USDA United States Department of Agriculture

Forest Service

Rocky Mountain Research Station

October 2004

Forest Resources of the Tonto National Forest

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About the author

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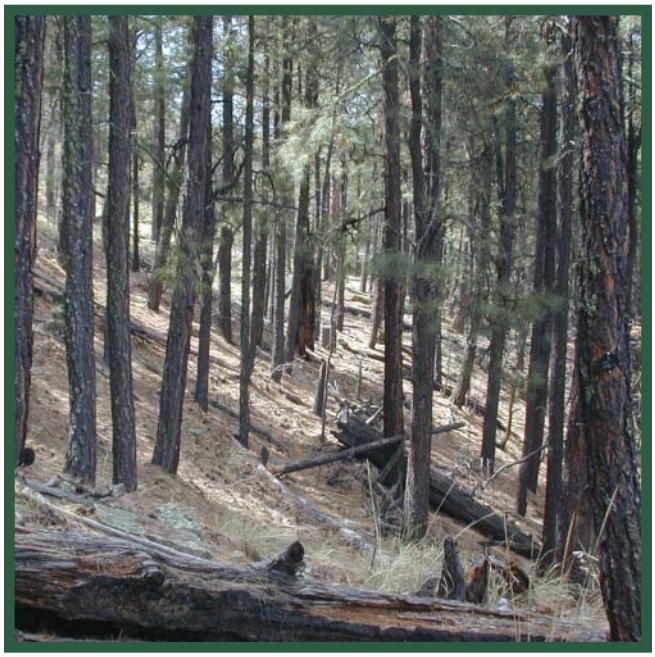
The Interior West Forest Inventory and Analysis (IWFIA) program of the USDA Forest Service, Rocky Mountain Research Station, as part of its national Forest Inventory and Analysis (FIA) duties, conducted forest resource inventories of the Southwestern Region (Region 3) National Forests. This report presents highlights of the Tonto National Forest 1996 inventory including population estimates and summaries of commonly requested variables. Any trends or disturbances (such as fire) that have occurred after 1996 will be discussed in future reports of the Tonto National Forest.

The information presented in this report is based solely on the IWFIA inventory sample (USDA 1995). The data can be summarized in other ways for different purposes (see "For further information" on the inside back cover for the national FIA database and related contacts). Supplemental documentation and inventory terminology can be found in USDA (2002a), O'Brien (2002), or on the World Wide Web at http://www.fs.fed.us/rm/ogden. Changes in terminology or procedures may limit comparisons with previous estimates and summaries for this area. Additional data collected for the Tonto National Forest, used separately or in combination with IWFIA data, may produce varying results.



Description of the Forest

The Tonto National Forest administers 2,873,406 acres (USDA 1996) of which 50 percent is classified as forest land and 50 percent nonforest or water. This report describes the characteristics of the forest land sampled on the Tonto. Forest land is land that is at least 10 percent stocked (or formerly stocked) with live tally tree species and is greater than 1 acre in size and 120 feet wide. Based on the tree species present, forest land can be further subdivided into two land categories: timberland and woodland (Figure 1). Timberland is forest land with mostly timber species typically used in the wood products industry, such as ponderosa pine and Douglas-fir. Woodland is forest land with mostly woodland species that often have a multistem growth form and are not typically used for industrial wood products, such as pinyon pine, junipers, and some oaks. On the Tonto, 7 percent of the total acreage is timberland and 43 percent is woodland.

Twenty-one percent of all land administered by the Tonto National Forest is reserved land, such as wilderness areas, meaning that it has been withdrawn from management for production of wood products. The first section of this report presents summaries of timber and woodland species for all forest land, including reserved designations. The subsequent section addresses nonreserved lands only and includes estimates for timber species sampled on the Tonto.

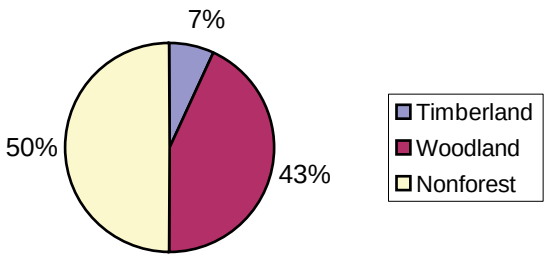


Figure 1—Percent of total area by land category, Tonto National Forest.

Total forest land: highlights of our inventory

Forest type—Forest resources are often described using a forest type classification. Forest type refers to the predominant tree species in a stand, based on plurality of tree stocking. Stocking is an expression of the extent to which growing space is effectively utilized by live trees.

Figure 2 presents the distribution of forest land area on the Tonto by forest type. Pinyon-juniper and pure juniper types are most common and cover a combined 61 percent of the total forest land area. Evergreen oak and mesquite woodlands account for 17 percent and 8 percent of forest land area, respectively. Ponderosa pine is the most common timber type, covering 10 percent of forest land. The remaining 4 percent comprises a variety of timber and woodland types including Douglas-fir, cottonwood, and miscellaneous western softwoods (timber forest types) plus deciduous woodland oak and miscellaneous western hardwoods (woodland forest types).

A field plot may sample more than one condition (stand). A forest condition is generally defined as an area of relatively homogeneous vegetative cover that meets the criteria for forest land. Forest type is one of several attributes that define and separate conditions identified on the plot. Table 1 presents the number of conditions and the condition proportions sampled on the Tonto National Forest by forest type for 242 plots that contained at least one forest condition.

