	101.3	63.5	56.4	57.1	107.0	19.0	814.8	8.3
Virginia pine	15.8	28.1	33.3	23.2	9.5	2.0	.5	.0	1.0	.0	113.4	18.0
Other yellow pines	23.0	45.6	42.3	32.8	24.1	13.7	4.4	2.7	1.2	.0	189.8	11.9
Eastern hemlock	115.0	181.6	177.8	194.1	187.1	131.7	97.9	62.1	123.1	11.3	1,281.7	5.4
Other softwoods	23.9	25.0	17.6	10.7	9.6	1.6	.8	.4	.5	.0	90.3	19.2
Total softwoods	246.2	379.1	396.1	378.9	331.6	212.5	160.0	122.3	232.9	30.3	2,490.1	4.2
Red maple	514.4	830.3	916.6	809.0	696.0	424.8	280.2	166.7	228.8	50.6	4,917.5	2.5
Sugar maple	176.2	386.5	448.0	417.1	355.1	230.7	158.7	96.5	141.8	33.8	2,444.5	4.0
Yellow birch	31.8	64.6	64.9	51.2	39.7	19.0	11.3	1.7	4.5	.7	289.5	8.1
Sweet birch	138.0	257.1	267.4	179.9	115.2	60.3	31.5	14.6	18.1	1.9	1,084.0	4.6
Hickory	38.0	107.6	148.2	133.6	107.5	70.4	37.0	27.9	17.3	4.8	692.4	6.0
Beech	99.2	154.0	183.2	168.7	150.0	146.0	93.7	85.6	123.7	18.6	1,222.7	5.1
White ash	70.7	126.8	192.3	220.9	197.8	154.4	99.5	82.3	102.1	19.8	1,266.5	4.7
Black walnut	9.6	16.6	14.5	17.9	21.6	14.1	9.4	5.0	6.1	.8	115.6	11.9
Yellow-poplar	20.9	38.0	71.8	104.0	133.8	136.2	121.9	105.9	137.7	35.7	906.0	7.3
Blackgum	43.4	37.1	26.2	20.9	12.9	10.6	5.4	3.9	7.2	.5	168.1	7.1
Aspen	39.2	61.3	54.3	39.2	13.3	8.0	2.5	.7	.0	.0	218.6	11.0
Black cherry	149.5	278.6	383.2	437.8	424.2	351.8	247.0	171.1	219.7	43.0	2,705.8	3.7
Chestnut oak	118.3	271.4	390.0	355.4	274.1	204.0	115.4	69.4	72.1	5.4	1,875.5	3.8
Northern red oak	77.9	185.8	291.1	394.7	398.8	360.9	317.7	229.8	388.8	99.0	2,744.6	3.4
Select white oaks	67.2	151.0	222.9	241.8	224.8	147.7	103.8	74.1	127.2	40.7	1,401.3	4.1
Other oaks	39.2	92.3	160.4	190.1	201.5	169.5	130.5	92.1	146.3	29.4	1,251.3	4.7
Black locust	22.2	36.9	45.8	28.5	27.9	19.6	9.8	6.4	11.1	.0	208.2	10.3
Basswood	13.0	46.7	61.2	75.6	76.8	43.3	23.5	14.0	16.0	5.2	375.3	8.7
Other hardwoods	87.6	170.4	209.2	195.1	140.6	81.7	60.7	34.3	69.7	34.3	1,083.5	5.2
Total hardwoods	1,756.3	3,312.9	4,151.4	4,081.4	3,611.6	2,653.0	1,859.6	1,282.2	1,838.4	424.1	24,971.0	1.0
All species	2,002.6	3,692.0	4,547.5	4,460.4	3,943.2	2,865.5	2,019.5	1,404.5	2,071.3	454.4	27,461.0	1.0
SE	1.7	1.5	1.4	1.4	1.6	2.0	2.4	2.8	2.9	5.8	1.0	

Table 11.--Net volume of growing-stock trees on timberland by species and forest-type group, Pennsylvania, 1989

(In millions of cubic feet)

