

Forest Nursery Seedling Production in the United States—Fiscal Year 2021

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Abstract

Forest nursery production for the 2021 planting season was more than 1.37 billion tree seedlings (including about 22.8 million container seedlings imported from Canada). Approximately 71 percent of seedlings were produced as bareroot stock. Only a small portion (3 percent) of seedlings were hardwood species. Based on this total number of seedlings and estimated planting densities in each State, more than 2.6 million ac (1,716,192 ha) were planted. Approximately 82 percent of production and planting occurred in the southern States, while 13 and 5 percent were planted in the western and eastern States, respectively.

Background

This annual report summarizes forest nursery seedling production in the United States. The number of seedlings reported is used to estimate the number of acres of forest planting per year. Prepared by the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) and State and Private Forestry, this report includes State-by-State breakdowns, regional totals, and an analysis of data trends. Universities in the Southern, Northeastern, and Western Regions of the United States made an effort 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

State and Private Forestry, 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. In addition, FIA average annual estimates of tree planting area based on ground-plot data that States collected during 5-, 7-, or 10-year periods is included. FIA estimates of acres of trees planted by State may not correlate with nursery production surveys because nurseries do not report shipments across State lines. Total acres by region, however, provide a reasonable estimate of 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 tree seedling production for each State and each region during the 2021 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	2,161,613	60,066	2,221,679	52,304,000	5,118,500	—	57,422,500	59,644,179
Georgia	4,616,621	500	4,617,121	203,854,180	148,341,600	—	352,195,780	356,812,901
North Carolina	440,000	—	440,000	60,700,000	13,925,193	—	74,625,193	75,065,193
South Carolina	647,000	—	647,000	159,299,000	—	—	159,299,000	159,946,000
Virginia	877,750	—	877,750	31,202,121	442,686	—	31,644,807	32,522,557
Regional Totals	8,742,984	60,566	8,803,550	507,359,301	167,827,979	0	675,187,280	683,990,830
South Central								
Alabama	3,719,200	—	3,719,200	100,785,667	36,683,624	—	137,469,291	141,188,491
Arkansas	9,573,490	—	9,573,490	85,009,925	166,875	—	85,176,800	94,750,290
Kentucky	530,400	—	530,400	56,760	—	—	56,760	587,160
Louisiana	—	—	—	—	53,677,288	—	53,677,288	53,677,288
Mississippi	—	177,000	177,000	74,184,000	11,003,000	—	85,187,000	85,364,000
Oklahoma	511,746	4,100	515,846	3,457,948	21,500	—	3,479,448	3,995,294
Tennessee	1,405,000	—	1,405,000	2,315,000	—	—	2,315,000	3,720,000
Texas	—	—	—	81,014,000	—	—	81,014,000	81,014,000
Regional Totals	15,739,836	181,100	15,920,936	346,823,300	101,552,287	0	448,375,587	464,296,523
Northeast								
Connecticut	—	—	—	—	—	—	—	—
Delaware	—	—	—	—	—	—	—	—
Maine ¹	—	3,500	3,500	—	—	3,984,760	3,984,760	3,988,260
Maryland	912,788	480,200	1,392,988	684,525	7,620	—	692,145	2,085,133
Massachusetts	500	20,000	20,500	—	200	—	200	20,700
New Hampshire	13,542	—	13,542	158,677	—	—	158,677	172,219
New Jersey	50,936	—	50,936	70,562	—	—	70,562	121,498
New York	134,500	—	134,500	492,600	—	—	492,600	627,100
Pennsylvania	531,665	40	531,705	3,155,945	200	—	3,156,145	3,687,850
Rhode Island	—	—	—	—	—	—	—	—
Vermont	37,100	925	38,025	1,300	—	—	1,300	39,325
West Virginia	—	—	—	—	—	—	—	—
Regional Totals	1,681,031	504,665	2,185,696	4,563,609	8,020	3,984,760	8,556,389	10,742,085
North Central								
Illinois	744,550	4,503	749,053	56,600	1,884	—	58,484	807,537
Indiana	1,684,879	500	1,685,379	468,600	—	—	468,600	2,153,979
Iowa	690,975	—	690,975	138,250	—	—	138,250	829,225
Michigan ¹	1,480,500	101,666	1,582,166	16,040,090	11,243,025	—	27,247,415	28,829,581

