USDA
United States Department of Agriculture

RESOURCE UPDATE FS-51

Forests of Indiana, 2014

Overview

This resource update provides an overview of forest resources in Indiana based on an inventory conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Northern Research Station in cooperation with the Indiana Department of Natural Resources. Estimates are based on field data collected using the FIA annualized strategic sample design and are updated yearly. The estimates presented in this update are for the measurement years 2009-2014 with comparisons between estimates reported in 2009. The current, 2009-2014 sample set consists of 6,492 plots with 1,661 of them being forested or partially forested. About 14.3 percent of the plots were measured each year with observations collected across a period of 6 years. Data used in this publication were accessed from the FIA Database in May 2015. See Bechtold and Patterson (2005) and O'Connell et al. (2014) for definitions and technical details. FIA estimates, tabular data, and maps may be generated at http://www.fia.fs.fed.us/tools-data/.

Currently, Indiana has nearly 4.9 million acres of forest land. Forested area has increased by about 3.5 percent (166,000 acres) since 2009 (Table 1). Timberland accounts for nearly 97 percent, while the remaining 3 percent of forest is reserved or unproductive. There were an estimated 2.2 billion live trees in 2014, an increase of 2.5 percent from 2009. The number of trees 1 inch and larger in 2014 averages 452 trees per acre. Net volume (10.5 billion ft^3) experienced an increase of about 8.4 percent, which in 2014, averages 2.1 thousand cubic feet per acre (statewide, about 26 cords per acre). Live tree biomass (aboveground) is estimated at 272.3 million oven-dry tons or about 55.8 tons per acre. Average annual net growth decreased by 27.5 percent partly due to reversions of nonforest to forest.[1] Statewide, average annual net growth is 46 cubic feet per acre per year while annual harvest removals decreased by 18.8 percent. Annual mortality increased by 30.4 percent between 2009 and 2014; however as a percentage of net volume, mortality in 2009 was 1.0 percent of net volume and mortality in 2014 was 1.24 percent of net volume, a difference of only 0.24 percent. Similar trends were observed on Indiana's timberlands (Table 1).

Table 1.—Indiana forest statistics, change between 2009 and 2014

	2009 Estimate	Sampling error (percent)	2014 Estimate	Sampling error (percent)	Percent change since 2009
Forest Land					
Area (1,000 acres)	4,713.6	1.1	4,879.6	1.0	3.5
Number of live trees ≥1 in diameter (million trees)	2,154	2.0	2,208.1	2.0	2.5
Net volume live trees ≥5 in diameter (million ft^3)	9,695.8	1.7	10,511.2	1.7	8.4
Live tree aboveground biomass (1,000 oven-dry tons)	254,240.3	1.6	272,327.0	1.5	7.1
Net growth live trees ≥5 in (thousand ft^3/yr)	316,065.6	5.1	229,165.2	4.7	-27.5
Harvest removals of live trees ≥5 in (thousand ft^3/yr)	90,920.1	14.5	73,784.9	14.2	-18.8
Annual mortality of live trees ≥5 in (thousand ft^3/yr)	100,300.4	7.6	130,776.8	6.3	30.4
Timberland					
Area (1,000 acres)	4,568.1	1.2	4,717.1	1.1	3.3
Number of live trees ≥1 in diameter (million trees)	2,071.6	2.1	2,116.2	2.1	2.2
Net volume live trees ≥5 in diameter (million ft^3/yr)	9,380.9	1.8	10,149.8	1.8	8.2
Live tree aboveground biomass (1,000 oven-dry tons)	245,858.8	1.9	262,733.6	1.6	6.9
Net growth of growing-stock trees ≥5 in (thousand ft^3/yr)	272,017.1	5.1	213,073.2	4.4	-21.7
Harvest removals of growing-stock trees ≥5 in (thousand ft^3/yr)	82,617.0	15.2	65,961.7	14.5	-20.2
Annual mortality of growing-stock trees ≥5 in (thousand ft^3/yr)	76,470.4	8.9	92,649.0	7. 4	21.2

[1] Some nonforest to forest reversions that occurred during and prior to the 1990s to early 2000s were not identified until early in the adoption of the annual inventory system and stem from use of enhanced imagery and GIS technology that began in the early 2000s. FIA improved its ability to detect forest early in the implementation of the annual inventory system and thus, more plots were field measured. As a result, higher estimates of growth were recorded in earlier annual inventories resulting in an artificially inflated growth estimate.