Number of live trees—Forest land can also be examined by looking at the composition of tree species. Figure 3 shows total number of live trees for all sampled tree species on the Tonto for three diameter classes. Over one third of live trees on the Tonto are oak species. Arizona white oak/gray oak makes up the plurality of live trees at 16 percent. Emory, Gambel, and silverleaf oaks combined make up an additional 18 percent. Alligator juniper makes up 14 percent of live trees, while Rocky Mountain, oneseed, Utah, and redberry junipers combined make up 13 percent. Ponderosa pine is the most common timber species, with 12 percent of live trees. Woodland pine species include Arizona pinyon, with 9 percent of live trees, singleleaf pinyon with 3 percent, common (twoneedle) pinyon with 1 percent, and border pinyon with less than 1 percent. In the FIA inventories of Arizona and New Mexico, single-needle varieties of pinyon pine were not consistently identified. They could be listed as either singleleaf or Arizona pinyon. In the remainder of this report, the two varieties will be reported as recorded in the field. Other timber species account for about 5 percent of live trees and include Arizona cypress, Douglas-fir, true firs, and narrowleaf cottonwood. Other woodland species account for 9 percent of live trees and include New Mexico locust, western honey mesquite, velvet mesquite, desert ironwood, and bigtooth maple. Species that are scarce may not be encountered with the sampling strategy used for this inventory.

Number and weight of dead trees—Standing and down dead trees are important to forest ecosystems because they provide habitat for many species of wildlife, function as nutrient sinks, and protect the soil from erosion. Approximately 19.5 million standing dead trees (snags) and 3.7 million down dead trees 1 inch diameter and greater are on Tonto forest land, an average of 13.6 snags per acre. Different size snags provide habitat components for many wildlife species.

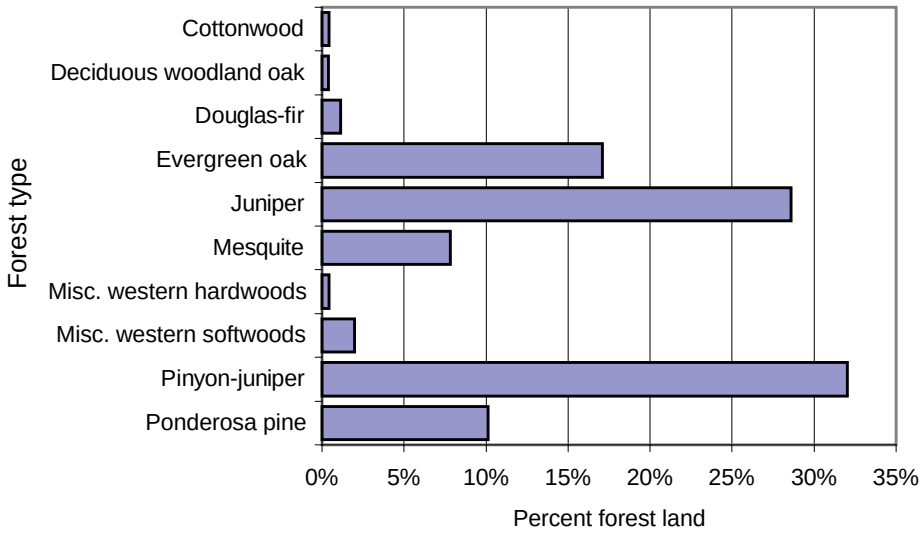


Figure 2—Percent of total forest land area by forest type, Tonto National Forest.

Table 1—Number of conditions and condition proportions on forest land by forest type and land category, Tonto National Forest, 1996.

Forest type	Number of conditions[a]	Condition proportions[b]
Timberland		
Ponderosa pine	30	23.6
Douglas-fir	3	2.8
Cottonwood	1	1.0
Misc. western softwoods	5	4.3
Total Timberland	**39**	**31.7**
Woodland		
Pinyon / juniper woodland	83	73.9
Juniper woodland	76	64.6
Evergreen oak woodland	47	39.3
Mesquite woodland	22	17.5
Deciduous oak woodland	2	0.9
Misc. western hardwood woodland	1	1.0
Woodland Total	**231**	***197.3**
Grand Total	**270**	**229.0**

[a]Number of conditions by forest type that were sampled. The sum of these numbers is often greater than the total number of plots because a plot may sample more than one forest condition.
[b]Sum of the condition proportions of plots by forest type that were sampled. The sum of these numbers is often less than the total number of plots because of nonforest condition proportions (from plots containing both forest and nonforest conditions) that are not included here.
*Number does not add to total due to rounding

Figure 4 shows the number of snags by forest type for three diameter classes. Of the total numbers of snags, 53 percent are between 1 inch and 4.9 inches diameter, with over half of these being oak species. Snags 5.0 to 10.9 inches in diameter account for 29 percent of the total. Again, oak species account for over half of the trees in this class. Snags 11 inches diameter or larger make up 18 percent of the total, with 1.2 snags per acre. Most of these large snags are Arizona white oak/gray oak (34 percent) and ponderosa pine (30 percent).

Dead and down material contributes to forest fuel loads and fire potential. Approximately 464 thousand tons of down dead trees and 1.5 million tons of standing dead trees are on Tonto forest land. Our estimate of down dead trees includes only the merchantable portion of trees 5.0 inches

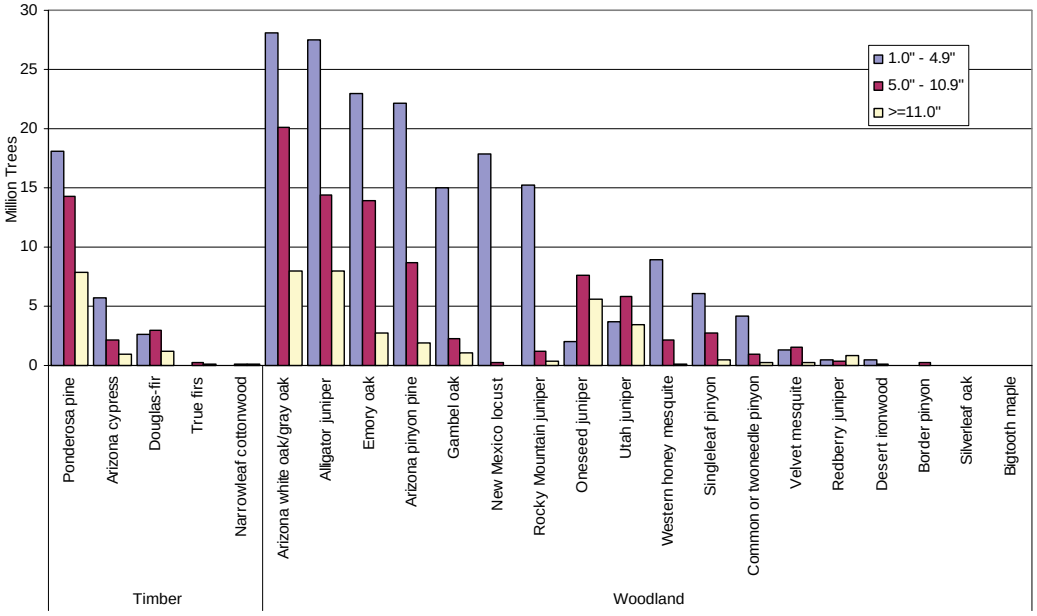


Figure 3—Number of live trees 1.0 inch diameter and greater on forest land by species and diameter-size class, Tonto National Forest.