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
Minnesota ¹	470,856	—	470,856	2,040,090	—	485,970	2,526,060	2,996,916
Missouri	892,985	—	892,985	465,695	—	—	465,695	1,358,680
Ohio	500	—	500	—	—	—	—	500
Wisconsin ¹	1,335,786	—	1,335,786	3,262,331	1,342,040	392,040	4,996,411	6,332,197
Regional Totals	7,301,786	106,669	7,407,700	22,435,956	12,586,949	878,010	35,900,915	43,308,615
Great Plains								
Kansas	—	12,200	12,200	—	47,925	—	47,925	60,125
Nebraska	279,370	5,000	284,370	468,700	680,665	—	1,149,465	1,433,735
North Dakota	13,150	19,930	33,080	684,390	72,450	—	756,840	789,920
South Dakota	729,625	1,700	731,325	290,550	2,425	—	292,975	1,024,300
Regional Totals	1,022,145	38,830	1,060,975	1,443,640	803,465	0	2,247,105	3,308,080
Intermountain								
Arizona	—	400	400	—	650	—	650	1,050
Colorado	63,700	32,516	96,216	12,025	137,445	—	149,470	245,686
Idaho ¹	12,250	45,885	58,135	1,390,180	4,539,872	880,820	6,810,872	6,869,007
Montana ¹	92,300	35,163	127,463	—	486,179	86,356	572,535	699,998
Nevada	—	1,446	1,446	—	177	—	177	1,623
New Mexico	—	7,000	7,000	—	112,000	—	112,000	119,000
Utah	—	—	—	—	—	—	—	—
Wyoming	—	—	—	—	—	—	—	—
Regional Totals	168,250	122,410	290,660	1,402,205	5,276,323	967,176	7,645,704	7,936,496
Alaska								
Alaska	—	—	—	—	—	—	—	—
Pacific Northwest								
Oregon ¹	700,00	1,269,500	1,969,500	37,227,000	31,270,774	15,582,044	84,079,818	86,049,318
Washington ¹	546,709	59,483	606,192	25,792,130	25,499,190	1,414,360	52,705,680	53,311,872
Regional Totals	1,246,709	1,328,983	2,575,692	63,019,130	56,769,964	16,996,404	136,785,498	139,361,190
Pacific Southwest								
California	1,517,800	30,000	1,547,800	3,348,447	20,745,987	—	24,094,434	25,642,234
Hawaii	—	158,226	158,226	—	2,497	—	2,497	160,723
Regional Totals	1,517,800	188,226	1,706,026	3,348,447	20,748,484	0	24,096,931	25,802,957
Totals	37,419,786	2,531,449	39,951,235	950,395,588	365,573,471	22,826,350	1,338,795,409	1,378,746,644

¹Totals include an estimate of container conifers produced in Canada; bareroot imports for Maine and containers for other States.

Table 2. Estimated hardwood and conifer tree seedling acres planted for each State and each region during the 2021 planting year.

