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NEVADA'S FOREST RESOURCES, 2009–2018

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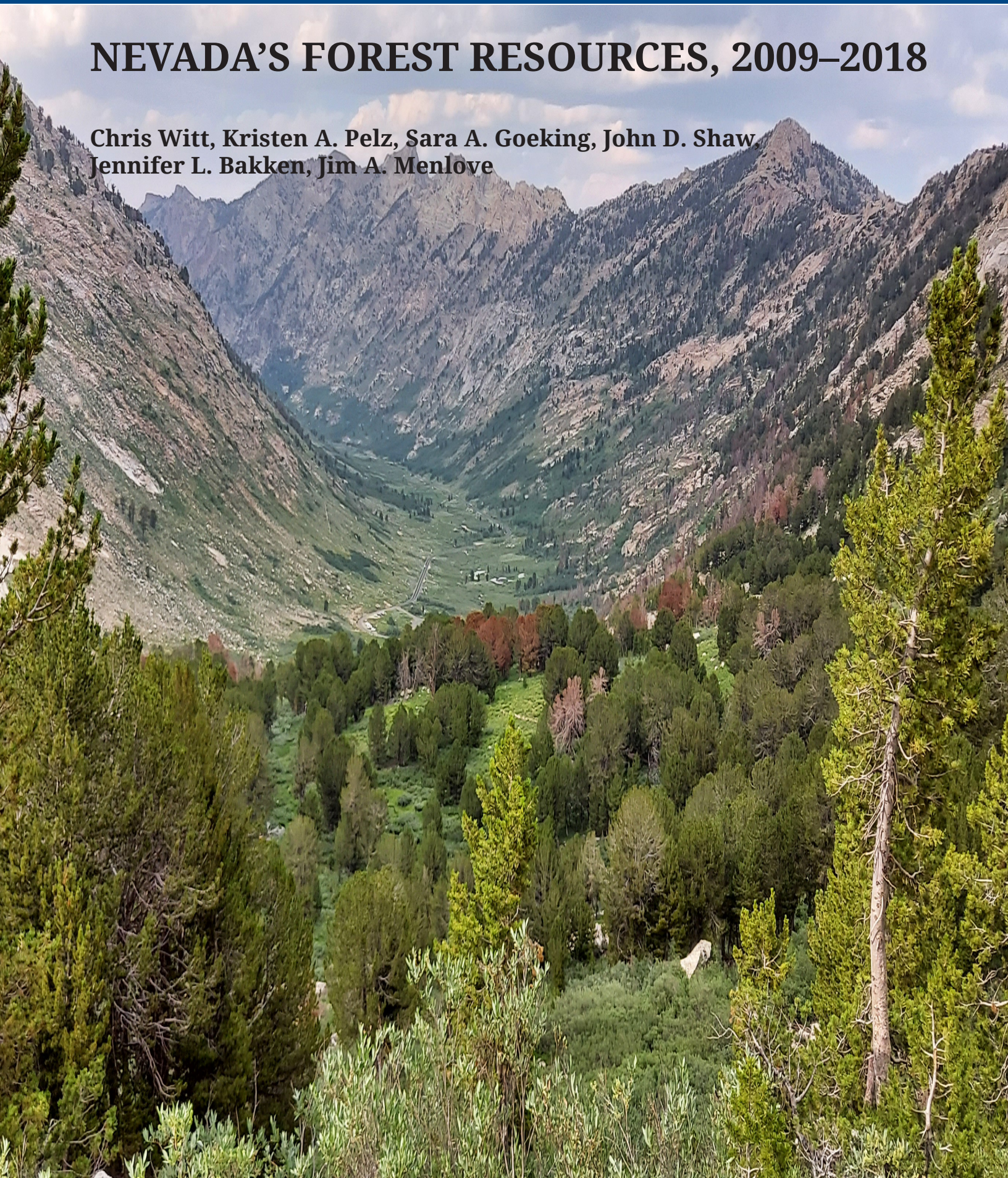

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Abstract

This report summarizes the most recent Forest Inventory and Analysis data of Nevada's forests based on field data collected between 2009 and 2018. Many of the results were compared to those from the 2004—2013 evaluation period. Results show that Nevada's forest land covers 10.6 million acres, most of which (63 percent or 6.7 million acres) are administered by the United States Department of the Interior Bureau of Land Management. The State's most abundant forest type is Pinyon-juniper woodland, which covers almost 7.3 million acres. At 1.9 billion live trees, woodland softwoods (principally pinyon and juniper species) make up the largest share of the estimated 2.5 billion live trees 5.0. inches or greater in diameter in Nevada, and this species group is the most abundant by volume and biomass as well. Nevada's forests contain 6.2 billion cubic feet of net volume in trees 5.0 inches diameter and larger. Nevada had positive annual net growth of all live trees 5.0 inches diameter and larger, at 9.5 million cubic feet per year during the most recent evaluation period (2009–2018). Most of this growth occurred in Pinyon-juniper woodland and ponderosa pine forest types. The bulk of the other forest types in Nevada had negative annual net growth for the evaluation period. The report includes descriptive highlights and tables of area, numbers of trees, biomass, volume, growth, and mortality on forested lands. Also included is a case study that uses the Forest Vegetation Simulator tool to project possible future conditions of the Pinyon-juniper woodlands that dominate Nevada's forested landscape. Most results are organized by forest type or forest-type group, tree species group, diameter class, or owner group.

Keywords: Nevada, forest inventory, field data, trees, biomass, growth, mortality, projections

Cover: Lamoille Canyon, Ruby Mountains, Humboldt-Toiyabe National Forest. USDA Forest Service photo by Marisa Anderson.

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Acknowledgments

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Introduction, Methods, and Data

Introduction

Nevada encompasses a wide variety of forested environments that are valued for their scenic beauty, forest products, wildlife habitat, and myriad ecosystem services. This report contains highlights of the status of Nevada's forest resources based on a full 10-year cycle of forest inventory data, collected from 2009 to 2018.

This chapter summarizes inventory methods conducted in Nevada. The following chapters present an overview of forest attributes quantified by the FIA program, such as forest land area, tree volume, and indicators of forest health. The appendices include supplemental information, including a glossary of terms used in this report, standard forest resource tables, a list of Nevada's forest types and forest-type groups, and a list of Nevada's tree species and species groups.

The annual inventory is designed with the intention of allowing for analysis of trends through time. This report can be compared to previous reports, while keeping in mind definitional changes within FIA that could contribute to apparent changes. Tree growth and mortality data have been updated since publication in past reports, so current analysis will differ slightly from previously published results.

Methods and Data

The data used to produce this report were collected by the Rocky Mountain Research Station Forest Inventory and Analysis (RMRS-FIA) program. In 1998, the Agricultural Research Extension and Education Reform Act, also known as the Farm Bill, mandated that inventories would be conducted throughout the forests of the United States under an annualized system. The annual inventory system includes a systematic national sampling design consisting of 1 plot per approximately 6,000 acres, a nationally consistent plot configuration with 4 fixed-radius subplots, and annual measurement of a constant proportion of permanent plots. The inventory strategy for the western United States involves measurement of 10 systematic samples, or subpanels, where one subpanel is completed each year and all subpanels are measured over a 10-year period. Each subpanel is spatially balanced across the State and is preassigned to be surveyed during a specific calendar year, which is referred to as inventory year (see Appendix B for standard FIA terminology). The year in which each plot is actually surveyed is recorded as its measurement year. The entire inventory cycle is designed to be completed in 10 years in RMRS-FIA. FIA's statistical sampling and estimation procedures are described in more detail in Bechtold and Patterson (2005). Where error bars are included in this report, they indicate one standard error from the estimated mean, or a 68 percent confidence interval (Bechtold and Patterson 2005).

Initial implementation of the annual inventory system in Nevada began in 2004 in tandem with the Nevada Photo-Based Inventory Pilot (NPIP) (Frescino et al. 2009). During the 2006 field season, annual inventory ceased due to lack of funding. In 2009, FIA crews resumed work in Nevada, completing as many of the plots scheduled for

measurement in previous inventory years as possible, and by 2013 the initial full inventory cycle was completed. Data collection in Nevada has been fully funded and followed the regular inventory schedule since 2012. This report is based on the aggregated data collected in inventory years 2009 to 2018. Nevada's full inventory consists of 11,346 plots, of which, during the current cycle, 1,931 sampled forest land and 9,415 sampled nonforest or water. This report focuses on forest resources on forest land only. FIA's forest land definition is described in detail in Appendix B. Results from the NPIP data are also available (Frescino et al. 2016), which evaluated Nevada's forest resources using different methods than FIA's standard annual field inventory and provide more information about land cover and land use on Nevada's nonforest areas.

Plot measurements begin when office staff assess plot locations using aerial photography. Any plot locations that are clearly nonforest (for example: in a lake, parking lot, or agricultural field) are recorded and entered into the database as nonforest, along with their nonforest land use and land cover type. Plot locations that are forested (or potentially forested) are designated for visit and potential full measurement by field crews. (When potentially forested plots are found to be nonforest, land use and land cover type are recorded by crews.)

The FIA field plot layout consists of four subplots (Bechtold and Scott 2005, USDA Forest Service 2016). The centers of subplots 2, 3, and 4 are 120 feet from the center of subplot 1 at azimuths of 360, 120, and 240 degrees, respectively (fig. 1). Trees with a diameter (diameter at breast height [d.b.h.] or at root collar [d.r.c.]) of 5.0 inches and larger are measured on a 24-foot radius (1/24 acre) circular subplot. All trees less than 5.0 inches diameter are measured on a 6.8-foot radius (1/300 acre) microplot located 12 feet and 90 degrees from each subplot center. Attributes reported here are generally measured on forested plots only (see Appendix B for FIA forest definition). Changes in land conditions (forest, nonforest, or water) that occur on the subplots and microplots are recorded. Those land conditions recorded as forest can be further differentiated by differences in reserved status, ownership group, forest type, stand-size class, tree regeneration status, and tree density.

Specific data collection procedures are described in RMRS-FIA field manuals (USDA Forest Service 2008, 2010, 2011, 2013, 2016), which are available online at https://www.fs.fed.us/rm/ogden/data-collection/field-manuals.shtml. FIA data, including those used for this report, are available to the public through the National FIA Tools and Data website (https://www.fia.fs.fed.us/tools-data/index.php). Data documentation (Burrill et al. 2018) is available from the FIA Library website (https://www.fia.fs.fed.us/library/database-documentation/index.php). For assistance with data, contact persons listed on the Customer Service website (https://www.fia.fs.fed.us/tools-data/customer-service/index.php) or authors of this report.

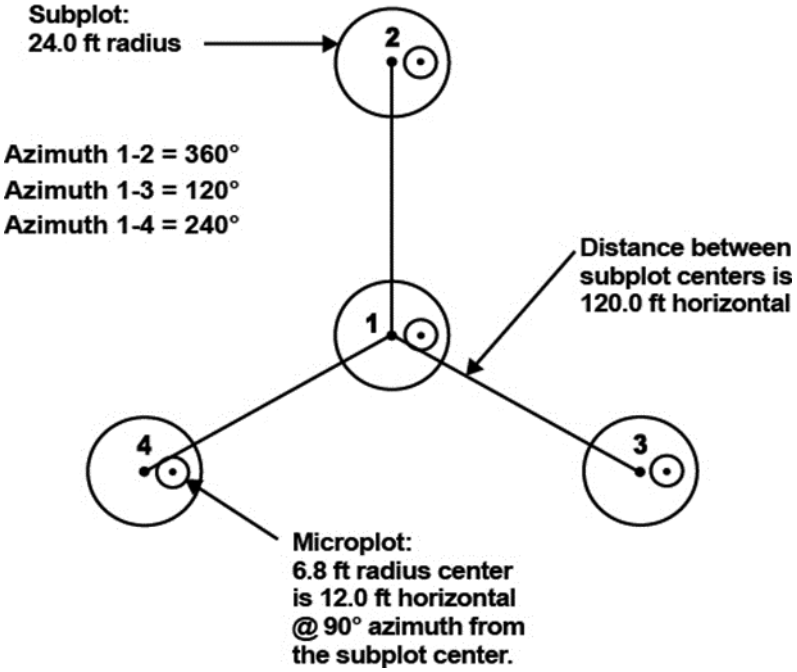

Figure 1—Forest Inventory and Analysis plot layout.

Overview of Nevada's Forests

This chapter summarizes the current status of Nevada's forests for attributes such as forest area and ownership, forest type, numbers of trees, tree volume and biomass, stand age, understory vegetation, tree growth, and mortality. When applicable, these will be compared to the most recent annual inventory report for Nevada (Menlove et al. 2016). Some forest attributes are reported at a statewide scale, while others are reported for specific forest land classifications. FIA uses a nationally consistent standard for defining different categories of forest land based on reserved status and productivity. These categories were originally developed for separating forest land deemed suitable for timber production from forest land that was either not suitable or unavailable for timber harvesting activity, which includes woodland forest types.

