USDA
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RESOURCE UPDATE FS-126

FORESTS OF Oklahoma, 2015

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. In contrast to FIA Resource Bulletins, which reflect comparisons between complete samples, the 2015 resource update highlights how the moving average has been updated since the 2014 report (Lambert and others 2015). The data used in this publication were accessed from the FIA Database on April 3, 2017.

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 (fig. 1). Historical inventory emphasis was focused on productive timberlands. West Oklahoma was not surveyed by FIA until 2009 as the scope broadened to include other forest benefits. West Oklahoma is on a 10-year cycle and 2015 marks 70 percent of the cycle complete. For West Oklahoma, 2014 estimates comprise inventory years 2009-2014, and estimates for 2015 are based on inventory years 2009-2015. Eastern Oklahoma is on a 5-year cycle, and has been part of the historical FIA survey area having 7 previous complete measurement cycles, the first taking place in 1936. For East Oklahoma, 2014 estimates comprise years 2010-2014, and 2015 estimates comprise years 2011-2015. Growth, removal, and mortality data presented only reflect East Oklahoma (table 1).

Oklahoma was allocated 5,700 plots, of which 5,529 were sampled. Reported estimates on current values such as area and volume are based on these 5,529 plots. Estimates on change variables such as growth, mortality, and removals are based on the 1,716 plots which were remeasured in East Oklahoma.

Table 1 – Oklahoma forest statistics, change between 2014 and 2015

Forest statistics	2014 estimate	Sampling error (percent)	2015 estimate	Sampling error (percent)	Change since 2014
Forest land					
Area *(thousand acres)*	12,273.93	1.335	12,284.18	1.244	10.25
Number of live trees ≥1.0 inch d.b.h. *(million trees)*	5,393.28	2.218	5,469.34	2.091	76.06
Net volume of live trees ≥5.0 inches d.b.h. *(million cubic feet)*	9,472.16	2.015	9,632.09	1.966	159.93
Live tree aboveground biomass *(thousand oven-dry tons)*	277,456.26	1.688	281,634.26	1.655	4,178.00
Net annual growth of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	149.94	7.09	131.15	7.61	-18.79
Annual removals of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	104.98	13.823	102.315	13.151	-2.67
Annual mortality of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	89.33	6.818	99.07	5.755	9.74
Timberland					
Area *(thousand acres)*	7,025.32	1.97	6,949.11	1.901	-76.22
Number of live trees ≥1.0 inch d.b.h. *(million trees)*	3,583.87	2.964	3,585.22	2.871	1.35
Net volume of live trees ≥5.0 inches d.b.h. *(million cubic feet)*	7,156.13	2.78	7,187.74	2.755	31.61
Live tree aboveground biomass *(thousand oven-dry tons)*	203,613.03	2.504	203,709.52	2.478	96.5
Net annual growth of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	148.74	7.13	139.90	7.324	-8.84
Annual removals of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	122.91	12.271	116.81	11.846	-6.11
Annual mortality of live trees ≥5.0 inches d.b.h. *(million cubic feet per year)*[a]	79.08	7.445	87.58	6.345	8.49

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

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Forest Area

In the Oklahoma 2015 FIA survey, an estimated 12.3 million acres of land was forested. Land that is 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 deemed timberland. In Oklahoma, 7.1 million acres of the forest land qualified as timberland. The 5.2 million acres of other forest land are not prime for timber extraction, but provide wildlife habitat, recreation opportunities, and ecosystem diversity. The remaining 32.5 million acres of Oklahoma area was water or nonforest land. These proportions were far from uniform across the State; in the Southeast unit, over half the total area was timberland, while the High Plains was 98 percent nonforest (fig. 2).

