Delaware's Forests, 2008: Statistics, Methods, and Quality Assurance

USDA United States Department of Agriculture

Forest Service

Northern Research Station

Forest Inventory Methods

Strategic Model

The Forest Inventory and Analysis program of the Northern Research Station (NRS-FIA) is part of the national enhanced FIA program that focuses on a set of six strategic objectives (McRoberts 2005):

- A standard set of variables with nationally consistent meanings and measurements
- Field inventories of all forested lands
- Nationally consistent estimation
- Adherence to national precision standards
- Consistent reporting and data distribution
- Credibility with users and stakeholders

To ensure that these objectives are achieved, 10 strategic approaches have been prescribed:

- A national set of prescribed core variables with a national field manual that prescribes measurement procedures and protocols for each variable
- A nationally consistent plot configuration
- A nationally consistent sampling design
- Estimation using standardized formulas for sample-based estimators
- A national database of FIA data with core standards and user-friendly public access
- A national information management system
- A nationally consistent set of tables with estimates of prescribed core variables
- Publication of statewide tables with estimates of prescribed core variables at 5-year intervals
- Documentation of the technical aspects of the FIA program, including procedures, protocols, and techniques
- Peer review and publication of the technical documentation for general access

The result of the strategic objectives and approaches is an inventory program with identifiably new features and a nationally consistent plot configuration, a nationally consistent sampling design for all lands, annual measurement of a proportion of plots in each state, nationally consistent estimation techniques and algorithms, and integration of the ground sampling components of the FIA inventory and the detection monitoring by the U.S. Forest Service's Forest Health Monitoring (FHM) program.

Plot Configuration

The national FIA plot design consists of four 24-foot-radius subplots configured as a central subplot and three peripheral subplots. Centers of the peripheral subplots are located 120 feet from the central subplot at azimuths of 0°, 120°, and 240° from the center of the central subplot (Fig. 77). Each tree with a diameter at breast height (d.b.h.) of 5 inches or greater is measured on these subplots. Each subplot contains a 6.8-foot-radius microplot with center located 12 feet east of the subplot center on which each tree with a d.b.h. of 1 to 5 inches is measured. Forest conditions on any of the four subplots are identified and recorded. If the area of the condition is 1 acre or greater, the condition is mapped on the subplot. Factors that differentiate forest conditions include forest type, stand-size class, stand origin, land use, ownership, and density.

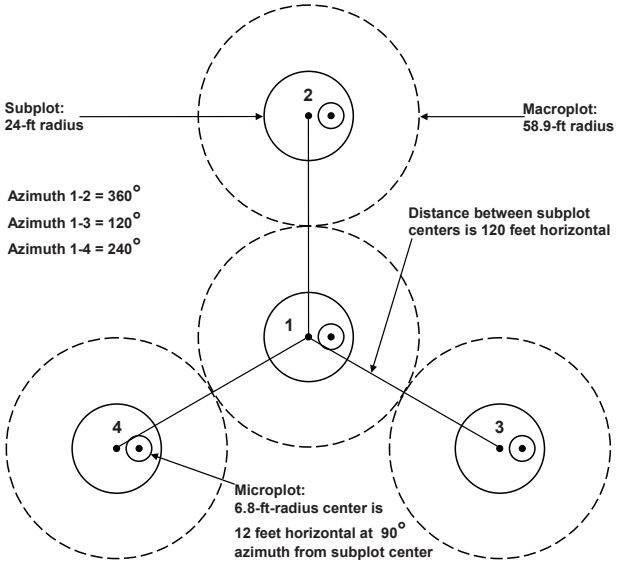

Figure 77.—National FIA plot design (adapted from Bechtold and Patterson 2005).

Sample Design

On the basis of historical sampling errors, a sampling intensity of about one plot per 6,000 acres is required to satisfy national FIA precision guidelines. FIA divided the area of the United States into nonoverlapping, 5,937-acre hexagons and established 1 plot in each hexagon as follows: (1) if an existing FHM plot was located in a hexagon, it was selected; (2) if no FHM plot existed in the hexagon, the existing FIA plot from the previous periodic inventory nearest the hexagon center was selected; and (3) if neither an FHM nor FIA plot was located in the hexagon, a new FIA plot was established at a random location in the hexagon (Brand et al. 2000, McRoberts 1999). This array of field plots is designated the Federal base sample and is considered an equal probability sample; measurement is funded by the Federal Government. Because of Delaware's size, the number of inventory plots in Delaware was doubled resulting in a sampling intensity of about one plot per 3,000 acres. The hexagon grid and plot location selection method in Delaware were the same as described above for the Federal sample, however two plots were located in each hexagon.

The Federal base sample was systematically divided into five interpenetrating, nonoverlapping panels or subsamples, each of which provides complete, systematic coverage of a state. Each year, the plots in a single panel are measured, and panels are selected on a 5-year, rotating basis (McRoberts 1999). For estimation purposes, the measurement of each panel of plots is considered an independent, equal probability sample of all lands in a state.

Three-phase Inventory

FIA conducts inventories in three phases. In Phase 1 (P1), remotely sensed data are used to obtain initial plot land cover observations and to stratify land area in the population of interest to increase the precision of estimates. In Phase 2 (P2), field crews visit the physical locations of permanent field plots to measure traditional inventory variables such as tree species, diameter, and height. In Phase 3 (P3), field crews visit a subset of P2 plots to obtain measurements for an additional suite of variables associated with forest and ecosystem health. The three phases of the enhanced FIA program are discussed in greater detail in the following sections.

Phase 1

Aerial photographs, digital orthoquads (DOQs: digitally scanned aerial photographs), and satellite imagery are used for initial plot measurement via remotely sensed data and stratification. P1 plot measurement consists of observations of conditions at the plot locations using aerial photographs or DOQs. Analysts determine a digitized geographic location for each field plot, and a human interpreter assigns the plot a land cover/use. Lands satisfying FIA's definition of forest land include commercial timberland, some pastured land with trees, forest plantations, unproductive forested land, and reserved, noncommercial forested land. In addition, forest land requires minimum stocking levels, a 1-acre minimum area, and a minimum bole-to-bole width of 120 feet with continuous canopy. Forest land excludes wooded strips, idle farmland with trees, and narrow windbreaks. All plot locations that could possibly contain accessible forest land are selected for further measurement during P2.

The combination of natural variability among plots and budgetary constraints prohibits measurement of a sufficient number of plots to satisfy national precision standards for most inventory variables unless the estimation process is enhanced using ancillary data. Thus, the land area is stratified by using remotely sensed data to facilitate stratified estimation. NRS-FIA uses canopy density classes to derive strata. Canopy density information was obtained from the 2001 National Land Cover Database (NLCD). The NLCD 2001 canopy density layer for the United States was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium (http://www.mrlc.gov/). The layer characterizes subtle variations of forest canopy density as a percentage estimate of forest canopy cover (0 to 100) within every 30-m pixel over the

United States. The method used to map canopy density for NLCD 2001 is described in Huang et al. (2001).

The current strata categorization was optimized for the entire NRS-FIA region. Using plot location information (center of the center subplot), we assigned a percent canopy density value to each plot. Plots were then aggregated into one of the five strata based on the center of the center subplot. The percent canopy cover stratification scheme consists of five groupings: (1) 0 to 5, (2) 6 to 50, (3) 51 to 65, (4) 66 to 80, and (5) 81 to 100. These groupings were based on observed natural clumping of pixel values. If there were not enough plots in each of these classes to create strata, then collapsing rules were used to combine classes until sufficient sample sizes were obtained.

In addition to being classified into one of the five canopy strata, every pixel was assigned to an ownership stratum. In Delaware, ownership layers, derived from the Protected Areas Database (http://www.databasin.org/protected-center/features/PAD-US-CBI) were used to classify pixels into three ownership classes: (1) inland census water, (2) public, and (3) private. Every pixel was also assigned to a unit based on pixel center location.

Stratified estimation requires two tasks. First, each plot must be assigned to a single stratum. Next, the proportion of each detailed stratum must be calculated (TM land-cover classification, ownership, and county group delineation). The first task is done by assigning each plot to the stratum assigned to the pixel containing the center of the center subplot. The second task is done by calculating the proportion of pixels in each stratum. The population estimate for a variable is calculated as the sum across all strata of the product of each stratum's observed proportion (from P1) and the variable's estimated mean per unit area for the stratum (from P2).

Phase 2

In P2, field crews record a variety of data for plot locations determined in P1 to include accessible forest land. Before visiting plot locations, field crews consult county land records to determine the ownership of plots and then seek permission from private landowners to measure plots on their lands. Field crews determine the location of the geographic center of the center subplot using GPS receivers. They record subplot-level observations that include land cover, forest type, stand origin, stand age, stand-size class, site productivity class, forest disturbance history, slope, aspect, physiographic class, and land use conditions. For each tree, field crews record a variety of observations and measurements including species, live/dead status, lean, diameter, height, crown ratio (percent of tree height represented by crown), crown class (e.g., dominant, co-dominant, suppressed), damage, and decay status. The office staff use statistical models based on field crew measurements to calculate values for additional variables including individual tree volume, per unit area estimates of number of trees, volume, and biomass by subplot, by species groups, and by live/dead status.

Phase 3

The third phase of the enhanced FIA program focuses on forest health. P3 is administered cooperatively by the FIA program, other Forest Service programs, other Federal agencies, State natural resource agencies, and universities, and it is partially integrated with the Forest Health Monitoring (FHM) program. The FHM program consists of four interrelated and complementary activities: detection monitoring, evaluation monitoring, intensive site ecosystem monitoring, and research on monitoring techniques. Detection monitoring consists of systematic aerial and ground surveys designed to collect baseline information on the current condition of forest ecosystems and to detect changes from those baselines over time. Evaluation monitoring studies examine the extent, severity, and probable causes of changes in forest health identified through the detection monitoring surveys. The intensive site ecosystem monitoring program examines regionally specific ecological

processes at a network of sites located in representative forested ecosystems. Finally, research on monitoring techniques focuses on developing and refining indicator measurements to improve the efficiency and reliability of data collection and analysis at all levels of the program.

The ground survey portion of the FHM detection monitoring program was integrated into the FIA program as P3 in 1999. For most states the P3 sample consists of a 1:16 subset of the P2 plots with one P3 plot for approximately every 96,000 acres. In Delaware, however, from 2004 to 2008, additional P3 plots were installed at an average intensity of one P3 plot for approximately every 14,250 acres. P3 measurements are made by field crews during the growing season and include an extended suite of ecological data: lichen diversity and abundance, soil quality (erosion, compaction, and chemistry), vegetation diversity and structure, and down woody material. The incidence and severity of ozone injury for selected bioindicator species also are monitored as part of an associated sampling scheme. All P2 measurements are made on each P3 plot at the same time as the P3 measurements.

P3 variables were selected to address specific criteria outlined by the Montreal Process (Montreal Process 1999) working group for the conservation and sustainable management of temperate and boreal forests and are based on the concept of indicator variables. Observations of an indicator variable represent an index of ecosystem functions that can be monitored over time to assess trends. Indicator variables are used in conjunction with each other, P2 data, data from FHM evaluation monitoring studies, and ancillary data to address ecological issues such as vegetation diversity, fuel loading, regional air quality gradients, and carbon storage. The P2 and P3 data of the enhanced FIA program serve as the Nation's environmental report card and are a primary source of reporting data for the Montreal Process Criteria and Indicators (for more information, see Woodall et al. 2010).

Estimation

Most of the estimates and analysis presented in this report (including all the estimate tables) are based on averages observed on 435 plots located across Delaware. These plots are located within 16 unique strata (Table A) defined by combinations of the five P1 percent canopy cover classes: (1) 0 to 5, (2) 6 to 50, (3) 51 to 65, (4) 66 to 80, and (5) 81 to 100 and a land ownership classification created from the Protected Areas Database. Nationally consistent algorithms were used to assign forest type and stand-size class to each condition observed on a plot. For NRS-FIA, panels are measured on an annual basis so that five panel estimates are equivalent to 5-year moving average estimates. Field plot measurements are combined with P1 estimates in the compilation process and table production. Procedures described in Bechtold and Patterson (2005) for stratified estimation with observed stratum areas were used in conjunction with the strata presented in Table A to produce all estimates. Table A shows the total area and number of plots within each stratum.

Integration with Previous Inventories

In 2008, NRS-FIA completed measurement of the fifth panel of inventory plots in Delaware. The 2008 panel, along with those surveyed in 2004, 2005, 2006, and 2007, completed data collection for the fifth inventory of Delaware's forests. Previous inventories of Delaware's forest resources were completed in 1957 (Ferguson 1959), 1972 (Ferguson et al. 1974), 1986 (Frieswyk and DiGiovanni 1989), and 1999 (Griffith and Widmann 2001). Data from new inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar.

To improve the efficiency and reliability of the inventory, several changes in procedures and definitions have been made since the 1999 Delaware inventory (Griffith and Widmann 2001). Although these changes will have little impact on statewide estimates of forest area, timber volume, and tree biomass, they may significantly

impact plot classification variables such as forest type and stand-size class. For estimating growth, removals, and mortality, the 1999 inventory was processed using estimation/summary routines for the 2008 inventory. Additionally, growth, removals, and mortality estimates were generated using the limited number of plots measured in both the 1999 and 2008 inventories (198 plots). Although these changes allow limited comparison of inventory estimates among separate inventories in this report, it is inappropriate to directly compare all portions of the 2004-2008 data with those published for earlier inventories.