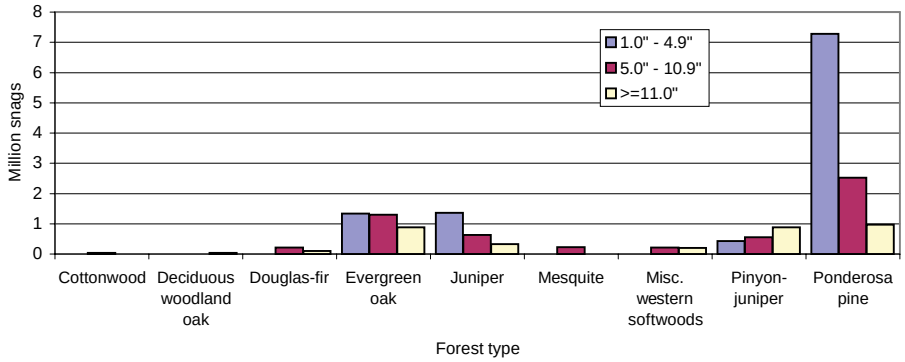


Figure 4—Number of standing dead trees 1.0 inch diameter and greater on forest land by forest type and diameter-size class, Tonto National Forest.

diameter and greater that have recently fallen. On forested land, this works out to an average of approximately 0.2 tons of down dead trees per acre. This is a low estimate of tonnage for some forest types, partly due to the low amount of material found in the majority of woodland types. For example, the ponderosa pine type averages 0.5 tons per acre and the Douglas-fir forest type averages over 9.5 tons per acre. When older fallen trees, branches and twigs, and litter are added, fuel loads may approach 15 to 20 tons per acre (J. Mercer, pers. comm.). Even higher loads are possible when large numbers of standing dead trees, like those killed by fire, insects, or disease, begin to fall over. About 38 percent of the down dead trees in our sample are oak species, 32 percent are ponderosa pine, 9 percent are Douglas-fir, and 15 percent are juniper species.

Tree and stand size—The size distribution of trees is an indicator of structural diversity. Figure 5 displays the number of live trees by 2-inch diameter class on the Tonto, combining trees from all stands. Overall, this shows a typical diameter distribution with a higher number of small trees than large trees.

Stand-size class is a categorization of forest land based on the predominant diameter-size of live trees that contribute to the stocking of a stand. Stocking values for each stand are generally summed by the following diameter classes: the large diameter class includes softwoods 9 inches diameter and greater, and hardwoods 11 inches diameter and greater; the medium diameter class includes softwoods 5 to 8.9 inches diameter, and hardwoods 5 to 10.9 inches diameter; and the saplings/seedlings class includes all trees under 5 inches diameter. Then each stand (condition) is assigned a class according to stocking predominance. In terms of stocking, fewer large-diameter trees compared to small-diameter trees are required to fully utilize a site; therefore, large-diameter trees have a greater impact on determining stand-size class. Figure 6 displays forest land area on the Tonto by stand-size class. Approximately 74 percent of the stands have a plurality of stocking from large trees and about 15 percent are nonstocked, such as stands that have been recently harvested or burned.

Wood volume, biomass, and basal area of live trees—In general, estimates of volume, basal area, and biomass describe the amount of wood fiber in the forest. Each estimate summarizes different portions of a tree and is therefore more appropriate for various forest resource applications. For example, volume relates closely to wood as a product, basal area to forest or tree density, and biomass to forest or tree productivity. In table 2, volume represents the amount of wood fiber in the merchantable bole of a tree, while biomass represents the amount of

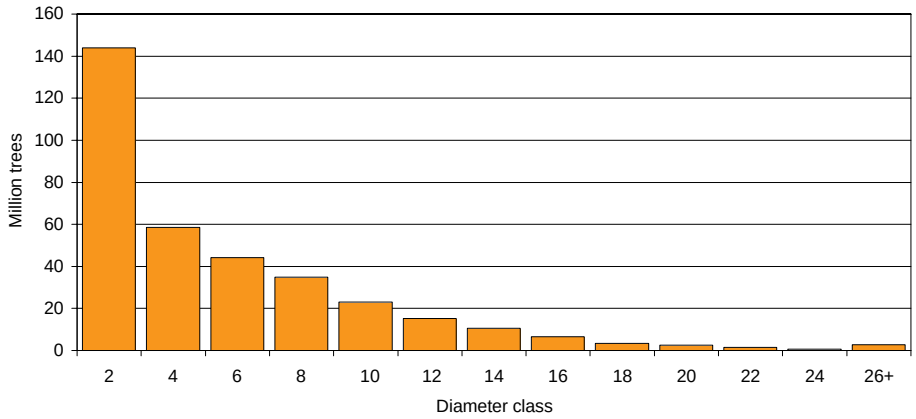


Figure 5—Number of live trees on forest land by 2-inch diameter class, Tonto National Forest.