The first division of forest land is unreserved forest land and reserved forest land. Unreserved forest land is considered available for harvesting activity where wood volume can be removed for timber products. Reserved forest land is considered unavailable for any type of wood utilization management practice due to legal designation. It should be noted that a combination of physical and regulatory factors may preclude removal of timber products from unreserved forest land, and timber removal may occasionally be allowed on reserved forest land to meet nontimber management objectives. Both unreserved and reserved forest lands are further divided based on productivity. Unreserved forest land is subdivided into timberland and unproductive forests. Timberland is defined as unreserved forest land capable of producing 20 cubic feet per acre per year of wood (at culmination of mean annual increment) from timber species. Unproductive forests, because of some combination of woodland (nontimber) tree species and site conditions, are those not capable of producing 20 cubic feet per acre of commercial-quality wood (see Appendix B for definition details).

Forest Area, Forest Type, and Ownership

The State of Nevada, minus the Nellis Air Force Range, covers almost 68 million acres, of which an estimated 10.6 million acres are classified as forest land by FIA. Most of this forest land (8.9 million acres) is unreserved and available for a multitude of uses, with 256,000 acres considered productive enough to meet FIA timberland standards. Only 1.7 million acres of forest land in Nevada are in reserved status, with 250,000 acres of reserved forest acres classified as productive. Table C1 (in Appendix C) reports the proportion of Nevada classified as forest land, along with the percentage of that forest land by reserve status and productivity.

A large portion of Nevada's forested land is classified in the Nonstocked forest type; it is second only to the Pinyon-juniper woodland forest type in acreage (FIA-defined forest types and forest-type groups are capitalized throughout the report to distinguish them from specific tree species or other categorizations of forest composition). Nonstocked forests (the Nonstocked forest type) include those forest lands that formerly had the requisite stocking of live trees to be considered forested, but, upon measurement during

the current evaluation period, were not stocked but are expected to return to a forested condition in a foreseeable period of time (see Appendix B for detailed definition). A Nonstocked condition is most often due to recent disturbance such as fire, disease, or commercial harvest where tree regeneration is expected. Nevada has an estimated 744,000 acres of Nonstocked forest land, a large portion of which has had disturbance (fig. 2). This is an increase from the 2004–2013 estimate of 598,000 acres (Menlove et al. 2016). The majority (87 percent) of Nevada's Nonstocked forests were formerly in the Pinyon/juniper woodland type group. Of the 303,000 Nonstocked acres with a recent disturbance (e.g., recorded during the current evaluation period), fire accounted for 91 percent of this acreage. This proportion is similar to the estimate from the 2004–2013 period. This suggests that over at least the past 15 years fire has played a role in the increasing conversion of the Pinyon-juniper woodland type to the Nonstocked forest type in Nevada. A more thorough examination of the role of disturbance in Nevada's forests appears later in this report.

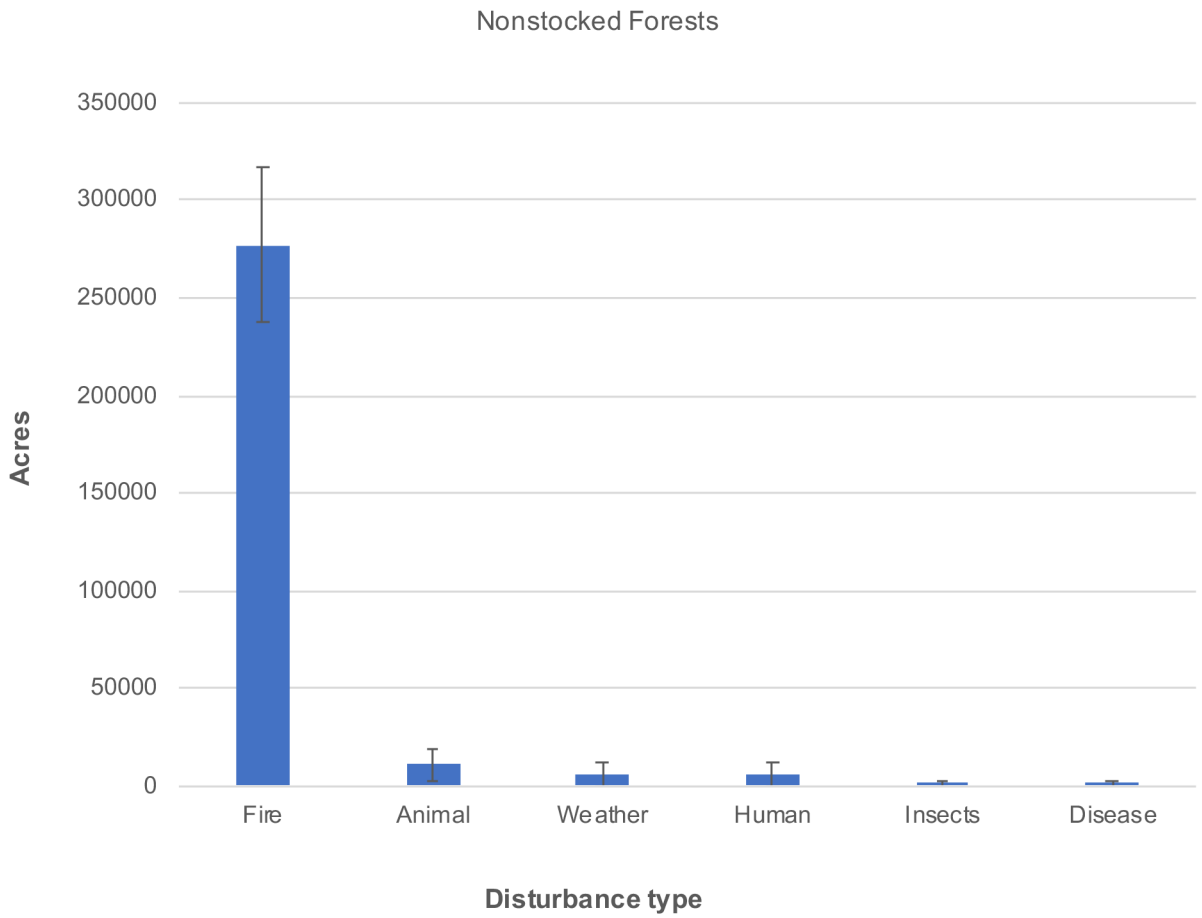

Figure 2—Estimated acres of recent disturbance type in Nonstocked forests. Error bars indicate +/-one standard error of the estimate. Nevada, 2009–2018.

Together, federal entities manage over 96 percent of all forested lands and 93 percent of the productive forest land in Nevada (figs. 3a and 3b). The United States Department of Interior Bureau of Land Management (BLM) manages most of Nevada's forest land (6.7 million acres) with the vast majority (98 percent) of BLM forest land classified as unproductive (table C2). These unproductive forests are dominated by the Pinyon/juniper (5.7 million acres) and Woodland hardwoods (294,000 acres) forest-type groups, which together account for 90 percent of the forest on BLM-administered lands. The BLM also holds more Nonstocked forest lands than all other owners combined, at an estimated 518,000 acres.

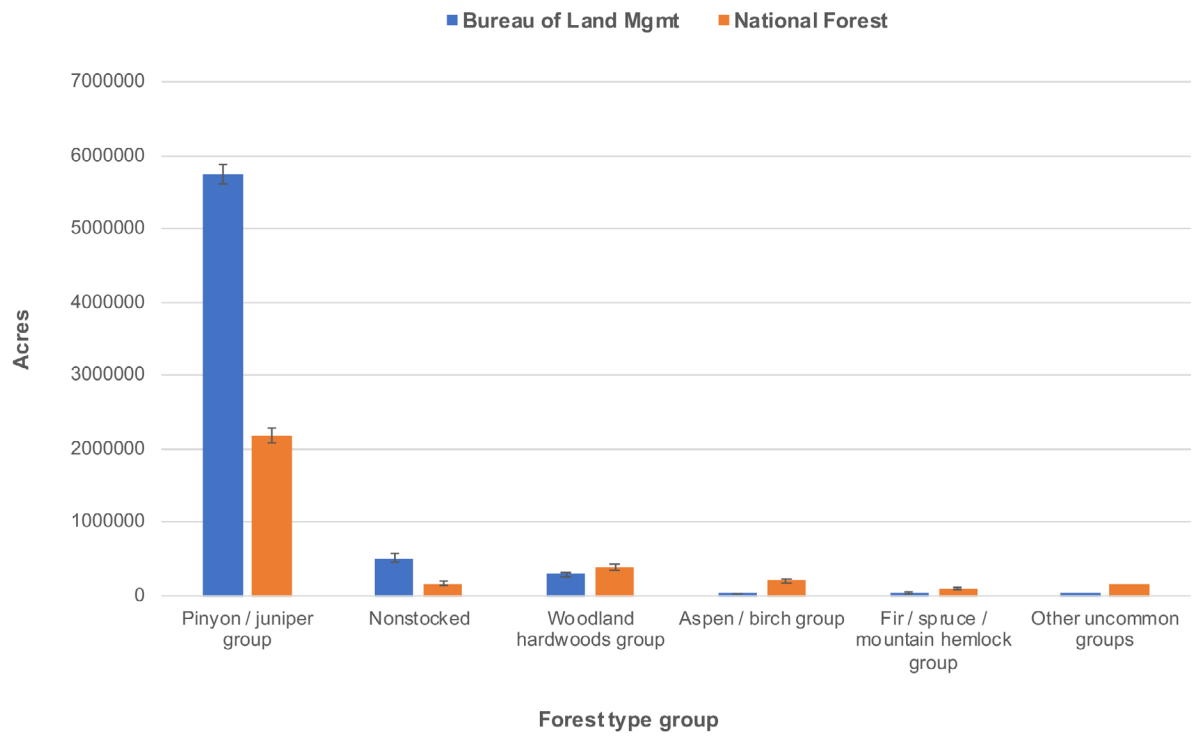

Figure 3a—Estimated acres of the most common forest-type groups administered by the U.S. Forest Service and BLM. Error bars indicate +/- one standard error of the estimate. Nevada 2009-2018.

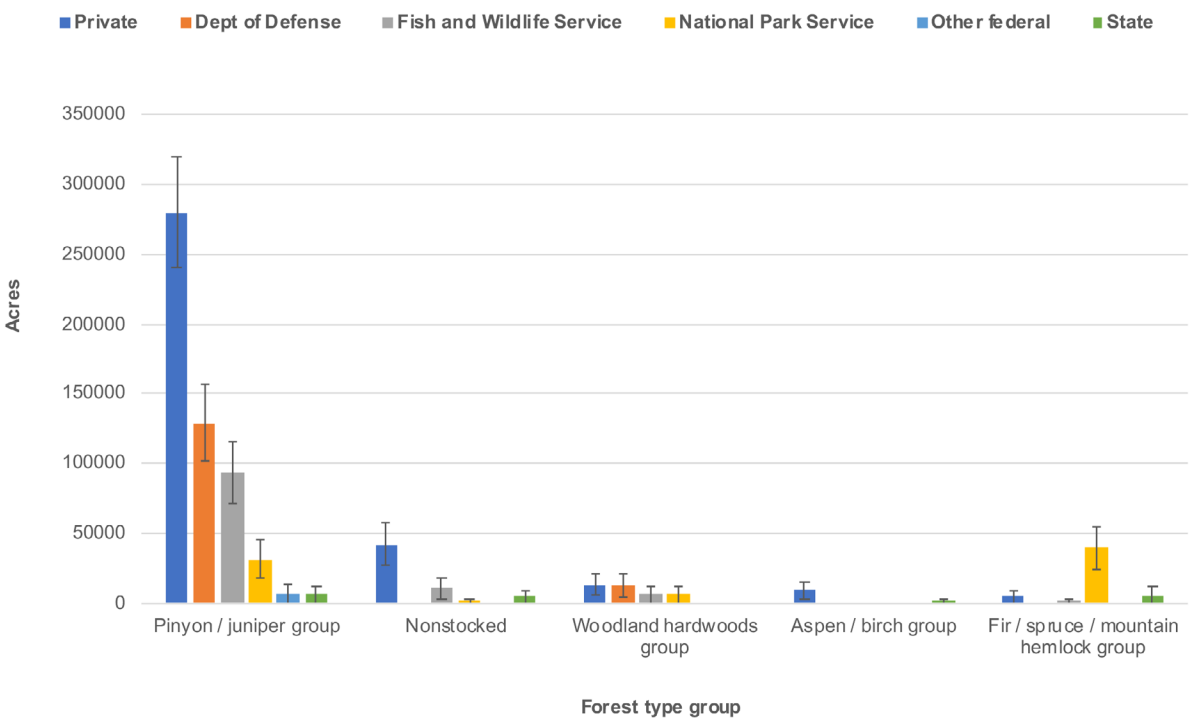

Figure 3b—Estimated acres of forest land administered by various ownership classes by the most abundant forest-type groups. Error bars indicate +/- one standard error of the estimate. Nevada 2009–2018.

The U.S. Department of Agriculture, Forest Service administers 30 percent (3.2 million acres) of all forest land in Nevada and 65 percent (166,000 acres) of the State's timberland. Similar to the BLM's lands, Forest Service forested lands are dominated by the Pinyon/juniper forest-type group, which makes up 68 percent of Forest Service forested acres. However, the Forest Service manages lands containing several hundreds of thousands of acres in the Fir/spruce/mountain hemlock (97,000), Aspen/birch (204,000), and Other western softwoods (95,000) forest-type groups that are not common under other ownerships in Nevada (table C4).