Forest Area

Indiana is divided into four survey units, with forest land (4.9 million acres) unevenly distributed among units: Northern (1.4 million acres), Lower Wabash (977 thousand acres), Upland Flats (677 thousand acres), and Knobs (1.83 million acres (Fig. 1). The three southern survey units comprise about 40 percent of the land and water area but contain over 70 percent of the forest with the Knobs survey unit containing about 40 percent of the forest.

Eighty-four percent or over 4.1 million acres of forest land is privately owned. The state and local government owns 8.0 percent or 391,000 acres of forest land while the Federal government owns roughly 7.4 percent or 380,000 acres. A little over 3 percent or 161,000 acres of forest land is considered reserved.

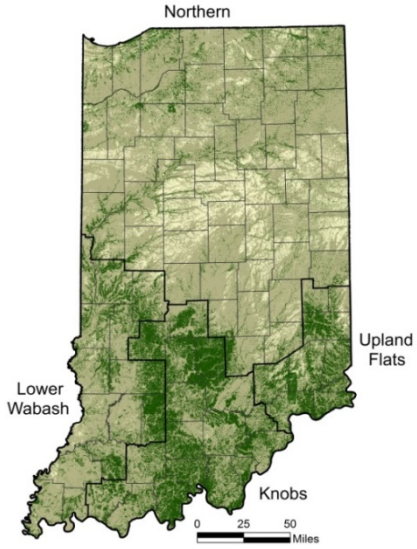

Figure 1.—Forest land (dark green) by survey unit, Indiana.

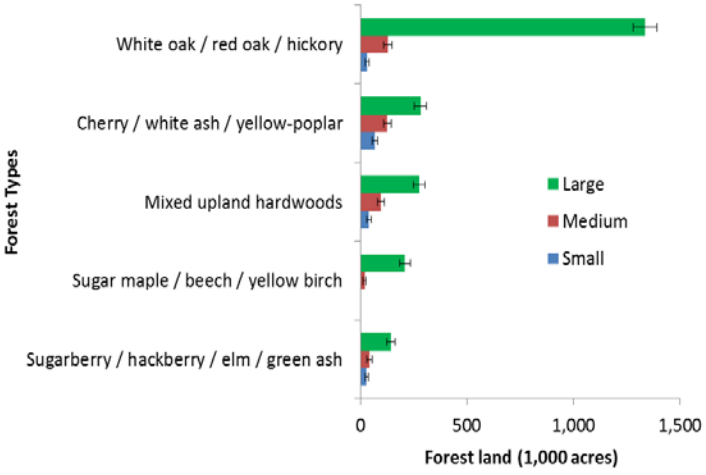

Figure 3.—Area of forest land by five most common forest-type groups and stand-size classes, Indiana, 2014. Error bars represent 1 standard error or a 67-percent confidence interval.

The total area of Indiana's forest land (4.9 million acres) and timberland (4.7 million acres) has modest increases over the past several decades following a trend since 1967 (Fig. 2).

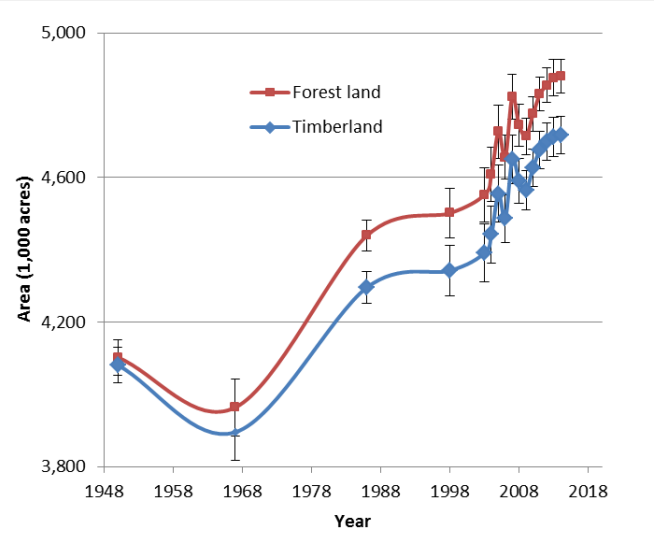

Figure 2.—Area of forest land and timberland in Indiana by inventory year. Error bars represent 1 standard error or a 67-percent confidence interval.

Hardwoods are the dominant species in Indiana. Some forest-type groups are much more common than others. The oak/hickory group alone occupies 71 percent of forest land, the bulk of which resides in the white oak/red oak/hickory forest type (1.5 million acres). Softwoods alone occupy 108,000 acres. The oak/pine group occupies almost 152,500 acres which represents 3 percent of the forest land wood basket.