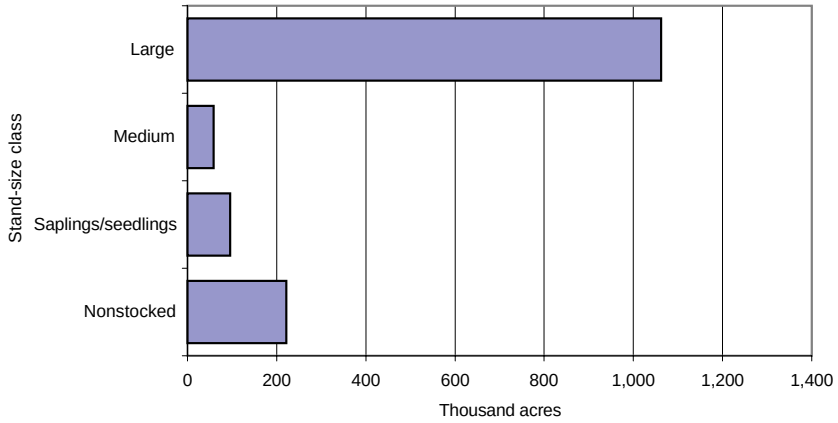
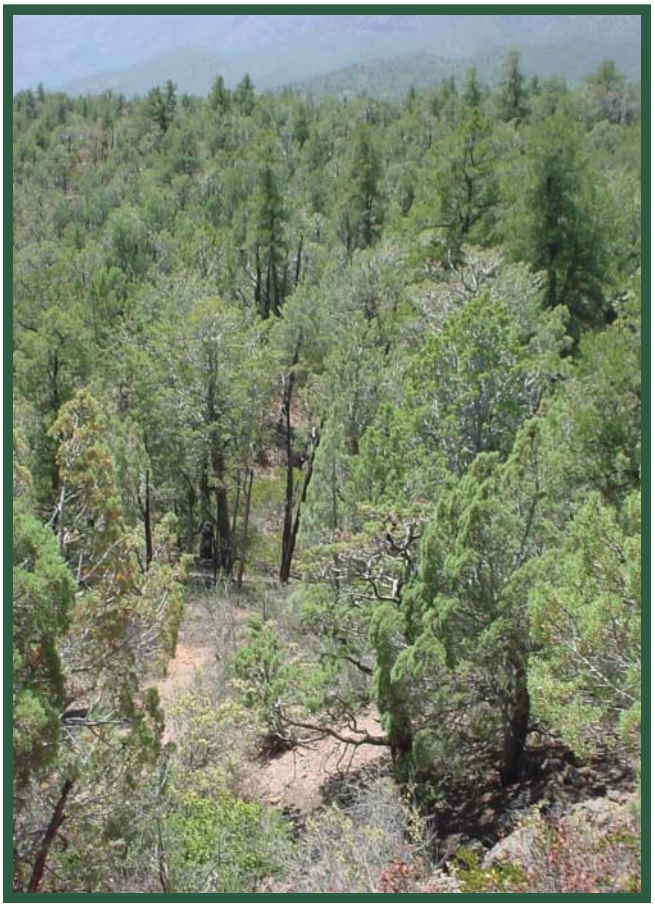


Figure 6—Forest land area by stand-size class, Tonto National Forest. Large trees include softwoods 9 inches and greater and hardwoods 11 inches and greater; medium trees include softwoods 5 inches to 8.9 inches and hardwoods 5 inches to 10.9 inches; saplings/seedlings include trees less than 5 inches.

Table 2—Net volume, biomass, and basal area on forest land by species for trees 5 inches diameter and greater, Tonto National Forest, 1996.

Species	Volume (million cubic feet)	Biomass (million tons)	Basal Area (million square ft.)
Ponderosa pine	315.5	6.0	15.1
Alligator juniper	191.4	2.4	20.2
Arizona white oak/gray oak	135.1	4.1	17.5
Oneseed juniper	92.3	1.2	12.2
Douglas-fir	55.6	1.0	2.8
Arizona pinyon pine	57.3	0.7	4.6
Emory oak	49.5	1.3	7.0
Utah juniper	45.9	0.6	6.6
Gambel oak	23.8	0.8	2.2
Arizona cypress	19.1	0.4	1.7
Singleleaf pinyon	16.9	0.2	1.3
Rocky Mountain juniper	10.5	0.1	0.9
Redberry juniper	9.6	0.1	1.2
Common or twoneedle pinyon	6.4	†	0.5
True firs	6.0	†	0.2
Western honey mesquite	4.3	0.1	0.8
Velvet mesquite	3.5	0.1	0.7
Narrowleaf cottonwood	2.9	†	0.2
Border pinyon	2.5	†	0.1
New Mexico locust	0.4	†	‡
Bigtooth maple	0.3	†	‡
Desert ironwood	0.1	†	‡
Silverleaf oak	§	†	‡
Total (all tree species)	***1049.1**	***19.8**	***96.2**

§ less than 100,000 cubic feet
† less than 100,000 tons
‡ less than 100,000 square feet
* numbers may not add to total due to rounding



wood fiber in terms of oven-dry weight including the bole, bark, and branches of the tree. Basal area estimates include the cross-sectional area of a tree stem/bole at the point where diameter is measured. Table 2 shows a breakdown by species of net volume, biomass, and basal area for live trees 5 inches diameter and larger on the Tonto. Ponderosa pine, juniper species, and oak species account for approximately 85 percent of net volume, biomass, and basal area. Junipers make up 33 percent of net volume, followed by ponderosa pine (30 percent) and oak species (20 percent). Other pines and Douglas-fir make up 8 and 5 percent of volume, respectively. Junipers also account for plurality of the basal area, with 43 percent of the total. Oaks account for 28 percent of basal area, while ponderosa pine makes up 16 percent. Other pines and Douglas-fir make up 7 and 3 percent of basal area, respectively. Oak species account for the largest portion of biomass (32 percent), followed by ponderosa pine (31 percent) and juniper species (22 percent). Other pines and Douglas-fir make up 5 and 6 percent of biomass, respectively.

Figure 7 shows the distribution of net volume of wood in trees by 2-inch diameter class on Tonto forest land. While the number of trees declines with larger diameter classes (see fig. 5), the volume increases significantly from diameter class 6 to 14 inches, where net volume peaks. Nearly two thirds of net volume occurs in the 18-inch and smaller size classes.