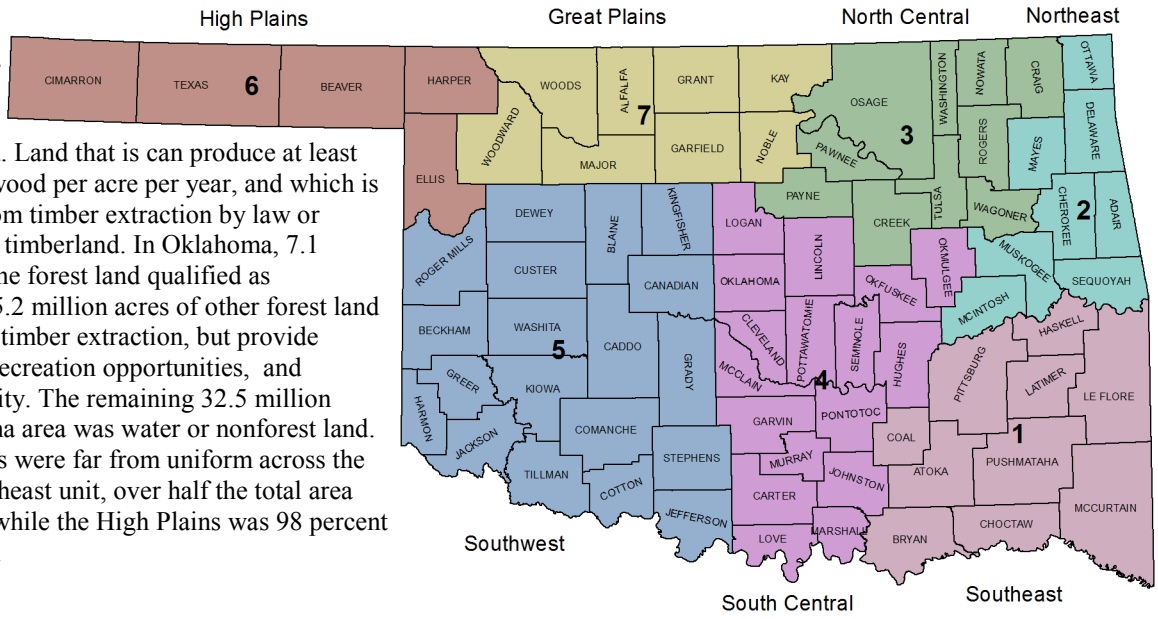


Figure 1— Counties and FIA survey units in Oklahoma.

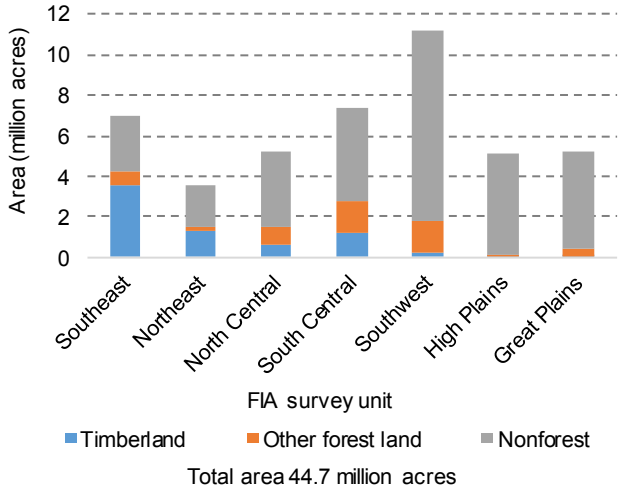


Figure 2—Land use proportions by survey unit, Oklahoma, 2015.

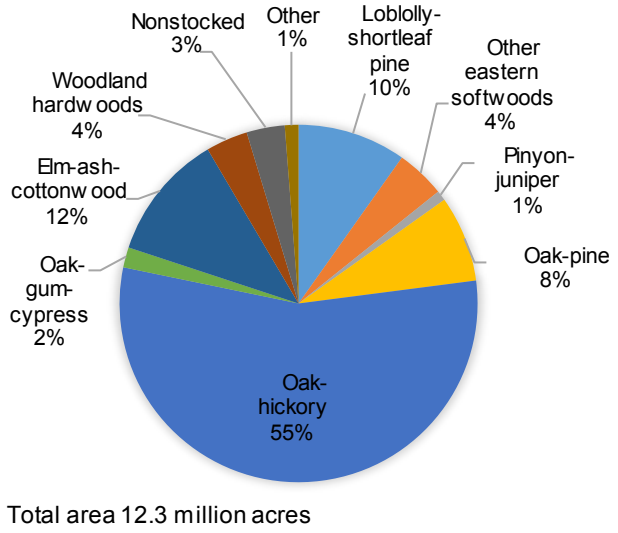


Figure 3—Forest land area by forest-type group, Oklahoma, 2015.

Of the lands that are forested, oak-hickory forest-types accounted for more than half of the area (fig. 3). Ninety-four percent of all Oklahoma's forest land is naturally regenerated. However, 50 percent of the loblolly-shortleaf pine group is artificially regenerated.