Species	Forest-type group									Total	SE
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch		
White and red pine	298.2	2.8	16.1	66.2	237.4	.0	2.1	163.4	15.1	801.4	8.4
Virginia pine	.0	.0	66.6	17.2	21.5	.0	.8	7.4	.0	113.4	18.0
Other yellow pines	45.7	.4	28.0	33.0	61.6	.0	.5	15.8	2.3	187.2	12.1
Eastern hemlock	392.5	.0	.0	4.2	158.0	.0	7.3	699.6	6.9	1,268.5	5.4
Other softwoods	4.5	21.8	2.2	2.5	15.9	.0	1.8	26.1	7.7	82.5	20.3
Total softwoods	740.9	24.9	112.8	123.0	494.4	.0	12.5	912.3	32.1	2,452.9	4.2
Red maple	105.3	.3	8.9	24.2	1,804.6	.0	451.8	2,346.4	39.3	4,780.9	2.5
Sugar maple	9.7	.0	.1	1.6	172.2	.0	17.0	2,174.9	7.8	2,383.4	4.1
Yellow birch	21.7	.0	.0	.2	9.4	.0	1.8	236.7	1.2	271.0	8.2
Sweet birch	30.8	.0	.9	6.2	315.2	.0	4.4	671.2	7.1	1,035.7	4.8
Hickory	6.8	.0	.0	2.6	500.2	.0	16.0	135.3	1.0	661.9	6.1
Beech	30.5	.0	.0	.0	167.1	.0	15.6	969.8	2.4	1,185.4	5.2
White ash	15.5	1.5	5.4	10.8	319.6	.0	56.9	805.2	4.1	1,219.1	4.7
Black walnut	1.6	.0	1.2	.5	71.0	.0	8.9	30.7	.0	113.8	12.0
Yellow-poplar	18.2	.0	4.5	.9	579.4	.0	11.7	248.9	.0	863.7	7.4
Blackgum	1.1	1.0	.2	.6	123.5	.0	1.1	35.4	.0	162.8	7.2
Aspen	4.7	.0	.0	.8	30.9	.0	15.5	96.1	69.2	217.3	11.1
Black cherry	37.4	3.0	1.7	6.3	549.4	.0	59.4	1,959.9	18.1	2,635.2	3.7
Chestnut oak	13.3	.0	3.2	14.5	1,661.7	.0	1.1	89.4	5.0	1,788.0	3.9
Northern red oak	24.6	.0	1.8	16.2	2,132.9	.0	13.7	410.9	19.3	2,619.3	3.5
Select white oaks	30.6	.0	1.2	12.8	1,180.4	.0	20.5	120.1	4.8	1,370.4	4.2
Other oaks	7.7	.0	3.8	11.0	1,109.2	.0	14.5	71.4	.6	1,218.2	4.8
Black locust	.3	.0	.0	2.2	148.6	.0	3.1	51.5	.3	206.0	10.4
Basswood	2.9	.0	.0	.4	32.8	.0	1.4	315.2	2.2	355.0	9.0
Other hardwoods	23.7	1.0	2.3	8.3	295.4	.0	180.0	396.2	141.8	1,048.7	5.3
Total hardwoods	386.3	6.7	35.2	120.2	11,203.6	.0	894.4	11,165.1	324.2	24,135.7	1.1
All species	1,127.2	31.6	148.0	243.2	11,697.9	.0	906.9	12,077.4	356.3	26,588.6	1.0
SE	10.7	54.0	24.6	21.4	2.3	.0	11.1	2.4	16.1	1.0	

Table 12.--Net volume of growing-stock trees on timberland by species and diameter class, Pennsylvania, 1989

(In millions of cubic feet)