Another way to look at wood volume is by forest type, for which per acre estimates can be computed along with biomass and basal area (table 3). These numbers include the many different species that can occur together within each forest type. The highest volume per acre on the Tonto is in the ponderosa pine forest type, followed by the cottonwood and Douglas-fir types. These three timber forest types also contain the highest biomass per acre, because biomass is strongly correlated with volume. Miscellaneous western softwoods and the evergreen- and deciduous woodland oak types have basal areas comparable to the

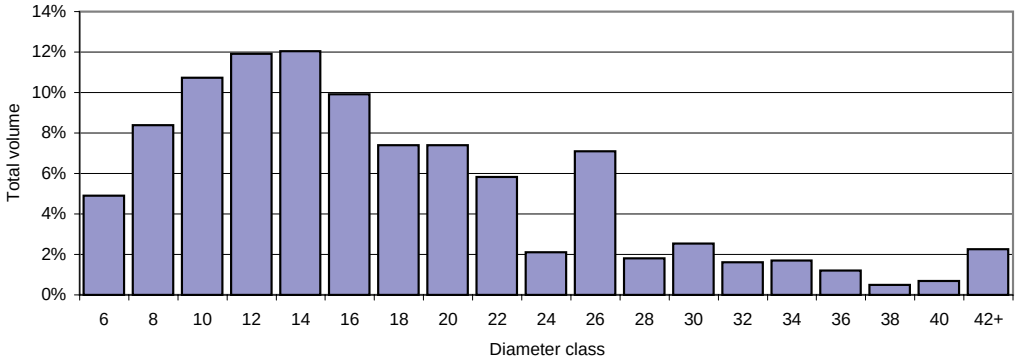


Figure 7—Percent of total net cubic-foot volume of live trees by 2-inch diameter class, Tonto National Forest.

Table 3—Net cubic foot volume per acre, tons of biomass per acre, and basal area per acre by forest type, Tonto National Forest, 1996.

Forest type	Volume (cubic ft. per acre)	Biomass (tons per acre)	Basal area (square feet per acre)
Ponderosa pine	2,460	50	140
Cottonwood	2,039	46	147
Douglas-fir	1,260	24	60
Misc. western softwoods	839	17	72
Evergreen oak	786	19	90
Deciduous woodland oak	461	13	42
Pinyon-juniper	567	8	62
Juniper	421	7	50
Mesquite	40	2	9
Misc. western hardwoods	23	1	6
Average (all types)	**730**	**14**	**67**

timber types, but volume and biomass are less than half due to the relatively smaller heights and diameters of trees that occur in these types.

The cottonwood, Douglas-fir, miscellaneous western softwoods, deciduous woodland oak, and miscellaneous western hardwoods forest types listed in table 3 may not be representative due to small sample sizes (see table 1). The ponderosa pine, evergreen oak, pinyon-juniper, juniper woodland, and mesquite forest types have large samples that provide better per-acre estimates.

Stand density index—Many factors influence the rate at which trees grow and thrive, or die. As tree size and density increase, competition for available resources increases. Stand density index (SDI), as developed by Reineke (1933), is a relative measure quantifying the relationship between trees per acre, stand basal area, average stand diameter, and stocking of a forested stand. The concept was developed for even-aged stands, but can also be applied to uneven-aged stands (Long and Daniel 1990, Shaw 2000; see next paragraph for an explanation of even-aged and uneven-aged stands). SDI is usually presented as a percentage of the maximum SDI for each forest type (USDA 1991). SDI was computed for each location using those maximums, and the results were grouped into six classes (fig. 8). A site is considered to be fully occupied at 35 percent of SDI maximum, which marks the onset of competition-related stresses and slowed growth rates (USDA 1991). Based on FIA sample data, 33 percent of all forest stands in the Tonto National Forest are considered to be fully occupied.

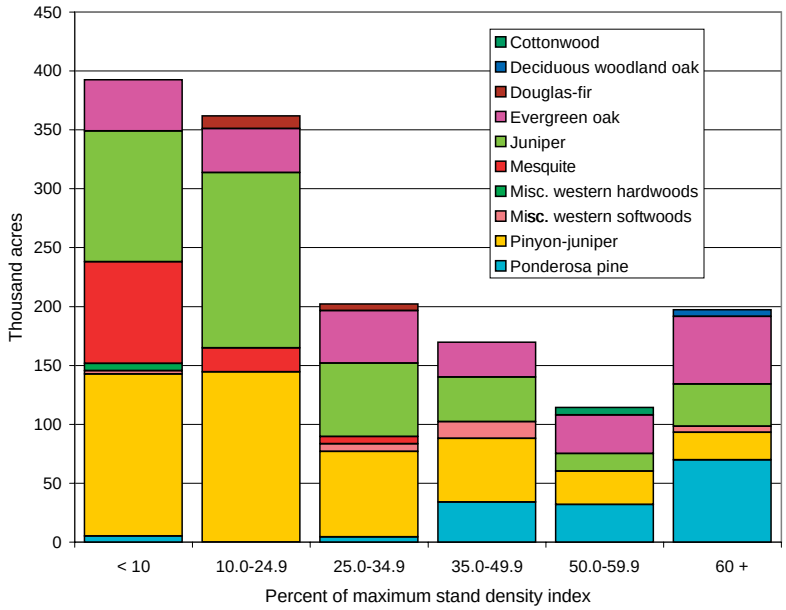


Figure 8—Area of forest land by forest type and percent stand density index, Tonto National Forest.

Southwest stand structure—Stands may be categorized on the basis of tree size, often in terms of their predominant diameter or height class. This works well for stands where just one or two size classes dominate. Such stands are called single-storied, or even-aged, because they have a structure characterized by a single canopy layer or two closely related layers. Stands having a structure composed of three or more size classes are called multistoried or uneven-aged stands. Both types of structure are important in forest diversity. Differences between single-storied stands provide structural diversity across a landscape. Differences between many layers within a multistoried stand provide vertical diversity.