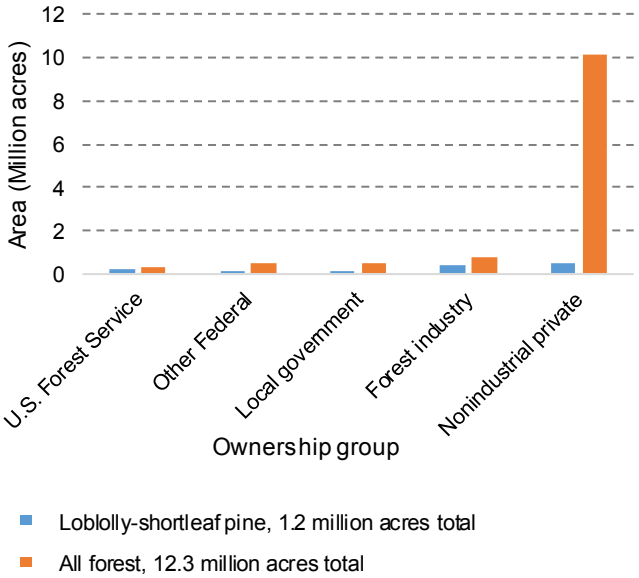


Figure 4—Loblolly-shortleaf pine and total forest area by ownership group, Oklahoma, 2015.

Nonindustrial private owners, which include all non-governmental groups, individuals, or corporations which do not operate a primary wood processing plant, own the vast majority (83 percent) of forest land in Oklahoma (fig. 4). Sorting by forest-type group, loblolly-shortleaf pine was again the exception, with non-industrial private owners only owning 40 percent of those acres (fig. 4).

Volume, Biomass, and Trends

Table 2—Number of live trees ≥1.0 inch diameter (top 10 species) on forest land, Oklahoma, 2015.

Species	Million trees
Post oak	756.79
Winged elm	573.41
Eastern redcedar	484.83
Blackjack oak	367.83
Shortleaf pine	316.52
Loblolly pine	279.48
Black hickory	219.81
American elm	191.11
Mockernut hickory	146.65
Black oak	118.04
All others	2,014.87
Total	5,469.34

Table 3—Volume of live trees ≥5.0 inches diameter (top 10 species) on forest land, Oklahoma, 2015.

Species	Million cubic feet
Post oak	2,097.65
Shortleaf pine	1,151.62
Loblolly pine	819.94
Black oak	501.75
Eastern redcedar	408.28
Pecan	362.23
White oak	311.87
American elm	300.75
Blackjack oak	272.72
Black hickory	245.36
All others	3,159.92
Total	9,632.09

Table 4—Aboveground biomass of live trees ≥1.0 inch diameter (top 10 species) on forest land, Oklahoma, 2015.

Species	Million short tons
Post oak	68.13
Shortleaf pine	24.71
Loblolly pine	17.92
Black oak	14.50
Blackjack oak	11.78
Pecan	10.72
Eastern redcedar	10.22
Black hickory	9.47
White oak	9.27
Winged elm	8.42
All others	96.50
Total	281.63

Seventy-six species (including unknowns collected to the genus level) of trees were recorded on Oklahoma forest land during the 2015 survey. Post oak, winged elm, and eastern redcedar were the most common species by number of live trees (table 2). And though the exact order differed, the same 10 species were predominant for timberland.

Oklahoma forest lands contained a net live volume of 9.6 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. Eight of these species were also in the top 10 on timberland, along with green ash and Shumard oak, which supplanted eastern redcedar and blackjack oak.

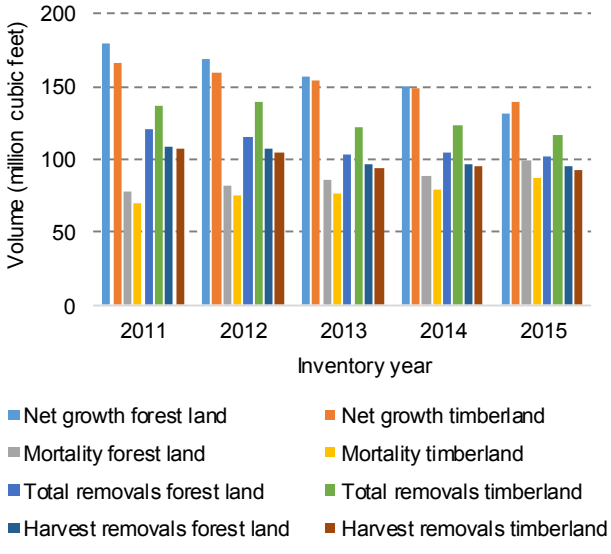


Figure 5—Average annual volume changes on forest land and timberland, east Oklahoma 2011-15.

Close to 282 million short tons of oven-dry biomass were present in the aboveground portion of trees on forest land in Oklahoma (table 3). Biomass is closely related to volume, so it is no surprise that the top four contributing species were the same for volume and biomass. Again, many of the top contributors for timberland were the same as for forest land. Green ash and American elm were added to the list, with blackjack oak and eastern redcedar removed from the top 10 for timberland.