Number of Trees

Nevada contains an estimated 2.5 billion live trees 1.0 inch in diameter or larger (table C10). Estimates of tree numbers are useful to a variety of silvicultural, forest health, and habitat management applications. FIA classifies individual tree species into species groups and categorizes each species and species group as either softwood or hardwood (Appendix E). FIA tree species group names are capitalized throughout the document to distinguish them from specific species.

Softwood species total over 2 billion live trees, or 81 percent of the State's live trees. Around 47 percent of live softwood trees are under 5.0 inches in diameter, and 7 percent are 15.0 inches and larger in diameter. The Woodland softwoods species group

contains the most live trees (1.9 billion) and accounts for 93 percent of all softwood trees in Nevada. The most abundant tree species in Nevada, singleleaf pinyon, accounts for 61 percent of all live softwoods (and half of all live trees), with 1.2 billion trees 1.0 inch or greater in diameter.

Hardwood species account for 19 percent, or 483 million, of Nevada's live trees. Only two species groups make up all hardwoods in Nevada. The Woodland hardwoods species group comprises the majority (60 percent) of the hardwood species, with 288 million trees, while trees in the Cottonwood and aspen group are the remaining 195 million hardwood trees in Nevada. The most common species in the Woodlands hardwood and Cottonwood and aspen groups are curlleaf mountain-mahogany (238 million trees) and quaking aspen (194 million trees), respectively.

Roughly 1.3 billion, or 52 percent, of Nevada's trees are less than 5.0 inches in diameter. The hardwoods species groups have at least 60 percent of their population in the 1.0–4.9 inch diameter class. In contrast, only 3 relatively scarce softwood species—lodgepole pine, Douglas-fir, and white fir—have more than 60 percent of their totals coming from small-diameter trees. Estimated tree numbers, by species, changed little from 2004–2013 to 2009–2018, suggesting little change in relative species abundance across the forested landscape during this time.

Nevada's timberlands contain 22 million growing-stock trees (trees that meet standards that identify them as a valuable timber resource; see Appendix B for full definition). Most of Nevada's growing-stock trees are quaking aspen (6.6 million) and white fir (5 million), but the majority of these are in size classes less than 9.0 inches in diameter (table C12). Jeffrey pine has the most growing-stock trees (1.9 million) in size classes equal to or greater than 11.0 inches in diameter.

There are over 151 million standing dead trees 5.0 inches in diameter or larger in Nevada's forests (table C11). Most of these are singleleaf pinyon (54 million) and Utah juniper (46 million). Together, these 2 species account for two-thirds of all dead trees 5.0 inches and greater diameter in Nevada. However, dead trees account for less than 10 percent of the total trees of these species (fig. 4). Of the species contributing at least 1 percent of the total number of trees in Nevada, limber pine has the largest proportion of standing trees that are dead (23 percent). Overall, standing dead trees make up 11 percent of total trees 5.0 inches or greater in diameter in Nevada.

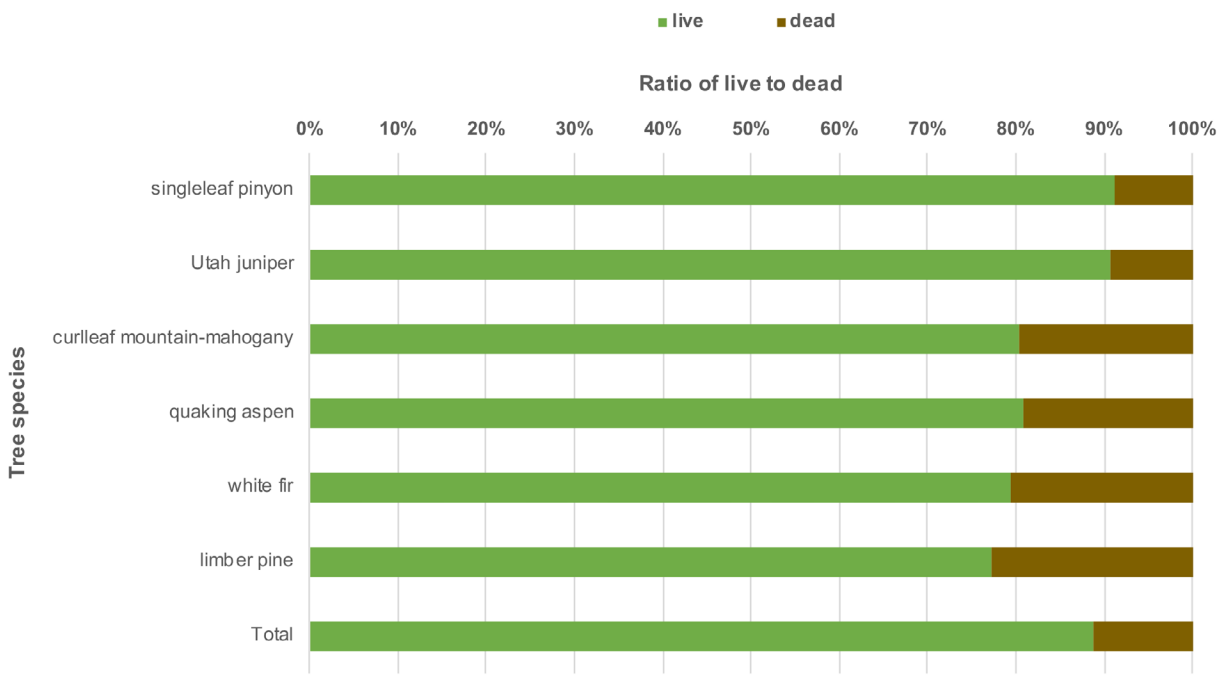

Figure 4—Ratio of live and dead trees 5.0 inches or greater in diameter for the most common species found in Nevada (> 10 million trees). Nevada, 2008–2019.

Dead Trees as Habitat: A Focus on Cavity-Nesting Birds

Standing dead trees are used by many species for nesting, denning, and foraging activities. Members of the guild of cavity-nesting birds are especially dependent on standing dead trees, or "snags," for nesting. There are a handful of bird species that act as primary excavators of nest sites. These birds create a cavity during one breeding season but often abandon it and create a new cavity the following year. The old cavities are then occupied by secondary cavity-nesting birds that depend on primary excavators, as well as a suite of other species. The suitability of an old cavity for a secondary nester often depends on the species of primary excavator that created it.

The Hairy Woodpecker (*Picoides villosus*), Red-naped Sapsucker (*Sphyrapicus nuchalis*), and Northern Flicker (*Colaptes auratus*) are relatively abundant and widespread throughout Nevada's forest types and create different sized openings and cavities in dead trees. They provide suitable nest sites for a wide variety of secondary nesting species across a large range of habitats. In the following analysis we estimated the abundance of snags in Nevada that meet these birds' nesting preferences. Suitability was based on mean diameters found to be used by these species regionally (Dobkin et al. 1995; Flack 1976; Martin et al. 2004; McClelland et al. 1979).

There are 52.6 million snags in Nevada that meet the diameter preferences of Hairy Woodpeckers (greater than or equal to 10.0 inches diameter). Almost 31 million snags are in the greater than or equal to 12.0-inch diameter class preferred by Red-naped Sapsuckers, and just over 17 million snags meet Northern Flicker size requirements of greater than or equal to 14.0 inches in diameter. Utah juniper and singleleaf pinyon provided the bulk of snags in each size class analyzed. Douglas-fir has the highest proportion of snags of a size suitable for all 3 bird species (e.g., greater than or equal to 14.0-inch class), with about 28 percent standing dead trees meeting or exceeding this diameter. This is closely followed by limber pine at 24 percent. However, these species are comparatively rare in Nevada, so the higher percentages do not necessarily equate to high snag numbers or densities overall.

Snags available for this suite of cavity-nesting birds have appeared to remain stable at the statewide scale from the 2004–2013 to the 2009–2018 time period (fig. 5). The greatest number of these snags (regardless of if they were in the 10.0-inch, 12.0-inch, or 14.0.-inch and greater size class), are in forests between 101 and 200 years old, with the second-highest number in forests between 0 and 100 years old. For the 10.0- and 12.0-inch or greater classes, the fewest snags are in forests over 200 years old, while for the 14.0-inch or greater class there are nearly equal numbers in the youngest and oldest forests (fig. 6). This warrants further investigation into whether these snags provide suitable nest sites, as site selection by birds includes other environmental and structural site characteristics, such as proximity to food and level of thermal and security cover provided by an individual nest tree and/or the surrounding stand. Forest stands of differing age classes and species composition will vary in how well they meet these other needs.

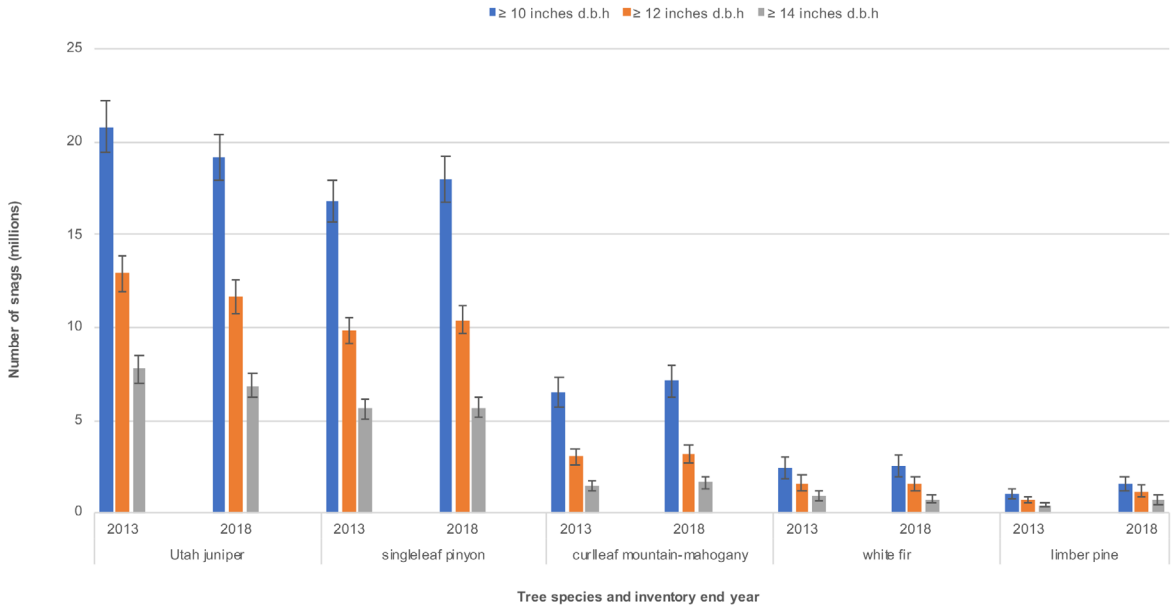

Figure 5—Number of snags meeting diameter preferences for three cavity-nesting bird species in Nevada, by tree species, diameter class, and inventory period. Nevada 2004–2013, 2009–2018.

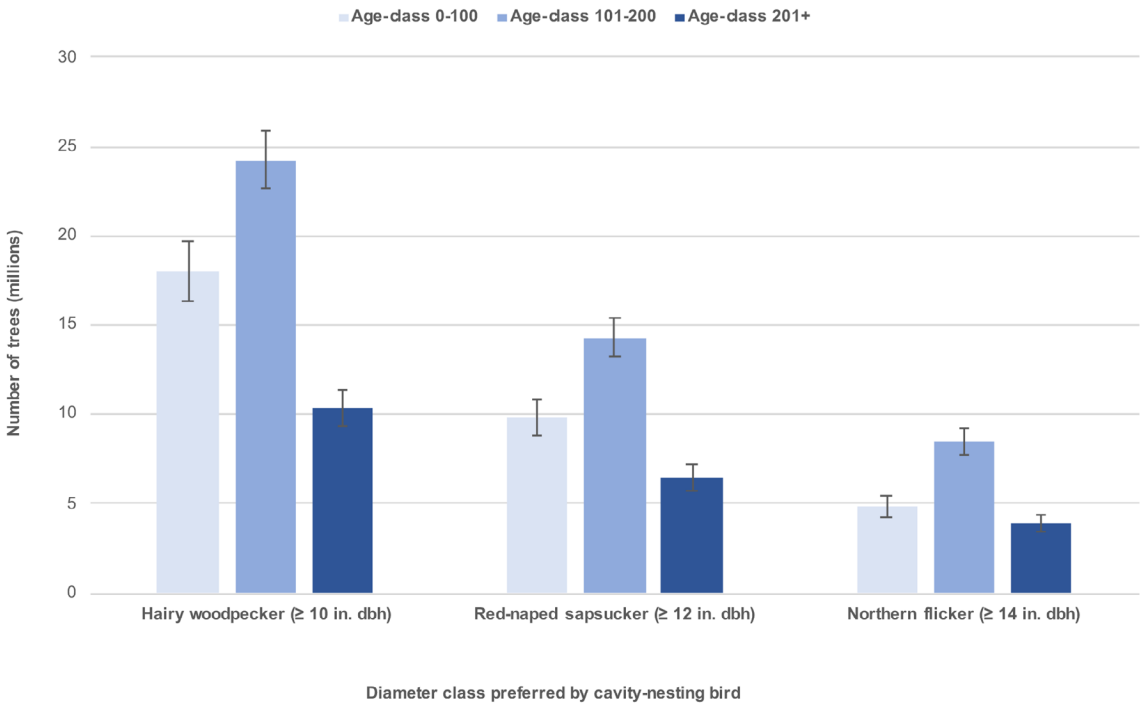

Figure 6—Estimated number of standing dead trees in Nevada that meet the diameter preferences of three cavity-nesting birds, by age class. Error bars indicate +/- one standard error of the estimate. Nevada, 2009–2018.