Figure 9 shows area of forest land by stand structure class and diameter class for three timber softwood forest type groups including pine, mixed conifer, and "other" timber softwood types. On the Tonto, the pine category is made up of ponderosa pine, the mixed conifer category includes Douglas-fir and white fir, and the "other" category contains miscellaneous softwoods such as Arizona cypress. The values shown are based on analysis of SDI and tree diameter classes, a method developed by the Southwest Region (USDA 2002b). Single-storied and multistoried timber stands are both common on the Tonto, with multistoried stands making up just under 40 percent of the total. Just over 60 percent of the single-storied stands occur in the 5.0 to 11.9 inch diameter class.

Growth and mortality—Forest vigor can be analyzed by measures of net annual growth and mortality. Net annual growth is the difference between gross annual growth and losses due to mortality. Gross annual growth is the average annual increase in the volume of live trees while mortality is the net volume of trees that have died over a 1-year period based on a 5-year average. Gross annual growth of all live trees 5 inches diameter and greater on all forest land on the Tonto is estimated to be 14.7 million cubic feet. Subtracting mortality results in an estimated net annual growth of 11.5 million cubic feet.

Mortality calculations estimate approximately 3.2 million cubic feet of wood 5 inches diameter and greater died on the Tonto in 1995. Ponderosa pine makes up most of the total mortality volume at over 61 percent, with alligator juniper at 11 percent, Gambel oak at 10 percent, Arizona white oak/gray oak at 9 percent, and Douglas-fir at 5 percent. The remaining mortality volume (less than 5 percent) was distributed among Arizona pinyon pine, Arizona cypress, Emory oak, desert ironwood, Rocky Mountain juniper, and velvet mesquite. No mortality trees were recorded for the remainder of species.

Based on field observations, 37 percent of the cubic-foot volume mortality on the Tonto was caused by fire, 22 percent

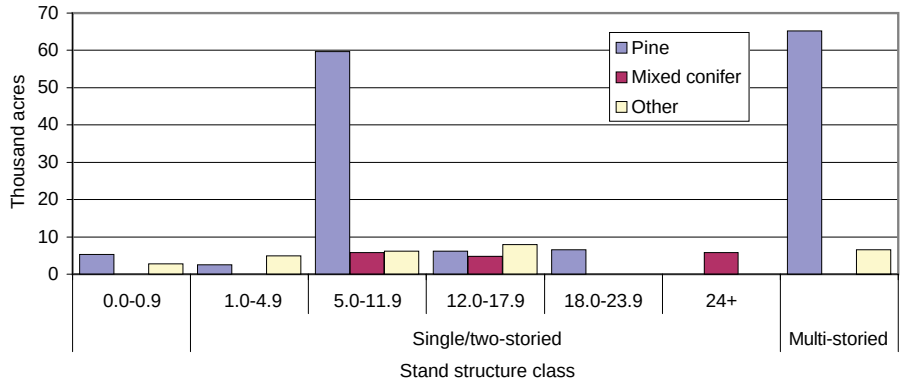


Figure 9—Area of forest land by stand-structure class, diameter class, and timber softwood forest type groups, Tonto National Forest.

by insects, 27 percent by disease, and 6 percent by weather-related stresses. Less than 1 percent was attributed to suppression by other vegetation. These figures reflect the fact that our inventory methods record the direct, or proximate, cause of mortality. Commonly, on the Tonto and elsewhere, the ultimate cause of mortality is high stand density. Fire is more severe in dense stands because of greater fuel volume and continuity, and insects and diseases take advantage of stress caused by overcrowding. Drought stress is also exacerbated by overcrowding because of intense competition for soil moisture.

Figure 10 compares gross annual growth to mortality for all trees. With the exception of desert ironwood, all species show positive net growth. Ponderosa pine accounted for 38 percent of net growth, with gross growth greater than 3 times mortality. Douglas-fir accounted for 9 percent of net growth, with gross growth nearly 8 times mortality. Overall gross growth on the Tonto National Forest was 4.6 times mortality.

Understory vegetation—Understory vegetation provides forage and cover for wildlife, contributes to forest fuel load, and can be an indication of the successional stage of the forest community. On each plot field crews visually estimated crown canopy coverage for four plant groups-tree seedlings/saplings, shrubs, forbs, and graminoids (see USDA 1995 for details). Figure 11 shows the average percent cover of plant groups on forest land by forest type. Cottonwood, miscellaneous western softwoods, deciduous oak woodland, and miscellaneous western hardwood forest types are based on relatively small samples (see table 1).

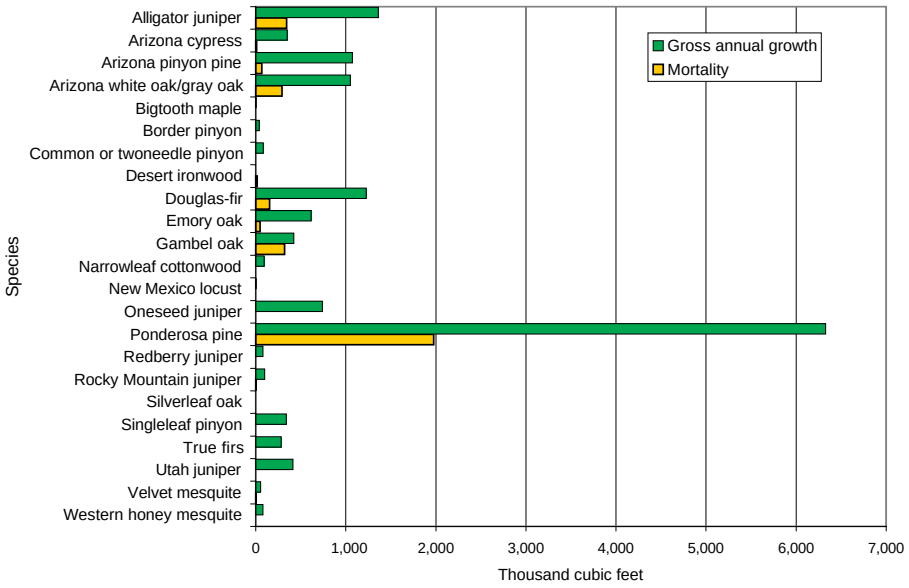


Figure 10—Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forest land,Tonto National Forest.