For further information about the sample protocols and estimation procedures for the first two phases of the FIA program, see Bechtold and Patterson (2005). For further information on P3 indicator sampling protocols, see USDA FS (2009).

Quality of the Estimates

The four primary sources of error common to all sample-based estimates are sampling, measurement, prediction, and nonresponse error. A section on each source of error defines the error within the context of the FIA inventory and discusses methods used to quantify and reduce this error.

Sampling Error

The process of sampling (selecting a random subset of a population and calculating estimates from this subset) causes estimates to contain error they would not have if every member of the population was observed and included in the estimate. The 2008 FIA inventory of Delaware is based on a sample of 435 plots located randomly across the State (a total area of 1,296,821 acres), a sampling rate of about one plot for every 2,981 acres.

The procedures for statistical estimation outlined in the previous section and described in detail in Bechtold and Patterson (2005) provide the estimates of the population totals and means presented in this report. Along with every estimate is an associated sampling error that is typically expressed as a percentage of the estimated value but that can also be expressed in the same units as the estimate or as a confidence interval (the estimated value plus or minus the sampling error). This sampling error is the primary measure of the reliability of an estimate. A sampling error can be interpreted to mean that had a 100-percent inventory been taken using these methods, the chances are two out of three that the results would have been within the limits indicated (i.e., 68-percent confidence interval).

The sampling errors for State-level estimates of the major attributes presented in this report are shown in Table B. Table DE-65 presents sampling errors for these estimates at the Forest Survey Unit and county-group levels.

Estimates for classifications smaller than the State totals presented in Table B will have larger sampling errors. For example, Table DE-65 shows that the sampling error for timberland area in any county is higher than that for total timberland area in the State. To compute an approximate sampling error for an estimate that is smaller than a State total, use the following formula:

$$E = \frac{(SE)\sqrt{(\text{State total estimate})}}{\sqrt{(\text{Smaller estimate})}} \qquad (1)$$

where:

E = approximate sampling error for smaller estimate
SE = sampling error for State total estimate

For example, to compute the error on the area of private forest land in the State, proceed as follows:

The total private forest land in Delaware (from Table DE-2) is estimated at 277,200 acres.

The total area of all forest land in DE (from Table DE-3) is 352,200 acres.

The State total error for forest land area (from Table B) is 4.2 percent.

Using formula (1):

$$\textbf{Sampling error} = \frac{(4.2)\sqrt{(352{,}200)}}{\sqrt{(277{,}200)}} = \textbf{4.73 percent.}$$

This approximation works well for estimates of area, volume, number of trees, and biomass. It is less effective for estimates of growth, removals, or mortality. Individuals seeking more accurate sampling errors should use Forest Inventory Data Online (FIDO), available at http://fiatools.fs.fed.us.

The estimators used by FIA are unbiased under the assumptions that the sample plots are a random sample of the total population and that the observed value for any plot is the true value for that plot. Deviations from these basic assumptions are not reflected in the computation of sampling errors. The following sections on measurement, prediction, and nonresponse error address possible departures from these basic assumptions.

Measurement Error

Errors associated with the methods and instruments used to observe and record the sample attributes are called measurement errors. On FIA plots, attributes such as the diameter and height of a tree are measured with different instruments, and other attributes such as species and crown class are observed without the aid of an instrument. On a typical FIA plot, 30 to 70 trees are observed with 15 to 20 attributes recorded on each tree. In addition, many attributes that describe the plot and conditions on the plot are observed. Errors in any of these observations affect the quality of the estimates. If a measurement is biased (such as tree diameter consistently taken at an incorrect place on the tree), then the estimates that use this observation (such as volume) will reflect this bias. Even if measurements are unbiased, high levels of random error in the measurements will add to the total random error of the estimation process.

To ensure that all FIA observations are made to the highest standards possible, a regular program of quality assurance and quality control is an integral part of all FIA data collection efforts. This program begins with the documentation of protocols and procedures used in the inventory followed by intensive crew training. To assess the quality of the data collected by these trained crews, a random sample of at least 4 percent of all plots are measured independently by a different expert crew. These independent measurements are referred to as blind checks, and their purpose is to assess the quality of field measurements. The second measurement on these blind check plots is done by a Quality Assurance (QA) crew. In all cases, QA crews have as much or more experience and training in FIA field measurements than standard FIA crews.

The quality of field measurements is assessed nationally through a set of measurement quality objectives (MQOs) established for every data item we collect. Each MQO consists of two parts: a tolerance or acceptable level of measurement error, and an objective in terms of the percent of measurements within tolerance. The blind check measurements are used to observe how often individual field crews are meeting these objectives and to assess the overall compliance among all crews. Table C shows the compliance rates for various measurements used to compute the estimates included in this report and other NRS-FIA reports. The columns labeled 'Delaware' come from blind check measurements of plots used in this report, and the columns labeled 'All NRS-FIA States' come from all measurements made by FIA crews within the entire 24-state area where the Northern Research Station implemented the FIA program in 2008. Training and supervision of crews is a regional effort and crews often work in more than one state. Regional data quality observations reflect the overall measurement quality of all data collected by FIA in the NRS region.

In addition to the percent compliance to MQOs, the blind check observations were used to test for relative bias in the field crew measurements. Relative bias is defined here as a tendency for the standard field crew measurements to be higher or lower than those measurements taken by the QA crews. The estimated relative bias and limits of 95 percent confidence intervals (based on parametric bootstrap estimates) for the relative bias are presented in Table D.

The blind check measurements do not provide direct observations of true bias in field measurements (average difference between field measurements and true values) because they are paired observations of two field measurements. The QA crew in these blind checks typically has more training and experience with FIA field measurements than the first crew, but both crews use the same methods and instruments to obtain the measurements. These methods were the best available and were selected for use nationwide by FIA; they are commonly used by other similar natural resource inventories. A basic assumption is that the methods, when correctly applied, provide unbiased observations of the attribute they are designed to measure. Under this assumption, relative bias observations in Table D provide observations of bias due to the difference in experience and training between the field and QA crews. In most cases there is no significant bias.

Prediction Error

Errors associated with using mathematical models (such as volume models) to provide observations of the attributes of interest based on sample attributes are referred to as prediction errors. Area, number of trees, volume, biomass, growth, removals, and mortality are the primary attributes of interest presented in this report. Area and number of trees estimates are based on direct observation and do not involve the use of prediction models; however, FIA estimates of volume, biomass, growth, removals, and mortality use model-based predictions in the estimation process. Models are used to predict volume and biomass estimates of individual tree volumes. Change estimates such as growth, mortality, and removals are based on these model-based predictions of volume from both the current plot measurements and the measurements taken in the previous inventory.

Estimates of model error associated with the volume models used in this report are presented by Scott (1979, 1981), along with the model forms, the methods used in model development, and the model parameter estimates. Biomass of individual trees is calculated using the procedures described by Heath et al. (2009). Numerous factors are involved in these computations, including tree volume models, wood and bark specific gravity, and various proportions of tree components (e.g., tops and limbs). Due to the complex methodology, errors associated with model-based predictions of biomass have not yet been quantified.

Users of FIA estimates should be aware of the possible prediction errors in FIA estimates. In comparing FIA estimates to other data sources, users need to be aware of the prediction models used in both estimates. If both estimates are based on the same prediction models with matching fitted parameter values, then the prediction bias of one estimate should cancel out that of the other estimate. If the estimates are based on different prediction models, then the user should be aware of the prediction error of both models.

Nonresponse Error

Nonresponse error refers to the error caused by not being able to observe some of the elements in the sample. In FIA, nonresponse occurs when crews are unable to measure a plot (or a portion of a plot) at a selected location. Nonresponse falls into the following three classes:

Denied access – Entire plots or portions of plots where the field crew is unable to obtain permission from the landowner and is therefore unable to measure the trees on the plot.

Hazardous/inaccessible – Entire plots or portions of plots where the conditions present prevent a crew from safely getting to the plot or measuring the trees on the plot.

Other – Plots where the field crew is unable to obtain a valid measurement for a variety of reasons other than those stated above.

Nonresponse has two effects on the sample. First, it reduces the sample size. The reduced sample size is reflected in the sampling errors discussed in that section.

Second, nonresponse can bias the estimates if the portion of the population not being sampled differs from the portion being sampled.

In FIA, unlike many survey samples, nonresponse rates are relatively low. In the 2008 Delaware inventory, a total of 435 sample plots were selected to be observed. Of the total sample plots selected for observation, 408 are in the sample used for the estimation of current resources. There were 26 plots where crews were unable to obtain owner permission to measure the plot, and 1 plot where hazardous conditions prevented the crew from measuring all or part of the plot; no plots were lost from the sample due to additional problems.

Even though an overall response rate of 94 percent is quite high, it can cause considerable bias if not properly accounted for. The major source of nonresponse is denied access to plots. Denied access plots primarily occur on lands in private ownership. Also, the observations needed for plots on nonforest and water land classes do not usually require crews to physically enter the land and permission is not needed to obtain the observation because it can be obtained from aerial photos or other remotely sensed information sources.

The stratified estimation process used by FIA with strata defined by three ownership classes (Inland census water, public, and private) and five canopy cover classes reduces the possible effects of bias caused by nonresponse. Under the stratified estimation process used by FIA, nonresponses are removed from the sample, and stratum estimates (means, totals, and sampling errors) are obtained from only those plots with valid observations. The net effect in the estimates of means and totals is that the average of the observed plots within the stratum (ownership class-forest cover class) becomes the estimate for all nonresponses within that stratum. The nonresponse rate in one stratum does not affect the estimate in other strata. The response rate within each stratum is presented in Table E for the Delaware 2008 inventory and for all FIA inventories conducted by the Northern Research Station over the same period.

The nonresponse plots in this inventory were not permanently removed from the FIA system of plots. In future inventories we will again attempt to measure these plots. At that time we may be able to obtain permission to access these plots, the hazardous conditions may have changed, or other circumstances that caused us to drop plots from a specific inventory cycle will probably be different.

Glossary

Average annual mortality of growing stock: The average annual change in the cubic-foot volume of sound wood in growing-stock trees that died over a defined measurement cycle.

Average annual mortality of sawtimber: The average annual change in the board-foot volume of sound wood in sawtimber trees that died over a defined measurement cycle.

Average annual net growth of growing stock: The average annual change in the cubic-foot volume of sound wood in live sawtimber and poletimber trees, and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes. Natural causes include mortality except that due to logging damage, timber stand improvement, or conversion to a nonforest land use.

Average annual net growth of sawtimber: The average annual change in the board-foot volume of live sawtimber trees, and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes. Natural causes include mortality except that due to logging damage, timber stand improvement, or conversion to a nonforest land use.

Average annual removals from growing stock: The average annual net growing-stock volume change in growing-stock trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals.

Average annual removals from sawtimber: The average annual net board-foot sawtimber volume of live sawtimber trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals.

Basal area: Tree area in square feet of the cross section at breast height of a single tree. When the basal areas of all trees in a stand are summed, the result is usually expressed as square feet of basal area per acre.

Bioindicator species: A tree, woody shrub, or nonwoody herb species that responds to ambient levels of ozone pollution with distinct visible foliar symptoms that are easy to diagnose.

Biomass: The aboveground volume of live trees (including bark but excluding foliage) reported in dry tons (dry weight). Biomass has four components:

Bole: Biomass of a tree from 1 foot above the ground to a 4-inch top outside bark or to a point where the central stem breaks into limbs.

Tops and limbs: Total biomass of a tree from a 1-foot stump minus the bole.

1-to 4.9-inch trees: Total aboveground biomass of a tree from 1.0 to 4.9 inches in d.b.h.

Stump: Biomass of a tree 5 inches d.b.h. and larger from the ground to a height of 1 foot.

Bulk density: The mass of soil per unit volume. A measure of the ratio of pore space to solid materials in a given soil. Expressed in units of grams per cubic centimeter of oven-dry soil.

Coarse woody debris (CWD): Dead branches, twigs, and wood splinters 3.0 inches in diameter and larger measured at the smallest end.

Commercial species: Tree species suitable for industrial wood products.

Compacted live crown ratio: The percent of the total length of the tree that supports a full, live crown. To determine compacted live crown ratio for trees that have uneven length crowns, lower branches are visually transferred to fill holes in the upper portions of the crown, until a full, even crown is created.

County and municipal: An ownership class of public lands owned by counties or local public agencies, or lands leased by these governmental units for more than 50 years.

Cropland: Land under cultivation within the last 24 months, including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, active Christmas tree plantations indicated by annual shearing, nurseries, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Crown: The part of a tree or woody plant bearing live branches or foliage.

Crown dieback: Recent mortality of branches with fine twigs, which begins at the terminal portion of a branch and proceeds toward the trunk. Dieback is considered only when it occurs in the upper and outer portions of the tree. When whole branches are dead in the upper crown, without obvious signs of damage such as breaks or animal injury, it is assumed the branches died from the terminal portion of the branch. Dead branches in the lower portion of the live crown are assumed to have died from competition and shading.

Cull tree: A live tree, 5.0 inches in d.b.h. or larger, that is unmerchantable for saw logs now or prospectively because of rot, roughness, or species. (See definitions for rotten and rough trees.)

