USDA Forest Service, US Department of Agriculture
Northern Research Station

New Jersey's Forest Resources, 2007

Research Note NRS-67

This publication provides an overview of forest resource attributes for New Jersey based on an annual inventory conducted by the Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service, Northern Research Station. These estimates, along with web-posted core tables, will be updated annually. For more information, refer to page 4 of this report.

Table 1.—Annual estimates and uncertainty, New Jersey, 2007

	2007 estimate	Sampling error (%)
Forest Land Estimates		
Area (1,000 acres)	1,967.6	2.8
Number of live trees 1-inch diameter or larger (1,000,000 trees)	991.0	5.8
Biomass of live trees 1-inch diameter or larger (1,000 tons)	106,548.8	3.9
Net volume in live trees (1,000,000 ft^3)	3,814.7	4.2
Timberland Estimates		
Area (1,000 acres)	1,844.1	3.1
Number of live trees 1-inch diameter or larger (1,000,000 trees)	924.5	6.2
Biomass of live trees 1-inch diameter or larger (1,000 tons)	100,419.7	4.2
Net volume in live trees (1,000,000 ft^3)	3,601.8	4.5
Net volume of growing-stock trees (1,000,000 ft^3)	3,440.5	4.6

Note: Estimates of growth, removals and mortality are currently unavailable. Sampling errors in this report represent 68% confidence intervals for the estimated values.

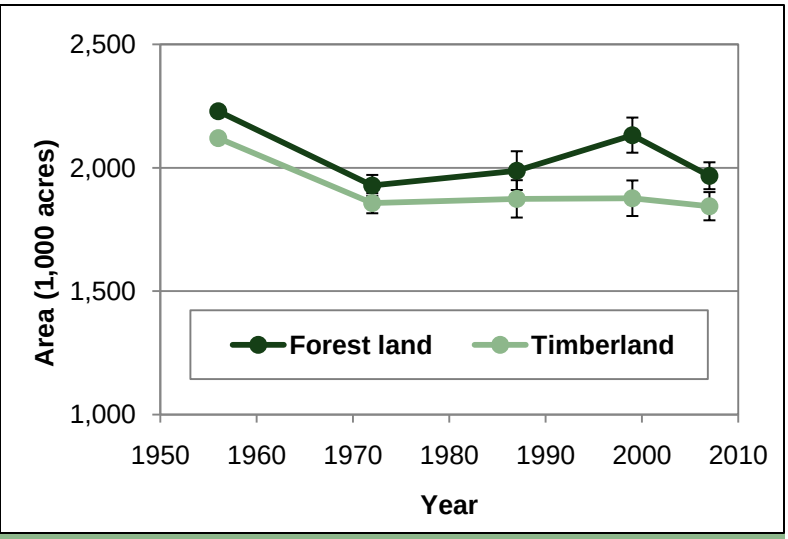


Figure 1.—Area of forest land and timberland by year, New Jersey, 2007.

