USDA
United States Department of Agriculture

RESOURCE UPDATE FS-77

# Forests of Iowa, 2015

This resource update provides an overview of forest resources in Iowa based on inventories conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Northern Research Station in cooperation with the Iowa Department of Natural Resources. Estimates are based on field data collected using the FIA annualized sample design and are updated yearly. For annual inventory years in Iowa 1999-2013, the cycle length was equal to 5 years. In 2014, NRS-FIA changed to a 7-year inventory cycle, wherein 1/7th (14.3 percent) of the plots will be measured annually until 2020.[1] This report includes inventory years 2010-2015 (2015) with comparisons made to 2006-2010 (2010). The current data consist of 626 field plots on forest land.

## Overview

Currently, Iowa is home to about 2.9 million acres of forest land. Forest land area has decreased by 3.4 percent (103,200 acres) since the previous inventory period (2010) (Table 1). The number of live trees on Iowa's forest land in 2015 was estimated at 1 billion trees, a decrease of 10 percent from 2010. Live tree aboveground biomass and net volume increased on both forest land and timberland.[2] Average annual net growth and annual other removals (e.g., land use change) decreased, while average annual mortality and harvest removals increased since 2010, on both forest land and timberland (Table 1).
(See footnotes on page 4.)

**Table 1.—Iowa forest statistics and change between 2010 and 2015.**

| | 2010 Estimate | Sampling error (percent) | 2015 Estimate | Sampling error (percent) | Change since 2010 (percent) |
|---|---|---|---|---|---|
| **Forest Land** | | | | | |
| Area (thousand acres) | 3,026.1 | 2.2 | 2,922.9 | 2.1 | -3.4 |
| Number of live trees ≥1 in (million trees) | 1,142.4 | 3.8 | 1,028.6 | 3.4 | -10.0 |
| Aboveground biomass of live trees ≥1 in (thousand oven-dry tons) | 119,006.0 | 3.3 | 123,221.2 | 3.2 | 3.5 |
| Net volume of live trees ≥5 in diameter (million $ft^3$) | 4,393.3 | 3.9 | 4,583.3 | 3.7 | 4.3 |
| Annual net growth live trees ≥5 in (thousand $ft^3$/yr) | 118,677.7 | 7.7 | 89,952.9 | 10.1 | -24.2 |
| Annual mortality of live trees ≥5 in (thousand $ft^3$/yr) | 70,230.4 | 8.1 | 96,114.6 | 8.9 | 36.9 |
| Annual harvest removals of live trees ≥5 in (thousand $ft^3$/yr) | 30,572.2 | 17.9 | 31,600.6 | 20.7 | 3.4 |
| Annual other removals of live trees ≥5 in (thousand $ft^3$/yr) | 25,240.5 | 33.1 | 8,669.5 | 26.3 | -65.7 |
| **Timberland** | | | | | |
| Area (thousand acres) | 2,891.4 | 2.3 | 2,803.9 | 2.3 | -3.0 |
| Number of live trees ≥1 in (million trees) | 1,096.9 | 4 | 986.0 | 3.7 | -10.1 |
| Aboveground biomass of live trees ≥1 in (thousand oven-dry tons) | 112,486.2 | 3.4 | 117,184.5 | 3.3 | 4.2 |
| Net volume of live trees ≥5 in diameter (million $ft^3$) | 4,130.9 | 4 | 4,340.3 | 3.7 | 5.1 |
| Net volume of growing-stock trees (million $ft^3$) | 2,963.5 | 4.9 | 3,061.0 | 4.5 | 3.3 |
| Annual net growth of growing-stock trees (thousand $ft^3$/yr) | 73,181.1 | 8.4 | 62,382.1 | 10.2 | -14.8 |
| Annual mortality of growing-stock trees (thousand $ft^3$/yr) | 42,512.7 | 10.4 | 52,468.1 | 11.3 | 23.4 |
| Annual harvest removals of growing-stock trees (thousand $ft^3$/yr) | 21,708.9 | 21.3 | 21,654.8 | 25.8 | -0.2 |
| Annual other removals of growing-stock trees (thousand $ft^3$/yr) | 18,683.8 | 40.8 | 3,897.7 | 36.2 | -79.1 |

