Forest Nursery Seedling Production in the United States—Fiscal Year 2023

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Abstract

Forest nurseries produced more than 1.27 billion tree seedlings for the 2023 planting season, including more than 38 million container seedlings imported from Canada. Approximately 68 percent of seedlings were produced as bareroot stock. Over 96 percent of the total stock grown was conifer seedlings; only a small portion (3.5 percent) of seedlings were hardwood species. Based on this total number of seedlings and estimated planting densities in each State, more than 3.7 million ac (1.5 million ha) were planted. Approximately 80 percent of production and planting occurred in the Southern States, while 14 and 6 percent were planted in the Western and Eastern States, respectively. In 2023, number of tree seedlings planted decreased in the Western and Southern States and increased in the Eastern States compared with the previous year. This decline is likely attributable to a lower-than-normal response rate to the annual data request.

Background

This annual report summarizes forest nursery seedling production in the United States, which serves as an estimate of the number of acres of forest planted per year. Prepared by the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) and State, Private, and Tribal Forestry, this report includes State-by-State breakdowns, regional totals, and an analysis of data trends. Support for the production of this annual report is part of FIA's mandate, as per Congress, to report on the status and trend of the Nation's forest resources.

Universities in the southern, eastern, and western regions of the United States attempted to collect data from all the major producers of forest and conservation seedlings in the 50 States. Forest and conservation nursery managers provided the information presented in this report. Because all data are provided voluntarily by outside sources and some data are estimated, caution must be used in drawing inferences.

Methodology

The Forest Service's State, Private, and Tribal Forestry Deputy Area, in collaboration with Auburn University, the University of Idaho, and Purdue University, produced the data for this report. These universities collected forest tree seedling production data directly from the forest and conservation nurseries that grow forest tree seedlings in their region of the United States (Auburn University collected from 12 States in the Southeast, the University of Idaho collected from 17 States in the West, and Purdue University collected from 21 States in the Northeast and Midwest). The estimate of planted acres for each State was calculated using FIA estimates of planting densities for the associated measurement cycle. FIA average annual estimates of trees planted are derived from permanent field plots, situated across the United States, that are sampled on a 5-, 7-, or 10-year remeasurement cycle by State.

FIA estimates of acres of trees planted by State may not correlate with those derived by nursery production surveys because FIA estimates are calculated across the measurement cycle. In addition, domestic nurseries are not asked to report shipments of seedlings across State lines; seedlings produced at that nursery are reported for planting in the State where the nursery is located. Total acres by region, however, provide a reasonable estimate for planted acreage. Data collected are reported for both hardwood and conifer species by bareroot and container seedlings produced (table 1) and by estimated acreage planted of each (table 2).

Table 1. Hardwood and conifer seedling production for each State and each region during the fiscal year 2023 planting year

