United States Department of Agriculture

RESOURCE UPDATE FS-177

# FORESTS OF Oklahoma, 2016

This resource update provides an overview of the forest resources of Oklahoma based on an inventory conducted by the U.S. Forest Service, Forest Inventory and Analysis (FIA) program at the Southern Research Station (SRS), and Oklahoma Forestry Services (OFS). Data collection and estimates are based on the FIA annualized sample design, and are updated yearly, creating a moving average. The 2016 resource update highlights how the moving average has been updated since the 2015 report (Dooley, 2017). The data used in this publication were accessed from the FIA Database between May 1 and June 15, 2018.

## Overview

Oklahoma's 77 counties are divided into seven survey units (fig. 1): Southeast (unit 1), Northeast (unit 2), North Central (unit 3), South Central (unit 4), Southwest (unit 5), High Plains (unit 6), and Great Plains (unit 7). Units 1 and 2 make up East Oklahoma, while West Oklahoma comprises units 3 through 7. West Oklahoma was not surveyed by FIA until 2009. West Oklahoma is on a 10-year cycle and 2016 marks 80 percent of the cycle complete. For West Oklahoma, 2015 estimates comprise inventory years 2009-2015, and estimates for 2016 are based on inventory years 2009-2016. Eastern Oklahoma is on a 5-year cycle, and has 8 previous complete measurement cycles, the first taking place in 1936. For East Oklahoma, 2015 estimates comprise years 2011-2015, and 2016 estimates comprise years 2012-2016 (table 1).

Oklahoma was allocated 6,307 plots, of which 6,091 were sampled, 4,443 field sampled. Estimates of current data, such as area of forest land or standing volumes, are derived from these plots. Estimates on change variables such as growth, mortality, and removals are based on a subset of 1,709 plots which were remeasured. Until West Oklahoma completes a cycle and begins remeasurement, all of the growth, mortality, and removal data are from East Oklahoma.

**Table 1 – Oklahoma forest statistics, change between 2015 and 2016**

| Forest statistics | 2015 estimate | Sampling error (percent) | 2016 estimate | Sampling error (percent) | Change since 2015 |
|---|---|---|---|---|---|
| **Forest land** | | | | | |
| Area (*thousand acres*) | 12,284.18 | 1.244 | 12,158.89 | 1.181 | -125.29 |
| Number of live trees ≥1 inch d.b.h. (*million trees*) | 5,469.34 | 2.091 | 5,532.21 | 2.049 | 62.86 |
| Net volume live trees ≥5 inches d.b.h. (*million cubic feet*) | 9,632.09 | 1.966 | 9,752.23 | 1.912 | 120.14 |
| Live trees aboveground biomass (*thousand oven-dry tons*) | 281,634.26 | 1.655 | 284,746.00 | 1.601 | 3,111.74 |
| Net growth live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 131.973 | 7.563 | 139.888 | 7.453 | 7.91 |
| Annual removals of live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 102.315 | 13.151 | 95.875 | 12.551 | -6.44 |
| Annual mortality of live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 99.066 | 5.755 | 99.611 | 5.504 | 0.55 |
| **Timberland** | | | | | |
| Area (*thousand acres*) | 6,949.11 | 1.901 | 6,888.23 | 1.852 | -60.88 |
| Number of live trees ≥1 inch d.b.h (*million trees*) | 3,585.22 | 2.871 | 3,607.16 | 2.846 | 21.94 |
| Net volume live trees ≥5 inches d.b.h. (*million cubic feet*) | 7,187.74 | 2.755 | 7,265.24 | 2.696 | 77.5 |
| Live trees aboveground biomass (*thousand oven-dry tons*) | 203,709.52 | 2.478 | 205,240.55 | 2.418 | 1,531.02 |
| Net growth live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 139.895 | 7.324 | 149.194 | 7.203 | 9.3 |
| Annual removals of live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 116.807 | 11.846 | 110.769 | 11.303 | -6.04 |
| Annual mortality of live trees ≥5 inches d.b.h. (*million cubic feet per year*)[a] | 87.575 | 6.345 | 87.513 | 6.178 | -0.06 |

[a] Net annual growth, removals, and mortality based on units 1 and 2 only.

