

Indiana's Forest Resources, 2009

Research Note NRS-76

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

Table 1. – Annual estimates, uncertainty, and change

	Estimate 2009	Sampling error (%)	Change since 2004 (%)
Forest Land Estimates			
Area (1,000 acres)	4,713.6	1.1	2.3
Number of live trees 1-inch diameter or larger (million trees)	2,154.0	2.0	-7.4
Dry biomass of live trees 1-inch diameter or larger (1,000 tons)	254,229.3	1.6	6.3
Net volume in live trees (1,000,000 ft ³)	9,695.3	1.7	7.7
Annual net growth of live trees (1,000 ft ³ /year)	316,845.2	5.1	-23.0
Annual mortality of live trees (1,000 ft ³ /year)	99,963.9	7.6	32.2
Annual harvest removals of live trees (1,000 ft ³ /year)	80,036.9	15.6	19.0
Annual other removals of live trees (1,000 ft ³ /year)	16,723.7	25.1	-25.0
Timberland Estimates			
Area (1,000 acres)	4,618.6	1.2	3.4
Number of live trees 1-inch diameter or larger (million trees)	2,097.9	2.1	-7.0
Dry biomass of live trees 1-inch diameter or larger (1,000 tons)	249,255.9	1.6	7.9
Net volume in live trees (1,000,000 ft ³)	9,509.4	1.8	9.5
Net volume of growing-stock trees (1,000,000 ft ³)	8,582.4	1.9	10.0
Annual net growth of growing-stock trees (1,000 ft ³ /year)	296,765.0	5.3	-17.5
Annual mortality of growing-stock trees (1,000 ft ³ /year)	76,855.0	8.8	49.8
Annual harvest removals of growing-stock trees (1,000 ft ³ /year)	73,347.4	16.2	27.8
Annual other removals of growing-stock trees (1,000 ft ³ /year)	15,565.1	24.2	1.0

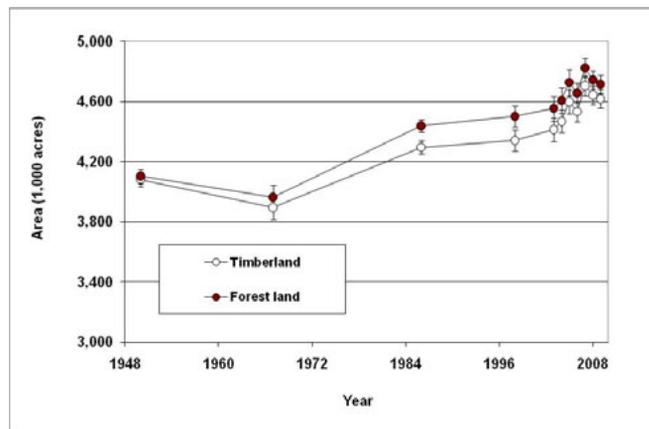


Figure 1. – Area of timberland and forest land by year.

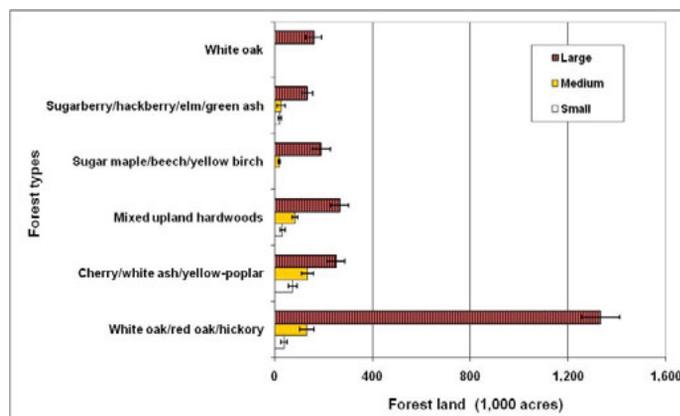


Figure 2. – Area of forest land area by top six forest types and stand size class, 2005-2009.