Forest land consists mainly of sawtimber stands (78 percent); 14 percent of forest land is made up of poletimber stands, 7 percent contain seedling-sapling stands and less than 1 percent is considered nonstocked.

Indicative of a maturing (aging) forest, white and red oak/hickory is found primarily in the large stand-size class (Fig. 3). The cherry/white ash/yellow-poplar group is less common (468,000 acres) as are the mixed upland hardwoods (406,000 acres). Both show similar distributions across stand-size classes with a large proportion in the medium and large diameter classes. The sugar maple/beech/yellow birch forest-type group is relatively abundant (224,000 acres) and occurs mostly in large stand-size classes (Fig. 3).

Currently, about 48 percent of the stands are over 61 years of age.

Volume, Biomass, and Trends

Crews recorded 95 species (including unknowns collected to the genus level) on Indiana forest land in the measurement years included in the 2014 data set. Hardwoods are the dominant forest land species comprising 97 percent. Sugar maple (*Acer saccharum*) is by far the most numerous tree in Indiana with an estimated 360 million individuals; red maple (*A. rubrum*) is second with an estimated 110 million trees (Table 2).

The most numerous species, sugar maple, is not the most voluminous species in the State. That distinction belongs to the State tree, yellow-poplar, also known as tulip tree (*Liriodendron tulipifera*), with a net volume of nearly 1.24 billion cubic feet. These yellow-poplars also store approximately 23.5 million tons of woody biomass statewide. Of the 10 most voluminous species, yellow-poplar and sugar maple are growing the most vigorously with each accumulating over 37 and 26 million cubic feet per year, respectively.

Black oak, followed by yellow-poplar, white ash, and sugar maple, show the highest mortality in Indiana. Black oaks that are stressed from drought, gypsy moth defoliation, old age, fire, poor site conditions, or other factors often succumb to secondary agents such as twolined chestnut borer (*Agrilus bilineatus*), Hypoxylon canker (*Hypoxylon mammatum*), and shoestring root rot (*Armillaria mellea*). This scenario, in which a primary agent stresses the tree and a secondary agent kills it, is known as "oak decline" and is responsible for considerable black oak mortality.

Several species are removed in harvests, but yellow-poplar removals are nearly double or more, by volume, than most species except sugar maple, white ash, and black oak (Table 2).

Biomass is distributed throughout the State, with the largest concentrations in the southern tier of Indiana (Fig. 4).

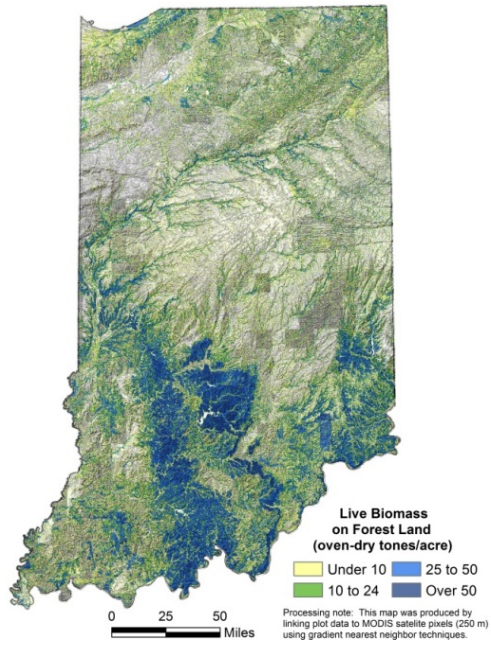

Figure 4.—Distribution of live-tree and sapling biomass on forest land, Indiana, 2014

Table 2.—Number, volume, biomass, growth, mortality, and removals of live trees on forest land by species of the top 10 tree species by net volume, Indiana, 2009-2014