Tree Volume and Biomass

Cubic-foot volume of wood in a forest is important for determining the possibility and sustainability of current and future wood utilization. Estimates of gross and net volume include only the sawlog portion of live trees 5.0 inches in diameter and larger. Net volume is computed by deducting rotten, missing, or form defects from gross volume. Net volume is reported here for the following categories: all live trees, growing-stock trees, sawtimber, and sawlogs (see Appendix B for detailed definitions). Tree biomass estimates are based on gross volume and describe aboveground tree weight by various components (merchantable bole and bark, tops and limbs, saplings). This method of estimating tree biomass is referred to as the component ratio method and is described by Woodall et al. (2011). Biomass estimates are in units of oven-dry weight (estimates of bone-dry weight can be calculated using the following conversion: 1 bone-dry unit equals 2,400 pounds of oven-dry wood). Tables C13 through C26 show the net volume of live and dead trees in Nevada, by various categories. Unless otherwise noted, all estimates of volume in this section include live trees 5.0 inches or greater in diameter.

The net volume of all live trees on Nevada's forest land is 6.2 billion cubic feet; 79 percent (4.9 billion cubic feet) on unreserved lands, and only 5 percent (297,000 cubic feet) on timberland (table C13). The Forest Service administers most (73 percent) of Nevada's timberland volume, even though the BLM oversees most (63 percent) of the unreserved forest land acres found in the State. Privately owned forests contain only 3 percent of the State's total live volume, or 186 million cubic feet.

The Pinyon/juniper forest-type group contains far more live-tree volume than any other forest-type group in Nevada, with an estimated 4.9 billion cubic feet, followed by the Fir/spruce/mountain hemlock group with 381 million cubic feet live volume (table C15). In terms of tree species rather than forest type, singleleaf pinyon (2.8 billion cubic feet) and Utah juniper (2.2 billion cubic feet) contribute the most volume statewide.

Growing-stock volume varies by species and also by owner class (table C24). Forest Service lands have the most growing-stock volume on timberland, where 3 fir species contribute a combined 131 million cubic feet to Nevada's total. Jeffrey pine is the largest contributor to growing-stock volume on privately owned lands in Nevada, with 21 million cubic feet on these lands. The net volume of Nevada's sawtimber trees on timberland totals 1.3 billion board feet (table C25). Sawtimber live volume includes softwood trees 9.0. inches in diameter or larger, or hardwood trees 11.0 inches in diameter or larger (International ¼-inch rule, Appendix B).

The total weight of oven-dry aboveground biomass for trees 1.0-inch diameter or greater on Nevada's forest land is 110 million tons, of which 78 percent (85.9 million tons) comes from 2 species, singleleaf pinyon and Utah juniper. Curlleaf mountain-mahogany has the most hardwood biomass, contributing 5.8 million dry short tons, or 5 percent, to Nevada's total. Although biomass is typically sold by green weight, the water content of wood is highly variable. In contrast, oven-dry weight does not change due to fluctuations in tree water content. Tables C27–C31 report aboveground biomass by various categories in Nevada.

Not surprisingly, the two forest types with the largest net volume and biomass per acre, White fir and Limber pine, are timber forest types (fig. 7). Because estimates for forest types with small samples may not be representative, only forest types sampled on at least 10 plots are discussed here. The White fir forest type had the highest per-acre net volume of live trees 5.0 inches or greater in diameter, with 1,510 cubic feet per acre, followed closely by the Limber pine type with 1,286 cubic feet per acre. The White fir and Limber pine forest types also have the most per-acre biomass of the forest types in Nevada (fig. 8). However, these 2 types are a small fraction of sampled forest land, with only 27 and 11 non-zero plots, respectively. The woodland forest type with the highest per-acre net volume and biomass is the Pinyon-juniper woodland forest type, with 622 cubic feet per acre (and 1,291 plots). The Aspen forest type has the highest biomass per acre of any hardwood type. Note that when estimating volume and biomass by forest type, all tree species found on the plot are included in the estimate.

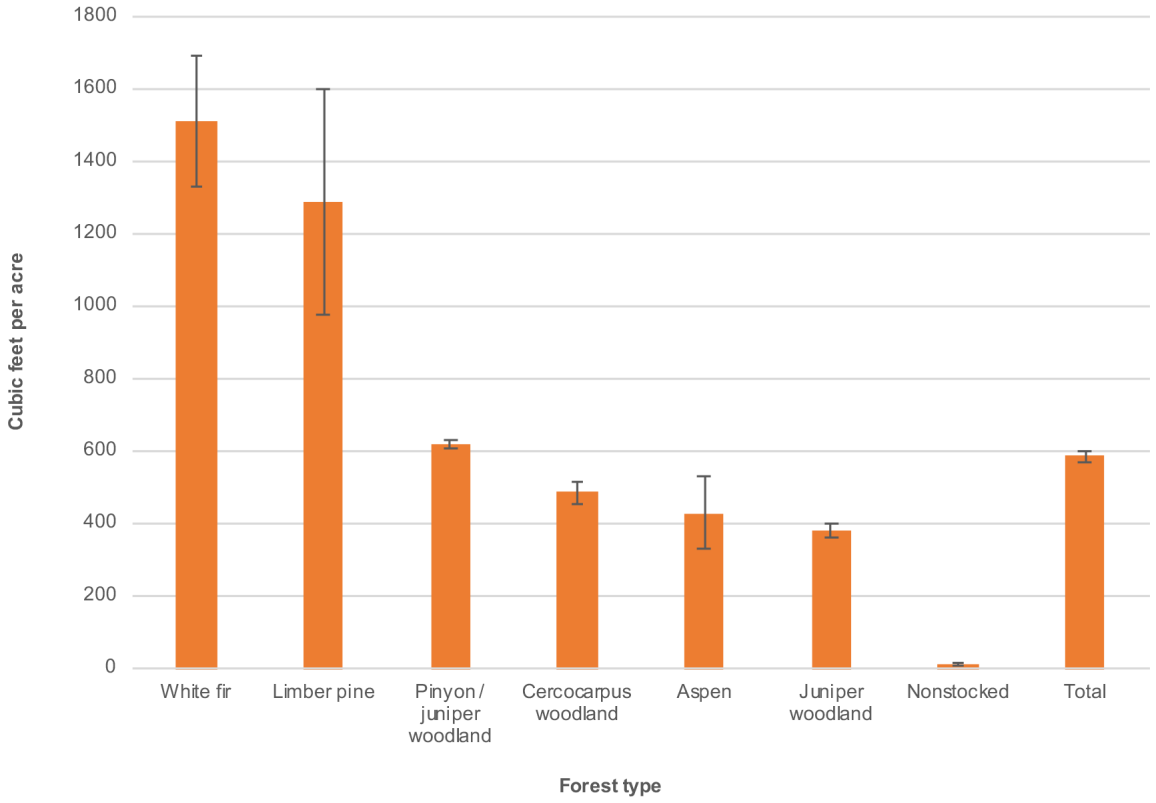

Figure 7—Estimated per-acre volume (cubic feet) of live trees ≥ 5.0 inches diameter by forest type (for forest types with ≥ 10 plots). Error bars indicate +/- one standard error of the estimate. Nevada 2009–2018.

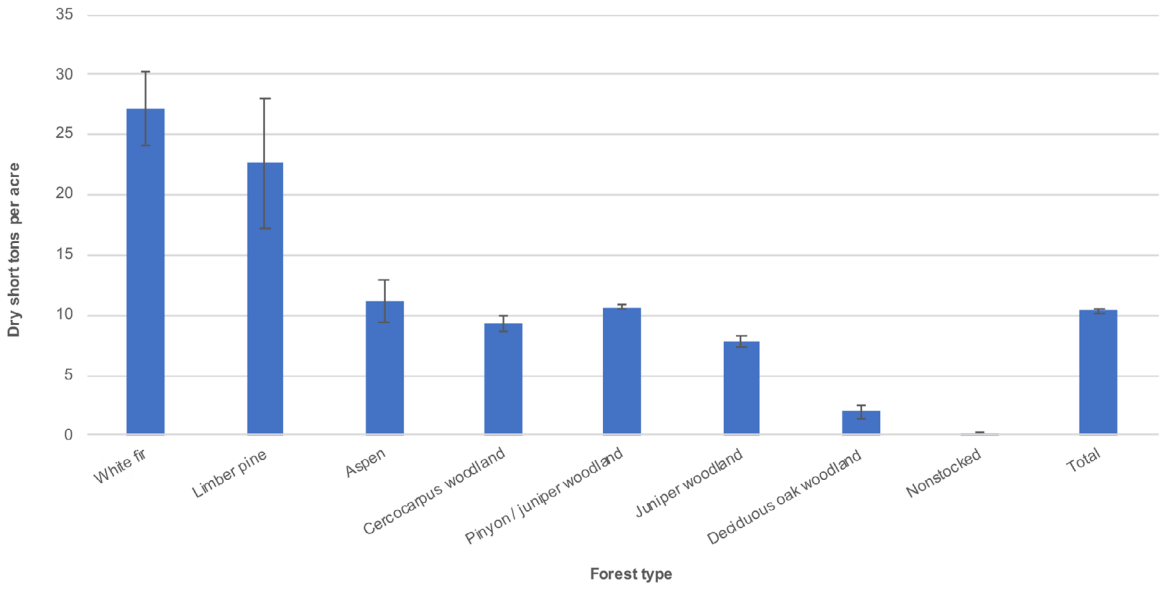

Figure 8—Estimated per-acre aboveground biomass (dry short tons) of live trees ≥ 5.0 inches diameter by forest type (for forest types with ≥ 10 plots). Error bars indicate +/- one standard error of the estimate. Nevada 2009–2018.

Stand-Age Class

Stand age is estimated on every FIA plot that samples forest land and has suitable trees for increment core extraction. This is based on the average age of those trees that fall within the calculated stand-size class (e.g., the dominant tree size). For example, suppose an FIA plot sampled a softwood forest type where about 30 percent of the live-tree stocking was in the large-diameter stand-size class (trees ≥ 9.0 inches d.b.h.) and 70 percent was in the medium-diameter stand-size class (trees between 5.0 and 9.0 inches d.b.h.). The stand would be classified as a medium-diameter stand-size class, and therefore only the medium-size trees would be used in determining stand age.

Table C6 shows the area of forest land, by age class and forest-type group, with 20-year intervals for stand-age classes. Half of Nevada's forest land, or 5.3 million acres, is dominated by trees between 100 and 200 years of age. Stands dominated by trees 121–140 years of age are the most prevalent age class and cover nearly 1.4 million acres, or 11 percent of Nevada's forest land area. Forests younger than 20 years, including the Nonstocked type, cover 1.1 million acres, while forests older than 200 years cover 1.7 million acres.

Figure 9 displays the age classes of four of the five most abundant stocked forest types in Nevada (the most abundant forest type, Pinyon-juniper woodland, is discussed separately). Four varying age-class distributions are evident for these types. Aspen stands rarely age past 120 years in Nevada and most of its stands are in the younger age classes. Juniper woodlands have many acres of young (< 100 years old) and old (> 200 years old) stands. The Cercocarpus (Mountain brush) woodlands (stocked primarily by curlleaf mountain-mahogany) are primarily in the moderate age classes (120–180 years old) and the White fir type is relatively equally distributed across ages, with slightly more acreage in the older classes.