Decay class: Qualitative assessment of stage of decay (five classes) of coarse woody debris based on visual assessments of color of wood, presence/absence of twigs and branches, texture of rotten portions, and structural integrity.

Diameter class: A classification of trees based on diameter outside bark measured at breast height (4-1/2 feet above ground). D.b.h. is the common abbreviation for "diameter at breast height." With 2-inch diameter classes, the 6-inch class, for example, includes trees 5.0 through 6.9 inches d.b.h.

Down woody material (DWM): Woody pieces of trees and shrubs that have been uprooted (no longer supporting growth) or severed from their root system, not self-supporting, and lying on the ground.

Duff: A soil layer dominated by organic material derived from the decomposition of plant and animal litter and deposited on either an organic or a mineral surface. This layer is distinguished from the litter layer in that the original organic material has undergone sufficient decomposition that the source of this material (e.g., individual plant parts) can no longer be identified.

Effective cation exchange capacity (ECEC): The sum of cations that a soil can adsorb in its natural pH. Expressed in units of centimoles of positive charge per kilogram of soil.

Federal: An ownership class of public lands owned by the U.S. Government.

Fiber products: Products derived from wood and bark residues, such as pulp, composition board products, and wood chips.

Fine materials: Wood residues not suitable for chipping, such as planer shavings and sawdust.

Fine woody debris (FWD): Dead branches, twigs, and wood splinters 0.1 to 2.9 inches in diameter.

Forest industry: An ownership class of private lands owned by companies or individuals operating wood-using plants.

Forest land: Land at least 10 percent stocked by forest trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that are at least 10 percent stocked with forest trees and forest areas adjacent to urban and builtup lands. Also included are pinyon-juniper and chaparral areas in the West and afforested areas. The minimum

area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of trees must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if less than 120 feet wide.

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

Forest-type group: A combination of forest types that share closely associated species or site requirements and are generally combined for brevity of reporting.

Major eastern forest-type groups:

White/red/jack pine: Forests in which eastern white pine, red pine, or jack pine, singly or in combination, comprise a plurality of the stocking. Common associates include hemlock, aspen, birch, and maple.

Oak/pine: Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which pine or eastern redcedar comprises 25 to 50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

Oak/hickory: Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25 to 50 percent, in which case the stand is classified as oak/pine. Common associates include yellow-poplar, elm, maple, and black walnut.

Oak/gum/cypress: Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking except where pines comprise 25 to 50 percent, in which case the stand is classified as oak/pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.

Elm/ash/cottonwood: Forests in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.

Maple/beech/birch: Forests in which maple, beech, or yellow birch, singly or in combination, comprise a plurality of the stocking. Common associates include hemlock, elm, basswood, and white pine.

Aspen/birch: Forests in which aspen, balsam poplar, paper birch, or gray birch, singly or in combination, comprise a plurality of the stocking. Common associates include maple and balsam fir.

Growing stock: A classification of timber inventory that includes live trees of commercial species meeting specified standards of quality or vigor. Cull trees are excluded. When associated with volume, this includes only trees 5.0 inches d.b.h. and larger.

Hardwood: A dicotyledonous tree, usually broad-leaved and deciduous.

Soft hardwoods: A category of hardwood species with wood generally of low specific gravity (less than 0.5). Notable examples include red maple, paper birch, quaking aspen, and American elm.

Hard hardwoods: A category of hardwood species with wood generally of high specific gravity (greater than 0.5). Notable examples include sugar maple, yellow birch, black walnut, and oaks.

Industrial wood: All commercial roundwood products except fuelwood.

Land area: The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 200 feet wide; and lakes, reservoirs, and ponds less than 4.5 acres in area.

Litter: Undecomposed or only partially decomposed organic material that can be readily identified (e.g., plant leaves, twigs).

Live cull: A classification that includes live, cull trees. When associated with volume, it is the net volume in live, cull trees that are 5.0 inches d.b.h. and larger.

Logging residues: The unused portions of growing-stock and nongrowing-stock trees cut or killed by logging and left in the woods.

Merchantable: Refers to a pulpwood or saw log section that meets pulpwood or saw log specifications, respectively.

National Forest: An ownership class of Federal lands, designated by Executive order or statute as National Forests or purchase units, and other lands under the administration of the Forest Service including experimental areas.

Net volume in cubic feet: The gross volume in cubic feet less deductions for rot, roughness, and poor form. Volume is computed for the central stem from a 1-foot stump to a minimum 4.0-inch top diameter outside bark, or to the point where the central stem breaks into limbs.

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

Nonforest land: Land that has never supported forests and lands formerly forested where use of timber management is precluded by development for other uses. (Note: Includes area used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 4.5-acre areas of water classified by the U.S. Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide, and clearings, etc., must be more than 1 acre in area to qualify as nonforest land.)

Nonindustrial private: An ownership class of private lands where the owner does not operate wood-using plants.

Nonstocked areas: Timberland less than 10 percent stocked with all live trees.

Other red oaks: A group of species in the genus *Quercus* that includes scarlet oak, northern pin oak, southern red oak, bear oak, shingle oak, laurel oak, blackjack oak, water oak, pin oak, willow oak, and black oak.

Other white oaks: A group of species in the genus *Quercus* that includes overcup oak, chestnut oak, and post oak.

Ownership: The property owned by one ownership unit.

Ownership unit: A classification of ownership encompassing all types of legal entities having an ownership interest in land, regardless of the number of people involved. A unit may be an individual; a combination of persons; a legal entity such as a corporation, partnership, club, or trust; or a public agency. An ownership unit has control of a parcel or group of parcels of land.

Ozone: A gaseous air pollutant produced primarily through sunlight-driven chemical reactions of nitrogen dioxide and hydrocarbons in the atmosphere and causing foliar injury to deciduous trees, conifers, shrubs, and herbaceous species.

Ozone bioindicator site: An open area used for ozone injury evaluations on ozone-sensitive species. The area must meet certain site selection guidelines on size, condition, and plant counts to be used for ozone injury evaluations in FIA.

Physiographic class: A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric: Very dry soils where excessive drainage seriously limits both growth and species occurrence. These sites are usually on upland and upper half slopes.

Xeromesic: Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. These sites are usually on lower half slopes.

Mesic: Deep, well-drained soils. Growth and species occurrence are limited only by climate. These include all cove sites and bottomlands along intermittent streams.

Hydromesic: Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent.

Hydric: Very wet sites where excess water seriously limits both growth and species occurrence.

Poletimber trees: Live trees at least 5.0 inches in d.b.h. but smaller than sawtimber trees.

Primary wood-using mill: A mill that converts roundwood products into other wood products. Common examples are sawmills that convert saw logs into lumber and pulpmills that convert pulpwood into wood pulp.

Productivity class: A classification of forest land in terms of potential annual cubic-foot volume growth per acre at culmination of mean annual increment in fully stocked natural stands.

Pulpwood: Roundwood, whole-tree chips, or wood residues used for the production of wood pulp.

Reserved forest land: Forest land withdrawn from timber utilization through statute, administrative regulation, or designation without regard to productive status.

Residues: Bark and woody materials that are generated in primary wood-using mills when roundwood products are converted to other products. Examples are slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings. Includes bark residues and wood residues (both coarse and fine materials) but excludes logging residues.

Rotten tree: A live tree of commercial species that does not contain a saw log now or prospectively primarily because of rot (that is, when rot accounts for more than 50 percent of the total cull volume).

Rough tree: (a) A live tree of commercial species that does not contain a saw log now or prospectively primarily because of roughness (that is, when sound cull due to such factors as poor form, splits, or cracks accounts for more than 50 percent of the total cull volume); or (b) a live tree of noncommercial species.

Roundwood products: Logs, bolts, and other round timber generated from harvesting trees for industrial or consumer use.

Salvable dead tree: A downed or standing dead tree considered currently or potentially merchantable by regional standards.

Saplings: Live trees 1.0 inch through 4.9 inches d.b.h.

Saw log: A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods, or meeting other combinations of size and defect specified by regional standards.

Sawtimber tree: A live tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches diameter outside bark (d.o.b.).

Sawtimber volume: Net volume of the saw log portion of live sawtimber in board feet, International ¼-inch rule (unless specified otherwise), from stump to a minimum 7.0 inches top d.o.b. for softwoods and a minimum 9.0 inches top d.o.b. for hardwoods.

Seedlings: Live trees less than 1.0 inch d.b.h. and at least 1 foot in height.

Select red oaks: A group of species in the genus *Quercus* that includes cherrybark oak, northern red oak, and Shumard oak.

Select white oaks: A group of species in the genus *Quercus* that includes white oak, swamp white oak, bur oak, swamp chestnut oak, and chinkapin oak.

Site index: An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Snag: A standing dead tree. In the current inventory, a snag must be 5.0 inches d.b.h./d.r.c. and 4.5 feet tall, and have a lean angle less than 45 degrees from vertical. A snag may be either self-supported by its roots or supported by another tree or snag.

Softwood: A coniferous tree, usually evergreen, having needles or scale-like leaves.

Sound dead: The net volume in salvable dead trees.

Stand: A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-size class: A classification of forest land based on the size class of live trees in the area. The classes include:

Nonstocked: Forest land stocked with less than 10 percent of full stocking with live trees. Examples are recently cutover areas or recently reverted agricultural fields.

Sapling-seedling: Forest land stocked with at least 10 percent of full stocking with live trees with half or more of such stocking in seedlings or saplings or both.

Poletimber: Forest land stocked with at least 10 percent of full stocking with live trees with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.

Sawtimber: Forest land stocked with at least 10 percent of full stocking with live trees with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of sawtimber is at least equal to that of poletimber.

State: An ownership class of public lands owned by states or lands leased by states for more than 50 years.

Stocking: The degree of occupancy of land by trees, measured by basal area or number of trees by size and spacing, or both, compared to a stocking standard; that is, the basal area or number of trees, or both, required to fully utilize the growth potential of the land.

Timberland: Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland are capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)

Timber products output: All timber products cut from roundwood and byproducts of wood manufacturing plants. Roundwood products include logs, bolts, or other round sections cut from growing-stock trees, cull trees, salvable dead trees, trees on nonforest land, noncommercial species, sapling-size trees, and limbwood. Byproducts from primary manufacturing plants include slabs, edging, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and screenings of pulpmills that are used as pulpwood chips or other products.

Tree: A woody plant usually having one or more erect perennial stems, a stem diameter at breast height of at least 3 inches, a more or less definitely formed crown of foliage, and a height of at least 15 feet at maturity.

Tree size class: A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Tops: The wood of a tree above the merchantable height (or above the point on the stem 4.0 inches diameter outside bark (d.o.b.) or to the point where the central stem breaks into limbs). It includes the usable material in the uppermost stem.

Urban forest land: Land that would otherwise meet the criteria for forest land but is in an urban-suburban area surrounded by commercial, industrial, or residential development and not likely to be managed for the production of industrial wood products on a continuing basis. Wood removed would be for land clearing, fuelwood, or esthetic purposes. Such forest land may be associated with industrial, commercial, residential subdivision, industrial parks, golf course perimeters, airport buffer strips, and public urban parks that qualify as forest land.

Unreserved forest land: Forest land not withdrawn from harvest by statute or administrative regulation. Includes forest lands that are not capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands.

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

Weight: The weight of wood and bark, oven-dry basis (approximately 12 percent moisture content).

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Table DE-61.—Average annual removals of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (International ¼-inch rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Table DE-61a.—Average annual removals of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (Doyle rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Table DE-65.—Sampling errors, in percent, for net volume, average annual net growth, average annual removals, and average annual mortality on timberland, and forest and timberland area by inventory unit and county, Delaware, 2008

*All tables containing forest attribute estimates for Delaware for measurements taken from 2004 to 2008 are designated with the date '2008'; tables with data for other periods are indicated with other years.

Table A.—Area and number of plots in each stratum, Delaware, 2008

Unit code	Estimation unit description[a]	Canopy cover stratum[b]	Acres	Selected[c]	Office selected[d]	Field selected[e]	Field sampled[f]	Field sampled forested[g]	Total plots sampled for change[h]	Field sampled plots for change[i]	Not measured[j]
1	Inland Census Water Cnty. Grp. 901, 5	Canopy cover 0 - 81	46,000	11	9	2	2	0	0	0	0
1	Private Cnty. Grp. 5	Canopy cover 0 - 5	352,000	105	34	71	68	14	0	0	3
1	Private Cnty. Grp. 5	Canopy cover 6 - 50	29,000	9	1	8	8	6	0	0	0
1	Private Cnty. Grp. 5	Canopy cover 51 - 65	25,000	6	0	6	4	3	0	0	2
1	Private Cnty. Grp. 5	Canopy cover 66 - 80	64,000	34	0	34	28	27	0	0	6
1	Private Cnty. Grp. 5	Canopy cover 81 - 100	69,000	28	0	28	24	24	0	0	4
1	Private Cnty. Grp. 901	Canopy cover 0 - 5	391,000	116	34	82	80	12	0	0	2
1	Private Cnty. Grp. 901	Canopy cover 6 - 50	41,000	10	4	6	5	1	0	0	1
1	Private Cnty. Grp. 901	Canopy cover 51 - 65	17,000	10	0	10	8	6	0	0	2
1	Private Cnty. Grp. 901	Canopy cover 66 - 80	46,000	20	0	20	16	15	0	0	4
1	Private Cnty. Grp. 901	Canopy cover 81 - 100	61,000	27	1	26	24	24	0	0	2
1	Public Cnty. Grp. 5	Canopy cover 0 - 5	28,000	10	2	8	8	5	0	0	0
1	Public Cnty. Grp. 5	Canopy cover 6 - 51	9,000	7	2	5	5	2	0	0	0
1	Public Cnty. Grp. 5	Canopy cover 66 - 81	24,000	4	1	3	3	3	0	0	0
1	Public Cnty. Grp. 901	Canopy cover 0 - 5	61,000	25	12	13	13	5	0	0	0
1	Public Cnty. Grp. 901	Canopy cover 6 - 81	34,000	13	0	13	13	13	0	0	0

[a]Estimation unit description: Description of the sub-population undergoing post-stratification. County groups are defined by one or more contiguous counties used for population estimation.