Forest Service | October 2018

# Forest Area

In the Oklahoma 2016 FIA survey, an estimated 12.2 million acres of land was forested, 27 percent of total area. Land that can produce at least 20 cubic feet of wood per acre per year, and which is not prohibited from timber extraction by law or statute is called timberland. In Oklahoma, 6.9 million acres of the forest land qualified as timberland. The 5.3 million acres of other forest land are not prime for timber extraction, but provide wildlife habitat, recreation opportunities, and ecosystem diversity. The remaining 32.6 million acres of Oklahoma area was water or nonforest land. Though the overall percent of forest land was 27, it was not uniformly distributed across the State. In Unit 1 (Southeast) more than 60 percent of the area is forest land, more than 50 percent being timberland, while 98 percent of unit 6 (High Plains) is nonforest (fig. 2).

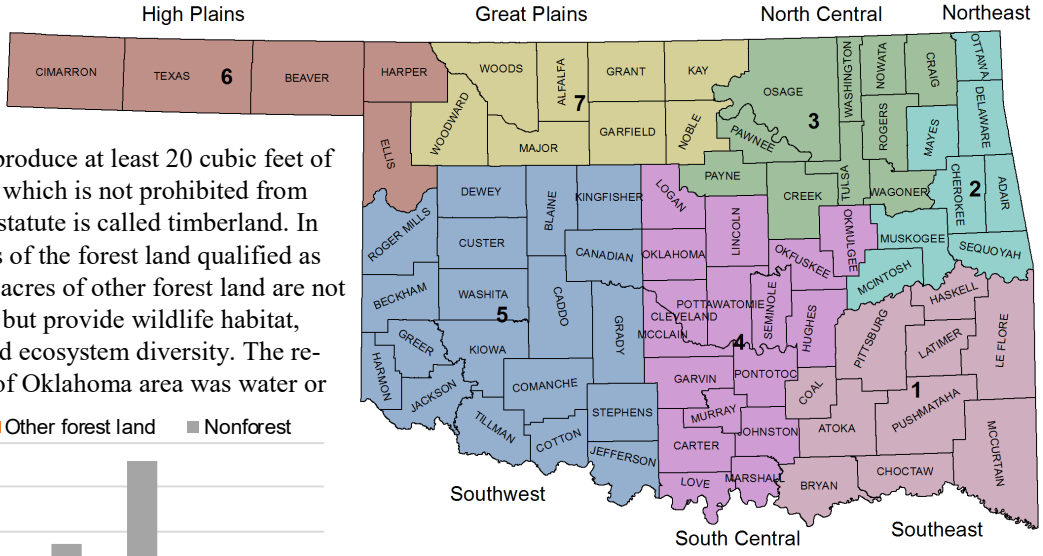



Figure 1—Counties and FIA survey units in Oklahoma.

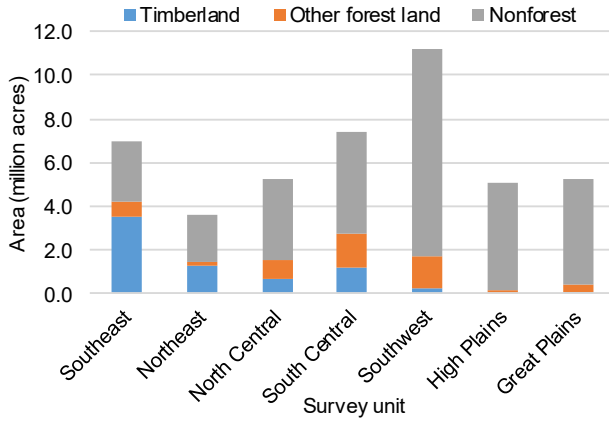



Figure 2—Area of timberland, forest land, and nonforest land by survey unit, Oklahoma, 2016. Total area 44.7 million acres.