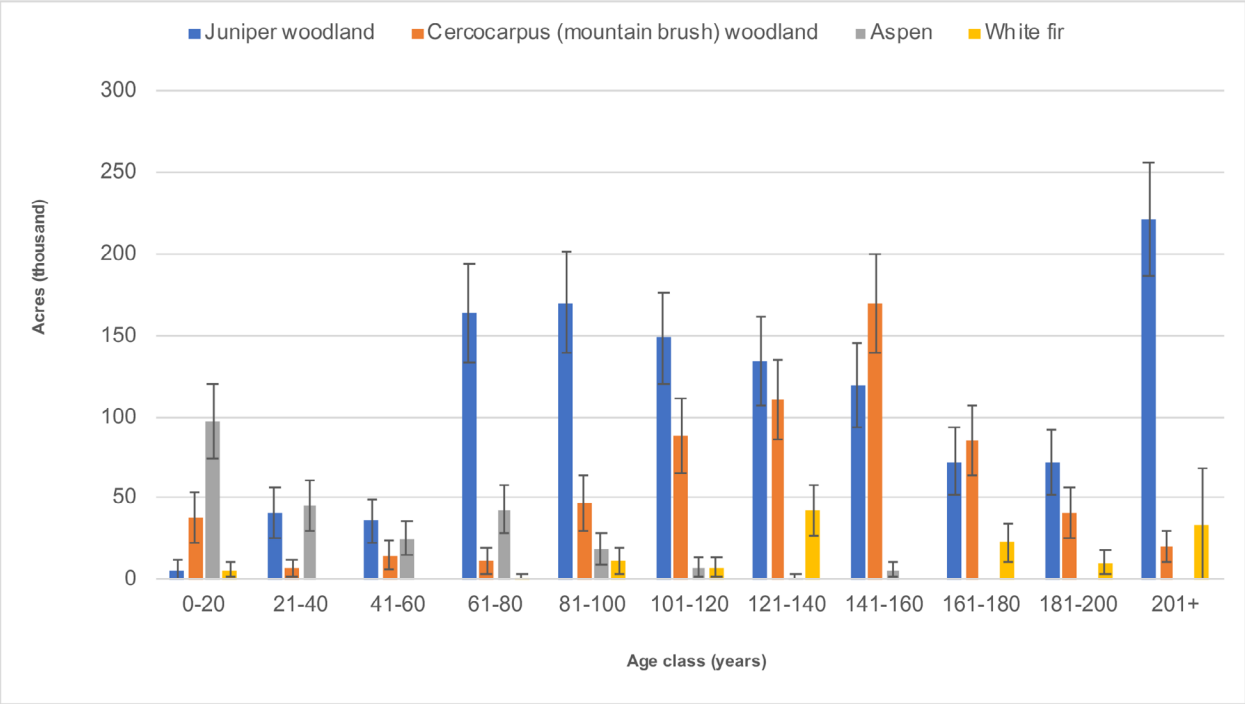

Figure 9—Age class, by acres, in four common forest types. Nevada 2009–2018.

There are limitations to collecting and interpreting data on stand ages. Reliable measurements of increment cores are difficult to collect from certain tree species, particularly woodland species, those that may be very long-lived, or those prone to rot (see the Quality Assurance section of this report for more detail). A single estimated stand age cannot represent the age structure of uneven-aged stands, which include trees of a variety of ages. Stand ages are difficult to accurately determine for stands that are dominated by small-diameter species such as Gambel oak. A stand age of 0 is categorized as Nonstocked forest, which is defined as stands that contain less than 10 percent stocking of live trees because of disturbance.

Pinyon Mast and Tree Age

Pinyon-juniper is the most common of Nevada's forest types and singleleaf pinyon the most abundant species. How pinyon-containing woodlands are distributed across age classes has important consequences for pinyon mast production. Pinyon pine seeds, or "pine nuts," are an extraordinary food resource very high in protein and fats and containing all amino acids required for human growth (Janetski 1997). Unlike many other food items used in the past by indigenous peoples, pine nuts were able to be stored for several years, making them a critical food in winter, times of drought, and periods of game scarcity. Pine nuts continue to be an important cultural and economic staple of contemporary communities in Nevada. Each year pine nuts supplement the diets and incomes of those who know how and where to collect, process, store, and sell them. U.S. pine nut production is estimated to be 400 to 500 tons per year, contributing to a $100 million domestic market for the seeds (Sharashkin and Gold 2004).

Singleleaf pinyon generally begins producing seeds at around 35 years of age. Although important to wildlife at this stage, the numbers of seeds produced by these young trees are not economical to harvest. Not until tree age reaches roughly 75 years do pinyon trees start producing pine nuts in sufficient quantities for efficient harvest. Singleleaf pinyon trees reach maximum seed production around 160 years old and continue until roughly 300 years old, at which time production often falls off considerably (Lanner 1981). Thus, it is useful to know how many acres of pinyon-juniper are currently of sufficient age to provide a useful crop of pine nuts, and how many acres are close to moving into and out of the most productive age classes.

Here we use FIA data to estimate the extent and age distribution of Nevada's Pinyon-juniper woodland forest type and relate the estimates to potential seed production. This analysis estimates the number of acres of "raw material" for pine nut production and does not account for timing and amount of annual precipitation, major disturbances, or other factors that might affect the extent of pinyon masting. Estimates were stratified by the age classes that reflect the varying seed productivity levels discussed above. In addition, the portion of each age class that will move to another in the next 20 years (in the absence of natural or anthropogenic disturbance) is identified. This information may be useful to resource managers interested in perpetuating Pinyon-juniper woodlands that have the potential to produce large quantities of pine nuts.

The 75–160 year age class currently covers over half (52 percent) of Nevada's Pinyon-juniper woodland area (fig. 10). This age class represents fully mature trees that consistently yield harvest-worthy quantities of pine nuts when environmental conditions are favorable. The second-most abundant age class, at 33 percent of the area, is 161–300 years. These stands produce the most pine nuts of any age class and this estimate is nearly the same as during the 2004–2013 period (was then 29 percent) (Menlove et al. 2016). While very few Pinyon-juniper woodlands are expected to move from a productive age class into an unproductive one due to aging during the next 20 years, many acres are within 20 years of moving into a more productive age class. Barring major mortality events, 54 percent (363,000 acres) of the 35–74 year age class will move into the productive 75–160 year class, and over 865,000 acres moving from that category to the older 161–300 class (fig. 11).

Figure 10—Area of Pinyon-juniper woodland by age class and inventory year. Error bars indicate +/- one standard error or the estimate. Nevada, 2004–2013, 2009–2018.

Figure 11—Acres of Pinyon-juniper woodland predicted to remain or shift age class over the next 20 years. Nevada 2009–2018.

These data suggest that in the absence of a major disturbance or shift in climate, Nevada's Pinyon-juniper woodland will likely increase its number of woodlands in prime pine-nut producing age classes over the next 20 years due to a large recruitment of stands into the most productive age class. However, should a major disturbance convert large areas of seed-producing woodlands into zero-aged (Nonstocked) sites, net pine nut productivity in Nevada could decrease or remain flat. Pinyon-juniper woodlands become more susceptible to catastrophic wildfire, disease, and insect outbreaks as they age and become more heavily stocked. In addition, as these

woodlands become more productive in terms of pine nut production, they often become less valuable to some wildlife species due to changes in stand structure and understory plant composition (Miller et al. 2008). Therefore, there are trade-offs that need to be considered when managing pinyon-juniper woodlands for the pine nut resource.

Understory Vegetation

The structure and composition of understory vegetation reflects the overall diversity, productivity, and habitat quality of forested ecosystems. FIA collects understory vegetation data using two distinct protocols that characterize vegetation structure and composition. Under the vegetation structure protocol, FIA field crews record the height class and percent cover that is occupied by each of four plant growth habits: forbs, graminoids, shrubs, and understory trees (trees less than 5.0 inches in diameter). Under the species composition protocol, height class, growth habit, and percent cover are recorded for individual plant species that occupy at least 3 percent of the ground area. Prior to 2011, there was a 5 percent minimum cover threshold for a species to be recorded. Only the most abundant four species per life form are recorded. The vegetation structure protocol includes all species of a life form, including both those that do and do not meet the minimum threshold for being recorded under the species composition protocol. On plots where many species are present but where each occupies less than 3 percent cover (or 5 percent prior to 2011), there are no species recorded under the species composition protocol but aggregate cover of these species within the same growth habit will be recorded using the understory structure protocol.

Average cover of each life form was calculated for each plot, then averaged across plots within each forest-type group (fig. 12). Understory trees cover more area on average than the other three growth habits in all forest-type groups, except for the Elm/ash/cottonwood and Nonstocked types, which have higher average shrub and graminoid cover, respectively. Average understory tree cover ranges from 1 percent in the Nonstocked forest-type areas to 27 percent in the Elm/ash/cottonwood forest-type group. Shrubs have the second-highest average cover in most forest-type groups. The lone exception is the Nonstocked group, which has higher mean cover of graminoids than shrubs. The Pinyon/juniper group has the lowest average forb and shrub cover of any forest-type group in Nevada, while the Fir/spruce/mountain hemlock group has the lowest graminoid cover, and Nonstocked stands have the lowest tree cover. These overall patterns have not changed from the 2013 evaluation period.

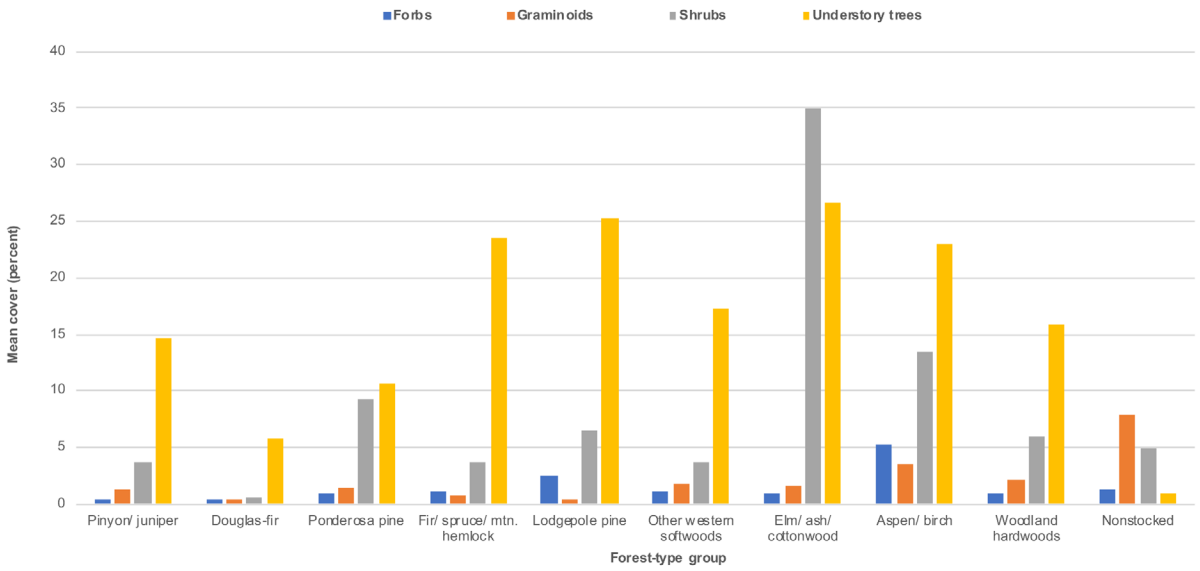

Figure 12—Mean cover of understory vegetation by growth habit and forest-type group. Nevada 2009–2018.

Unsurprisingly, the most common forest-type group in Nevada, the Pinyon/juniper group, was the most frequent location for all but four species recorded (table 1). Species diversity was highest in the shrubs, with 162 species identified. There were 139 forbs recorded, followed by 84 graminoid species and 29 tree species. The two most ubiquitous understory tree species, singleleaf pinyon and Utah juniper, were encountered more frequently than all species other than cheatgrass, big sagebrush, and black sagebrush.

Cheatgrass (*Bromus tectorum*) was one of the most frequently encountered understory plants and has been increasing its average coverage and frequency of detection since 2013. Cheatgrass is a nonnative annual grass that has invaded and displaced native vegetation throughout the Interior West, particularly the Great Basin (Knapp 1999). Cheatgrass grows and produces seeds earlier than most native species, thus gaining a competitive advantage for the limited resources in the arid environments of Nevada and elsewhere. The fine, continuous fuels created by cheatgrass facilitate fire spread and therefore increase fire frequency in areas that formerly had bare ground patches between native shrubs and other plants. Fire perpetuates the spread of cheatgrass, which sprouts prolifically after burning, by creating new areas to invade after native plants adapted to the less frequent historical fire regime are killed (Melgoza et al. 1989).

Table 1—Average cover of the four most frequently observed understory species, by growth habit and most common forest-type group, where observed. This data uses a 5 percent minimum threshold for a species to be recorded. Nevada 2009–2018.

Growth habit	Scientific name	Common name	Average percent cover (where found)	Most frequent forest-type group (where found)
Forb	*Wyethia amplexicaulis*	mule-ears	12.7	Woodland hardwoods
	Collinsia parviflora	maiden blue-eyed Mary	6.2	Pinyon/juniper
	Balsamorhiza sagittata	arrowleaf balsamroot	4.7	Woodland hardwoods
	Stenotus acaulis	stemless mock goldenweed	3.4	Pinyon/juniper
Graminoid	*Bromus tectorum*	cheatgrass	15.0	Pinyon/juniper
	Pseudoroegneria spicata	bluebunch wheatgrass	7.6	Pinyon/juniper
	Festuca idahoensis	Idaho fescue	7.5	Pinyon/juniper
	Poa secunda	Sandberg bluegrass	6.8	Pinyon/juniper
Shrub	*Artemesia nova*	black sagebrush	9.8	Pinyon/juniper
	Artemesia tridentata	big sagebrush	9.5	Pinyon/juniper
	Symphoricarpos oreophilus	mountain snowberry	9.5	Pinyon/juniper
	Purshia tridentata	antelope bitterbrush	6.9	Pinyon/juniper
Tree	*Populus tremuloides*	quaking aspen	28.7	Aspen/birch
	Cercocarpus ledifolius	curlleaf mountain-mahogany	9.0	Woodland hardwoods
	Pinus monophylla	singleleaf pinyon	6.1	Pinyon/juniper
	Juniperus osteosperma	Utah juniper	5.7	Pinyon/juniper

Both public and private land managers are interested in understanding the spatial and temporal patterns of cheatgrass and any other information that can be used to mitigate infestation. FIA field crews document this species using the understory vegetation procedure if its cover reaches the threshold (3 percent in 2011 or later, 5 percent before 2011). In addition, vegetation data is only collected on forested conditions (USDA FS 2016). Therefore, the data do not reflect areas with trace amounts of cheatgrass or cheatgrass on nonforest portions of plots. In order to maintain data consistency over all years used in this report, we compare mean cover of cheatgrass measured at 5 percent cover or greater between the 2004–2013 and 2009–2018 evaluation periods.