State	Hardwood acres planted	Conifer acres planted	Total acres planted	FIA estimated acres planted ⁹
Southeast				
Florida ²	4,039	104,405	108,444	150,006
Georgia ²	8,395	640,356	648,751	212,353
North Carolina ²	800	135,682	136,482	108,401
South Carolina ²	1,176	289,635	290,811	88,362
Virginia ²	1,596	57,536	59,132	57,031
Regional Totals	16,006	1,227,613	1,243,620	616,153
South Central				
Alabama ²	6,762	249,944	256,706	218,748
Arkansas ²	17,406	154,867	172,273	89,136
Kentucky ³	1,219	130	1,350	1,142
Louisiana ²	—	97,595	97,595	160,561
Mississippi ²	322	154,885	155,207	140,495
Oklahoma ²	938	6,326	7,264	31,659
Tennessee ²	2,555	4,209	6,764	24,386
Texas ²	—	147,298	147,298	126,044
Regional Totals	29,202	815,256	844,458	792,171
Northeast				
Connecticut ³	—	—	—	—
Delaware ²	—	—	—	515
Maine ⁵	6	6,641	6,647	4,069
Maryland ²	2,533	1,258	3,791	—
Massachusetts ³	47	—	48	—
New Hampshire ³	31	365	396	402
New Jersey ³	117	162	279	—
New York ⁵	224	821	1,045	2,077
Pennsylvania ³	1,222	7,256	8,478	1,847
Rhode Island	—	—	—	—
Vermont ³	87	3	90	—
West Virginia ³	—	—	—	—
Regional Totals	4,268	16,507	20,774	8,910
North Central				
Illinois ³	1,722	134	1,856	1,667
Indiana ⁴	2,593	721	3,314	2,413
Iowa ⁵	1,152	230	1,382	—
Michigan ²	2,877	49,541	52,417	6,330
Minnesota ²	856	4,593	5,449	8,403
Missouri ³	2,053	1,071	3,123	223
Ohio ³	1	—	1	2,173
Wisconsin ⁶	1,670	6,246	7,915	8,256
Regional Totals	11,201	62,401	73,602	29,465

State	Hardwood acres planted	Conifer acres planted	Total acres planted	FIA estimated acres planted ⁹
Great Plains				
Kansas ²	22	87	109	1,012
Nebraska ²	517	2,090	2,607	—
North Dakota ²	60	1,376	1,436	—
South Dakota ²	1,330	533	1,862	164
Regional Totals	1,929	4,086	6,015	1,176
Intermountain				
Arizona ²	1	1	2	-
Colorado ²	175	272	447	669
Idaho ²	106	12,383	12,489	10,016
Montana ²	232	1,041	1,273	4,506
Nevada ²	3	—	3	—
New Mexico ²	13	204	216	—
Utah ²	—	—	—	—
Wyoming	—	—	—	846
Regional Totals	528	13,901	14,430	16,037
Alaska				
Alaska ²	—	—	—	—
Pacific Northwest				
Oregon ⁷	5,627	240,228	245,855	118,350
Washington ⁷	1,732	150,588	152,320	96,376
Regional Totals	7,359	390,816	398,175	214,726
Pacific Southwest				
California ⁸	3,440	53,543	56,983	36,986
Hawaii ⁸	352	6	357	568
Regional Totals	3,791	53,549	57,340	37,554
TOTALS	74,285	2,584,128	2,6582,413	1,716,192

¹ Acres planted were estimated assuming:

² 550 stems/acre.

³ 435 stems/acre.

⁴ 650 stems/acre.

⁵ 600 stems/acre.

⁶ 800 stems/acre.

⁷ 350 stems/acre.

⁸ 450 stems/acre.

⁹ FIA = Forest Inventory and Analysis; average annual acreage planted estimated for all States on 5-year cycles, except for Alabama, Louisiana, Mississippi, and North Carolina, which are on 7-year cycles, and for Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, and Washington, which are on 10-year cycles. Data generated by Andy Hartsell, USDA Forest Service.

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 2021 planting season (i.e., seedlings that were planted from fall of 2020 through spring of 2021).*

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). Therefore, only shippable seedlings were counted.