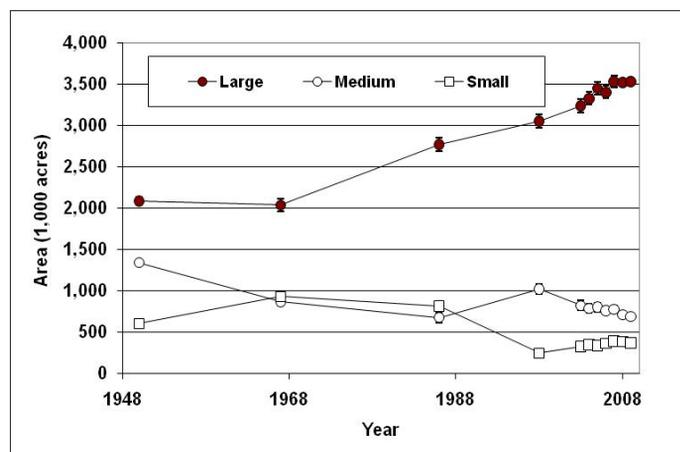
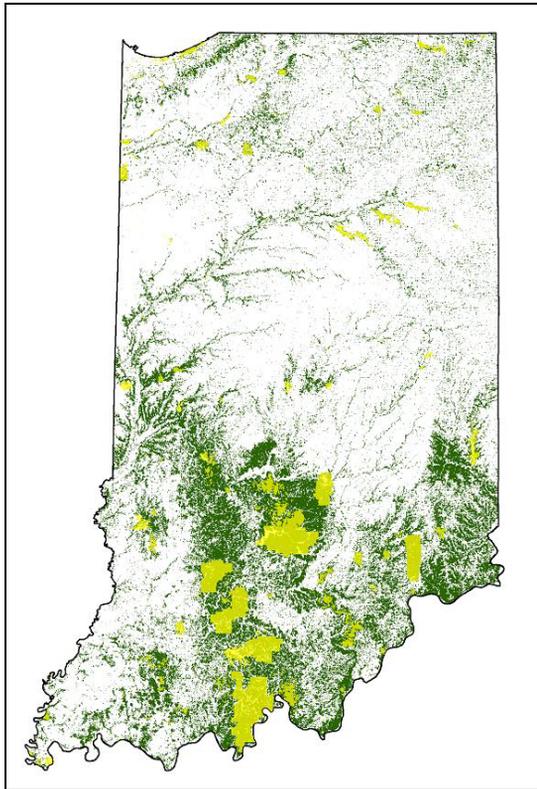


Figure 3. – Area of timberland by stand size class and year.

Note: When available, sampling errors/bars provided in figures and tables represent 68 percent confidence intervals

Table 2. – Top 10 tree species by statewide volume estimates, 2005-2009

Rank	Species	Volume of live trees on forest land (1,000,000 ft ³)	Sampling Error (%)	Change since 2004 (%)	Volume of sawtimber trees on timberland (1,000,000 bdf)	Sampling error (%)	Change since 2004 (%)
1	Yellow-poplar	1,080.4	6.5	9.70	4,730.4	7.2	11.20
2	Sugar maple	1,030.4	4.9	17.70	3,075.6	6.1	25.00
3	White oak	740.5	6.3	-0.20	2,824.1	6.6	1.40
4	Black oak	530.8	7.4	-3.50	2,125.9	7.9	1.60
5	White ash	528.6	6.7	2.60	1,762.8	8.3	10.60
6	Northern red oak	447.2	7.7	1.90	1,820.9	8.3	4.00
7	Red maples	417.5	9.0	44.80	1,152.4	11.6	70.10
8	American sycamore	402.2	9.7	7.30	1,656.5	10.2	14.80
9	Shagbark hickory	345.8	7.3	19.40	1,317.0	8.3	32.40
10	Black cherry	305.3	7.7	27.60	692.8	10.1	36.10
	Other softwoods	328.0	9.7	6.00	1,057.1	12.0	3.00
	Other hardwoods	3,538.6	3.0	4.30	11,214.2	3.7	10.40
	All Species	9,695.3	1.7	7.70	33,429.8	2.1	12.40



Map Legend

- Private forest land – 84.1percent of all forest land
- Public forest land – 15.9 percent of all forest land
- Non forest

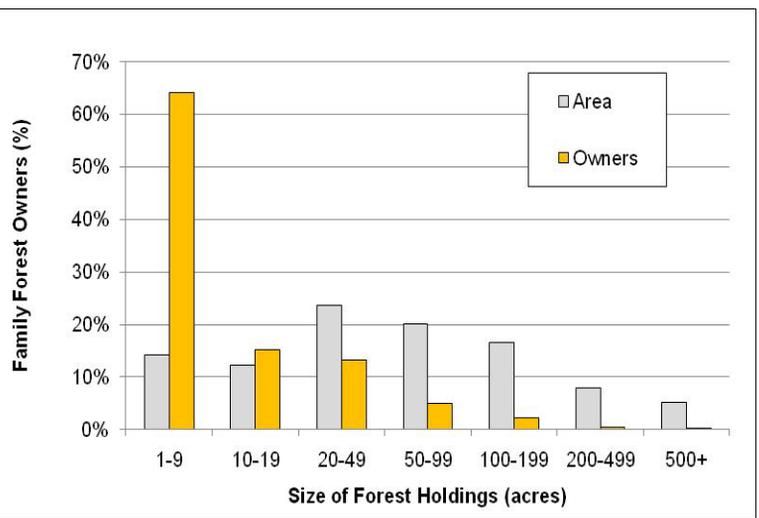


Figure 4. – Area and number of family forests in Indiana by size of forest landholdings, Indiana, 2004-2008.