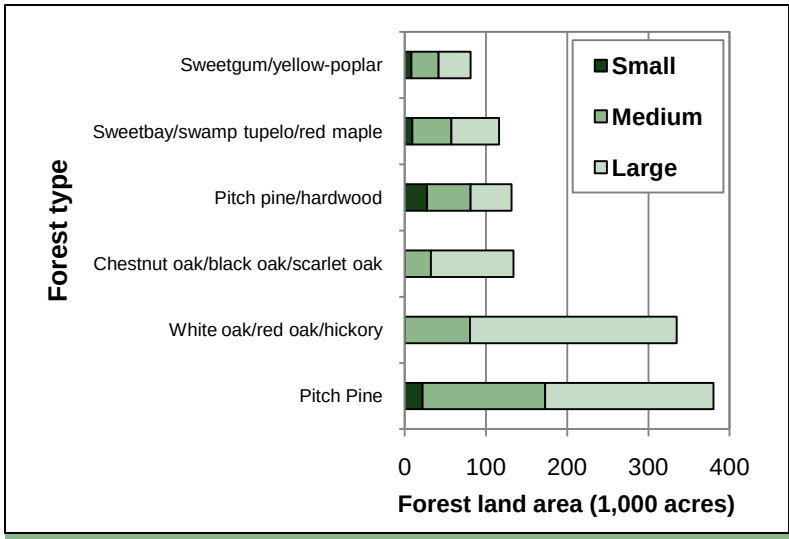
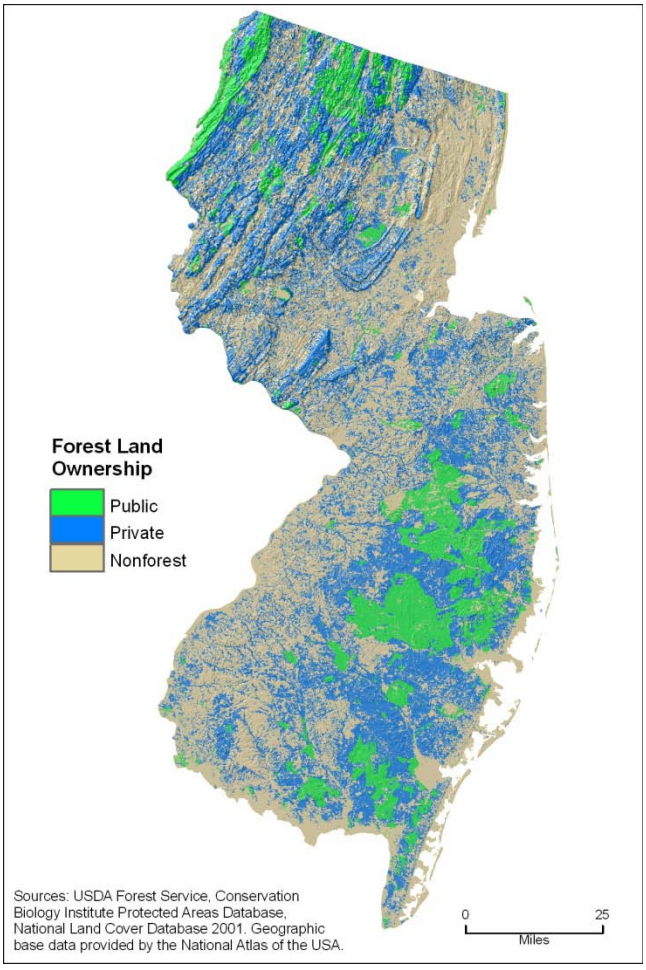


Figure 2.—Area of forest land by top six forest types and stand-size class, New Jersey, 2007.

Table 2.—Top 10 tree species by statewide volume estimates, New Jersey, 2007

Rank	Species	Volume of live trees on forest land (1,000,000 ft³)	Sampling error (%)	Volume of sawtimber trees on timberland (1,000,000 bdft)	Sampling error (%)
1	Pitch pine	532.1	9.9	1,261.4	11.4
2	Red maple	471.2	12.7	986.7	17.3
3	White oak	281.5	13.4	794.3	21.5
4	Yellow-poplar	264.3	23.0	1,329.6	25.3
5	White ash	246.0	16.2	840.3	21.3
6	Northern red oak	219.4	16.7	898.8	18.8
7	Sweetgum	188.6	24.6	667.7	27.1
8	Chestnut oak	176.9	18.8	559.1	23.1
9	Black oak	170.9	19.3	593.6	26.0
10	Atlantic white-cedar	166.5	39.9	432.8	42.2
	Other softwoods	167.5	22.6	445.7	28.9
	Other hardwoods	929.9	7.4	2,450.7	10.7
	All Species	**3,814.7**	**4.2**	**11,260.6**	**6.1**