# Forest Area

**Story County, Iowa, forest land. Photograph by Lisa Schulte-Moore, Iowa State University, used with permission.**

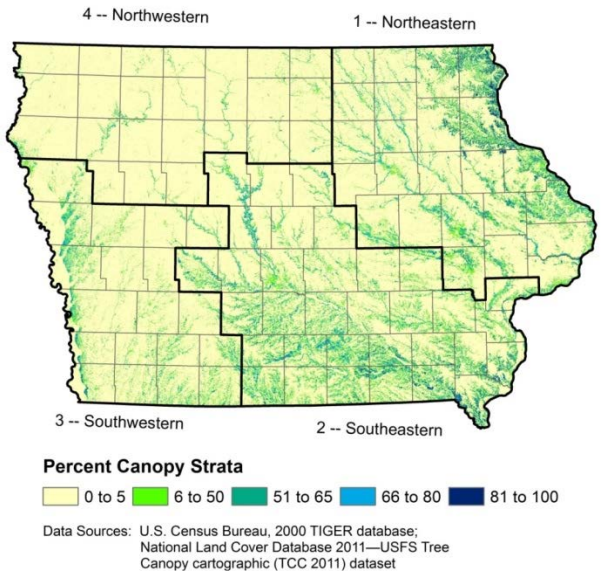


**Figure 1.—Forest land by canopy cover stratum and survey unit, Iowa.**

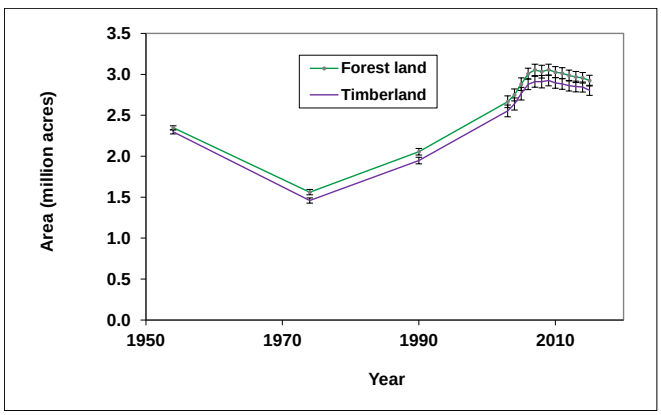


**Figure 2.—Area of timberland and forest land in Iowa, by year. Note: Sampling errors and error bars shown in the tables and figures in this report represent 68 percent confidence intervals for the estimated values.**

Iowa is divided into four survey units, with forest land area unevenly distributed among units: Northeastern (33 percent of statewide forest land area), Southeastern (49 percent), Southwestern (14 percent) and Northwestern (4 percent) (Fig. 1).

Area of Iowa forest land has remained relatively stable during recent years, but differs substantially from past decades (Table 1, Fig. 2). Historical forest land area exceeded 7 million acres during the mid 1800s (Thornton and Morgan 1959). Forest land area declined between the 1950s and 1970s, rebounded during the 1990s, and is now showing a slightly declining trend (Fig. 2).

The oak/hickory forest-type group occupies the largest proportion of timberland in Iowa at 1.91 million acres. The next most common forest-type groups are elm/ash/cottonwood at 641,000 acres, maple/birch at 90,000 acres, and oak/pine at 70,000 acres (Fig. 3). Most of Iowa's forests are in the large diameter stand-size class (73 percent); small diameter stand-size class dominates timberland acreage for other hardwoods, and all softwoods forest type-groups (Fig. 3).

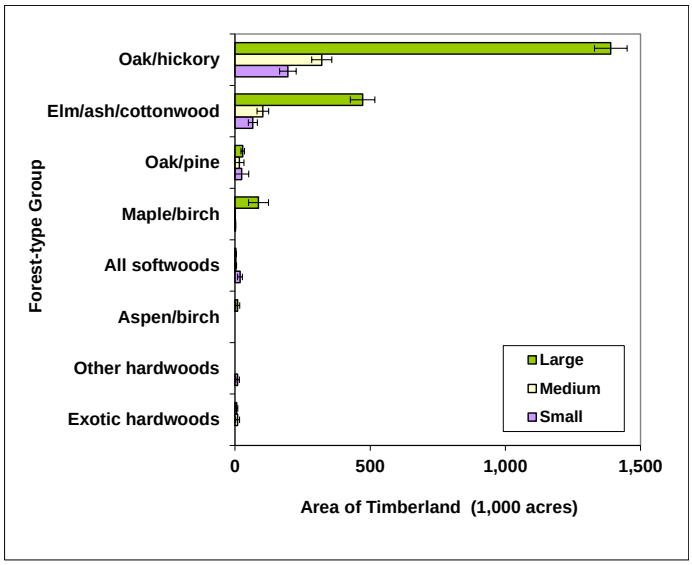


**Figure 3.—Area of timberland by forest-type group and stand-size class, Iowa, 2015. Note: Forest type definitions have changed and may not be directly comparable with published estimates from previous years. Composition of forest-type groups varies geographically. In Iowa, maple/beech/birch forest-type group is referred to as 'maple/birch' due to the absence of beech. Large diameter trees are at least 11.0 inches diameter for hardwoods and at least 9.0 inches diameter for softwoods. Medium diameter trees are at least 5.0 inches diameter but smaller than large diameter trees. Small diameter trees are less than 5.0 inches diameter. Additional details are available in U.S. Forest Service (2013).**

# Volume, Biomass, and Trends

FIA field crews recorded trees of 60 species on Iowa forest land in the 2015 inventory. More than one-third of Iowa's 1 billion trees are represented by just five species: American elm (*Ulmus americana*, 120 million), eastern hophornbeam (*Ostrya virginiana*, 90 million), hackberry (*Celtis occidentalis*, 76 million), shagbark hickory (*Carya ovata*, 48 million), and mulberry spp. (including red mulberry, *Morus rubra*, and white mulberry, *Morus alba*, 48 million).