Cheatgrass was measured at 5 percent or greater cover on 241 plots during the current evaluation period, an increase from 202 plots in the 2004 to 2013 inventory (table

2). The Nonstocked forest-type group has the highest average cover of cheatgrass in Nevada, followed by three common woodland types (fig. 13). The high incidence in the Nonstocked forest type is expected as cheatgrass invades and quickly establishes itself in areas of severe or frequent disturbance.

Table 2—Comparison of number of plots where cheatgrass was detected (where ≥ 5 percent ground cover) between the 2004–2013 and 2009–2018 Nevada inventories, by forest type.

Forest type	2013	2018	Change in detections
Nonstocked	57	82	25
Cercocarpus woodland	10	19	9
Juniper woodland	31	39	8
Pinyon/juniper woodland	101	97	-4
Aspen	0	2	2
Deciduous oak woodland	2	1	-1
Jeffrey pine	1	1	0
Total	**202**	**241**	**49**

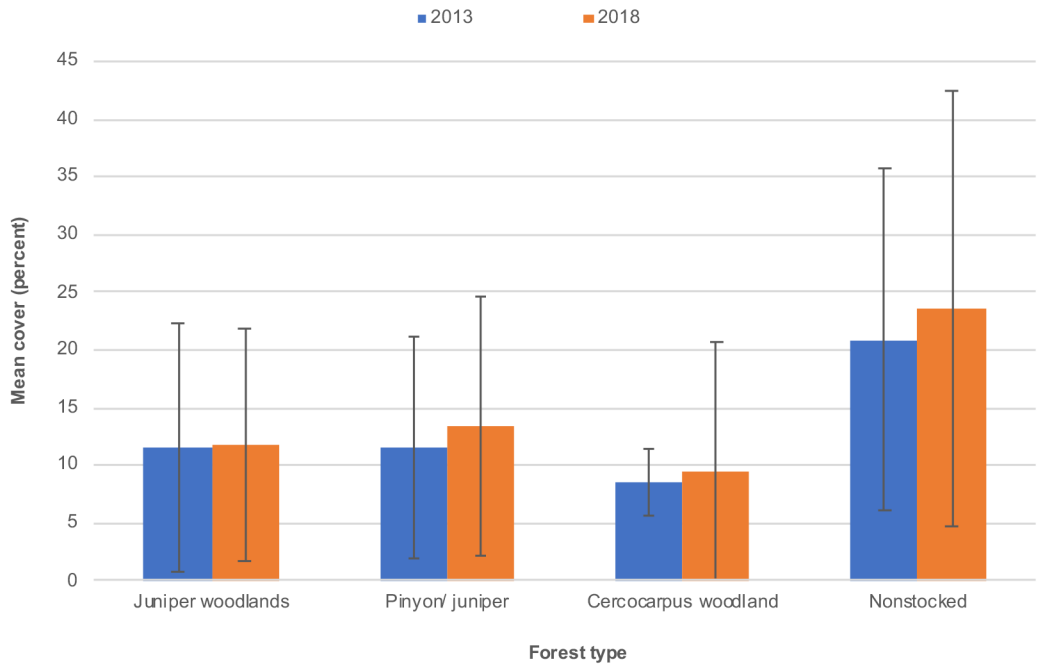

Figure 13—Mean cover of cheatgrass by forest type and inventory period. Error bars indicate +/- one standard error of the estimate. Nevada 2004–2013, 2009–2018.

The average cover of cheatgrass, where found at 5 percent or greater cover on forested plots, is not appreciably different among ecological section, or "ecosections" (Bailey 1995; Cleland et al. 2007) across Nevada, nor between the 2004–2013 and 2009–2018 inventories by ecosection (figs. 14, 15). Acres infested, by ecosection, are reflected in figure 16. There are currently just under 1.3 million forest acres in Nevada with cheatgrass at 5 percent or greater cover, with the East Great Basin and Mountains ecosection containing the highest number of infested acres (367,000). No cheatgrass (at 5 percent cover or greater) was found on plots located within the sampled portions of the Bonneville Basin and Owyhee Uplands ecosections. These estimates are only for the portion of the ecosection in Nevada (fig. 14).

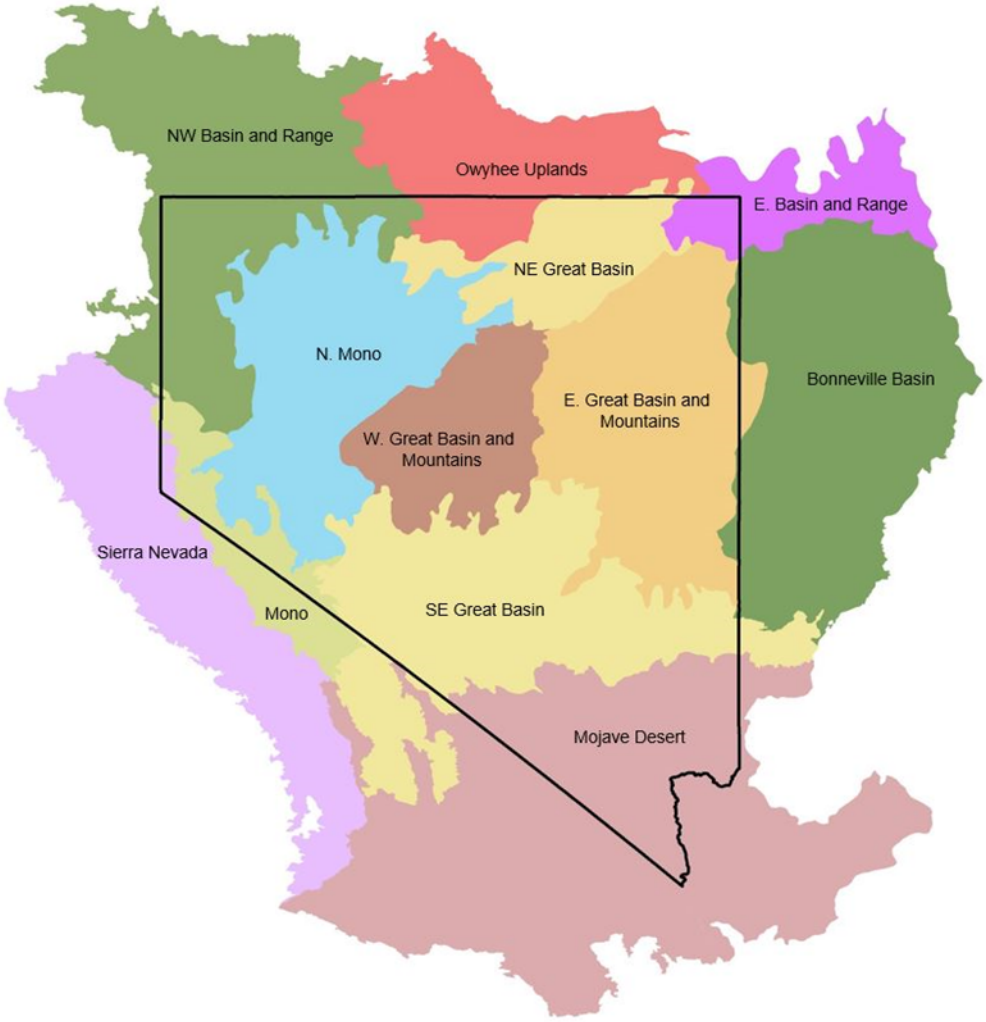

Figure 14—Ecological sections found fully or partially within Nevada (Bailey 1995; Cleland et al. 2007).

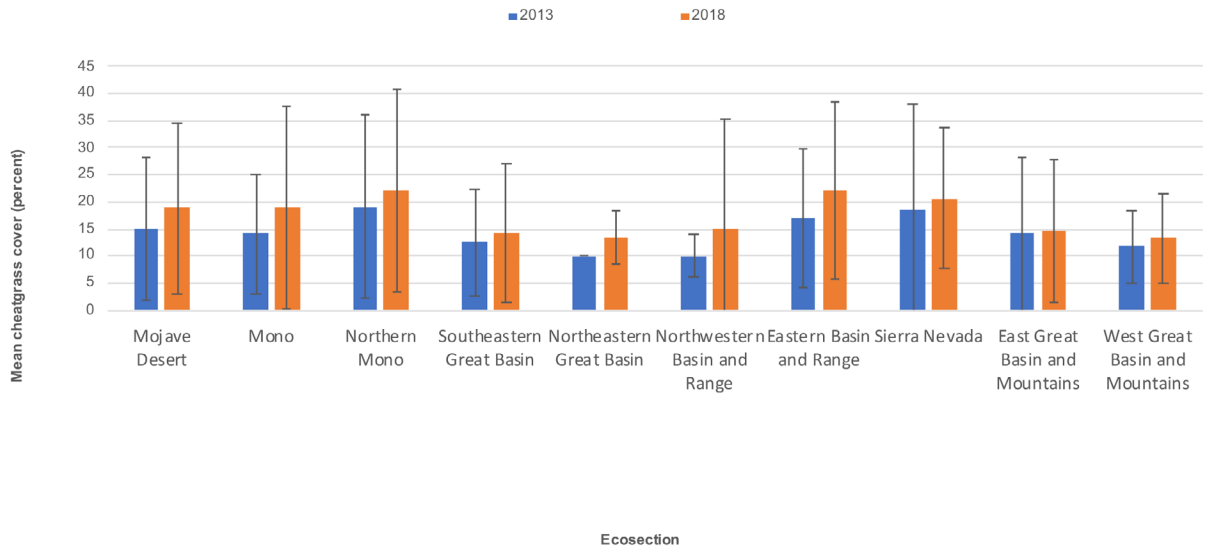

Figure 15—Mean cover of cheatgrass (where found) by ecosection and inventory period. Error bars indicate +/- one standard error of the estimate. Nevada 2004–2013, 2009–2018.

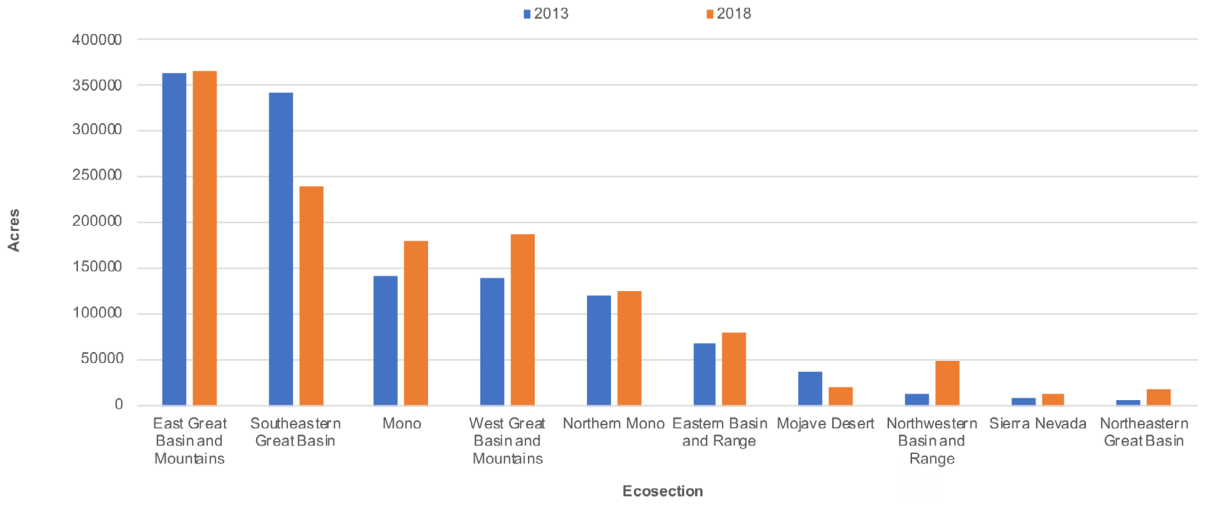

Figure 16—Acres of forest with cheatgrass by ecosection and inventory period. Nevada 2004–2013, 2009–2018.