[b]Canopy cover stratum: A stratum within each estimation unit defined by partitioning the full range of percent canopy (0 - 100%) into 5 strata.

[c]Selected: The number of plots selected when the sample was drawn.

[d]Office selected: The number of plots determined to have no chance of being forested during a prefield interpretation procedure. These plots are withheld from field sampling and considered remotely sampled.

[e]Field selected: The number of plots determined to have some chance of being forested, or that were forested or non-sampled on a previous visit.

[f]Field sampled: The number of field selected plots that were successfully sampled in the field.

[g]Field sampled forested: The number of field selected plots that were successfully sampled in the field and found to intersect forest land.

[h]Total plots sampled for change: The number of plots included in the sample that were successfully sampled in the previous cycle.

[i]Field sampled plots for change: The number of plots included in the sample that were successfully sampled in the previous cycle and that were sent to the field for sampling.

[j]Not measured: The number of plots that were selected as part of the sample, but were completely non-sampled.

Table B.—State-level estimates of major forest resource attributes and their sampling errors, Delaware, 2008

Item	State total	Sampling error
Growing stock on timberland	*million cubic feet*	*percent*
Volume	810.0	5.9
Average annual net growth	31.3	12.4
Average annual removals	6.9	55
Average annual mortality	4.5	25.3
Sawtimber on timberland	*million board feet*[a]	
Volume	2,899.0	7.7
Average annual net growth	142.3	14.48
Average annual removals	24.3	57.47
Average annual mortality	13.3	37.67
Area	*thousand acres*	
Forest land	352.0	4.2
Timberland	345.0	4.4
Biomass (above-ground live trees and saplings)	*million dry tons*	
Forest land	23.6	5.6
Timberland	22.9	5.8

[a]International ¼-inch rule.

Table C.—Measurement quality objective (MQO) tolerance compliance based on blind check plots, Delaware, 2008

Variable	Tolerance	Objective (%)	Delaware		All NRS States	
			% of data within tolerance	Observations	% of data within tolerance	Observations
Plot Level						
National Variables						
Distance to Road	No Tolerance	90.0	75.0	4	83.3	1,903
Water on Plot	No Tolerance	90.0	100.0	4	87.1	1,903
Regional Variables						
Elevation	±50 feet	99.0	100.0	2	86.5	1,809
Latitude - decimal degrees	±0.0001 degree	99.0	100.0	2	92.4	1,811
Longitude - decimal degrees	±0.0001 degree	99.0	100.0	2	90.3	1,811
Latitude - distance	±140 feet		100.0	2	99.3	1,811
Longitude - distance	±140 feet		100.0	2	98.4	1,811
Number of plots				4		1,970
Condition Level						
National Variables						
Condition Status	No Tolerance	99.0	100.0	14	99.2	4,052
Reserve Status	No Tolerance	99.0	100.0	14	99.6	4,052
Owner Group	No Tolerance	99.0	75.0	4	98.4	2,158
Forest Type (Type)	No Tolerance	95.0	100.0	4	84.7	2,158
Forest Type (Group)	No Tolerance	99.0	100.0	4	91.3	2,158
Stand Size	No Tolerance	99.0	50.0	4	88.8	2,158
Regeneration Status	No Tolerance	99.0	100.0	4	98.1	2,158
Tree Density	No Tolerance	99.0	100.0	4	97.4	2,158
Owner Class	No Tolerance	99.0	50.0	4	95.2	2,158
Owner Status	No Tolerance	99.0	100.0	4	96.7	2,158
Regeneration Species	No Tolerance	99.0	100.0	4	98.2	2,158
Stand Age	±10 percent	95.0	75.0	4	78.5	2,158
Disturbance 1	No Tolerance	99.0	100.0	4	87.8	2,141
Disturbance Year 1	±1 year	99.0	.	.	44.8	29
Disturbance 2	No Tolerance	99.0	.	.	88.8	277
Disturbance Year 2	±1 year	99.0	.	.	.	.
Disturbance 3	No Tolerance	99.0	.	.	96.8	31

(Table C continued on next page)

(Table C continued)

Variable	Tolerance	Objective (%)	Delaware		All NRS States	
			% of data within tolerance	Observations	% of data within tolerance	Observations
Disturbance Year 3	±1 year	99.0	.	.	.	.
Treatment 1	No Tolerance	99.0	100.0	4	96.5	2,141
Treatment Year 1	±1 year	99.0	.	.	94.2	138
Treatment 2	No Tolerance	99.0	.	.	84.8	210
Treatment Year 2	±1 year	99.0	.	.	100.0	13
Treatment 3	No Tolerance	99.0	.	.	97.7	44
Treatment Year 3	±1 year	99.0	.	.	100.0	1
Physiographic Class	No Tolerance	80.0	100.0	4	80.4	2,158
Present Nonforest Use	No Tolerance	99.0	85.7	14	92.1	4,052
Regional Variables						
NC Land Use	No Tolerance	99.0	100.0	14	93.8	4,052
Number of conditions				14		4,052
Boundary Level						
National Variables						
Boundary Change	No Tolerance	99.0	100.0	4	79.5	606
Constrasting Condition	No Tolerance	99.0	100.0	4	92.7	606
Left Azimuth	±10 degrees	90.0	100.0	4	83.0	606
Corner Mapped	No Tolerance	90.0	100.0	4	96.5	606
Corner Azimuth	±10 degrees	90.0	.	.	92.5	40
Corner Distance	±1 foot	90.0	.	.	87.5	40
Right Azimuth	±10 degrees	90.0	100.0	4	84.2	606
Number of boundaries				4		606
Subplot Level						
National Variables						
Subplot Center Condition	No Tolerance	99.0	100.0	16	97.4	7,488
Microplot Center Condition	No Tolerance	99.0	100.0	16	97.2	7,488
Slope	±10 percent	90.0	100.0	13	98.1	7,067
Aspect	±10 degrees	90.0	100.0	13	89.4	6,659
Snow/Water Depth	±0.5 foot		100.0	16	69.1	7,488
Number of subplots				16		7,488

(Table C continued on next page)

(Table C continued)

Variable	Tolerance	Objective (%)	Delaware		All NRS States	
			% of data within tolerance	Observations	% of data within tolerance	Observations
Tree Level						
National Variables						
DBH	±0.1 inch per 20 inches	95.0	93.8	64	93.7	31,293
DRC	±0.1 inch per 20 inches	95.0	.	.	91.7	24
Azimuth	±10 degrees	90.0	96.9	65	99.1	32,900
Horizontal Distance	±0.2 foot per 1.0 foot	90.0	92.3	65	98.5	32,900
Species	No Tolerance	95.0	93.8	65	97.5	32,900
Tree Genus	No Tolerance	99.0	95.4	65	99.5	32,855
Tree Status	No Tolerance	95.0	100.0	65	98.9	32,900
Rotten/Missing Cull	±10 percent	90.0	90.9	44	98.6	21,153
Total Length	±10 percent	90.0	81.8	44	81.1	20,703
Actual Length	±10 percent	90.0	50.0	2	76.0	2,375
Compacted Crown Ratio	±10 percent	80.0	91.9	62	84.2	26,967
Uncompacted Crown Ratio (P3)	±10 percent	90.0	.	.	80.9	1,027
Crown Class	No Tolerance	85.0	88.7	62	82.1	26,967
Decay Class	±1 class	90.0	100.0	2	94.5	4,191
Cause of Death	No Tolerance	80.0	100.0	2	86.2	4,191
Condition	No Tolerance	99.0	100.0	65	97.7	32,900
Mortality Year	±1 year	70.0	.	.	95.5	1,372
Crown Position	No Tolerance		.	.	86.9	834
Crown Light Exposure	±1 class	85.0	.	.	91.3	1,027
Sapling Crown Vigor Class	No Tolerance	85.0	.	.	77.7	193
Crown Density	±10 percent	90.0	.	.	79.7	834
Crown Dieback	±10 percent	90.0	.	.	97.2	834
Transparency	±10 percent	90.0	.	.	91.7	834
Regional Variables						
NC Tree Class	No Tolerance	90.0	93.8	64	91.1	29,985
NC Damage Agent 1	No Tolerance	90.0	95.2	62	90.9	26,967
NC Damage Agent 2	No Tolerance	90.0	85.7	7	86.1	4,920
Missouri Damage Code	No Tolerance		.	.	.	.
Utilization	No Tolerance	99.0	.	.	100.0	1,003

(Table C continued on next page)

(Table C continued)

Variable	Tolerance	Objective (%)	Delaware		All NRS States	
			% of data within tolerance	Observations	% of data within tolerance	Observations
NC Tree Grade	No Tolerance	90.0	.	.	68.5	2,747
DBH-Live & Trees with Decay Code 1 or 2	±0.1 inch per 20 inches	95.0	93.7	63	93.8	28,413
DBH-Trees with Decay Codes 3, 4 or 5	±1 inch per 20 inches	95.0	100.0	1	99.2	1,300
Total Length-trees 40 feet and greater	±10 percent	90.0	82.5	40	82.5	16,832
Total Length-trees less than 40 feet	±10 percent	90.0	75.0	4	74.8	3,871
Total Length-trees less than 5 inches DBH	±10 percent	90.0	57.1	7	64.3	277
Number of trees				65		32,900
Seedling Level						
National Variables						
Species	No Tolerance	85.0	89.5	19	91.3	5,997
Genus	No Tolerance	90.0	100.0	19	96.8	5,997
Seedling Count	±20 percent	90.0	36.8	19	68.1	5,997
Seedling Count (coded)	No Tolerance	90.0	36.8	19	73.0	5,997
Number of microplots				4		2,644
Site Tree Level						
National Variables						
Condition List	No Tolerance	99.0	100.0	2	92.9	3,124
Diameter	±0.1 inch per 20 inches	95.0	100.0	2	91.8	3,083
Species	No Tolerance	95.0	100.0	2	98.1	3,124
Genus	No Tolerance	99.0	100.0	2	99.8	3,124
Azimuth	±10 degrees	90.0	100.0	2	98.5	3,083
Distance	±5 feet	90.0	100.0	2	99.3	3,083
Total Length	±10 percent	90.0	100.0	2	92.9	3,083
Diameter Age	±5 years	95.0	100.0	2	92.3	3,083
Regional Variables						
Site Index Method	No Tolerance	99.0	100.0	2	99.9	3,124
Field Site Index	No Tolerance	99.0	100.0	2	99.8	3,124
Number of site trees				2		3,124

Table D.—Observed relative bias values (Average [field crew - QA crew]) for measurement variables on blind check plots, Delaware, 2008

Variable	Unit of measure	Delaware				All NRS States			
		Relative bias	95% CI limits		Number of observations	Relative bias	95% CI limits		Number of observations
			Lower	Upper			Lower	Upper	
Plot Level									
National Variables									
Distance to Road	code	-0.25	-0.75	0.00	4	-0.04	-0.07	-0.01	1,903
Water on Plot	code	0.00	0.00	0.00	4	0.12	0.05	0.20	1,903
Regional Variables									
Elevation	foot	11.00	2.00	20.00	2	60.26	1.35	196.53	1,809
Latitude - decimal degrees	degree	0.00	0.00	0.00	2	0.00	0.00	0.00	1,811
Longitude - decimal degrees	degree	0.00	0.00	0.00	2	0.00	0.00	0.00	1,811
Latitude - distance	foot	3.04	-3.04	9.11	2	-77.01	-225.30	-1.00	1,811
Longitude - distance	foot	-8.34	-22.15	5.48	2	54.04	4.26	152.43	1,811
Number of plots					4				1,970
Condition Level									
National Variables									
Condition Status	code	0.00	0.00	0.00	14	-0.01	-0.01	0.00	4,052
Reserve Status	code	0.00	0.00	0.00	14	0.00	0.00	0.00	4,052
Owner Group	code	-2.50	-7.50	0.00	4	0.23	0.08	0.39	2,158
Forest Type (Type)	code	0.00	0.00	0.00	4	10.10	6.40	14.51	2,158
Forest Type (Group)	code	0.00	0.00	0.00	4	10.29	6.51	14.69	2,158
Stand Size	code	0.00	-0.75	0.75	4	0.00	-0.01	0.02	2,158
Regeneration Status	code	0.00	0.00	0.00	4	0.00	0.00	0.01	2,158
Tree Density	code	0.00	0.00	0.00	4	0.00	0.00	0.01	2,158
Owner Class	code	-2.00	-7.50	1.50	4	0.22	0.06	0.40	2,158
Owner Status	code	0.00	0.00	0.00	4	0.02	0.02	0.03	2,158
Regeneration Species	code	0.00	0.00	0.00	4	0.17	-1.65	1.87	2,158
Stand Age	year	1.00	-0.75	2.75	4	-0.53	-1.62	0.12	2,158
Disturbance 1	code	0.00	0.00	0.00	4	1.37	0.90	1.87	2,141
Disturbance Year 1	year				.	3,584.07	1,791.83	4,962.72	29
Disturbance 2	code				.	-2.27	-3.80	-0.90	277
Disturbance Year 2	year				.				