Species	Diameter class (inches at breast height)										All classes	SE
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	68.0	97.6	124.2	116.7	100.0	62.4	54.8	55.1	104.5	18.0	801.4	8.4
Virginia pine	15.8	28.1	33.3	23.2	9.5	2.0	.5	.0	1.0	.0	113.4	18.0
Other yellow pines	22.5	44.7	41.8	32.1	24.1	13.7	4.4	2.7	1.2	.0	187.2	12.1
Eastern hemlock	113.4	178.9	175.5	191.6	186.6	131.7	96.1	61.6	121.8	11.3	1,268.5	5.4
Other softwoods	20.2	22.3	16.8	10.2	9.6	1.6	.8	.4	.5	.0	82.5	20.3
Total softwoods	239.8	371.6	391.5	373.8	329.8	211.5	156.6	119.8	229.1	29.4	2,452.9	4.2
Red maple	498.6	807.1	889.8	785.3	675.5	410.8	276.3	163.3	224.3	49.8	4,780.9	2.5
Sugar maple	171.8	376.1	436.8	407.4	344.9	226.8	154.3	94.3	138.3	32.6	2,383.4	4.1
Yellow birch	30.1	60.7	60.1	48.8	35.1	17.9	11.3	1.7	4.5	.7	271.0	8.2
Sweet birch	130.9	242.7	254.5	172.2	113.0	57.6	30.7	14.0	18.1	1.9	1,035.7	4.8
Hickory	36.9	105.2	144.2	126.1	101.1	66.6	33.0	27.0	16.9	4.8	661.9	6.1
Beech	95.2	146.5	176.1	164.9	145.6	143.6	92.3	84.7	118.9	17.5	1,185.4	5.2
White ash	69.5	125.0	185.3	214.9	189.5	150.0	93.6	77.5	95.1	18.7	1,219.1	4.7
Black walnut	9.6	16.6	14.5	17.9	20.7	14.1	9.4	5.0	5.3	.8	113.8	12.0
Yellow-poplar	20.5	37.5	70.9	100.2	128.6	127.6	116.9	98.0	129.5	34.1	863.7	7.4
Blackgum	42.5	36.9	25.6	19.9	12.9	9.6	4.4	3.9	6.5	.5	162.8	7.2
Aspen	39.1	60.7	54.3	39.2	12.8	8.0	2.5	.7	.0	.0	217.3	11.1
Black cherry	148.7	273.5	377.5	426.8	414.6	341.7	235.1	168.3	209.1	40.0	2,635.2	3.7
Chestnut oak	115.1	260.3	371.8	335.2	261.5	193.7	111.6	66.7	66.8	5.4	1,788.0	3.9
Northern red oak	75.6	179.9	283.2	377.6	372.9	347.7	301.3	219.0	367.6	94.4	2,619.3	3.5
Select white oaks	66.7	148.1	218.2	239.1	220.2	142.5	101.9	71.2	123.8	38.8	1,370.4	4.2
Other oaks	38.6	89.5	158.0	185.2	196.2	163.5	126.3	87.6	143.8	29.4	1,218.2	4.8
Black locust	22.1	36.3	45.4	28.2	27.9	19.1	9.8	6.0	11.1	.0	206.0	10.4
Basswood	12.3	44.5	57.8	73.0	72.8	40.7	22.0	13.3	14.4	4.1	355.0	9.0
Other hardwoods	86.7	166.7	203.7	187.5	134.3	75.9	57.7	34.3	67.7	34.3	1,048.7	5.3
Total hardwoods	1,710.8	3,213.9	4,027.7	3,949.3	3,480.1	2,557.3	1,790.4	1,236.5	1,761.7	407.8	24,135.7	1.1
All species	1,950.6	3,585.6	4,419.3	4,323.2	3,809.9	2,768.8	1,947.0	1,356.3	1,990.8	437.2	26,588.6	1.0
SE	1.7	1.6	1.5	1.5	1.7	2.0	2.5	2.8	3.0	6.0	1.0	

Table 13.--Net volume of sawtimber trees on timberland by species and forest-type group, Pennsylvania, 1989

(In millions of board feet)