Forest Health in Nevada

Growth and Mortality

The change in live-tree volume over time is influenced by ingrowth of new trees, continued growth on existing trees, mortality, removals, and changes in plot status (from forest to nonforest, for example). Growth is typically expressed as net annual growth, which is defined as the gross growth minus the volume lost to mortality. Mortality is expressed as the average annual net volume of trees that died over a given time period due to natural causes. Tree mortality typically occurs at low and predictable rates due to factors such as endemic levels of insects and disease, self-thinning, or advanced tree age—this is often referred to as "background mortality." Occasionally, severe losses occur due to insect or disease epidemics, wildfire, or major weather events.

Growth and mortality can be assessed in one of two ways: (1) by using measurements of the same plot at two points in time; or (2) based on a single inventory, as described in the next paragraph. Gross growth, mortality, and net growth are analyzed here. Removal estimates are not provided. Remeasurement data is needed for standard removal estimates and remeasurement of Nevada's plots did not begin until 2014. Estimates of removals (net volume trees harvested or otherwise removed from the inventory) will be available prior to the next 5-year State report.

The procedures used to estimate tree growth and mortality depend on the remeasurement status of the annual plot. A remeasured plot refers to a plot where an inventory plot was established in the previous inventory (time 1), and the field crews remeasured the plot during the current inventory (time 2). Over 50 percent of all plots that sampled forest land in Nevada during the current inventory (2009–2018) were remeasured between 2014 and 2018 and thus the same trees measured at 2 points in time. The time interval between remeasurement in Nevada varied from 3 to 12 years, with an average time of 8.5 years. This is less than the regularly scheduled remeasurement period of 10 years due to the delayed implementation of the annual inventory in Nevada. Growth on plots with two measurements is based on a similar model using individual tree changes in diameter over the remeasurement period. On remeasurement plots, mortality volume is the volume of any tree that dies during the time between visits. On plots with no previous measurement, growth is estimated from the previous 10 years of radial growth taken from increment cores and mortality is estimated from trees that died in the 5 years prior to measurement. Differences between remeasured versus new plots, and differences in remeasurement periods, can influence estimates of average annual growth and mortality. When FIA has completed a full cycle of remeasurement in Nevada, then procedures and remeasurement periods used to estimate growth and mortality will be consistent across all plots.

The annual estimate of gross growth of all live trees 5.0 inches or greater diameter on forest land in Nevada totaled nearly 61.5 million cubic feet (MMCF). This is the sum of growth on all survivor and ingrowth trees. Survivor trees on remeasured plots are live

trees 5.0 inches or greater diameter at time 1 and still alive at time 2, and on new plots they are live trees determined to be 5.0 inches or greater diameter 10 years prior to the current measurement. Ingrowth trees are live trees 5.0 inches or greater diameter that grew over the 5.0-inch threshold during the previous 10 years. While 61.5 MMCF gross growth appears large in absolute terms, it is small compared to the net volume of live trees 5.0 inches or greater diameter; average annual gross growth and net growth were both less than 1 percent per year. Average annual mortality was estimated at 51.9 MMCF (tables C39–C42). Average annual net growth (the difference between annual gross growth and annual mortality) was estimated at 9.5 MMCF (tables C35–C38). Net growth for the previous reporting period (2004–2013) was also positive, with 16.3 MMCF per year, while mortality was 47.7 MMCF per year and gross growth was 64 MMCF per year (Menlove et al. 2016).

The relationship between growth and mortality varies by ownership group in Nevada. Net growth and mortality during 2009–2018 are summarized by ownership class in tables C35 and C39, while figure 17 shows comparisons of these estimates with those for 2004–2013. The algorithm for calculating net growth on remeasurement plots was revised in 2016, so the estimates provided for 2008–2019 are slightly different from those reported by Menlove et al. for 2004–2013 (2016). As in 2004–2013, net growth continues to be positive on Forest Service, BLM, and State lands, while it is negative on National Park Service and private lands; all of these patterns are more than one standard error from zero net growth.

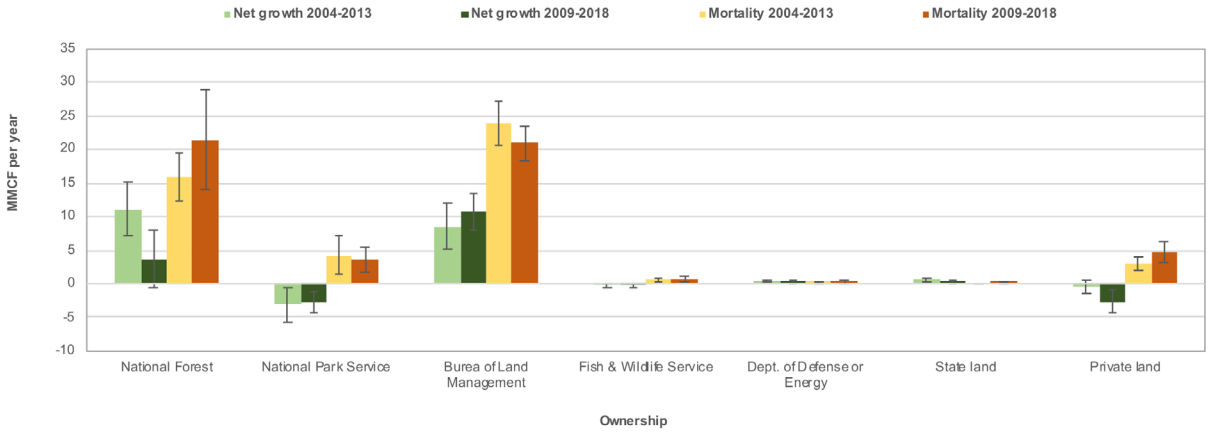

Figure 17—Average net growth and mortality, by ownership class, in Nevada for the periods 2004–2013 and 2009–2018. Error bars represent +/- one standard error of the estimate. The class representing "Other Federal" is not shown because it is negligibly small (less than 10,000 MMCF).

Estimates of growth and mortality per acre, rather than totals, reflect a clearer picture of the density of growth and mortality in each ownership class Although Forest Service and BLM lands contain the greatest volume of trees and therefore the greatest volumes of growth and mortality, they both have relatively low densities of mortality and live-tree growth per acre. In contrast, mortality is occurring at a higher density per acre than growth on National Park Service lands, and live-tree growth per acre is highest on State lands (fig. 18).

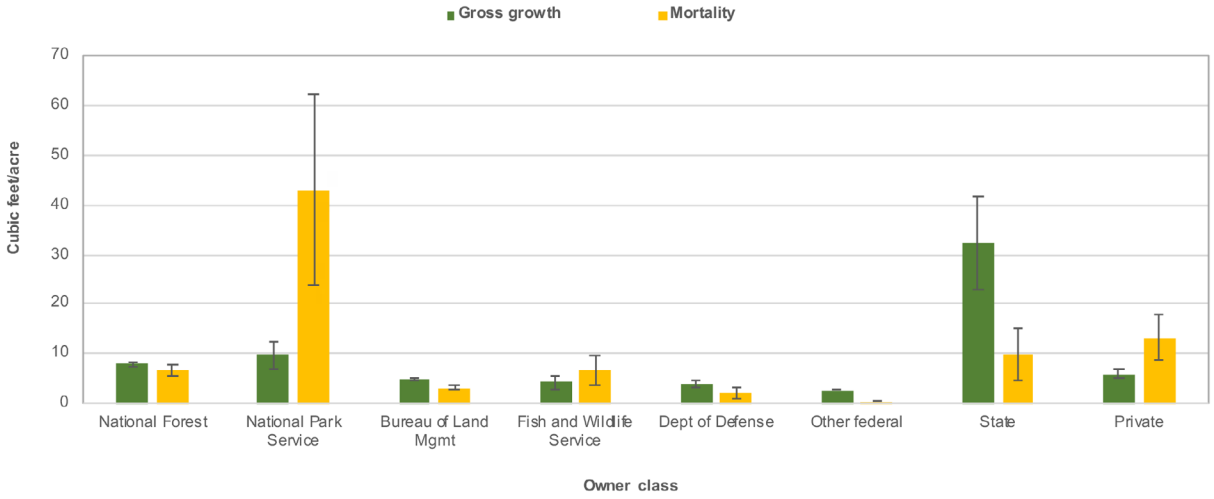

Figure 18—Growth of live trees and mortality, by ownership class, per acre of forest land. Error bars represent +/- one standard error of the estimate. Nevada 2009–2018.

For the two most voluminous species in Nevada, singleleaf pinyon and Utah juniper, live-tree growth exceeded mortality (fig. 19). Curlleaf mountain-mahogany, white fir, and Great Basin bristlecone pine also had more growth than mortality, but because the magnitude of the difference between growth and mortality was less than one standard error, growth and mortality should be considered approximately equivalent for these species. Limber pine is the only species, among the six most voluminous species in Nevada, with mortality that appeared greater than live-tree growth (fig. 19). Mortality also appeared to exceed live-tree growth for subalpine fir, Rocky Mountain juniper, whitebark pine, lodgepole pine, and Douglas-fir.

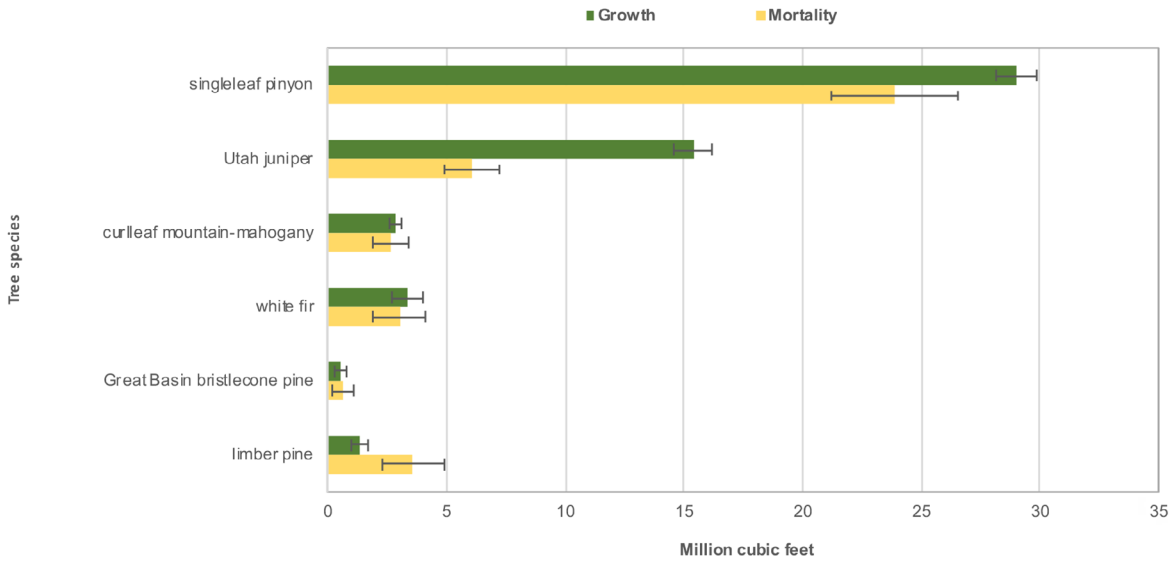

Figure 19—Growth of live trees and mortality for the six species that make up the greatest tree volume. Error bars represent +/- one standard error of the estimate. Nevada 2009–2018.

Of the 51.9 MMCF of annual mortality estimated from the 2009–2018 data, 41 percent was attributed to fire, 32 percent to insects, and 13 percent due to disease (fig. 20). A combination of weather, adverse effects of other vegetation, logging or human-induced physical damage, animals, or unknown/other causes were responsible for the remaining 14 percent of mortality volume. These mortality agents are the most obvious and proximate even though mortality is often caused by an interaction of factors. Although total mortality was higher on unreserved land (33.9 MMCF per year) than on reserved land (18.0 MMCF per year), there is far more unreserved than reserved forest land in Nevada and mortality per acre was much less on unreserved lands (3.8 cubic feet per acre per year) than reserved lands (10.3 cubic feet per acre per year). This is similar to what was observed in Nevada in 2004–2013 (Menlove et al. 2016) and in adjacent Arizona (Shaw et al. 2018) and Utah (Werstak et al. 2016).