(Table D continued on next page)

(Table D continued)

Variable	Unit of measure	Delaware				All NRS States			
		Relative bias	95% CI limits		Number of observations	Relative bias	95% CI limits		Number of observations
			Lower	Upper			Lower	Upper	
Disturbance 3	code				.	-2.58	-9.03	0.00	31
Disturbance Year 3	year				.				
Treatment 1	code	0.00	0.00	0.00	4	0.12	-0.02	0.25	2,141
Treatment Year 1	year				.	0.06	-0.08	0.18	138
Treatment 2	code				.	2.05	0.19	4.19	210
Treatment Year 2	year				.	0.23	0.04	0.46	13
Treatment 3	code				.	0.23	0.00	0.68	44
Treatment Year 3	year				.	0.00	0.00	0.00	1
Physiographic Class	code	0.00	0.00	0.00	4	0.13	-0.01	0.27	2,158
Present Nonforest Use	code	0.29	0.00	0.71	14	0.16	0.04	0.28	4,052
Regional Variables									
NC Land Use	code	0.00	0.00	0.00	14	-0.11	-0.23	0.00	4,052
Number of conditions					14				4,052
Boundary Level									
National Variables									
Boundary Change	code	0.00	0.00	0.00	4	0.14	0.09	0.20	606
Constrasting Condition	cond	0.00	0.00	0.00	4	0.01	-0.01	0.03	606
Left Azimuth	degree	0.25	-1.50	2.75	4	1.05	-2.34	4.54	606
Corner Mapped	code	0.00	0.00	0.00	4	0.00	-0.02	0.01	606
Corner Azimuth	degree				.	-9.20	-26.91	0.23	40
Corner Distance	foot				.	-0.18	-1.14	0.55	40
Right Azimuth	degree	-1.25	-2.00	-0.25	4	-1.36	-4.28	1.96	606
Number of boundaries					4				606

(Table D continued on next page)

(Table D continued)

Variable	Unit of measure	Delaware				All NRS States			
		Relative bias	95% CI limits		Number of observations	Relative bias	95% CI limits		Number of observations
			Lower	Upper			Lower	Upper	
Subplot Level									
National Variables									
Subplot Center Condition	code	0.00	0.00	0.00	16	0.00	0.00	0.01	7,488
Microplot Center Condition	code	0.00	0.00	0.00	16	0.00	0.00	0.01	7,488
Slope	percent	0.00	0.00	0.00	13	0.06	-0.08	0.17	7,067
Aspect	degree	0.00	0.00	0.00	13	0.42	-0.62	1.47	6,659
Snow/Water Depth	foot	0.00	0.00	0.00	16	-0.11	-0.22	0.01	7,488
Number of subplots					16				7,488
Tree Level									
National Variables									
DBH	inch	-0.18	-0.52	0.03	64	-0.07	-0.08	-0.06	31,293
DRC	inch				.	-0.04	-0.16	0.04	24
Azimuth	degree	0.06	-3.19	4.63	65	0.10	0.02	0.17	32,900
Horizontal Distance	foot	-0.03	-0.23	0.08	65	0.00	-0.01	0.01	32,900
Species	code	3.88	0.09	8.88	65	0.11	-0.22	0.39	32,900
Tree Genus	code	3.78	0.00	8.83	65	0.09	-0.17	0.37	32,855
Tree Status	code	0.00	0.00	0.00	65	0.00	0.00	0.00	32,900
Rotten/Missing Cull	percent	0.05	-1.49	1.82	44	-0.06	-0.10	-0.01	21,153
Total Length	foot	0.57	-1.37	2.56	44	0.16	-0.07	0.38	20,703
Actual Length	foot	-4.60	-20.83	11.63	2	-2.55	-3.87	-1.26	2,375
Compacted Crown Ratio	percent	-0.65	-2.35	0.90	62	-0.13	-0.25	-0.01	26,967
Uncompacted Crown Ratio (P3)	percent				.	-0.15	-1.01	0.61	1,027
Crown Class	code	-0.11	-0.19	-0.03	62	-0.04	-0.04	-0.03	26,967
Decay Class	code	0.00	-1.00	1.00	2	0.01	-0.02	0.03	4,191
Cause of Death	code	0.00	0.00	0.00	2	2.38	1.89	2.80	4,191
Condition	code	0.00	0.00	0.00	65	-0.01	-0.01	-0.01	32,900
Mortality Year	year				.	0.08	0.04	0.12	1,372
Crown Position	code				.	-0.09	-0.11	-0.06	834
Crown Light Exposure	code				.	0.02	-0.04	0.06	1,027

(Table D continued on next page)

(Table D continued)

Variable	Unit of measure	Delaware				All NRS States			
		Relative bias	95% CI limits		Number of observations	Relative bias	95% CI limits		Number of observations
			Lower	Upper			Lower	Upper	
Sapling Crown Vigor Class	code				.	-0.10	-0.18	-0.02	193
Crown Density	percent				.	0.91	0.30	1.68	834
Crown Dieback	percent				.	-0.57	-0.97	-0.11	834
Transparency	percent				.	-1.09	-1.65	-0.52	834
Regional Variables									
NC Tree Class	code	0.03	-0.03	0.09	64	-0.09	-0.12	-0.05	29,985
NC Damage Agent 1	code	7.90	-0.32	20.40	62	4.42	3.24	5.68	26,967
NC Damage Agent 2	code	1.43	0.00	4.29	7	11.34	7.57	15.56	4,920
Missouri Damage Code	code				.				
Utilization	code				.	0.00	0.00	0.00	1,003
NC Tree Grade	code				.	3.49	-1.67	7.90	2,747
DBH-Live & Trees with Decay Code 1 or 2	inch	-0.18	-0.42	0.02	63	-0.06	-0.08	-0.06	28,413
DBH-Trees with Decay Codes 3, 4 or 5	inch	-0.10	-0.10	-0.10	1	-0.03	-0.06	-0.02	1,300
Total Length-trees 40 feet and greater	foot	0.17	-1.72	2.05	40	0.71	0.58	0.86	16,832
Total Length-trees less than 40 feet	foot	4.56	-2.03	12.59	4	-2.22	-3.32	-1.12	3,871
Total Length-trees less than 5 inches DBH	foot	-10.33	-15.05	-5.03	7	2.44	0.65	4.14	277
Number of trees					65				32,900
Seedling Level									
National Variables									
Species	code	0.11	0.00	0.26	19	0.00	-0.01	0.01	5,997
Genus	code	0.00	0.00	0.00	19	0.00	-0.01	0.00	5,997
Seedling Count	number	-28.60	-56.40	-1.32	19	-15.25		-10.65	5,997
Seedling Count (coded)	number	-0.16	-0.68	0.34	19	-0.01	-0.03	0.02	5,997
Number of microplots					4				2,644

(Table D continued on next page)

(Table D continued)

Variable	Unit of measure	Delaware				All NRS States			
		Relative bias	95% CI limits		Number of observations	Relative bias	95% CI limits		Number of observations
			Lower	Upper			Lower	Upper	
Site Tree Level									
National Variables									
Condition List	code	0.00	0.00	0.00	2	-8.08	-17.06	-2.80	3,124
Diameter	inch	0.00	0.00	0.00	2	-0.01	-0.01	0.00	3,083
Species	code	0.00	0.00	0.00	2	-0.15	-0.32	-0.03	3,124
Genus	code	0.00	0.00	0.00	2	-0.15	-0.30	-0.03	3,124
Azimuth	degree	0.00	0.00	0.00	2	0.14	-0.24	0.59	3,083
Distance	foot	0.00	0.00	0.00	2	0.00	-0.05	0.04	3,083
Total Length	foot	4.60	2.94	6.25	2	-0.14	-0.42	0.10	3,083
Diameter Age	year	2.50	0.00	5.00	2	0.09	-0.04	0.23	3,083
Regional Variables									
Site Index Method	code	0.00	0.00	0.00	2	0.00	0.00	0.00	3,124
Field Site Index	feet	0.00	0.00	0.00	2	0.07	0.01	0.14	3,124
Number of site trees					2				3,124

Table E.—FIA nonresponse by ownership, Delaware, 2008

Owner and strata (um)	Number of plots selected	Sampled	Denied access	Hazardous	Other	Response Rate (%)
			number of plots			
Inland Census Water:						
1,2,3,4,5	11.0	11.0	.0	.0	.0	100.0
Private:						
1		221.0	215.3	5.5	.3	.0	97.4
2		19.0	18.0	1.0	.0	.0	94.7
3		16.0	12.0	4.0	.0	.0	75.0
4		54.0	43.8	10.0	.0	.3	81.0
5		55.0	49.0	6.0	.0	.0	89.1
Public:						
1		35.0	35.0	.0	.0	.0	100.0
2,3		7.0	7.0	.0	.0	.0	100.0
4,5		4.0	4.0	.0	.0	.0	100.0
2,3,4,5		13.0	13.0	.0	.0	.0	100.0
Total		435.0	408.1	26.5	.3	.3	93.7

Strata codes:

1: Canopy cover 0 - 5

2: Canopy cover 6 - 50

3: Canopy cover 51 - 65

4: Canopy cover 66 - 80

5: Canopy cover 81 - 100

Table DE-1.—Percentage of area by land status, Delaware, 2008

Land status	Percentage of area
Accessible forest land	
Unreserved forest land	
Timberland	23.6
Unproductive	- -
Total unreserved forest land	23.6
Reserved forest land	
Productive	0.6
Unproductive	- -
Total reserved forest land	0.6
All accessible forest land	24.2
Nonforest and other land	
Nonforest land	66.1
Water	
Census	3.5
Non-Census	0.8
All nonforest and other land	70.4
Nonsampled land	
Access denied	5.3
Hazardous conditions	0.1
Other	0.0
All land	100.0
Total area (thousands of acres)	1,297

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the percentage rounds to less than 0.1 percent. Columns and rows may not add to their totals due to rounding.

Table DE-2.—Area of forest land, in thousand acres, by owner class and forest-land status, Delaware, 2008

Owner class	Unreserved forests			Reserved forests			All forest land
	Timberland	Unproductive	Total	Productive	Unproductive	Total	
Other Federal							
Fish and Wildlife Service	2.4	--	2.4	4.5	--	4.5	7.0
Other Federal	4.9	--	4.9	--	--	--	4.9
State and local government							
State	50.4	--	50.4	3.2	--	3.2	53.6
Local (county, municipal, etc.)	6.6	--	6.6	--	--	--	6.6
Other non-Federal lands	2.9	--	2.9	--	--	--	2.9
Private							
Undifferentiated private	277.2	--	277.2	--	--	--	277.2
All owners	344.5	--	344.5	7.7	--	7.7	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-3.—Area of forest land, in thousand acres, by forest-type group and productivity class, Delaware, 2008

Forest-type group	Site-productivity class (cubic feet/acre/year)							All classes
	0-19	20-49	50-84	85-119	120-164	165-224	225+	
Loblolly / shortleaf pine group	- -	23.6	20.6	9.2	0.3	- -	- -	53.7
Oak / pine group	- -	12.8	6.1	6.8	5.0	- -	- -	30.8
Oak / hickory group	- -	95.0	63.3	33.0	- -	- -	- -	191.3
Oak / gum / cypress group	- -	33.8	9.3	2.4	- -	- -	- -	45.6
Elm / ash / cottonwood group	- -	10.7	2.4	- -	- -	- -	- -	13.2
Maple / beech / birch group	- -	3.9	2.4	6.4	- -	- -	- -	12.6
Other hardwoods group	- -	2.4	- -	- -	- -	- -	- -	2.4
Nonstocked	- -	2.6	- -	- -	- -	- -	- -	2.6
All forest-type groups	- -	184.8	104.2	57.9	5.3	- -	- -	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-4.—Area of forest land, in thousand acres, by forest-type group, ownership group, and forest-land status, Delaware, 2008

Forest-type group	Forest Service		Other Federal		State and local government		Undifferentiated private		All forest land
	Timber-land	Other forest land	Timber-land	Other forest land	Timber-land	Other forest land	Timber-land	Other forest land	
Loblolly / shortleaf pine group	- -	- -	- -	- -	13.4	- -	40.3	- -	53.7
Oak / pine group	- -	- -	- -	- -	9.5	- -	21.3	- -	30.8
Oak / hickory group	- -	- -	- -	- -	20.6	3.2	167.5	- -	191.3
Oak / gum / cypress group	- -	- -	2.4	- -	7.7	- -	35.4	- -	45.6
Elm / ash / cottonwood group	- -	- -	- -	4.5	1.5	- -	7.2	- -	13.2
Maple / beech / birch group	- -	- -	2.4	- -	7.2	- -	2.9	- -	12.6
Other hardwoods group	- -	- -	2.4	- -	- -	- -	- -	- -	2.4
Nonstocked	- -	- -	- -	- -	- -	- -	2.6	- -	2.6
All forest-type groups	- -	- -	7.3	4.5	60.0	3.2	277.2	- -	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-5.—Area of forest land, in thousand acres, by forest-type group and stand-size class, Delaware, 2008