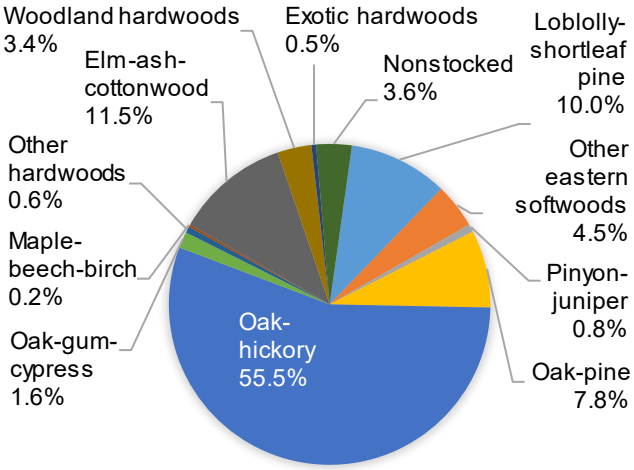



Figure 3—Proportion of forest land by forest-type group, Oklahoma, 2016. Total area 12.2 million acres.

Of the lands that are forested, oak-hickory forest-types accounted for more than half of the area (fig. 3). Timberlands had close to the same proportions by forest-type group, with the exception of loblolly-shortleaf pine, which accounts for 17 percent of timberland area.

Most of the forest land in Oklahoma is naturally regenerated, with only 6 percent being planted (11 percent of timberlands). But, this is not uniform across forest-types. Most of the forest-type groups have no artificially regenerated stands, while loblolly-shortleaf pine is in planted stands 51 percent of the time (54 percent on timberlands).

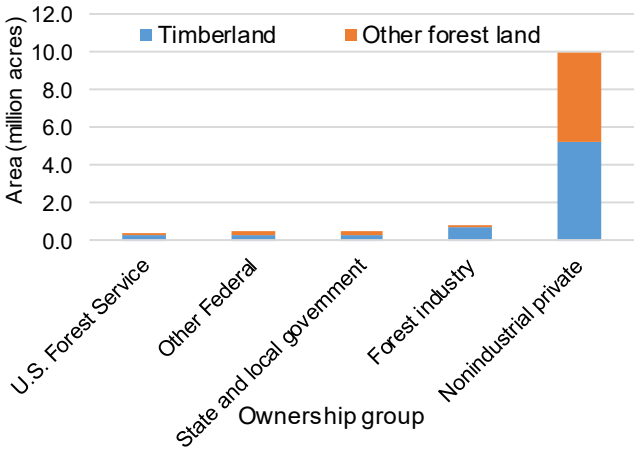



Figure 4—Timberland and forest land area by ownership group, Oklahoma, 2016. Total area 12.2 million acres.

Nonindustrial private owners, which include all nongovernmental groups, individuals, or corporations which do not operate a primary wood processing plant, own the vast majority (88 percent) of forest land in Oklahoma (fig. 4). About half (53 percent) of the forest land owned by nonindustrial private landowners is timberland. Similar proportions are seen in State and local government owned forest land (50 percent timberland) and other federal (59 percent timberland). Conversely, the vast majority of forest lands owned by U.S. Forest Service, and forest industry are timberland (85 and 99 percent respectively).

# Volume, Biomass, and Trends

Table 2—Number of live trees ≥1.0 inch diameter on forest land, Oklahoma, 2016.

| Species | Million trees |
|---|---|
| Post oak | 759.96 |
| Winged elm | 604.60 |
| Eastern redcedar | 494.38 |
| Blackjack oak | 369.60 |
| Shortleaf pine | 325.26 |
| Loblolly pine | 305.46 |
| Black hickory | 216.61 |
| American elm | 200.94 |
| Mockernut hickory | 141.26 |
| Sugarberry | 127.07 |
| All others | 1,987.05 |
| Total | 5,532.21 |

Table 3—Net merchantable volume of live trees ≥5.0 inches diameter on forest land, Oklahoma, 2016.