State	Hardwood bareroot seedlings produced	Hardwood container seedlings produced	Total hardwood seedlings produced	Conifer bareroot seedlings produced	Conifer container seedlings produced	Conifer container seedlings imported	Total conifer seedlings produced	Total seedlings produced
Southeast								
Florida	1,111,000	60,000	1,171,000	40,349,000	1,121,000	-	41,470,000	42,641,000
Georgia	6,653,000	135,000	6,788,000	172,786,000	150,229,000	-	323,015,000	329,803,000
North Carolina	390,000	40,000	430,000	39,871,000	16,003,000	-	55,874,000	56,304,000
South Carolina	-	-	-	138,550,000	6,000	-	138,556,000	138,556,000
Virginia	2,186,000	-	2,186,000	29,860,000	644,000	-	30,504,000	32,690,000
Regional totals	**10,340,000**	**235,000**	**10,575,000**	**421,416,000**	**168,003,000**	**-**	**589,419,000**	**599,994,000**
South-Central								
Alabama	3,674,000	15,000	3,689,000	90,259,000	35,598,840	-	125,857,840	129,546,840
Arkansas	11,473,000	-	11,473,000	87,743,000	-	-	87,743,000	99,216,000
Kentucky	757,280	-	757,280	126,060	-	-	126,060	883,340
Louisiana	-	-	-	-	47,047,000	-	47,047,000	47,047,000
Mississippi	-	178,000	178,000	69,346,000	13,753,000	-	83,099,000	83,277,000
Oklahoma	280,000	4,000	284,000	452,000	323,000	-	775,000	1,059,000
Tennessee	2,164,000	-	2,164,000	2,075,000	-	-	2,075,000	4,239,000
Texas	-	-	-	59,204,000	-	-	59,204,000	59,204,000
Regional totals	**18,348,280**	**197,000**	**18,545,280**	**309,205,060**	**96,721,840**	**-**	**405,926,900**	**424,472,180**
Northeast								
Connecticut	-	-	-	-	-	-	-	-
Delaware	-	-	-	-	-	-	-	-
Maine	-	-	-	-	-	25,622,500	25,622,500	25,622,500
Maryland	987,550	-	987,550	861,925	-	-	861,925	1,849,475
Massachusetts	-	11,117	11,117	-	1,946	-	1,946	13,063
New Hampshire	24,100	-	24,100	209,100	-	-	209,100	233,200
New Jersey	28,798	690	29,488	18,310	524	-	18,834	48,322
New York	209,350	-	209,350	245,000	20,500	-	265,500	474,850
Pennsylvania	610,177	105,000	715,177	1,120,610	50,000	-	1,170,610	1,885,787
Rhode Island	-	-	-	-	-	-	-	-
Vermont	22,800	800	23,600	100	150	-	250	23,850
West Virginia	-	-	-	-	-	-	-	-
Regional totals	**1,882,775**	**117,607**	**2,000,382**	**2,455,045**	**73,120**	**25,622,500**	**28,150,665**	**30,151,047**
North-Central								
Illinois	730,100	36,177	766,277	130,000	1,117	-	131,117	897,394
Indiana	1,702,462	73,900	1,776,362	455,600	5,079	-	460,679	2,237,041
Iowa	640,775	-	640,775	227,250	-	-	227,250	868,025
Michigan	3,252,999	27,646	3,280,645	7,895,991	15,850,659	39,000	23,785,650	27,066,295
Minnesota	443,800	-	443,800	2,463,625	209,293	472,000	3,144,918	3,588,718
Missouri	916,435	-	916,435	571,850	-	-	571,850	1,488,285
Ohio	-	3,500	3,500	-	-	-	-	3,500
Wisconsin	867,063	-	867,063	2,197,802	50,000	685,000	2,932,802	3,799,865
Regional totals	**8,553,634**	**141,223**	**8,694,857**	**13,942,118**	**16,116,148**	**1,196,000**	**31,254,266**	**39,949,123**

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Table 1 Continued. Hardwood and conifer seedling production for each State and each region during the fiscal year 2023 planting year

State	Hardwood bareroot seedlings produced	Hardwood container seedlings produced	Total hardwood seedlings produced	Conifer bareroot seedlings produced	Conifer container seedlings produced	Conifer container seedlings imported	Total conifer seedlings produced	Total seedlings produced
Great Plains								
Kansas	-	20,000	20,000	-	38,500	-	38,500	58,500
Nebraska	279,810	-	279,810	573,790	1,163,694	-	1,737,484	2,017,294
North Dakota	61,350	18,656	80,006	570,860	50,466	-	621,326	701,332
South Dakota	-	-	-	-	-	-	-	-
Regional totals	**341,160**	**38,656**	**379,816**	**1,144,650**	**1,252,660**	**-**	**2,397,310**	**2,777,126**
Intermountain								
Arizona	-	-	-	-	-	-	-	-
Colorado	-	-	-	-	-	-	-	-
Idaho	1,400,000	21,070	1,421,070	4,143,574	4,985,872	6,863,370	15,992,816	17,413,886
Montana	-	35,000	35,000	-	100,000	120,710	220,710	255,710
Nevada	-	15,798	15,798	-	739	-	739	16,537
New Mexico	-	9,000	9,000	-	100,000	-	100,000	109,000
Utah	-	-	-	-	-	-	-	-
Wyoming	-	-	-	-	-	-	-	-
Regional totals	**1,400,000**	**80,868**	**1,480,868**	**4,143,574**	**5,186,611**	**6,984,080**	**16,314,265**	**17,795,133**
Alaska								
Alaska	-	-	-	-	-	203,000	203,000	203,000
Pacific Northwest								
Oregon	1,559,112	684,293	2,243,405	35,528,682	33,230,791	2,621,250	71,380,723	73,624,128
Washington	257,800	20,000	277,800	35,563,679	22,144,100	2,143,150	59,850,929	60,128,729
Regional totals	**1,816,912**	**704,293**	**2,521,205**	**71,092,361**	**55,374,891**	**4,764,400**	**131,231,652**	**133,752,857**
Pacific Southwest								
California	-	10,442	10,442	1,915,840	23,021,998	-	24,937,838	24,948,280
Hawaii	-	7,146	7,146	-	600	-	600	7,746
Regional totals	**-**	**17,588**	**17,588**	**1,915,840**	**23,022,598**	**-**	**24,938,438**	**24,956,026**
National totals	**42,682,761**	**1,532,235**	**44,214,996**	**825,314,648**	**365,750,868**	**38,769,980**	**1,229,835,496**	**1,274,050,492**

Assumptions

The following assumptions were used in compiling this report.