Forest-type group	Stand-size class					All size classes
	Large diameter	Medium diameter	Small diameter	Chaparral	Nonstocked	
Loblolly / shortleaf pine group	39.6	11.2	3.0	- -	- -	53.7
Oak / pine group	16.4	4.6	9.8	- -	- -	30.8
Oak / hickory group	155.2	22.5	13.6	- -	- -	191.3
Oak / gum / cypress group	36.9	5.7	3.0	- -	- -	45.6
Elm / ash / cottonwood group	7.2	4.8	1.2	- -	- -	13.2
Maple / beech / birch group	1.5	7.2	3.9	- -	- -	12.6
Other hardwoods group	- -	- -	2.4	- -	- -	2.4
Nonstocked	- -	- -	- -	- -	2.6	2.6
All forest-type groups	256.7	56.0	36.9	- -	2.6	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-6.—Area of forest land, in thousand acres, by forest-type group and stand-age class, Delaware, 2008

Forest-type group	Non stocked	Stand-age class (years)											All classes
		1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181-200	201+	
Loblolly / shortleaf pine group	--	7.5	13.9	20.7	11.7	--	--	--	--	--	--	--	53.7
Oak / pine group	--	8.6	5.4	7.7	6.9	2.3	--	--	--	--	--	--	30.8
Oak / hickory group	--	16.9	5.2	52.6	66.9	41.3	8.4	--	--	--	--	--	191.3
Oak / gum / cypress group	--	0.6	2.4	6.4	13.6	16.5	5.5	0.5	--	--	--	--	45.6
Elm / ash / cottonwood group	--	1.2	0.8	7.0	4.1	--	--	--	--	--	--	--	13.2
Maple / beech / birch group	--	3.9	6.4	0.9	1.5	--	--	--	--	--	--	--	12.6
Other hardwoods group	--	2.4	--	--	--	--	--	--	--	--	--	--	2.4
Nonstocked	2.6	--	--	--	--	--	--	--	--	--	--	--	2.6
All forest-type groups	2.6	41.0	34.1	95.1	104.8	60.1	13.9	0.5	--	--	--	--	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-7.—Area of forest land, in thousand acres, by forest-type group and stand origin, Delaware, 2008

Forest-type group	Stand origin		All forest land
	Natural stands	Artificial regeneration	
Loblolly / shortleaf pine group	44.0	9.7	53.7
Oak / pine group	24.8	6.1	30.8
Oak / hickory group	188.5	2.8	191.3
Oak / gum / cypress group	45.0	0.6	45.6
Elm / ash / cottonwood group	13.2	- -	13.2
Maple / beech / birch group	12.6	- -	12.6
Other hardwoods group	2.4	- -	2.4
Nonstocked	0.9	1.7	2.6
All forest-type groups	331.3	20.9	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-8.—Area of forest land, in thousand acres, by forest-type group and primary disturbance class, Delaware, 2008

Forest-type group	Disturbance class									All forest land
	None	Insects	Disease	Weather	Fire	Domestic animals	Wild animals	Human	Other	
Loblolly / shortleaf pine group	53.7	--	--	--	--	--	--	--	--	53.7
Oak / pine group	28.0	--	--	--	--	--	--	2.8	--	30.8
Oak / hickory group	191.3	--	--	--	--	--	--	--	--	191.3
Oak / gum / cypress group	41.4	--	--	4.1	--	--	--	--	--	45.6
Elm / ash / cottonwood group	8.7	--	--	4.5	--	--	--	--	--	13.2
Maple / beech / birch group	12.6	--	--	--	--	--	--	--	--	12.6
Other hardwoods group	2.4	--	--	--	--	--	--	--	--	2.4
Nonstocked	2.6	--	--	--	--	--	--	--	--	2.6
All forest-type groups	340.7	--	--	8.7	--	--	--	2.8	--	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-9.—Area of timberland, in thousand acres, by forest-type group and stand-size class, Delaware, 2008

Forest-type group	Stand-size class					All size classes
	Large diameter	Medium diameter	Small diameter	Chaparral	Nonstocked	
Loblolly / shortleaf pine group	39.6	11.2	3.0	--	--	53.7
Oak / pine group	16.4	4.6	9.8	--	--	30.8
Oak / hickory group	152.1	22.5	13.6	--	--	188.1
Oak / gum / cypress group	36.9	5.7	3.0	--	--	45.6
Elm / ash / cottonwood group	7.2	0.3	1.2	--	--	8.7
Maple / beech / birch group	1.5	7.2	3.9	--	--	12.6
Other hardwoods group	--	--	2.4	--	--	2.4
Nonstocked	--	--	--	--	2.6	2.6
All forest-type groups	253.6	51.5	36.9	--	2.6	344.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-10.—Number of live trees (at least 1 inch d.b.h.), in thousand trees, on forest land by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)															All classes
	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	15.0-16.9	17.0-18.9	19.0-20.9	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups																
Eastern softwood species groups																
Loblolly and shortleaf pines	6,658	1,153	2,085	2,169	1,467	1,210	718	221	163	135	71	17	--	--	--	16,066
Other yellow pines	3,117	558	795	291	267	164	186	162	17	63	27	--	--	--	--	5,648
Cypress	173	--	14	--	--	--	--	--	--	--	--	--	--	--	--	187
Other eastern softwoods	1,557	215	51	79	28	--	--	--	28	--	--	--	--	--	--	1,958
All softwoods	11,505	1,926	2,945	2,540	1,762	1,373	904	384	208	198	98	17	--	--	--	23,860
Hardwood species groups																
Eastern hardwood species groups																
Select white oaks	1,933	1,557	795	544	461	604	401	287	165	76	149	16	33	--	--	7,021
Select red oaks	483	215	123	48	29	55	14	41	28	34	17	--	15	--	--	1,103
Other white oaks	--	562	--	42	17	28	--	--	14	--	--	--	--	--	--	662
Other red oaks	3,616	2,418	1,207	821	847	407	543	371	328	283	200	68	56	--	--	11,165
Hickory	1,492	431	156	141	66	74	47	--	--	--	12	--	--	--	--	2,418
Hard maple	--	--	15	38	--	--	--	--	--	--	--	--	--	--	--	53
Soft maple	31,910	10,530	5,227	3,477	2,423	1,391	914	443	600	229	282	50	14	--	--	57,489
Beech	2,751	215	333	281	115	127	48	--	15	17	33	--	--	--	--	3,936
Sweetgum	17,926	5,379	2,086	1,816	1,241	830	610	444	335	176	78	21	32	--	--	30,975
Tupelo and blackgum	13,830	3,733	1,567	882	399	340	204	147	34	--	16	15	--	--	--	21,167
Ash	1,001	389	267	231	132	156	58	63	29	16	15	29	--	--	--	2,385
Cottonwood and aspen	183	--	--	29	14	--	--	21	--	--	--	--	--	--	--	247
Yellow-poplar	2,303	985	764	531	228	224	118	194	130	55	172	122	91	--	--	5,915
Black walnut	--	--	15	21	28	--	--	21	15	--	62	--	--	--	--	161
Other eastern soft hardwoods	6,190	3,385	1,772	1,318	589	441	193	67	29	--	49	--	--	--	--	14,032
Other eastern hard hardwoods	36,538	7,487	3,418	1,101	579	114	99	29	12	16	--	--	--	--	--	49,392
Eastern noncommercial hardwoods	7,774	1,942	505	61	53	--	--	--	17	--	--	--	--	--	--	10,352
All hardwoods	127,931	39,227	18,249	11,382	7,220	4,790	3,250	2,127	1,751	901	1,086	319	240	--	--	218,474
All species groups	139,436	41,153	21,194	13,922	8,982	6,163	4,154	2,511	1,959	1,100	1,184	337	240	--	--	242,334

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the number of trees rounds to less than 1 thousand trees. Columns and rows may not add to their totals due to rounding.

Table DE-11.—Number of growing-stock trees (at least 5 inches d.b.h.), in thousand trees, on timberland by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)													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	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups														
Eastern softwood species groups														
Loblolly and shortleaf pines	2,043	2,141	1,381	1,210	718	221	163	118	71	17	--	--	--	8,082
Other yellow pines	795	291	229	164	186	162	17	63	27	--	--	--	--	1,935
Cypress	14	--	--	--	--	--	--	--	--	--	--	--	--	14
Other eastern softwoods	51	64	14	--	--	--	28	--	--	--	--	--	--	157
All softwoods	2,903	2,496	1,623	1,373	904	384	208	181	98	17	--	--	--	10,188
Hardwood species groups														
Eastern hardwood species groups														
Select white oaks	764	527	461	590	384	287	165	76	149	16	33	--	--	3,451
Select red oaks	123	31	29	55	14	41	28	34	17	--	15	--	--	388
Other white oaks	--	42	17	14	--	--	14	--	--	--	--	--	--	87
Other red oaks	1,133	821	847	407	498	371	328	283	200	68	56	--	--	5,011
Hickory	138	141	66	53	47	--	--	--	12	--	--	--	--	457
Hard maple	15	38	--	--	--	--	--	--	--	--	--	--	--	53
Soft maple	3,797	2,570	2,170	1,066	868	382	586	214	282	36	14	--	--	11,984
Beech	240	264	115	110	48	--	15	17	33	--	--	--	--	842
Sweetgum	1,937	1,772	1,170	814	594	414	335	145	78	21	16	--	--	7,297
Tupelo and blackgum	1,456	868	364	324	204	147	34	--	16	15	--	--	--	3,428
Ash	219	231	132	142	58	63	29	16	15	29	--	--	--	933
Cottonwood and aspen	--	29	14	--	--	21	--	--	--	--	--	--	--	64
Yellow-poplar	724	513	228	224	118	178	130	55	140	97	78	--	--	2,485
Black walnut	--	21	28	--	--	21	15	--	21	--	--	--	--	105
Other eastern soft hardwoods	1,254	1,046	460	282	181	67	29	--	49	--	--	--	--	3,366
Other eastern hard hardwoods	2,754	934	441	77	34	29	12	--	--	--	--	--	--	4,281
All hardwoods	14,554	9,847	6,542	4,158	3,049	2,019	1,720	840	1,013	280	211	--	--	44,233
All species groups	17,458	12,343	8,165	5,531	3,953	2,403	1,928	1,021	1,111	297	211	--	--	54,421

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the number of trees rounds to less than 1 thousand trees. Columns and rows may not add to their totals due to rounding.

Table DE-12.—Net volume of live trees (at least 5 inches d.b.h.), in million cubic feet, by owner class and forest-land status, Delaware, 2008

Owner class	Unreserved forests			Reserved forests			All forest land
	Timberland	Unproductive	Total	Productive	Unproductive	Total	
Other Federal							
Fish and Wildlife Service	1.5	- -	1.5	7.6	- -	7.6	9.1
Other Federal	0.1	- -	0.1	- -	- -	- -	0.1
State and local government							
State	147.8	- -	147.8	16.6	- -	16.6	164.4
Local (county, municipal, etc.)	8.0	- -	8.0	- -	- -	- -	8.0
Other non-Federal lands	11.5	- -	11.5	- -	- -	- -	11.5
Private							
Undifferentiated private	669.4	- -	669.4	- -	- -	- -	669.4
All owners	838.3	- -	838.3	24.2	- -	24.2	862.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-13.—Net volume of live trees (at least 5 inches d.b.h.), in million cubic feet, on forest land by forest-type group and stand-size class, Delaware, 2008

Forest-type group	Stand-size class					All size classes
	Large diameter	Medium diameter	Small diameter	Chaparral	Nonstocked	
Loblolly / shortleaf pine group	105.0	17.2	0.9	- -	- -	123.0
Oak / pine group	51.2	6.9	1.1	- -	- -	59.3
Oak / hickory group	482.4	30.6	2.2	- -	- -	515.3
Oak / gum / cypress group	105.3	11.0	1.5	- -	- -	117.8
Elm / ash / cottonwood group	25.3	7.7	0.1	- -	- -	33.2
Maple / beech / birch group	5.5	8.2	0.1	- -	- -	13.8
Other hardwoods group	- -	- -	0.1	- -	- -	0.1
All forest-type groups	774.7	81.8	6.0	- -	- -	862.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-14.—Net volume of live trees (at least 5 inches d.b.h.), in million cubic feet, on forest land by species group and ownership group, Delaware, 2008