A Tale of Two Oak Species in Indiana

As the global climate changes, it has been postulated that tree ranges may shift in response. (Woodall et al. 2009) A northward shift of tree species may occur in the eastern U.S. with the possibility that new tree species may move into Indiana's forests. The process of tree migration in Indiana maybe broadly summarized as a "Tale of Two Oak Species." Northern pin oak (*Quercus ellipsoidalis*) is found in the Lake States with some of its range extending into northern Indiana. Over 30 years ago, its range was defined as spreading across northern Indiana (yellow shade, Fig. 5). Currently, FIA only recorded this tree species at two locations within its previous range. In contrast, a largely southern oak species, chestnut oak (*Quercus prinus*), had the former extent of its range in southern Indiana. Currently, FIA has observed chestnut oak not only within its previously defined range, but also exceeding its previous range boundaries (grey shade, Fig. 5).

What typically southern oak tree species may move across Indiana if a warming climate favors the success of their regeneration? As an indicator, the forecasted area of expansion of selected oak species (predominantly southern oak species) was compared to the current difference between observed FIA tree species locations and the northern border of Indiana (Fig. 6). There are numerous oak species that have their northern limit farther south than Indiana's northern border and are forecasted to greatly increase their range in the eastern U.S., such as laurel oak (*Quercus laurifolia*) and southern red oak (*Quercus falcata*). Centuries from now there may still be ample oak forests across Indiana; however, different oak species may occupy these forests.

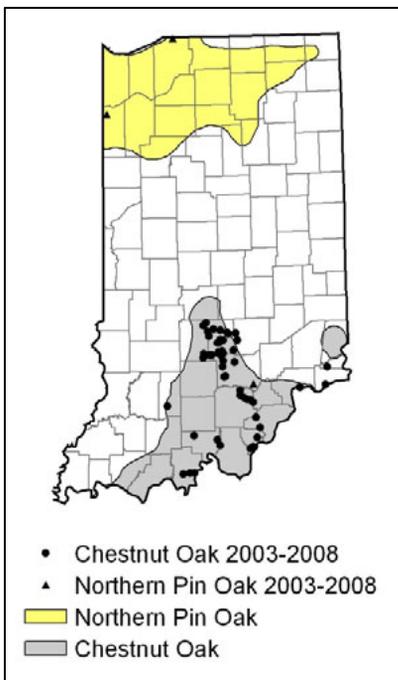


Figure 5. – Defined tree species ranges (Little 1971) compared to tree locations determined by FIA inventories (2003-2008).

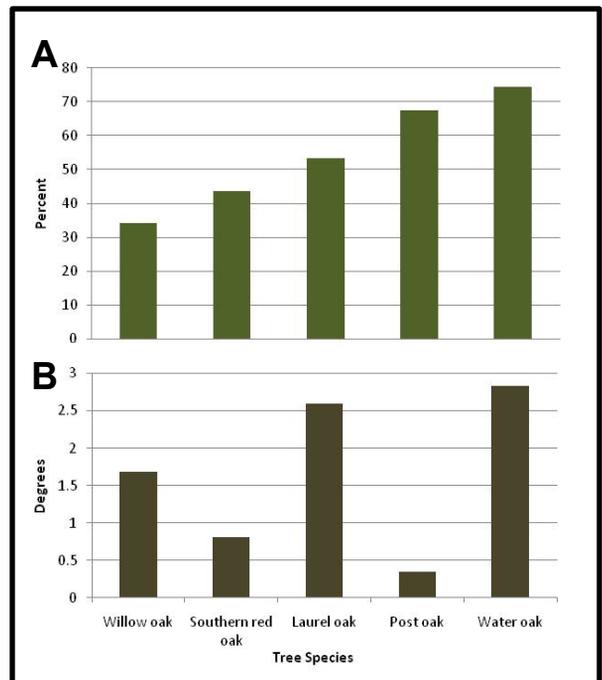


Figure 6. – (A) Forecasted percent gain of species area (Iverson et al. 2008) across the U.S. under the low Hadley climate scenario compared to (B) latitudinal difference between northern IN border and current northern most limit of selected oak species in the U.S. according to FIA inventory.



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FIA Program 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.

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).

Additional Information

Iverson, L.R.; Prasad, A.M.; Matthews, S.N.; Peters, M. 2008. Estimating potential habitat for 134 eastern US tree species under six climate scenarios. *Forest Ecology and Management*. 254: 390-406.

Little, E.L., Jr. 1971. **Atlas of United States trees. Volume I. Conifers and important hardwoods**. Misc. Pub. 1146. Washington, DC: U.S. Department of Agriculture Forest Service. 9 p. 200 maps.

Woodall, C.W.; Oswalt, C.M.; Westfall, J.A.; Perry, C.H.; Nelson, M.D.; Finley, A.O. 2009. **An indicator of tree migration in forests of the eastern United States**. *Forest Ecology and Management*. 257: 1434-1444.

Additional Indiana Inventory Information

Woodall, C.W.; Johnson, D.; Gallion, J.; Perry, C.; Butler, B.; Piva, R.; Jepsen, E.; Nowak, D.; Marshall, P. 2005. **Indiana's forests, 1999-2003 Part A**. Resour. Bull. NC-253A. St. Paul, MN: U.S. Department of Agriculture, Forest Service North Central Research Station. 95 p.

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