Species	Forest-type group									Total	SE
	White/ red pine	Spruce/ fir	Loblolly/ shortleaf	Oak/ pine	Oak/ hickory	Oak/gum/ cypress	Elm/ash/ red maple	Northern hardwoods	Aspen/ birch		
White and red pine	935.9	1.3	64.2	246.9	798.8	.0	9.1	645.4	45.2	2,746.7	8.6
Virginia pine	.0	.0	139.0	37.9	39.6	.0	1.5	17.3	.0	235.3	20.1
Other yellow pines	47.8	1.3	71.6	94.7	162.4	.0	2.0	42.3	4.5	426.6	13.5
Eastern hemlock	1,307.9	.0	.0	14.2	471.9	.0	18.7	2,102.0	19.3	3,934.0	6.0
Other softwoods	6.7	31.2	4.4	4.8	18.5	.0	2.0	66.8	13.7	148.1	23.2
Total softwoods	2,298.3	33.9	279.1	398.4	1,491.2	.0	33.4	2,873.7	82.6	7,490.6	4.7
Red maple	246.3	.0	12.4	26.6	3,260.2	.0	1,105.1	6,168.6	45.2	10,864.3	3.5
Sugar maple	18.5	.0	.0	4.9	354.4	.0	55.1	5,332.9	16.3	5,782.2	5.1
Yellow birch	33.4	.0	.0	.0	14.5	.0	1.8	447.9	.0	497.6	10.9
Sweet birch	61.8	.0	.0	5.9	516.7	.0	7.7	1,097.7	6.2	1,696.0	6.2
Hickory	29.3	.0	.0	9.2	1,136.2	.0	47.1	342.5	.0	1,564.3	7.1
Beech	107.2	.0	.0	.0	500.7	.0	33.5	2,759.4	4.0	3,404.8	6.3
White ash	43.8	2.5	11.6	28.0	949.6	.0	192.3	2,456.5	14.7	3,699.0	5.5
Black walnut	5.2	.0	5.2	2.0	186.2	.0	29.6	81.9	.0	310.1	13.3
Yellow-poplar	66.4	.0	13.2	4.7	2,341.9	.0	49.1	1,016.0	.0	3,491.2	7.9
Blackgum	.0	3.8	.0	.0	151.1	.0	3.1	81.3	.0	239.2	10.7
Aspen	9.3	.0	.0	.0	50.7	.0	13.3	138.0	58.3	269.6	14.8
Black cherry	117.6	8.2	2.6	17.9	1,494.1	.0	211.7	6,463.2	31.6	8,346.9	4.4
Chestnut oak	35.0	.0	4.7	22.6	3,713.1	.0	2.9	263.2	10.5	4,052.0	4.6
Northern red oak	91.7	.0	2.2	41.4	7,163.9	.0	56.6	1,551.8	62.7	8,970.4	3.9
Select white oaks	94.8	.0	4.7	39.2	3,396.7	.0	71.5	444.3	16.0	4,067.1	4.6
Other oaks	24.7	.0	4.2	32.7	3,631.5	.0	54.9	243.4	.0	3,991.4	5.4
Black locust	.0	.0	.0	3.6	327.5	.0	4.0	93.6	.0	428.6	13.8
Basswood	9.4	.0	.0	1.5	78.2	.0	3.1	946.5	6.5	1,045.1	9.4
Other hardwoods	46.8	2.5	6.5	16.0	705.9	.0	639.3	1,001.3	190.7	2,608.9	6.8
Total hardwoods	1,041.0	17.0	67.2	256.0	29,972.9	.0	2,581.7	30,929.9	462.9	65,328.7	1.5
All species	3,339.3	50.9	346.4	654.4	31,464.1	.0	2,615.1	33,803.6	545.5	72,819.3	1.4
SE	11.6	63.0	26.6	23.8	2.7	.0	12.4	2.7	20.3	1.4	

Table 14.--Net volume of sawtimber trees on timberland by species and diameter class, Pennsylvania, 1989

(In millions of board feet)