Species group	Ownership group				
	Forest Service	Other Federal	State and local government	Undifferentiated private	All owners
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	16.6	81.8	98.4
Other yellow pines	--	--	12.9	11.9	24.8
Cypress	--	--	--	0.0	0.0
Other eastern softwoods	--	0.1	--	1.5	1.6
All softwoods	--	0.1	29.5	95.2	124.7
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	12.5	58.2	70.7
Select red oaks	--	--	--	10.4	10.4
Other white oaks	--	--	--	1.2	1.2
Other red oaks	--	--	18.5	96.2	114.7
Hickory	--	--	0.4	5.6	6.0
Hard maple	--	--	0.2	0.0	0.2
Soft maple	--	8.6	24.7	156.4	189.7
Beech	--	--	1.4	10.9	12.3
Sweetgum	--	--	23.8	90.8	114.5
Tupelo and blackgum	--	--	7.8	26.0	33.8
Ash	--	0.0	1.3	17.5	18.9
Cottonwood and aspen	--	--	--	1.4	1.4
Yellow-poplar	--	--	50.0	44.7	94.7
Black walnut	--	--	--	5.4	5.4
Other eastern soft hardwoods	--	0.4	9.0	29.4	38.8
Other eastern hard hardwoods	--	--	4.7	18.4	23.1
Eastern noncommercial hardwoods	--	--	0.1	1.8	1.9
All hardwoods	--	9.1	154.4	574.3	737.8
All species groups	--	9.2	183.9	669.4	862.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-15.—Net volume of live trees (at least 5 inches d.b.h.), in million cubic feet, on forest land by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)													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	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups														
Eastern softwood species groups														
Loblolly and shortleaf pines	5	13	15	20	18	7	7	6	5	2	--	--	--	98
Other yellow pines	2	2	3	3	5	5	1	3	2	--	--	--	--	25
Cypress	0	--	--	--	--	--	--	--	--	--	--	--	--	0
Other eastern softwoods	0	0	0	--	--	--	1	--	--	--	--	--	--	2
All softwoods	8	15	18	23	22	12	9	9	7	2	--	--	--	125
Hardwood species groups														
Eastern hardwood species groups														
Select white oaks	2	3	5	10	10	10	7	4	11	2	5	--	--	71
Select red oaks	0	0	0	1	0	2	1	2	1	--	2	--	--	10
Other white oaks	--	0	0	0	--	--	1	--	--	--	--	--	--	1
Other red oaks	3	5	9	7	14	13	16	17	15	7	9	--	--	115
Hickory	0	1	1	1	1	--	--	--	1	--	--	--	--	6
Hard maple	0	0	--	--	--	--	--	--	--	--	--	--	--	0
Soft maple	11	20	26	24	24	16	28	13	22	5	2	--	--	190
Beech	1	2	1	2	1	--	1	1	3	--	--	--	--	12
Sweetgum	5	11	14	15	17	16	16	10	6	2	4	--	--	115
Tupelo and blackgum	4	5	4	6	5	5	2	--	1	2	--	--	--	34
Ash	1	2	2	3	2	3	1	1	1	4	--	--	--	19
Cottonwood and aspen	--	0	0	--	--	1	--	--	--	--	--	--	--	1
Yellow-poplar	2	4	3	5	4	9	8	4	18	19	19	--	--	95
Black walnut	0	0	0	--	--	1	1	--	3	--	--	--	--	5
Other eastern soft hardwoods	4	8	6	7	5	3	1	--	4	--	--	--	--	39
Other eastern hard hardwoods	6	5	5	2	2	1	1	1	--	--	--	--	--	23
Eastern noncommercial hardwoods	1	0	0	--	--	--	1	--	--	--	--	--	--	2
All hardwoods	39	66	77	85	86	78	84	53	87	41	42	--	--	738
All species groups	47	81	96	108	108	90	93	62	94	42	42	--	--	862

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the volume rounds to less than 1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-16.—Net volume of live trees (at least 5 inches d.b.h.), in million cubic feet, on forest land by forest-type group and stand origin, Delaware, 2008

Forest-type group	Stand origin		All forest land
	Natural stands	Artificial regeneration	
Loblolly / shortleaf pine group	108.8	14.3	123.0
Oak / pine group	54.6	4.7	59.3
Oak / hickory group	511.8	3.4	515.3
Oak / gum / cypress group	117.8	0.0	117.8
Elm / ash / cottonwood group	33.2	- -	33.2
Maple / beech / birch group	13.8	- -	13.8
Other hardwoods group	0.1	- -	0.1
All forest-type groups	840.1	22.4	862.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-17.—Net volume of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, on timberland by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)													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	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups														
Eastern softwood species groups														
Loblolly and shortleaf pines	5	13	15	20	18	7	7	6	5	2	--	--	--	97
Other yellow pines	2	2	3	3	5	5	1	3	2	--	--	--	--	24
Cypress	0	--	--	--	--	--	--	--	--	--	--	--	--	0
Other eastern softwoods	0	0	0	--	--	--	1	--	--	--	--	--	--	1
All softwoods	8	15	17	23	22	12	9	9	7	2	--	--	--	123
Hardwood species groups														
Eastern hardwood species groups														
Select white oaks	2	3	5	10	10	10	7	4	11	2	5	--	--	70
Select red oaks	0	0	0	1	0	2	1	2	1	--	2	--	--	10
Other white oaks	--	0	0	0	--	--	1	--	--	--	--	--	--	1
Other red oaks	3	5	9	7	13	13	16	17	15	7	9	--	--	114
Hickory	0	1	1	1	1	--	--	--	1	--	--	--	--	6
Hard maple	0	0	--	--	--	--	--	--	--	--	--	--	--	0
Soft maple	8	16	24	20	23	14	28	12	22	4	2	--	--	173
Beech	1	2	1	2	1	--	1	1	3	--	--	--	--	12
Sweetgum	5	11	13	15	16	15	16	8	6	2	2	--	--	109
Tupelo and blackgum	3	5	4	6	5	5	2	--	1	2	--	--	--	33
Ash	1	2	2	3	2	3	1	1	1	4	--	--	--	19
Cottonwood and aspen	--	0	0	--	--	1	--	--	--	--	--	--	--	1
Yellow-poplar	2	4	3	5	4	8	8	4	15	15	17	--	--	85
Black walnut	--	0	0	--	--	1	1	--	1	--	--	--	--	3
Other eastern soft hardwoods	3	6	5	5	5	3	1	--	4	--	--	--	--	33
Other eastern hard hardwoods	5	5	4	1	1	1	1	--	--	--	--	--	--	18
All hardwoods	33	59	72	77	82	75	82	50	82	37	38	--	--	687
All species groups	41	74	90	100	104	87	91	59	89	38	38	--	--	810

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the volume rounds to less than 1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-18.—Net volume of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, on timberland by species group and ownership group, Delaware, 2008

Species group	Ownership group				All owners
	Forest Service	Other Federal	State and local government	Undifferentiated private	
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	16.6	80.3	96.9
Other yellow pines	--	--	12.6	11.9	24.5
Cypress	--	--	--	0.0	0.0
Other eastern softwoods	--	0.0	--	1.4	1.4
All softwoods	--	0.0	29.2	93.6	122.8
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	12.5	57.6	70.1
Select red oaks	--	--	--	10.3	10.3
Other white oaks	--	--	--	1.1	1.1
Other red oaks	--	--	18.3	95.6	113.8
Hickory	--	--	0.4	5.3	5.7
Hard maple	--	--	0.2	0.0	0.2
Soft maple	--	1.0	22.4	149.6	172.9
Beech	--	--	1.4	10.6	12.0
Sweetgum	--	--	19.8	89.5	109.3
Tupelo and blackgum	--	--	7.5	25.7	33.2
Ash	--	0.0	1.3	17.3	18.7
Cottonwood and aspen	--	--	--	1.4	1.4
Yellow-poplar	--	--	40.0	44.6	84.5
Black walnut	--	--	--	3.2	3.2
Other eastern soft hardwoods	--	0.4	7.7	24.9	33.0
Other eastern hard hardwoods	--	--	1.6	16.0	17.7
All hardwoods	--	1.4	132.9	553.0	687.3
All species groups	--	1.5	162.1	646.6	810.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-19.—Net volume of sawtimber trees (International ¼-inch rule), in million board feet, on timberland by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)											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	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups												
Eastern softwood species groups												
Loblolly and shortleaf pines	47	78	75	31	32	29	26	8	--	--	--	326
Other yellow pines	8	12	21	22	4	17	9	--	--	--	--	92
Other eastern softwoods	0	--	--	--	4	--	--	--	--	--	--	4
All softwoods	55	90	96	52	40	46	35	8	--	--	--	422
Hardwood species groups												
Eastern hardwood species groups												
Select white oaks	--	36	41	48	36	23	63	12	34	--	--	293
Select red oaks	--	3	1	7	5	10	7	--	14	--	--	48
Other white oaks	--	1	--	--	2	--	--	--	--	--	--	3
Other red oaks	--	26	55	57	75	84	78	41	54	--	--	470
Hickory	--	4	5	--	--	--	6	--	--	--	--	16
Soft maple	--	64	91	64	131	63	114	22	12	--	--	561
Beech	--	8	6	--	4	6	14	--	--	--	--	38
Sweetgum	--	49	67	68	75	42	31	14	13	--	--	359
Tupelo and blackgum	--	20	21	24	9	--	7	9	--	--	--	90
Ash	--	11	8	13	7	5	7	22	--	--	--	72
Cottonwood and aspen	--	--	--	5	--	--	--	--	--	--	--	5
Yellow-poplar	--	18	15	39	38	22	81	94	106	--	--	414
Black walnut	--	--	--	4	4	--	7	--	--	--	--	15
Other eastern soft hardwoods	--	17	21	12	7	--	22	--	--	--	--	80
Other eastern hard hardwoods	--	4	3	5	3	--	--	--	--	--	--	14
All hardwoods	--	261	334	344	397	255	438	215	234	--	--	2,478
All species groups	55	351	430	396	436	301	473	223	234	--	--	2,899

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the volume rounds to less than 1 million board feet. Columns and rows may not add to their totals due to rounding.

Table DE-19a.—Net volume of sawtimber trees (Doyle rule), in million board feet, on timberland by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)											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	21.0-24.9	25.0-28.9	29.0-32.9	33.0-36.9	37.0+	
Softwood species groups												
Eastern softwood species groups												
Loblolly and shortleaf pines	16	37	45	21	25	25	23	8	--	--	--	200
Other yellow pines	3	6	12	15	3	14	8	--	--	--	--	61
Other eastern softwoods	0	--	--	--	3	--	--	--	--	--	--	3
All softwoods	19	43	58	36	30	39	31	8	--	--	--	264
Hardwood species groups												
Eastern hardwood species groups												
Select white oaks	--	15	21	28	24	16	50	12	39	--	--	205
Select red oaks	--	1	1	4	4	7	5	--	16	--	--	38
Other white oaks	--	0	--	--	2	--	--	--	--	--	--	2
Other red oaks	--	11	28	33	49	61	62	36	62	--	--	341
Hickory	--	2	3	--	--	--	5	--	--	--	--	9
Soft maple	--	27	47	38	86	45	90	20	14	--	--	366
Beech	--	4	3	--	3	4	11	--	--	--	--	24
Sweetgum	--	21	34	40	49	30	25	13	15	--	--	227
Tupelo and blackgum	--	8	11	14	6	--	6	8	--	--	--	53
Ash	--	5	4	7	4	4	5	20	--	--	--	49
Cottonwood and aspen	--	--	--	3	--	--	--	--	--	--	--	3
Yellow-poplar	--	8	8	23	25	16	65	86	120	--	--	351
Black walnut	--	--	--	2	2	--	6	--	--	--	--	10
Other eastern soft hardwoods	--	7	11	7	5	--	18	--	--	--	--	48
Other eastern hard hardwoods	--	2	2	3	2	--	--	--	--	--	--	8
All hardwoods	--	109	171	202	261	183	349	194	265	--	--	1,735
All species groups	19	152	229	238	291	222	380	202	265	--	--	1,999

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the volume rounds to less than 1 million board feet. Columns and rows may not add to their totals due to rounding.