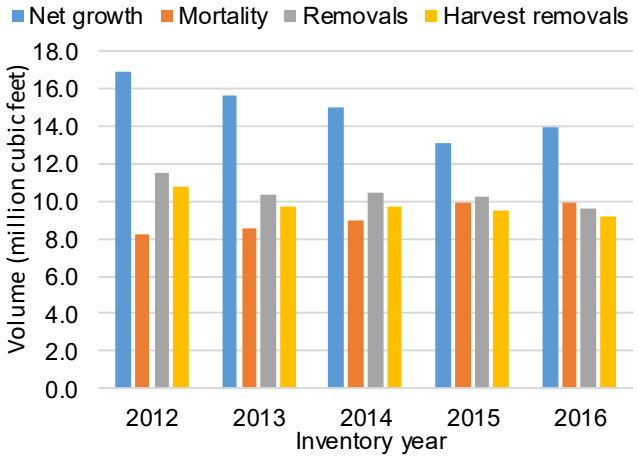
| Species | Million cubic feet |
|---|---|
| Post oak | 2,142.06 |
| Shortleaf pine | 1,154.02 |
| Loblolly pine | 845.35 |
| Black oak | 481.59 |
| Eastern redcedar | 430.50 |
| Pecan | 354.61 |
| White oak | 315.90 |
| American elm | 305.20 |
| Blackjack oak | 266.91 |
| Green ash | 240.31 |
| All others | 3,215.79 |
| Total | 9,752.23 |

Table 4—Aboveground, dry biomass of live trees ≥1.0 inch diameter on forest land, Oklahoma, 2016.

| Species | Million short tons |
|---|---|
| Post oak | 69.43 |
| Shortleaf pine | 24.78 |
| Loblolly pine | 18.45 |
| Black oak | 13.98 |
| Blackjack oak | 11.70 |
| Eastern redcedar | 10.67 |
| Pecan | 10.52 |
| White oak | 9.38 |
| Winged elm | 9.31 |
| Black hickory | 9.18 |
| All others | 97.36 |
| Total | 284.75 |

Including unknowns collected to the genus level, 95 species of trees were recorded on Oklahoma forest land during the 2016 survey, 19 more than in 2015. Post oak, winged elm, and eastern redcedar were the most common species by number of live trees (table 2). Most of the 95 species are relatively uncommon. The three most common species account for more than a third of the total tree count, and the 10 most frequent species accounting for nearly two-thirds. Nine of the 10 most common species were also most common on timberland (green ash replaced sugarberry on timberland) though ranking within the top 10 was different.

Oklahoma forest lands contained a net live volume of 9.8 billion cubic feet (table 3). As with number of trees, post oak was the top contributor, accounting for 22 percent of the volume. In this category, shortleaf and loblolly pines ranked next.




Average annual volume changes on forest land, East Oklahoma, 2012-2016.

Close to 285 million short tons of oven-dry biomass were present in the aboveground portion of trees on forest land in Oklahoma (table 4). Biomass is closely related to volume, so it is no surprise that the top four contributing species were the same for volume and biomass, and eight of the top 10 species by volume were also in the top 10 biomass contributors.

In units 1 and 2 where data from previous years is available, change components (growth, mortality, and removals) can be evaluated in addition to current volumes. After years of decline, the average annual net growth volume increased in 2016 (fig. 5). At 13.9 million cubic feet, it is still well below the 21.6 million cubic feet in 2010, but it is promising. Average annual mortality is still increasing, but at a much reduced rate. Compared with 2015 the average annual mortality on forest land in 2016 increased by about 0.05 million cubic feet, the increase between 2014 and 2015 was 0.97 million cubic feet, nearly 20 times the increase seen this year. This is a good sign, but continued monitoring of this volume is important, as at 9.96 million cubic feet, the average annual mortality of 2016 is still 1.73 million cubic feet greater than the 2011 level of 8.24 million cubic feet (fig. 5).

Removal volume can include trees taken out of the land-use category sample (e.g., land changing from timberland to other forest or from forest to nonforest) as well as harvest removals for timber use. The harvested removals can be summarized separately. Total removals were about 9.6 average annual million cubic feet. Average annual harvest removals for forest land were 9.2 million cubic feet. Since 2012, total removal volume and harvest removal volume have both reduced; 2.0 and 1.5 average annual million cubic feet, respectively.