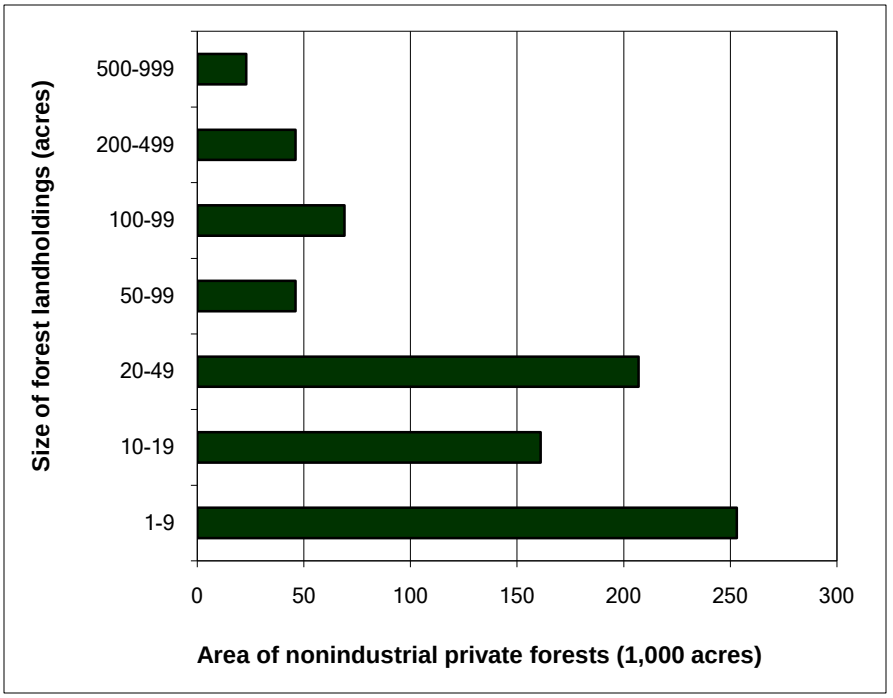


Figure 3.—Distribution of forest land by major owner group (map) and size of nonindustrial private forest landholdings (graph), New Jersey, 2006.

Issue Update: Continuous Improvement Process for Volume, Biomass, and Carbon Estimation

Implementation of an annual inventory requires continuous evaluation and incorporation of improvement of all methods. Significant changes were recently made to volume and biomass (dry weight) estimation methods for Northeastern states. Additionally, the calculation of change components (net growth, removals, and mortality) was modified for national consistency. These changes have improved the ability to report consistent estimates across time and space – a primary objective for FIA.

Volume Estimation

Volume estimation is critical as it forms the basis for biomass and carbon calculation. In the past, gross estimates of tree volume (cubic foot and board foot) were derived using equations based on field-measured diameters and lengths (bole and saw log). Net tree volume was computed by subtracting field-measured cull from gross volume (Scott 1981, Scott 1979). During annual inventory re-measurement activities, noise or random variation in tree length and cull measurements were found to outweigh true changes in volumetric variables, thus limiting the ability to estimate actual change. Possible sources of noise included: measurement variability, model error, and changes in field protocols, definitions, field crew cohorts and processing algorithms. Noise impacted estimates of volume, biomass, carbon, and associated change components.

To ameliorate the impact of noise, taper (Westfall in press) and cull models were used to estimate length and cull percentage of total volume. Modeled length and cull estimates were used in conjunction with volume equations developed by Scott (1981) and (1979), providing a consistent estimation procedure across the Northeast. In general, new volume estimates are larger than earlier estimates because previous estimates were based on length measurements that included reductions based on merchantability; e.g., prior to 2007, the measurement of the top of a bole may have been below the 4-inch top requirement due to deficiencies in form that would have prevented its use for pulpwood. In 2007, merchantability limits were removed from field protocols and changes in cull measurements were implemented, such that net tree volume would continue to represent only the merchantable portion of the tree. Modeled lengths and culls were then aligned with new measurement protocols.

Component Ratio Method (CRM) for Biomass/Carbon Estimation

Estimates of biomass and carbon have become more important to FIA clients due to increased demand for new bioenergy resources and carbon sequestration opportunities. To meet user requests, a method for harmonizing volume, biomass, and carbon estimates was developed (i.e., CRM). Prior to implementation of the CRM, volume and biomass were estimated using separate sets of equations. The CRM is comprised of the following steps (Heath et al. 2009):

- Conversion of sound-wood volume in the merchantable bole to biomass using species-level specific gravities (dry mass per unit of green volume)
- Calculation of bark biomass using a set of percent bark and bark specific gravities
- Calculation of biomass in tops and limbs as a proportion of merchantable bole biomass based on component proportions using equations from Jenkins et al. (2003)
- Calculation of stump biomass using equations from Raile (1982)
- Summation of biomass components to obtain total aboveground biomass

Estimates of carbon were derived through simple conversion of the biomass variables.