1. The number of seedlings reported by the participating forest and conservation nurseries was the number of shippable seedlings produced for distribution in the 2023 planting season (i.e., seedlings that were planted from fall of 2022 through spring of 2023).

Some species of forest seedlings require two or more growing seasons to reach accepted forest and conservation seedling size standards, so not all seedlings in production at a nursery at any given time are considered shippable (i.e., available for distribution). In the East and West, nurseries only reported shippable seedlings. In contrast, nurseries in the Southern States reported production numbers, however, nearly all the tree seedlings grown in this region are shippable after growing a single year.

2. All seedling production reported in this survey met the grading standards for the respective nurseries (i.e., cull seedlings were not included in the estimates).

Production estimates are often based on seedbed inventories of seedlings meeting grading standards. When nurseries ship seedlings by weight, as opposed to examining and counting each seedling, landowners and tree planters often plant every seedling that is shipped to them.

3. Seedling production data were collected from all the major nurseries that produced forest and conservation tree seedlings for the planting season.

Considerable effort was made to contact all major producers of forest and conservation seedlings (private, State, Federal, Tribal). The universities collecting the survey data reported, with few exceptions, that the major producers are included in the results.

4. All seedlings reported in this survey were produced for reforestation and conservation projects.

Some of the nurseries that participated in this survey also produce seedlings for ornamental use, Christmas tree production, or other horticultural purposes. Private nurseries were asked to report only seedling production destined for conservation and reforestation planting.

5. Forest tree seedlings remain in the general area where they are produced.

Forest and conservation seedlings are routinely shipped across State borders and at times across international borders. It is assumed that, on average, the number of seedlings imported into a State is equal to the number of seedlings exported from that State. In some States, a significant number of seedlings are produced in Canada and imported for planting in those States. Estimates of the number of seedlings shipped from Canada were obtained from Canadian nurseries that routinely export seedlings to the United States.

6. Dividing the number of seedlings shipped from forest and conservation nurseries by the average number of stems planted per acre in a specific State is an appropriate proxy of the number of acres of trees planted during the planting season (table 2).

These estimations do not include direct seeding or natural forest regeneration activities. Average tree planting acreage and densities for each State were provided by FIA.

7. Respondents to the production survey reported only hardwood and conifer trees produced.

Nurseries were asked not to include shrubs in their production estimates. Many conservation and restoration plantings include shrubs and herbaceous plants to address wildlife, biodiversity, or other management objectives. Using only tree production to estimate acres planted results in an underestimate of planted acreage where a mixed planting of shrubs and trees occurred.

Data Trends

More than 1.27 billion forest tree seedlings were planted in the United States in fiscal year (FY) 2023, a decrease of approximately 7 percent from FY 2022 and less than 1 percent lower than the 10-year average (figure 1). This decrease is likely attributable to insufficient data: all three universities conducting the survey reported a lower than usual response rate from across the entire United States. This trend was especially evident in the Southern United States where reported seedling production dropped 7 percent from 2022 to 2023 (figure 2). (Note that in the previous year's report (Pike et al. 2023), the total production for the southern region was inadvertently inflated by almost 75 million seedlings, exclusively bareroot conifers in the Southern United States. Figures 1 and 2 reflect the actual (adjusted) seedling production for the fiscal year 2022 production year.) In the Western United States, production was lower than the previous year and approximated the 10-year average. In the Eastern United States, production in 2023 was slightly higher than the previous year despite lower survey return rates.