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. For cases in which 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. The universities collecting the survey data reported, with few exceptions, that the major producers were 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.*

These estimations do not include direct seeding or natural forest regeneration activities. Average tree planting 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 1.37 billion forest tree seedlings were planted in the United States in fiscal year (FY) 2021. This production level is an approximately 9-percent increase from FY 2020 (figure 1). The increase is attributable, in part, to a return of operations following the coronavirus pandemic. Seedling production in the Southern United States has increased annually from 2012 through 2021 (figure 2). In the Eastern United States, seedling production generally declined from 2012 to 2020, but nearly doubled from 2020 to 2021 because many nurseries had ceased lifting operations during the pandemic (figure 2). In the Western United States, production has fluctuated over time (figure 2). Some of the year-to-year variation is attributed to inconsistent participation from nurseries during data collection and shifting planting needs following wildfires,

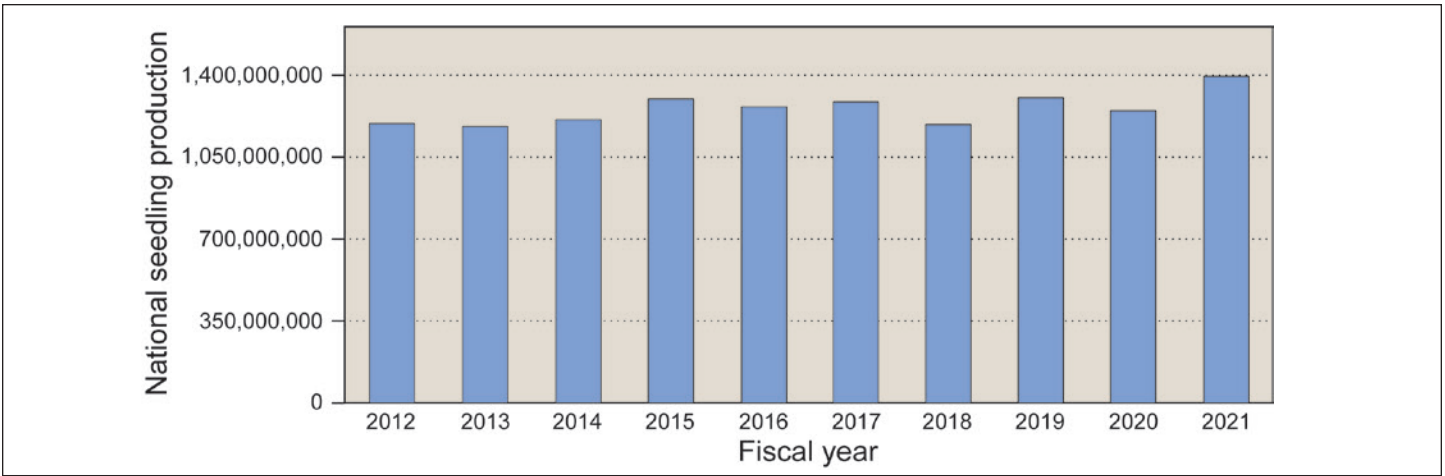


Figure 1. Total annual forest nursery seedling production in the United States for fiscal years 2012 through 2021. Sources: this report, Haase et al. (2019, 2020, 2021), Harper et al. (2013, 2014), Hernández et al. (2015, 2016, 2017, 2018)