None of these five most numerous species, however, make the top five list in terms of volume (Table 2). Three oak species together comprise over 1.1 billion cubic feet of Iowa's 4.6 billion cubic feet of live tree volume on forest land. The 10 most voluminous tree species comprise more than two-thirds of all cubic foot volume on forest land, and more than three-fourths of all sawtimber board foot volume on timberland, with five tree species each exceeding 1 billion board feet (Table 2). Eastern cottonwood (*Populus deltoides*) ranks first in board foot volume and fourth in cubic foot volume, but only twenty-eighth in terms of number of trees (11.5 million).

Total cubic foot volume on forest land increased by 4.3 percent and board foot volume on timberland increased by 6.0 percent since 2010, with gains and losses varying among individual species (Table 2). Iowa's growth, harvest removals (excluding 'other' removals), and mortality between 2010 and 2015 were 90, 31.6, and 96.1 million cubic feet on forest land and 62.4, 21.7, and 52.5 million cubic feet in growing-stock trees on timberland, respectively (Table 1). Individual species with the largest contributions to change were black walnut (*Juglans nigra*) (17 percent of growth), silver maple (*Acer saccharinum*) (21 percent of removals), and American elm (19 percent of mortality).

Iowa currently has more than 123 million tons of aboveground tree biomass on forest land, 84 percent of which is on private land (Fig. 4). Growing-stock biomass is nearly three times larger than non-growing-stock biomass. About 73 percent of biomass is contained in the boles of trees; the remaining 27 percent is distributed among stumps, tops, limbs, and in trees smaller than 5 inches diameter at breast height (d.b.h.) (Fig. 4). Biomass trends are similar to volume, with biomass increasing since 2010 by 3.5 percent on forest land, and 4.2 percent on timberland (Table 1).

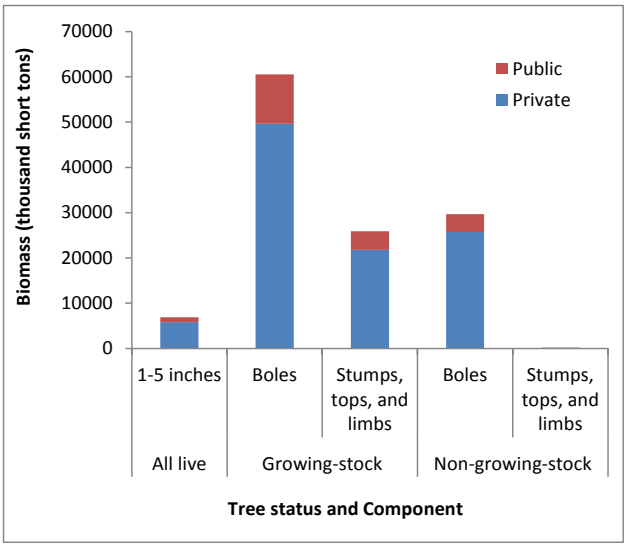


**Figure 4.—Aboveground dry weight of live trees (at least 1 inch d.b.h./d.r.c.), in thousand dry short tons, on forest land by owner category and tree component, Iowa, 2015.**

**Table 2.—Top tree species by statewide volume estimates on forest land and timberland, Iowa, 2015.**

| Rank | Species | Volume of live trees on forest land (1,000,000 $ft^3$) | Sampling error (%) | Change since 2010 (%) | Volume of sawtimber trees on timberland (1,000,000 board feet) | Sampling error (%) | Change since 2010 (%) |
|---|---|---|---|---|---|---|---|
| 1 | Bur oak | 489.4 | 11.0 | 6.5 | 1,068.2 | 13.3 | 4.7 |
| 2 | Silver maple | 464.4 | 18.0 | -5.3 | 922.5 | 20.2 | -6.9 |
| 3 | White oak | 368.5 | 13.2 | 2.1 | 1,266.1 | 14.6 | 5.6 |
| 4 | Cottonwood | 335.3 | 25.5 | -7.2 | 1,373.5 | 25.6 | -3.5 |
| 5 | Black walnut | 322.4 | 11.0 | 8.7 | 1,024.1 | 14.0 | 7.6 |
| 6 | Northern red oak | 293.8 | 13.7 | 3.9 | 1,139.9 | 15.4 | 3.4 |
| 7 | Hackberry | 246.8 | 12.4 | 19.4 | 653.2 | 15.7 | 23.4 |
| 8 | American basswood | 240.2 | 14.0 | 19.6 | 817.0 | 16.9 | 31.8 |
| 9 | Shagbark hickory | 195.5 | 7.6 | -6.4 | 251.2 | 14.7 | -5.8 |
| 10 | American elm | 195.1 | 11.3 | 14.6 | 523.5 | 15.2 | 14.5 |
| | Other softwood species | 59.5 | 14.1 | 4.2 | 41.9 | 42.0 | -33.8 |
| | Other hardwood species | 1,372.6 | 4.7 | 5.8 | 2,637.2 | 7.7 | 8.4 |
| | **All species** | **4,583.3** | **3.7** | **4.3** | **11,718.4** | **5.1** | **6.0** |