Table DE-20.—Net volume of sawtimber trees, in million cubic feet, on timberland by species group and ownership group, Delaware, 2008

Species group	Ownership group				
	Forest Service	Other Federal	State and local government	Undifferentiated private	All owners
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	14.3	55.5	69.8
Other yellow pines	--	--	11.0	7.7	18.7
Other eastern softwoods	--	--	--	1.0	1.0
All softwoods	--	--	25.4	64.1	89.5
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	9.9	40.1	50.0
Select red oaks	--	--	--	8.0	8.0
Other white oaks	--	--	--	0.6	0.6
Other red oaks	--	--	13.9	66.9	80.8
Hickory	--	--	--	2.9	2.9
Soft maple	--	--	13.6	89.4	102.9
Beech	--	--	0.9	5.7	6.6
Sweetgum	--	--	13.2	53.0	66.2
Tupelo and blackgum	--	--	4.0	12.9	16.9
Ash	--	--	0.9	11.2	12.1
Cottonwood and aspen	--	--	--	0.8	0.8
Yellow-poplar	--	--	32.9	30.9	63.8
Black walnut	--	--	--	2.4	2.4
Other eastern soft hardwoods	--	0.2	1.8	12.6	14.6
Other eastern hard hardwoods	--	--	--	2.7	2.7
All hardwoods	--	0.2	91.1	340.1	431.4
All species groups	--	0.2	116.5	404.2	520.9

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-24.—Average annual net growth of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, on timberland by species group and ownership group, Delaware, 1999 to 2008

Species group	Ownership group				All owners
	Forest Service	Other Federal	State and local government	Undifferentiated private	
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	0.6	5.3	5.9
Other yellow pines	--	--	0.8	0.4	1.2
Cypress	--	--	--	0.0	0.0
Other eastern softwoods	--	--	--	0.0	0.0
All softwoods	--	--	1.4	5.7	7.1
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	0.1	2.6	2.7
Select red oaks	--	--	--	0.2	0.2
Other white oaks	--	--	--	0.1	0.1
Other red oaks	--	--	0.5	2.7	3.2
Hickory	--	--	0.0	0.1	0.1
Hard maple	--	--	--	0.0	0.0
Soft maple	--	--	0.6	5.5	6.2
Beech	--	--	0.1	0.3	0.4
Sweetgum	--	--	0.4	2.4	2.8
Tupelo and blackgum	--	--	0.1	0.7	0.8
Ash	--	--	0.0	0.2	0.2
Cottonwood and aspen	--	--	--	0.3	0.3
Yellow-poplar	--	--	2.0	2.1	4.1
Black walnut	--	--	--	0.0	0.0
Other eastern soft hardwoods	--	--	0.8	1.6	2.4
Other eastern hard hardwoods	--	--	0.1	0.8	0.9
All hardwoods	--	--	4.6	19.5	24.2
All species groups	--	--	6.0	25.2	31.3

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-28.—Average annual mortality of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, on timberland by species group and ownership group, Delaware, 1999 to 2008

Species group	Ownership group				All owners
	Forest Service	Other Federal	State and local government	Undifferentiated private	
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	0.1	0.4	0.5
Other yellow pines	--	--	0.1	0.2	0.2
All softwoods	--	--	0.1	0.6	0.7
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	0.3	0.0	0.3
Select red oaks	--	--	--	0.5	0.5
Other red oaks	--	--	0.1	0.6	0.7
Soft maple	--	--	0.0	0.7	0.7
Sweetgum	--	--	--	0.5	0.5
Tupelo and blackgum	--	--	0.0	0.0	0.0
Cottonwood and aspen	--	--	--	0.1	0.1
Yellow-poplar	--	--	--	0.9	0.9
Other eastern soft hardwoods	--	--	--	0.2	0.2
Other eastern hard hardwoods	--	--	--	0.0	0.0
All hardwoods	--	--	0.4	3.4	3.8
All species groups	--	--	0.5	4.0	4.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-30.—Average annual removals of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, on timberland by species group and ownership group, Delaware, 1999 to 2008

Species group	Ownership group				
	Forest Service	Other Federal	State and local government	Undifferentiated private	All owners
Softwood species groups					
Eastern softwood species groups					
Loblolly and shortleaf pines	--	--	--	4.0	4.1
All softwoods	--	--	--	4.0	4.1
Hardwood species groups					
Eastern hardwood species groups					
Select white oaks	--	--	--	0.6	0.6
Select red oaks	--	--	--	0.1	0.1
Other red oaks	--	--	--	0.6	0.6
Soft maple	--	--	--	0.1	0.2
Beech	--	--	--	--	0.2
Sweetgum	--	--	--	0.2	0.3
Tupelo and blackgum	--	--	--	0.2	0.2
Yellow-poplar	--	--	--	0.1	0.5
Other eastern hard hardwoods	--	--	--	0.1	0.1
All hardwoods	--	--	--	1.9	2.8
All species groups	--	--	--	5.9	6.9

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic feet. Columns and rows may not add to their totals due to rounding.

Table DE-31.—Aboveground dry weight of live trees (at least 1 inch d.b.h.), in thousand dry short tons, by owner class and forest-land status, Delaware, 2008

Owner class	Unreserved forests			Reserved forests			All forest land
	Timberland	Unproductive	Total	Productive	Unproductive	Total	
Other Federal							
Fish and Wildlife Service	67	--	67	276	--	276	343
Other Federal	2	--	2	--	--	--	2
State and local government							
State	3,811	--	3,811	383	--	383	4,195
Local (county, municipal, etc.)	201	--	201	--	--	--	201
Other non-Federal lands	302	--	302	--	--	--	302
Private							
Undifferentiated private	18,571	--	18,571	--	--	--	18,571
All owners	22,954	--	22,954	659	--	659	23,613

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the aboveground tree biomass rounds to less than 1 thousand dry tons. Columns and rows may not add to their totals due to rounding.

Table DE-32.—Aboveground dry weight of live trees (at least 1 inch d.b.h., computed using "component ratio method" - CRM), in thousand dry short tons, on forest land by species group and diameter class, Delaware, 2008

Species group	Diameter class (inches)															All classes
	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	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
Softwood species groups																
Eastern softwood species groups																
Loblolly and shortleaf pines	18	22	117	276	327	423	371	146	150	148	51	57	33	--	--	2,137
Other yellow pines	13	10	44	33	60	62	100	102	17	76	37	--	--	--	--	555
Cypress	2	--	0	--	--	--	--	--	--	--	--	--	--	--	--	2
Other eastern softwoods	3	2	2	6	3	--	--	--	13	--	--	--	--	--	--	29
All softwoods	36	33	163	315	390	485	471	248	180	224	87	57	33	--	--	2,724
Hardwood species groups																
Eastern hardwood species groups																
Select white oaks	11	48	66	95	151	324	316	321	235	139	236	135	--	66	177	2,319
Select red oaks	1	4	8	9	11	29	11	49	36	61	42	--	--	--	72	335
Other white oaks	--	16	--	8	5	11	--	--	17	--	--	--	--	--	--	56
Other red oaks	19	80	96	156	294	235	434	385	479	530	382	84	216	--	261	3,651
Hickory	5	13	14	34	24	51	45	--	--	--	36	--	--	--	--	223
Hard maple	--	--	1	5	--	--	--	--	--	--	--	--	--	--	--	5
Soft maple	143	259	297	514	658	612	598	404	710	322	412	140	120	--	51	5,240
Beech	13	5	19	56	39	68	39	--	23	32	74	--	--	--	--	368
Sweetgum	60	93	125	266	328	354	390	371	369	230	109	34	--	58	105	2,890
Tupelo and blackgum	51	77	92	121	101	139	121	122	42	--	--	32	39	--	--	938
Ash	5	14	21	48	49	84	50	73	40	29	33	--	43	58	--	549
Cottonwood and aspen	1	--	--	5	5	--	--	19	--	--	--	--	--	--	--	30
Yellow-poplar	9	23	44	77	64	108	77	180	155	86	198	163	173	208	380	1,946
Black walnut	--	--	1	3	7	--	--	19	18	--	108	--	--	--	--	156
Other eastern soft hardwoods	21	87	108	195	148	185	130	66	38	--	58	41	--	--	--	1,078
Other eastern hard hardwoods	122	181	193	160	145	47	64	29	15	31	--	--	--	--	--	987
Eastern noncommercial hardwoods	25	38	24	6	10	--	--	--	17	--	--	--	--	--	--	119
All hardwoods	486	939	1,110	1,757	2,039	2,247	2,274	2,039	2,195	1,461	1,690	629	590	390	1,046	20,889
All species groups	522	972	1,273	2,071	2,428	2,732	2,745	2,287	2,375	1,685	1,777	686	623	390	1,046	23,613

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the aboveground tree biomass rounds to less than 1 thousand dry tons. Columns and rows may not add to their totals due to rounding.

Table DE-54.—Area of forest land, in thousand acres, by inventory unit, county, and forest-land status, Delaware, 2008

Inventory unit and county	Unreserved forests			Reserved forests			All forest land
	Timberland	Unproductive	Total	Productive	Unproductive	Total	
State							
Sussex	194.3	- -	194.3	4.5	- -	4.5	198.8
Kent/New Castle	150.2	- -	150.2	3.2	- -	3.2	153.4
Total	344.5	- -	344.5	7.7	- -	7.7	352.2
All counties	344.5	- -	344.5	7.7	- -	7.7	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-55.—Area of forest land, in thousand acres, by inventory unit, county, ownership group and forest-land status, Delaware, 2008

Inventory unit and county	Forest Service		Other Federal		State and local government		Undifferentiated private		All forest land
	Timber-land	Other forest land	Timber-land	Other forest land	Timber-land	Other forest land	Timber-land	Other forest land	
State									
Sussex	- -	- -	- -	4.5	29.2	- -	165.1	- -	198.8
Kent/New Castle	- -	- -	7.3	- -	30.8	3.2	112.2	- -	153.4
Total	- -	- -	7.3	4.5	60.0	3.2	277.2	- -	352.2
All counties	- -	- -	7.3	4.5	60.0	3.2	277.2	- -	352.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-57.—Area of timberland, in thousand acres, by inventory unit, county, and stand-size class, Delaware, 2008

Inventory unit and county	Stand-size class					All size classes
	Large diameter	Medium diameter	Small diameter	Chaparral	Nonstocked	
State						
Sussex	123.6	43.3	27.4	--	--	194.3
Kent/New Castle	130.0	8.2	9.5	--	2.6	150.2
Total	253.6	51.5	36.9	--	2.6	344.5
All counties	253.6	51.5	36.9	--	2.6	344.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE-58.—Area of timberland, in thousand acres, by inventory unit, county, and stocking class, Delaware, 2008

Inventory unit and county	Stocking class of growing-stock trees					
	Nonstocked	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked	All classes
State						
Sussex	2.8	19.9	67.5	97.4	6.7	194.3
Kent/New Castle	5.0	22.8	48.3	67.2	6.9	150.2
Total	7.8	42.8	115.7	164.6	13.6	344.5
All counties	7.8	42.8	115.7	164.6	13.6	344.5

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table DE- 59.—Net volume of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (International ¼-inch rule), on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	97.7	1.3	177.0	111.8	387.9	326.8	4.0	485.2	368.5	1,184.5
Kent/New Castle	23.7	0.1	257.4	141.1	422.3	90.9	- -	1,023.3	600.6	1,714.8
Total	121.4	1.4	434.4	252.9	810.2	417.7	4.0	1,508.5	969.1	2,899.3
All counties	121.4	1.4	434.4	252.9	810.2	417.7	4.0	1,508.5	969.1	2,899.3

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-59a.—Net volume of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (Doyle rule), on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	97.7	1.3	177.0	111.8	387.9	204.5	3.0	299.5	246.6	753.7
Kent/New Castle	23.7	0.1	257.4	141.1	422.3	56.4	- -	747.8	441.1	1,245.4
Total	121.4	1.4	434.4	252.9	810.2	261.0	3.0	1,047.3	687.7	1,999.0
All counties	121.4	1.4	434.4	252.9	810.2	261.0	3.0	1,047.3	687.7	1,999.0

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-60.—Average annual net growth of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (International ¼-inch rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	5.3	0.0	6.8	2.7	14.7	19.9	- -	27.2	8.4	55.5
Kent/New Castle	1.8	0.0	9.7	5.1	16.6	9.4	- -	49.1	28.4	86.9
Total	7.1	0.0	16.4	7.8	31.3	29.2	- -	76.3	36.8	142.3
All counties	7.1	0.0	16.4	7.8	31.3	29.2	- -	76.3	36.8	142.3

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-60a.—Average annual net growth of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (Doyle rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	5.3	0.0	6.8	2.7	14.7	10.1	- -	16.5	4.1	30.7
Kent/New Castle	1.8	0.0	9.7	5.1	16.6	6.2	- -	38.5	19.6	64.4
Total	7.1	0.0	16.4	7.8	31.3	16.3	- -	55.0	23.7	95.1
All counties	7.1	0.0	16.4	7.8	31.3	16.3	- -	55.0	23.7	95.1

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-61.—Average annual removals of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (International ¼-inch rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	4.0	- -	0.7	1.0	5.7	14.2	- -	1.1	3.1	18.4
Kent/New Castle	0.2	- -	0.5	0.6	1.2	0.7	- -	2.3	2.9	5.9
Total	4.1	- -	1.2	1.6	6.9	14.9	- -	3.4	6.0	24.3
All counties	4.1	- -	1.2	1.6	6.9	14.9	- -	3.4	6.0	24.3

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-61a.—Average annual removals of growing-stock trees (at least 5 inches d.b.h.), in million cubic feet, and sawtimber trees (Doyle rule), in million board feet, on timberland by inventory unit, county, and major species group, Delaware, 2008

Inventory unit and county	Growing stock					Sawtimber				
	Major species group					Major species group				
	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species
	(In million cubic feet)					(In million board feet)				
State										
Sussex	4.0	- -	0.7	1.0	5.7	- -	- -	- -	- -	- -
Kent/New Castle	0.2	- -	0.5	0.6	1.2	0.5	- -	1.8	0.7	3.0
Total	4.1	- -	1.2	1.6	6.9	0.5	- -	1.8	0.7	3.0
All counties	4.1	- -	1.2	1.6	6.9	0.5	- -	1.8	0.7	3.0

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the volume rounds to less than 0.1 million cubic or board feet. Columns and rows may not add to their totals due to rounding.

Table DE-65.—Sampling errors, in percent, for net volume, average annual net growth, average annual removals, and average annual mortality on timberland, and forest and timberland area by inventory unit and county, Delaware, 2008

Inventory unit and county	Forest area	Timberland area	Growing stock				Sawtimber			
			Volume	Average annual net growth	Average annual removals	Average annual mortality	Volume	Average annual net growth	Average annual removals	Average annual mortality
State										
Sussex	6.10	6.44	9.02	18.17	75.24	39.45	12.09	22.94	81.17	52.53
Kent/New Castle	5.81	6.25	9.74	23.49	90.35	34.55	12.66	25.30	94.68	56.05
Total	4.27	4.54	6.66	13.07	66.56	26.63	8.97	16.26	69.13	38.50
All counties	4.27	4.54	6.66	13.07	66.56	26.63	8.97	16.26	69.13	38.50

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