Species	Diameter class (inches at breast height)								All classes	SE
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
White and red pine	437.4	478.5	437.3	276.3	262.6	247.0	530.4	77.3	2,746.7	8.6
Virginia pine	101.9	82.1	36.6	8.1	2.2	.0	4.4	.0	235.3	20.1
Other yellow pines	125.0	114.4	94.5	56.5	19.5	11.2	5.5	.0	426.6	13.5
Eastern hemlock	529.0	720.8	758.8	566.8	445.8	272.4	590.0	50.4	3,934.0	6.0
Other softwoods	54.8	39.8	38.5	6.5	4.0	2.3	2.2	.0	148.1	23.2
Total softwoods	1,248.2	1,435.5	1,365.6	914.1	734.1	532.9	1,132.5	127.7	7,490.6	4.7
Red maple	.0	2,898.3	2,818.8	1,863.9	1,252.5	755.9	991.7	283.3	10,864.3	3.5
Sugar maple	.0	1,522.6	1,405.4	937.0	703.5	418.6	640.0	155.2	5,782.2	5.1
Yellow birch	.0	196.2	147.3	71.8	49.0	8.5	21.5	3.4	497.6	10.9
Sweet birch	.0	692.4	475.0	231.6	132.2	69.7	85.1	10.0	1,696.0	6.2
Hickory	.0	472.5	438.0	279.4	160.4	89.6	97.9	26.4	1,564.3	7.1
Beech	.0	646.7	640.2	599.6	449.8	359.3	606.6	102.6	3,404.8	6.3
White ash	.0	874.4	841.3	663.4	446.8	369.8	392.0	111.2	3,699.0	5.5
Black walnut	.0	67.2	87.4	60.5	41.7	23.6	25.1	4.5	310.1	13.3
Yellow-poplar	.0	384.2	546.6	603.0	600.5	464.2	692.5	200.4	3,491.2	7.9
Blackgum	.0	74.0	52.9	40.1	19.6	18.0	32.4	2.3	239.2	10.7
Aspen	.0	160.2	58.2	35.3	12.3	3.5	.0	.0	269.6	14.8
Black cherry	.0	1,628.6	1,793.7	1,589.5	1,147.3	867.3	1,100.7	219.8	8,346.9	4.4
Chestnut oak	.0	1,219.0	990.7	766.8	462.3	290.1	291.1	31.9	4,052.0	4.6
Northern red oak	.0	1,401.4	1,539.3	1,450.6	1,346.5	1,010.3	1,794.2	428.1	8,970.4	3.9
Select white oaks	.0	904.5	933.4	621.0	451.9	332.9	596.2	227.2	4,067.1	4.6
Other oaks	.0	688.6	809.8	684.9	568.0	401.2	705.7	133.2	3,991.4	5.4
Black locust	.0	105.1	117.1	82.1	43.3	27.5	53.4	.0	428.6	13.8
Basswood	.0	281.7	327.4	189.1	100.0	60.4	62.1	24.4	1,045.1	9.4
Other hardwoods	.0	747.7	586.0	332.4	259.8	160.3	322.3	200.5	2,608.9	6.8
Total hardwoods	.0	14,965.1	14,608.5	11,101.9	8,247.5	5,730.7	8,510.7	2,164.3	65,328.7	1.5
All species	1,248.2	16,400.6	15,974.1	12,016.1	8,981.6	6,263.6	9,643.1	2,292.0	72,819.3	1.4
SE	6.6	1.5	1.7	2.1	2.5	2.8	3.0	6.2	1.4	

McWilliams, William H.; Alerich, Carol A.; Devlin, Daniel A.; Lister, Tonya W.; Sterner, Stephen L.; Westfall; James A. 2002. **Annual inventory report for Pennsylvania's forests: results from the first two years.** Resour. Bull. NE-156. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 71 p.

In 2000, the USDA Forest Service's Forest Inventory and Analysis (FIA) program implemented a new system for inventory and monitoring Pennsylvania's forest resources. The most salient benefit of the new inventory process will be a nearly threefold improvement in timeliness. This report summarizes the results of the first 2 years of annual inventory measurements. The area of forest land in Pennsylvania has remained stable since a previous inventory in 1989. The Keystone State's forests continue to mature as larger trees and an increase in inventory volume were recorded. A separate study of tree seedlings revealed a general lack of regeneration in one-third to one-half of the stands in which regeneration should be adequate.

Keywords: forest composition; forest health; sustainability; timber volume; tree regeneration

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