Based on the total number of seedlings shipped and the average number of seedlings planted per acre in each State, more than 3.7 million acres (1.5 million ha) of tree seedlings were planted during the fall 2022 through spring 2023 planting season. FIA reported tree planting acres of 1.7 million acres (687,966 ha), roughly half of the estimate

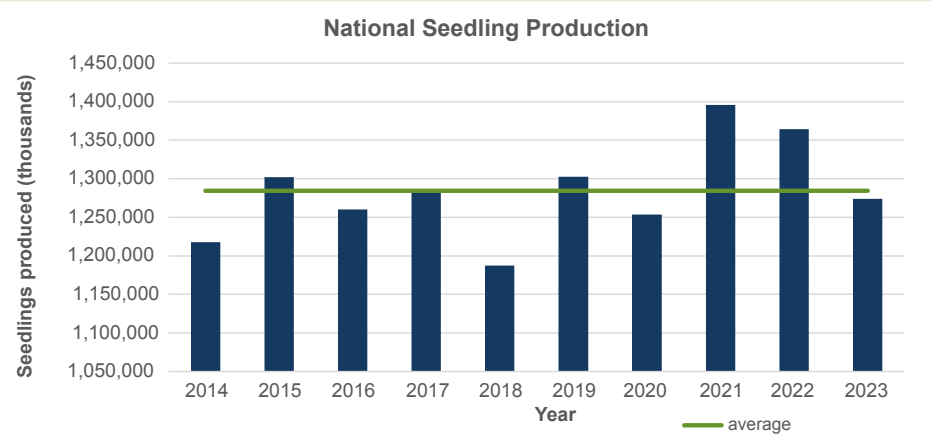
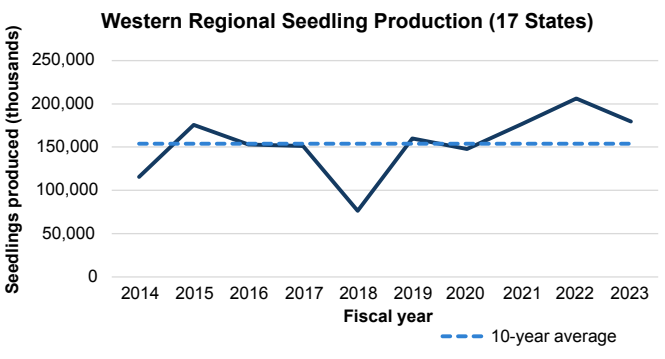
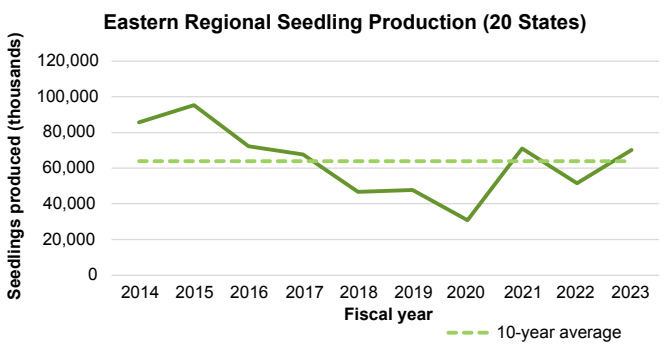


Figure 1. Total annual forest nursery seedling production in the United States for fiscal years 2014 through 2023. Data for the southern region in 2022 reflects actual numbers and are corrected from the previously published report in Pike et al. (2023). Sources: this report, Haase et al. (2019, 2020, 2021, 2022), Harper et al. (2014), and Hernández et al. (2015, 2016, 2017, 2018).





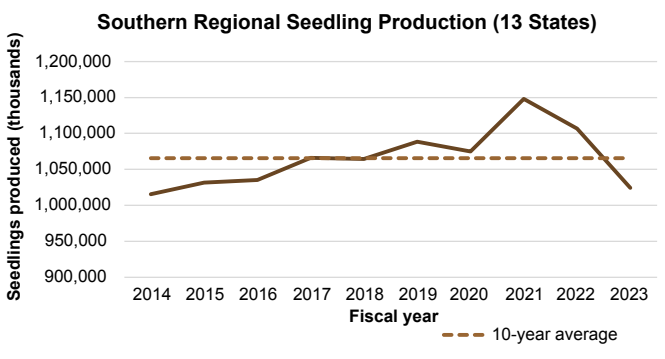


Figure 2. Annual forest nursery seedling production by region for fiscal years 2014 through 2023. Ten-year production averages are: 154,094,046 (west), 63,891,469 (east), and 1,065,549,141 (south). Ten-year averages and data for the southern region in 2022 reflect actual numbers and are corrected from the previously published report in Pike et al. (2023). Sources: this report, Haase et al. (2019, 2020, 2021, 2022), Harper et al. (2014), and Hernández et al. (2015, 2016, 2017, 2018).

derived from nursery reports, but their estimate is based on 5- 7- and 10-year cycles and includes seedlings that are grown out of State.