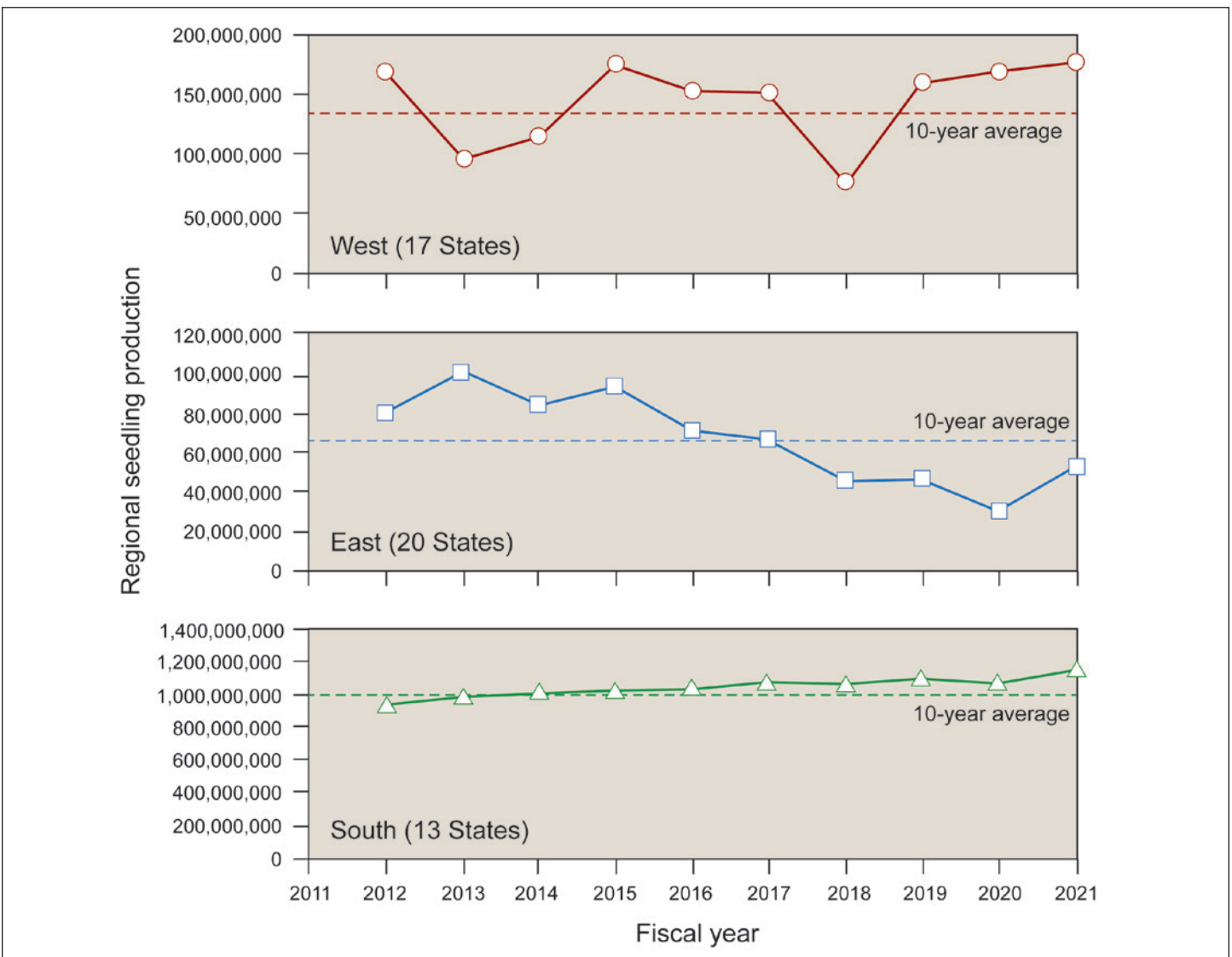


Figure 2. Annual forest nursery seedling production by region for fiscal years 2012 through 2021. Ten-year production averages are: 142,277,318 (west), 69,851,412 (east), and 1,044,440,614 (south). Sources: this report, Haase et al. (2019, 2020, 2021), Harper et al. (2013, 2014), Hernández et al. (2015, 2016, 2017, 2018)

pests, and harvests. Based on the total number of seedlings shipped and the average number of seedlings planted per acre in each State, more than 2.6 million ac (1,072,310 ha) of tree seedlings were planted during the fall 2020 through spring 2021 planting season.

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Acknowledgments

The authors thank the U.S. Department of Agriculture, Forest Service, Washington Offices of the Forest Inventory and Analysis program, and the State and Private Forestry Deputy Area for their support.

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