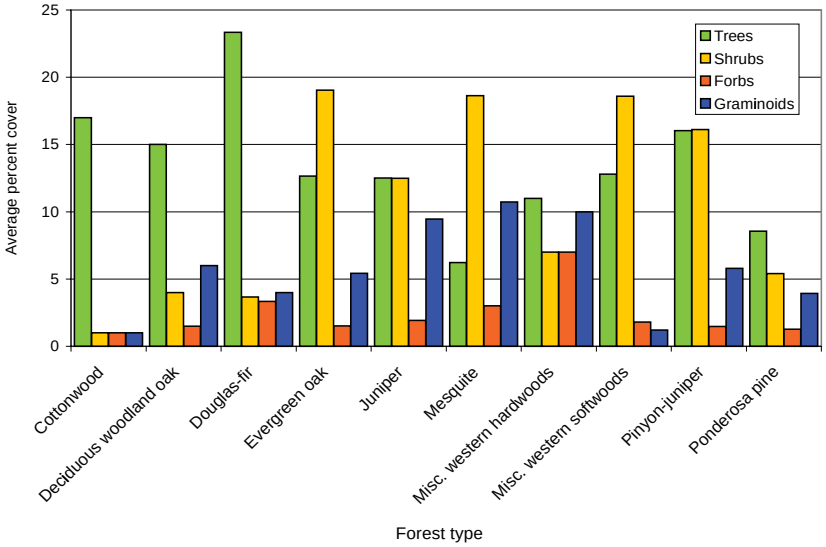


Figure 11—Average percent cover of trees (seedlings/saplings), shrubs, forbs, and graminoids on forest land by forest type, Tonto National Forest.

Nonreserved timberland: highlights of our inventory

Tree and stand size—About 11 percent of forest land in the Tonto National Forest is nonreserved timberland. The area of nonreserved timberland by stand-size class is presented in figure 12. Similar to all forest land in the Tonto (see fig. 6), most of the nonreserved timberland area has a plurality of stocking from large trees.

Figure 13 shows the number of growing-stock trees by 2-inch diameter class on nonreserved timberland on the Tonto. Growing-stock trees are live timber species meeting specific standards of quality and vigor. Of all growing-stock trees on nonreserved timberland on the Tonto, 35 percent are 9 inches diameter or greater.

Wood volume, biomass, and basal area of growing-stock trees—Table 4 displays a breakdown of net cubic-foot volume, tons of wood biomass, and square foot basal area for growing-stock trees 5 inches diameter and greater by species on nonreserved timberland for the Tonto. The total net cubic-foot volume of growing stock on nonreserved timberland is about 292 million cubic feet. Ponderosa pine accounts for 79 percent of this volume. Total wood biomass is estimated at 5.5 million tons, with ponderosa pine again making up 79 percent of this amount. Total basal area for growing-stock trees on nonreserved timberland is estimated at over 13.4 million square feet, 77 percent of which is ponderosa pine.

The total net sawtimber volume on nonreserved timberland is estimated at 1.2 billion board feet (Scribner rule).

Sawtimber includes all growing-stock trees 9 inches and greater for softwoods, and 11 inches diameter and greater for hardwoods. Ponderosa pine accounts for over 79 percent of this volume and Douglas-fir accounts for 17 percent.

Growth and mortality—Gross annual growth of growing-stock trees on nonreserved timberland on the Tonto is estimated to be 5.8 million cubic feet, with mortality estimated at 0.8 million cubic feet. This calculates to a net annual growth of 5.0 million cubic feet. All of the mortality volume was attributed to only two species: ponderosa pine (81 percent) and Douglas-fir (19 percent). Gross annual growth is compared to mortality for timber species in figure 14. Mortality for nonreserved timberland on the Tonto is about 14 percent of gross annual growth, somewhat lower than the 22 percent mortality for all forest land.

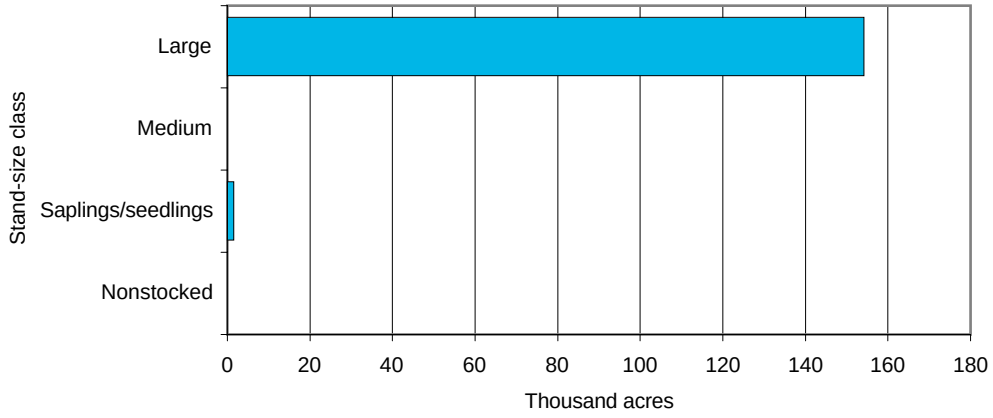


Figure 12—Area of nonreserved timberland by stand-size class, Tonto National Forest.