Common name	Latin name	Million trees[a]	Net volume[b] (million ft³)	Aboveground biomass[a] (thousand dry tons)	Average annual net growth[b] (thousand ft³)	Average annual mortality[b] (thousand ft³)	Average annual harvest removals[b] (thousand ft³)
Yellow-poplar	*Liriodendron tulipifera*	74.55	1,238.95	23,525.10	37,160.77	10,249.96	10,999.28
Sugar maple	*Acer saccharum*	359.91	1,113.08	33,016.16	26,202.99	9,227.39	7,779.98
White oak	*Quercus alba*	35.98	747.48	20,649.19	12,832.32	3,897.60	4,967.37
White ash	*Fraxinus americana*	99.26	567.16	15,497.47	10,320.22	10,094.14	6,604.36
Black oak	*Quercus velutina*	34.12	566.92	15,576.87	6,200.11	11,552.40	7,380.07
Red maple	*Acer rubrum*	110.16	465.74	11,411.58	13,233.55	3,008.57	1,035.61
Northern red oak	*Quercus rubra*	24.05	450.12	12,624.32	10,471.73	4,964.90	4,165.83
American sycamore	*Platanus occidentalis*	16.51	468.63	9,567.00	13,404.59	1,371.43	2,697.38
Shagbark hickory	*Carya ovata*	44.86	365.26	11,591.81	6,582.19	1,075.14	1,619.30
Black cherry	*Prunus serotina*	40.75	350.62	11,093.26	6,245.69	1,435.66	1,451.20

[a] *Trees ≥ 1 in diameter*
[b] *Trees ≥ 5 in diameter*

Indiana's Timber Product Output, 2013

Primary wood-using mills in Indiana were surveyed to determine the size and composition of the State's primary wood-using industry, the use of roundwood, and the generation and disposition of wood residues. Below are some preliminary findings from that survey. A full report is in preparation.

There were 67.8 million cubic feet of industrial roundwood harvested in 2013, an 8 percent increase from 2008. Saw logs accounted for 93 percent of industrial roundwood harvested in 2013 (Fig. 5). Veneer logs, the second most harvested product, only accounted for 3 percent of the total harvest.

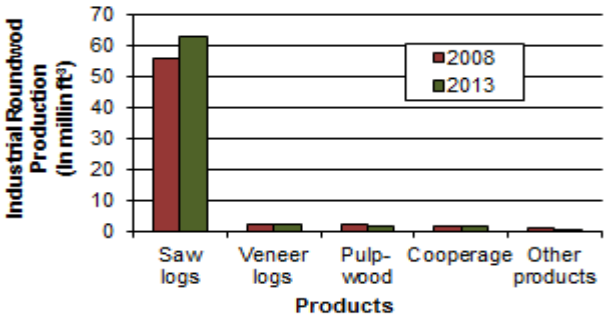

Figure 5.—Industrial roundwood production by product, Indiana, 2008 and 2013.

Yellow-poplar replaced red oaks as the most harvested species in 2013, making up 20 percent of the total harvest (Fig. 6). Other important species harvested were red and white oaks, ash, and hard maple. Between 2008 and 2013, the harvesting of ash increased by 47 percent.

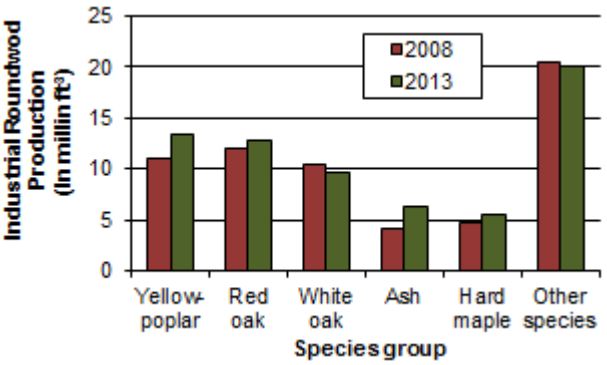

Figure 6.—Industrial roundwood production by species group, Indiana, 2008 and 2013.

There were 1.1 million green tons of mill residues generated during the processing of industrial roundwood in 2013. Nearly two-thirds of the mill residues were either used by the pulp and paper industry or used for mulch (Fig. 7). Only 1 percent of the mill residues from Indiana's primary wood-using industry went unused.

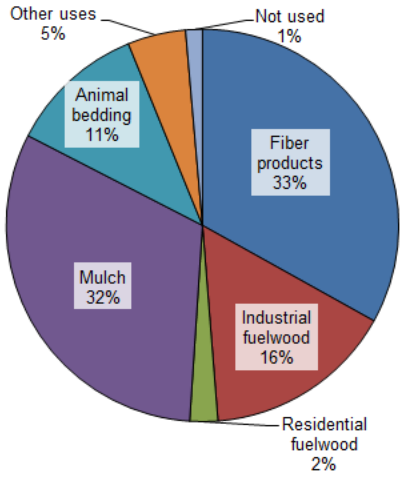

Figure 7.—Distribution of residues generated by primary wood-using mills by method of disposal, Indiana, 2013.

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