In addition to looking at current volumes, in units 1 and 2 where data from previous years is available, change components (growth, mortality, and removals) can be evaluated.

The average annual net growth has declined each year since 2011 for both timberland and total forest land (fig. 5). This reduction is less pronounced on timberland than total forest land. The reduction is attributed to both a reduction in gross growth, and to an increase in mortality. Compared with 2011, the average annual mortality in 2015 increased by about 17 million cubic feet on timberland; on all forest land it increased about 21 million cubic feet, for a total mortality volume of 99 million cubic feet, an increase of about 26 percent (fig. 5). In the following section (page 4), there is more discussion on mortality and forest health.

Removal volume can include trees taken out of the land-use category sample (i.e., land changing from timberland to forest or from forest to nonforest) as well as harvest removals for timber use. Average annual harvest removals for timberland were 93 million cubic feet, and for all forest land, the average was 95 million cubic feet. For both categories, this is a reduction of 14 million cubic feet as compared to the 2011 average annual harvest removal volume.

Oak Mortality

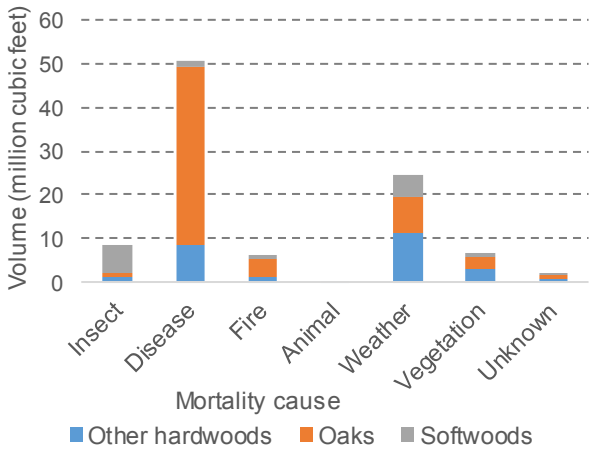
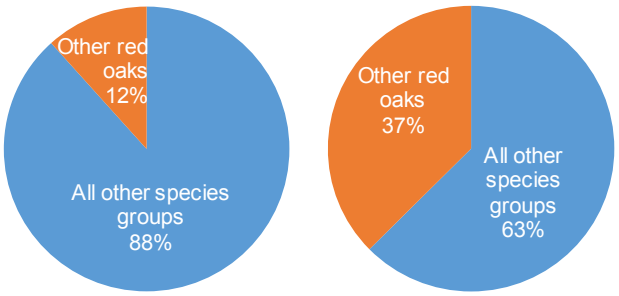


Figure 6 —Average annual mortality volume by cause and major species group, Oklahoma, 2015

The 2015 inventory year shows an average annual volume loss to mortality of approximately 99.1 million cubic feet on all forest land in east Oklahoma (fig. 5). More than half of this mortality (50.7 million cubic feet) was attributed to disease, and almost another quarter (24.5 million cubic feet) attributed to weather (fig. 6).

By species, the mortality volume comes mostly from oaks, which account for 56.8 million cubic feet of the volume loss, or 57 percent of the total. The species group "other red oaks" was hit particularly hard. This species group accounts for about 12 percent of the total live volume but for 37 percent of the mortality volume (fig. 7). As with the overall tree mortality, the majority of oak species' mortality volume was caused by disease followed by weather (fig. 6).

Though it is common for multiple factors to contribute to a tree's decline and death, FIA crews are not able to select more than one cause of death. Instead they must select the one cause they believe is most directly responsible for a tree's death. A review of the crew notes on species from the species group "other red oaks" with disease cited as the cause of death revealed that the crews often did observe multiple factors leading to tree mortality. In addition, these notes showed Hypoxylon canker was frequently the suspected disease; no other specific disease was cited as a mortality cause for these trees. The fungus that causes Hypoxylon canker may be present in wood and bark for a long time, and trees may not exhibit symptoms or decline until an additional factor comes into play (Olson 2013). It is quite likely that the trees in the "other red oaks" species group which ultimately succumbed to disease, were also affected by other stressors. Surveys in the coming years will help shed light on whether the heavy oak mortality was a short term event or is a continuing trend.



(A)Total live volume 9.6 billion cubic feet.

(B)Total mortality volume 99.1 million cubic feet

Figure 7—Proportion of "other red oaks" to live (A), and mortality (B) volume in east Okalhoma, 2015.

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Olson, J. 2013. Biscogniauxia (Hypoxylon) Canker and Dieback of Trees. Oklahoma Cooperative Extension Fact Sheet EPP-7620. http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Version-14257/EPP-7620-13.pdf. [Date accessed May 23, 2017].

How to Cite This Publication
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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