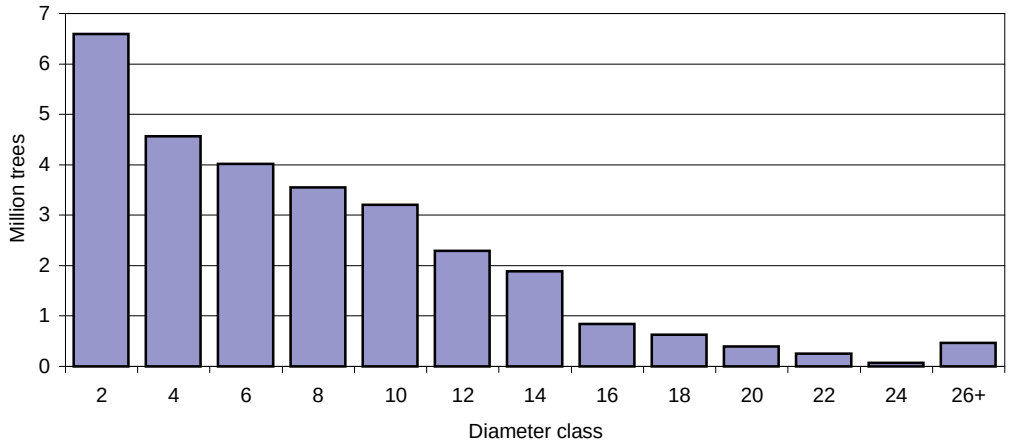


Figure 13—Number of growing-stock trees on nonreserved timberland by 2-inch diameter class, Tonto National Forest.

Table 4—Net cubic-foot volume, tons of biomass, and square feet of basal area by species on nonreserved timberland, 5 inches diameter and greater, Tonto National Forest, 1996.

Species	Volume (million cubic feet)	Biomass (million tons)	Basal area (million square feet)
Ponderosa pine	232.2	4.4	10.4
Douglas-fir	46.8	0.9	2.2
True firs	6.0	†	0.3
Arizona cypress	4.8	0.1	0.4
Narrowleaf cottonwood	2.7	†	0.2
Total*	***292.4**	***5.5**	**13.4**

† less than 100,000 tons
* numbers may not add to total due to rounding

The inventory methods

About the two-phase sample design—FIA inventories provide a statistically-based sample of forest resources across all ownerships that can be used for planning and analyses at local, state, regional, and national levels (for further information about the national FIA program, refer to the World Wide Web at http://www.fia.fs.fed.us). IWFIA uses a two-phase sampling procedure for all inventories. Phase one of the inventory is based on a grid of sample points systematically located every 1,000 meters (approximately one sample point per 247 acres) across all lands in the State. Phase one points are assigned ownership and vegetative cover attributes using maps and remotely sensed imagery. Field crews conduct phase two of the inventory on a subsample of the phase one points that occur on forest land. The sampling intensity is one field plot every 5,000 meters (approximately one field plot per 6,178 acres), or about every 3 miles. Phase two plots are stratified based on phase one ownership and vegetation information, and weights are assigned to each stratum based on the proportion of phase one points in that stratum.

Phase two plots were sampled using the mapped-plot design. There were 464 field plots on the Tonto National Forest, of which nine were determined to be inaccessible.

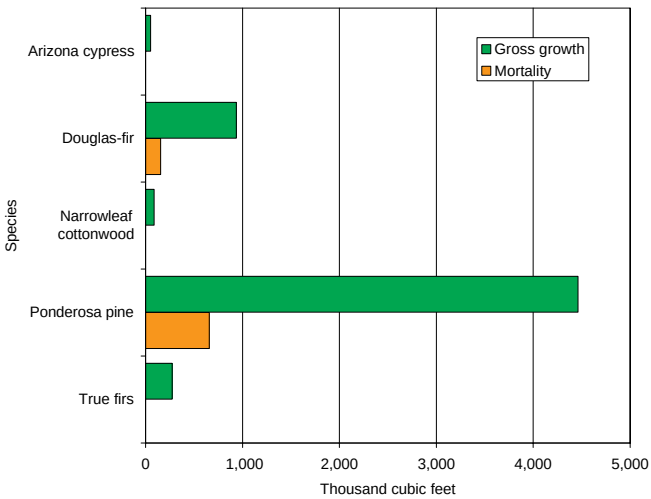


Figure 14—Gross annual growth of growing-stock trees 5.0 inches diameter and greater compared to mortality on nonreserved timberland, Tonto National Forest.

A total of 216 field plots sampled only forest conditions, 26 sampled both forest and nonforest conditions, and 213 sampled only nonforest conditions. A total of 270 forest conditions (stands) were sampled on 242 plots that contain 229.0 forest and 13.0 nonforest/water condition proportions.

About the mapped-plot design—The mapped-plot design was adopted by Forest Inventory and Analysis nationwide by 1995. The predetermined subplot layout uses boundary delineation, when necessary, to classify differing conditions. Most plots sample a single forest condition, therefore delineating conditions is often not required.

Conditions were separated or mapped on differences in any of five attributes: forest/nonforest, forest type, stand-size class, stand origin, and stand density. The condition proportion is the fraction of plot area sampled on each condition. The sum of all condition proportions for a plot equals 1.00. Therefore, the number and relative size of plot conditions determines the weighted area (condition proportion multiplied by expansion factor) used for sample expansion.

Standard errors—The two-phase sampling scheme was designed to meet national standards for precision in State and regional estimates of forest attributes. Standard errors, which denote the precision of an estimate, are usually higher for smaller subsets of data. Percent standard errors for estimates of area, net volume, net annual growth and annual mortality are presented in table 5. Standard errors for other estimates are available upon request (see "For further information" section on the inside back cover).

Table 5—Percent standard error for area estimate on total forest land, and percent standard errors for estimates of net volume, net annual growth, and annual mortality for all trees on total forest land, and growing-stock trees on nonreserved timberland (5 inches diameter and greater), Tonto National Forest.

Land class	Attribute	Estimate	Percent standard error
Total forest land (acres)	Area	1,438,099	±3.8
Total forest land (all trees cubic feet)	Volume	1,049,108,852	±7.5
	Growth	11,504,166	±16.2
	Mortality	3,231,842	±42.6
Nonreserved timberland (growing-stock trees cubic feet)	Volume	292,436,425	±20.1
	Growth	4,998,615	±24.6
	Mortality	812,012	±57.1

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Selected data for this Forest are part of a national database that houses information for much of the forest land in the United States. This database can be accessed on the Internet at the following web site. Select FIADB for data

http://www.fs.fed.us/rm/ogden/data_retrieval.html

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