# Trees Outside Forests

Photograph by Linda Haugen, U.S. Forest Service.

Trees in Iowa occur in many different arrangements: single scattered trees, riparian buffers, linear plantings, woodlots, urban trees, and large forested areas. FIA measures only those trees that meet their definition of forest land. More data are needed for describing trees outside of forests (TOF), such as those in agroforestry practices. The GIS Section of the Iowa Department of Natural Resources utilized aerial imagery from the National Agriculture Imagery Program (NAIP) and LiDAR-derived elevation data to produce a 15-class high-resolution (1-meter) land cover dataset (HRLCD) for the entire state. To better understand the distribution of nonforest tree resources in Iowa, we compared estimates of tree cover obtained from the HRLCD with estimates of forest land area reported by FIA.

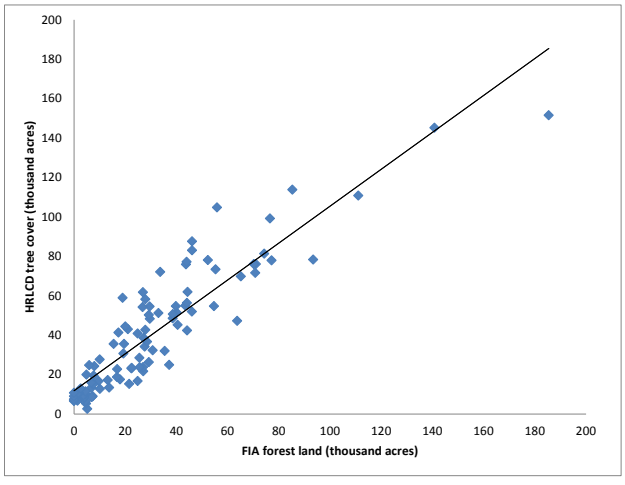


**Figure 5.—Relationship between Iowa per-county estimates of FIA forest land area (2009) and HRLCD tree cover area (IA DNR:** https://programs.iowadnr.gov/nrgislibx/).

Compared with FIA's 2009 estimate of 3.055 million acres of forest land area, HRLCD estimated 4.036 million acres of tree cover. Some counties were estimated to have no forest land by FIA, but do contain areas of tree cover according to HRLCD (Fig. 5). Additional studies are being conducted to better understand TOF and urban tree cover in Iowa.

## Additional Inventory Information

**Metadata**

Information published in this report and in related tables is based on Forest Inventory and Analysis database (FIADB), accessed in December 2015. Data were collected under field guides 4.0 to 6.02, compiled in National Information Management System (NIMS) version 6.0, installed on November 15, 2012. Due to occasional changes to NIMS and FIADB, trend analyses should be made using FIA's online estimation tools, not by comparing published reports or tables. FIA estimates, tabular data, and maps may be generated at http://fiatools.fs.fed.us. See Bechtold and Patterson (2005) and O'Connell et al. (2014) for definitions and technical details.

**Footnotes**

[1]See Nelson et al. (2015) for additional details.

[2]Timberland is defined as forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment and excludes reserved forest lands.

## References

Bechtold, W.A.; Patterson, P.L., eds. 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.

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O'Connell, B.M.; LaPoint, E.B.; Turner, J.A.; Ridley, T.; Pugh, S.A.; et al. 2014. **The Forest Inventory and Analysis Database: Database description and user guide version 6.0.1 for Phase 2**. Washington, DC: U.S. Department of Agriculture, Forest Service. 748 p. http://www.fia.fs.fed.us/library/database-documentation/.

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Contact Information

Mark D. Nelson, Research Forester
USDA Forest Service, Northern Research Station
1992 Folwell Ave.
St. Paul, MN 55108
Ph: 651-649-5104 / Fax: 651-649-5140
mdnelson@fs.fed.us
Northern FIA: http://nrs.fs.fed.us/fia/
National FIA: http://fia.fs.fed.us



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