# Forest Fires

FIA field crews collect "fire disturbance" data on all accessed forested plots. The data is collected at the stand level, and includes ground and crown fires, prescribed or wild. Though the term disturbance is used, it is important to note that the fires do not have to be damaging. To be considered disturbed, at least 25 percent of the area must be affected by fire—which can include reduced undergrowth, charring on trees, ash/char on the soil surface, etc. For remeasured plots—those which were part of earlier inventories—crews will record evidence of fire since the last field visit. For plots being measured for the first time—such as the plots in central and western Oklahoma—crews will record fires that occurred in the previous five years.

The total estimated acres disturbed by fires across the entire timeframe is 1.1 million, or about 9 percent of forest land. This works out to an average of 114,000 acres annually.

Although dividing the data into sub-categories will generally increase sampling error rates, it can still be enlightening to look at the data filtered this way. More than 40 percent of the estimated acres were located in the Southeast survey unit (fig. 6). As Oklahoma has a variety of ecosystems and land uses, it is important to note that this data is only collected on forest land . Because the units vary in amount of forest land acres, it is also useful to compare the proportion of forest land affected by fire. Using this evaluation, the North Central unit shows the greatest amount of fire disturbance evidence (fig. 6).

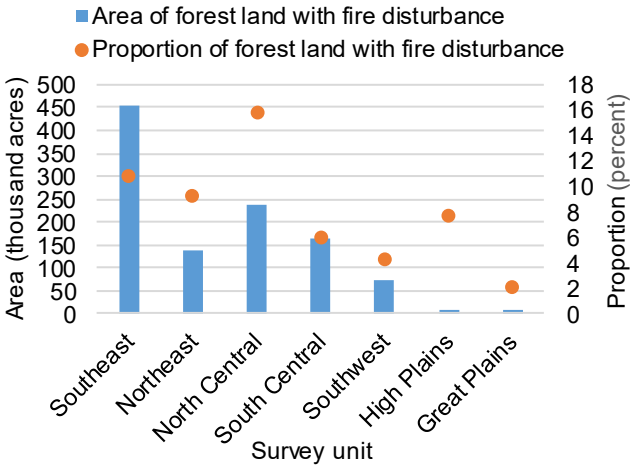



Figure 6—Prevalance of fire disturbance by survey unit, in total area and as proportion of forest land.

In addition to location, we can compare fire occurrences by forest types. In Oklahoma, the oak-hickory forest type group is by far the most common; therefore, it is not surprising that it had the most acres with fire evidence as well (fig.7).

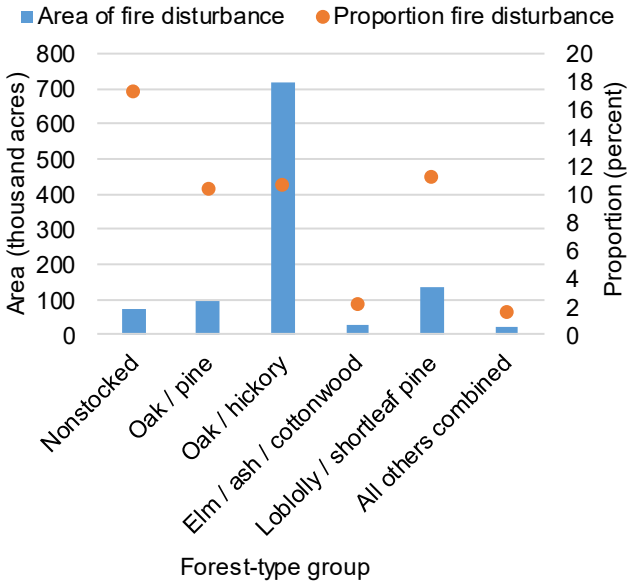



Figure 7—Prevalance of fire disturbance by forest-type group, in total area and as a proportion of forest land.

Nonstocked forest land was proportionally highest. Nonstocked means land that does not currently have 10 percent tree cover or 40 seedlings per acre, but which is staying in forest use—for example land that is surveyed post-harvest but before replanting.

# Literature Cited

Dooley, Kerry. 2017. Forests of Oklahoma, 2015. Resource Update FS–126. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 4 p.

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