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Table 2. Estimated hardwood and conifer tree seedling acres planted for each State and each region during the 2023 planting year

State	Hardwood acres planted	Conifer acres planted	Total acres planted	FIA estimated acres planted
Southeast				
Florida[1]	1,952	69,117	71,068	149,727
Georgia[1]	11,313	538,358	549,672	256,438
North Carolina[1]	717	93,123	93,840	108,826
South Carolina[1]	-	230,927	230,927	119,340
Virginia[1]	3,643	50,840	54,483	82,870
Regional totals	**17,625**	**982,365**	**999,990**	**717,201**
South-Central				
Alabama[1]	6,148	209,763	215,911	218,711
Arkansas[1]	19,122	146,238	165,360	121,864
Kentucky[2]	1,741	290	2,031	2,034
Louisiana[1]	-	78,412	78,412	136,539
Mississippi[1]	297	138,498	138,795	133,685
Oklahoma[1]	473	1,292	1,765	26,526
Tennessee[1]	3,607	3,458	7,065	13,761
Texas[1]	-	98,673	98,673	102,489
Regional totals	**31,388**	**676,625**	**708,012**	**755,609**
Northeast				
Connecticut	-	-	-	386
Delaware	-	-	-	-
Maine[1]	-	42,704	42,704	3,309
Maryland[3]	1,796	1,567	3,363	1,159
Massachusetts[2]	26	4	30	-
New Hampshire[2]	55	481	536	-
New Jersey[2]	68	43	111	-
New York[1]	349	443	791	3,118
Pennsylvania[2]	1,644	2,691	4,335	307
Rhode Island	-	-	-	-
Vermont[2]	54	1	55	-
West Virginia	-	-	-	-
Regional totals	**3,992**	**47,934**	**51,925**	**8,279**
North-Central				
Illinois[2]	1,762	301	2,063	888
Indiana[4]	2,733	709	3,442	2,057
Iowa[1]	1,068	379	1,447	-
Michigan[3]	5,965	43,247	49,211	7,730
Minnesota[3]	807	5,718	6,525	12,852
Missouri[2]	2,107	1,315	3,421	267
Ohio[2]	8	-	8	1,077
Wisconsin[5]	1,084	3,666	4,750	7,487
Regional totals	**15,533**	**55,334**	**70,867**	**32,358**

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Table 2 Continued. Estimated hardwood and conifer tree seedling acres planted for each State and each region during the 2023 planting year

State	Hardwood acres planted	Conifer acres planted	Total acres planted	FIA estimated acres planted
Great Plains				
Kansas[3]	36	70	106	631
Nebraska[3]	509	3,159	3,668	-
North Dakota[3]	145	1,130	1,275	-
South Dakota	-	-	-	380
Regional totals	**691**	**4,359**	**5,049**	**1,011**
Intermountain				
Arizona	-	-	-	-
Colorado	-	-	-	786
Idaho[3]	1,421,070	29,078	1,450,148	8,326
Montana[3]	35,000	401	35,401	2,587
Nevada[3]	15,798	1	15,799	-
New Mexico[3]	9,000	182	9,182	-
Utah	-	-	-	-
Wyoming	-	-	-	-
Regional totals	**1,480,868**	**29,662**	**1,510,530**	**11,699**
Alaska				
Alaska[3]	-	369	369	-
Pacific Northwest				
Oregon[6]	6,410	203,945	210,355	120,180
Washington[6]	794	171,003	171,796	73,004
Regional totals	**7,203**	**374,948**	**382,151**	**193,184**
Pacific Southwest				
California[7]	23	45,342	45,365	26,833
Hawaii[7]	16	1	17	-
Regional totals	**39**	**45,343**	**45,382**	**26,833**
National totals	**1,557,338**	**2,216,938**	**3,774,276**	**1,746,174**

Calculations for hardwood, conifer, and total acres planted divided the production data reported in table 1 by an estimated number of stems planted per acre:

1 600 stems/acre
2 435 stems/acre
3 550 stems/acre
4 650 stems/acre
5 800 stems/acre
6 350 stems/acre
7 450 stems/acre

The Forest Inventory and Analysis (FIA) estimates for average annual acreage planted for all States are based on 5-, 7-and 10-year cycles. Cycle lengths vary by State and geographic area. Data generated by T. Ridley and A. Hartsell, USDA Forest Service, Southern Research Station, Forest Inventory and Analysis.