Change Component Estimation

Change components are indicative of sustainability (e.g., net growth-to-removals ratio) and forest health (e.g., mortality). Gross growth is equal to ingrowth (volume of trees reaching a 5.0-inch minimum diameter for merchantable volume) plus accretion (growth of surviving trees above the diameter threshold at previous measurement). Net growth is equal to gross growth minus mortality (volume of trees meeting the threshold at previous measurement that have died). Removals are equal to the volume of trees meeting the threshold at the previous measurement that were harvested or on forest land that changed to a nonforest land-use. Net change in inventory is equal to net growth minus removals.

The National Inventory Management System (NIMS) is the compilation system for all FIA estimates. Implementation of NIMS has included some adjustments to regional change-component algorithms to achieve national consistency. A new method, termed the "midpoint method," has introduced some fundamental differences (Westfall et al. 2009). The new approach uses models to "grow" trees to the midpoint of the inventory cycle (2.5 years for a 5-year cycle). Although the overall net changes are equivalent under the previous and new evaluation methods, estimates for individual components will be different. For ingrowth, the midpoint method produces a smaller estimate because volumes are calculated at the 5.0-inch threshold instead of using the actual diameter measurement, which may be larger. The estimate for accretion is higher because growth on ingrowth, mortality, and removal trees is included. As such, the removals and mortality estimates will also be higher than before.

Citation for this Publication

Crocker, Susan. J.; McWilliams, William H. 2010. New Jersey's forest resources, 2007. Res. Note NRS-67. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 4 p.

Literature cited

Heath, L.S.; Hansen, M.H.; Smith, J.E.; Smith, W.B.; P.D. Miles. 2009. Investigation into calculating tree biomass and carbon in the FIADB using a biomass expansion factor approach. In: McWilliams, W.; Moisen, G.; Czaplewski, R., comps. 2008 forest inventory and analysis symposium; 2008 October 21-23; Park City, UT. Proc. RMRS-P-56CD. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. CD.

Jenkins, J.; Chojnacky, D.C.; Heath, L.S.; Birdsey, R.A. 2003. National scale biomass estimators for United States tree species. Forest Science. 49(1):12-35.

Raile, G.K.1982. Estimating stump volume. Res. Pap. NC-224. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 4 p.

Scott, C.T. 1979. Northeastern forest survey board-foot volume equations. Res. Note NE-271. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 2 p.

Scott, C.T. 1981. Northeastern forest survey revised cubic-foot volume equations. Res. Note NE-304. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 2 p.

Westfall, J.A. In press. Taper models for tree species in the Northeastern U.S. Forest Science.

Westfall, J.A.; Frieswyk, T.; Griffith, D.M. 2009. Implementing the measurement interval midpoint method for change estimation. In: McRoberts, R.E.; Reams, G.A.; Van Deusen, P.C.; McWilliams W., eds. Proceedings of the eighth annual forest inventory and analysis symposium; 2006 October 16-19; Monterey, CA. Gen. Tech. Rep. WO-79. U.S. Department of Agriculture, Forest Service: 221-236.

FIA Program and New Jersey Inventory Information

Bechtold, W.A.; Patterson, P.L. 2005. The enhanced Forest Inventory and Analysis Program: national sampling design and estimation procedures. Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 85 p.

Griffith, D.M; Widmann, R.H. 2001. Forest statistics for New Jersey: 1987 and 1999. Resour. Bull. NE-152. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, North Central Research Station. 70 p.

Ferguson, Roland H.; Mayer, Carl E. 1974. The timber resources of New Jersey. Resour. Bull. NE-34. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 59 p.

Smith, W.B. 2002. Forest inventory and analysis: a national inventory and monitoring program, Environmental Pollution. 116: 233-242.

USDA Forest Service. 2005. Forest inventory and analysis national core field guide, Vol. 1, field data collection procedures for phase 2 plots, ver. 3.0. Available at http://www.fia.fs.fed.us/library/field-guides-methods-proc/ (verified Aug. 1 2008).

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Estimates, tabular data, and maps may be generated at: www.fiatools.fs.fed.us
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