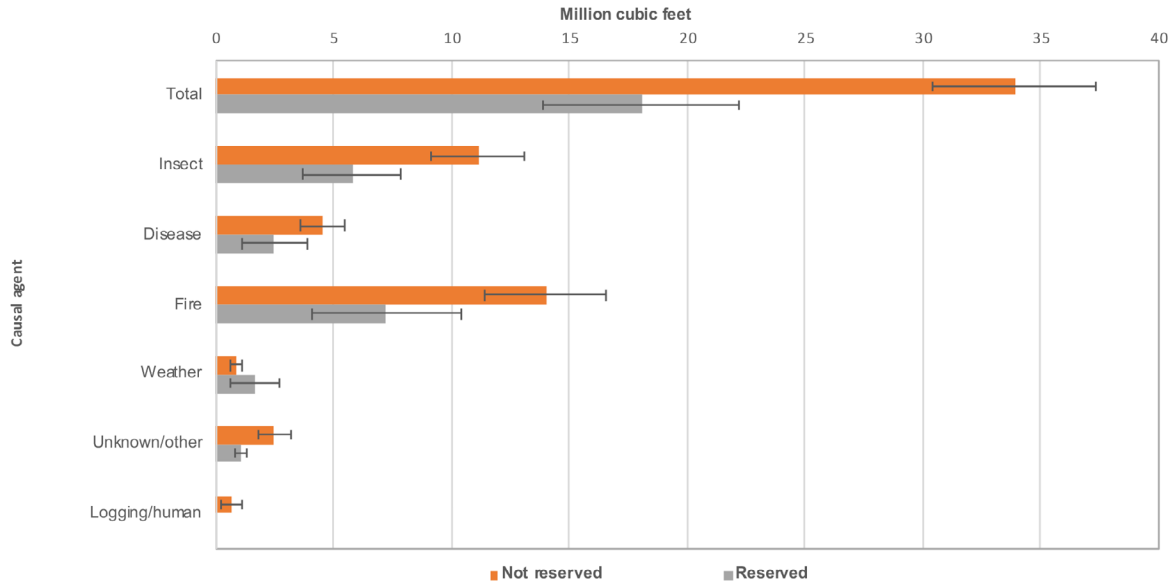

Figure 20—Mortality by causal agent and reserved status. Error bars represent +/- one standard error of the estimate. Nevada 2009–2018.

Tree Damage and Forest Disturbance

Damage to live trees 5.0 inches or greater in diameter are recorded on FIA plots if they will often prevent the tree from surviving more than 1 or 2 years, reduce the growth of the tree in the near term, or negatively affect a tree's merchantability. In this report, damage agents have been grouped into nine major categories: insect, disease, fire, animal, abiotic, competition, human, form defect, and unknown. Most damage agents affect a tree's health, resulting in reduced growth and often tree death. Form defect can have very little negative impact on a tree's health. Up to three damage agents may be assigned to one tree by inspecting a tree beginning from the roots, then traveling along the bole, branches, and finally to the foliage. Because damage lower in the tree (roots/bole) is typically more consequential, more detrimental damage is typically listed as primary damage, while damages occurring higher up, typically less serious, would be secondary (or tertiary). Primary damage agents are reported here unless otherwise indicated.

A forest disturbance is an event that causes a noticeable change in the structure or composition of a forested area. The FIA program records both natural- and human-caused disturbances that cause live-tree damage and mortality (see *Growth and Mortality* section). The affected disturbance area must be an acre in size and affect at least 25 percent of all trees or 50 percent of an individual species. Additionally, some disturbances (e.g., grazing, browsing, flooding) may affect ground surface or nontree vegetation, in which case at least 25 percent of the ground surface or vegetation must be affected. Disturbances are grouped into nine general categories including: insect, disease, fire, animal, weather, vegetation, human, geologic, and unknown. Human

disturbance reported here includes silvicultural treatments (e.g., cutting, pruning, or chaining) as well as more general human-caused disturbance (e.g., firewood cutting or excessive tree marking). Since a forest may be impacted by more than one disturbance at a time (e.g., drought and insect disturbance) up to three disturbances may be recorded at once, ranging from the disturbance exhibiting the most impact to the least impact at the time of the field visit. Primary disturbances are reported here unless otherwise indicated.

Primary damages were recorded on 19 percent (229.0 million) of all live trees (1.2 billion); 5 percent of all trees had a secondary damage and 0.8 percent also had a tertiary damage. Form defect was recorded most often (usually from a dead top), occurring on 9 percent of trees of all species, on 21 percent of timber species trees, and 8 percent of Woodland species trees (table 3) (Woodland species are those measured at d.r.c.; see Appendix E for species designations). Disease damage was next most common, recorded on 7 percent of all trees (on 11 percent of timber species trees and 7 percent of woodland species trees). Dwarf mistletoe was the most common disease agent, followed by rot, foliage or crown dieback, and stem or broom rusts.

Table 3—Percent of all live trees, timber species trees, and woodland species trees ≥ 5.0 inches d.b.h. (for timber species) or d.r.c. (for woodland species) with primary damage, damage agent group. Woodland species are those measured at d.r.c.; see Appendix E for designations. Parentheses indicate +/- one standard error of the estimate. Nevada 2009–2018.

Damage agent	All live trees	Timber species	Woodland species
No damage	81.1 (1.7)	63.9 (7.6)	82.4 (1.8)
Insect	1.0 (0.1)	1.2 (0.4)	1.0 (0.1)
Disease	7.3 (0.5)	11.1 (2.3)	7.0 (0.5)
Fire	0.2 (0.1)	0.4 (0.3)	0.2 (0.1)
Animal	0.3 (0.0)	0.3 (0.2)	0.3 (0.0)
Abiotic	0.4 (0.1)	1.0 (0.3)	0.4 (0.1)
Competition	0.2 (0.0)	0.7 (0.3)	0.4 (0.1)
Human	0.4 (0.1)	0.0 (0.0)	0.1 (0.0)
Form defects	8.5 (0.4)	21.3 (2.5)	7.5 (0.4)
Unknown	0.6 (0.1)	0.1 (0.1)	0.6 (0.1)
Total	**100.0 (1.9)**	**100.0 (10.3)**	**100.0 (2.0)**

At least one forest disturbance was found on 10 percent of Nevada's forest land while two or more disturbances occurred on only 0.4 percent of forest land. Forest disturbance was present at different levels within groupings of Nevada's forest types based on their dominant species. Timber types include: Douglas-fir, Ponderosa pine, Fir/spruce/mountain hemlock, Lodgepole pine, Other western softwoods, and Aspen/birch.

Woodland types include: Pinyon-juniper and Woodland hardwoods (see Appendix D forest types and timber vs. woodland designations). Forest disturbance was recorded on 42 percent of Nonstocked forest-type acres, 15 percent on timber forest-type acres, and 7 percent on woodland forest-type acres. Fire was the most common disturbance and occurred on 3 percent of all forest land, with a large footprint on Nonstocked type acres (37 percent of acres) (table 4). Nonstocked type is often associated with forest disturbances that result in severe live-tree loss such as intense fire, tree harvesting/removals, or severe levels of disease and/or insect disturbance. Disease disturbance acres were the second highest, affecting nearly 3 percent of all forest land.

Table 4—Percent occurrence of primary disturbances on all forest types, timber forest types, and woodland forest types, and the Nonstocked forest type. Timber vs. woodland forest types are based on the primary tree species present; woodland species are those measured at d.r.c. See Appendix D. Parentheses indicate +/- one standard error of the estimate. Nevada 2009–2018.

Disturbance agent	All forest types	Timber forest types	Woodland forest types	Nonstocked
No disturbance	90.0 (1.3)	85.1 (7.7)	92.9 (1.5)	58.2 (5.6)
Insect	1.9 (0.3)	3.9 (1.8)	1.9 (0.3)	0.2 (0.2)
Disease	2.6 (0.4)	4.3 (1.9)	2.6 (0.4)	0.2 (0.2)
Fire	3.2 (0.4)	3.2 (1.7)	0.5 (0.2)	37.2 (5.3)
Animal	0.6 (0.2)	0.9 (0.9)	0.5 (0.2)	1.5 (1.1)
Weather	0.5 (0.2)	0.0 (0.0)	0.5 (0.2)	0.8 (0.8)
Competition	0.2 (0.1)	0.0 (0.0)	0.2 (0.1)	0.0 (0.0)
Human	0.6 (0.1)	1.0 (0.9)	0.5 (0.1)	1.8 (0.0)
Geologic	0.3 (0.3)	0.6 (0.5)	0.3 (0.3)	0.0 (1.6)
Unknown	0.1 (0.1)	0.9 (0.6)	0.1 (0.1)	0.0 (0.0)
Total	**100.0 (1.4)**	**100.0 (8.7)**	**100.0 (1.6)**	**100.0 (8.4)**

Live-tree damage in Nevada has been fairly consistent from the 2004–2013 to the 2009–2018 inventory. Form defect damage occurred most often in both periods and for both timber and woodland species groups (figs. 21-22). Form defect was present on over 20 percent of timber species trees in both periods. Form defect in woodland species averaged 7 percent, or 5.8 million damaged trees. The incidence of damage from disease showed little change from 2004–2013 to 2008–2017 but then appeared to rise by the 2009–2018 period. At this time there were 9.5 million disease-damaged timber species trees 79.1 million disease-damaged woodland species trees.

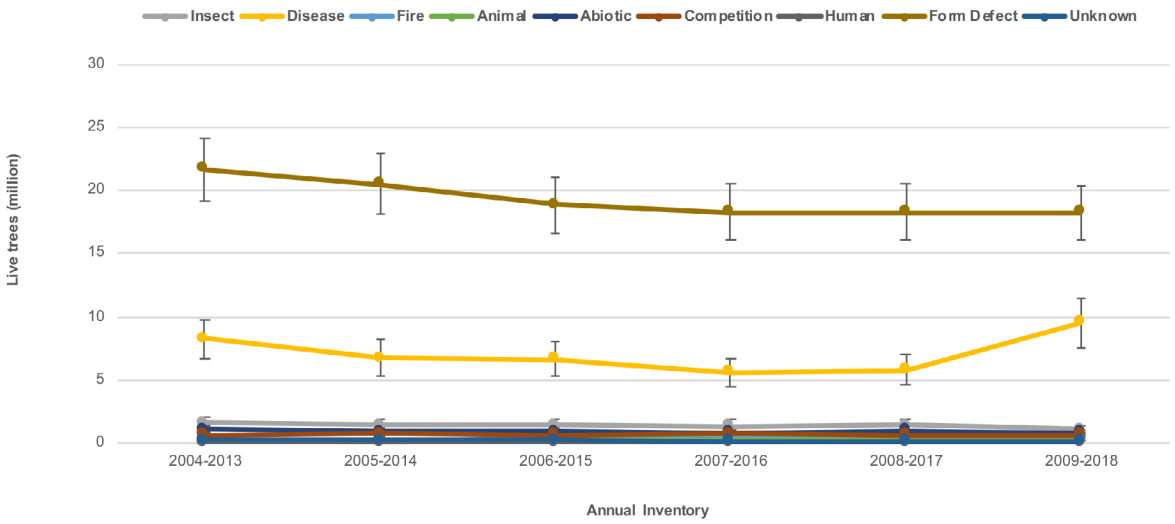

Figure 21—Damage agents on live timber species trees (≥ 5.0 inches d.b.h.) through time. Error bars indicate +/-one standard error of the estimate. Nevada 2009–2018.

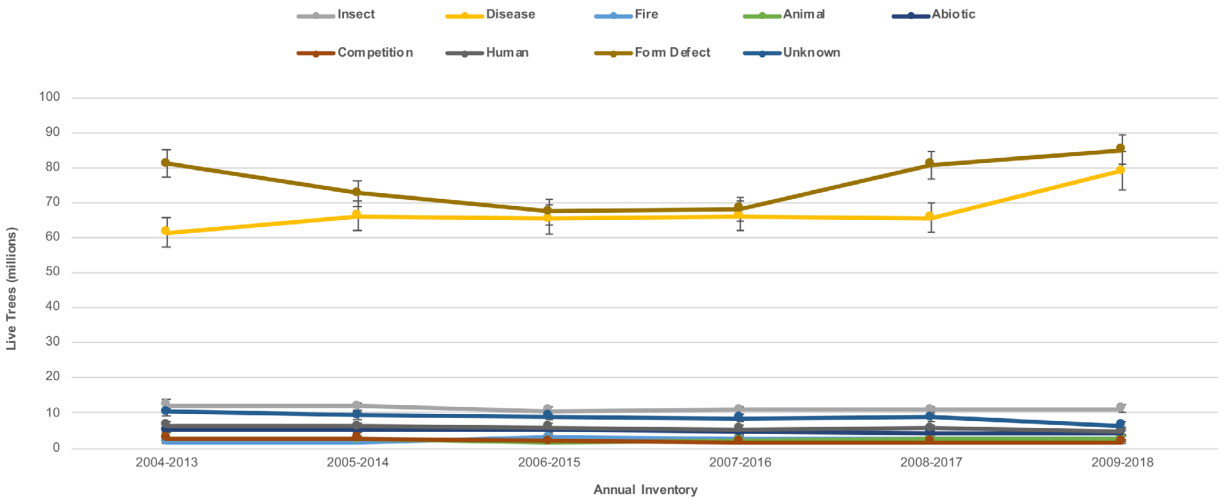

Figure 22—Damage agents on live woodland species trees (≥ 5.0 inches d.r.c.) through time. Error bars indicate +/- one standard error of the estimate. Nevada 2009–2018.

Approximately 10 percent (an estimated 1,019,003 acres) of forest land was disturbed in Nevada in the 2009–2018 inventory and 9 percent (an estimated 898,418 acres) in the 2004–2013 period (fig. 23). Fire has been a dominant disturbance, affecting over 3 percent (341,417 acres) of forest land in the 2009–2018 period. Disease disturbance affected nearly 3 percent of total forest area (272,803 acres) in 2009–2018, up slightly but within the standard error of the 2004–2013 estimate of affected area (222,066 acres).

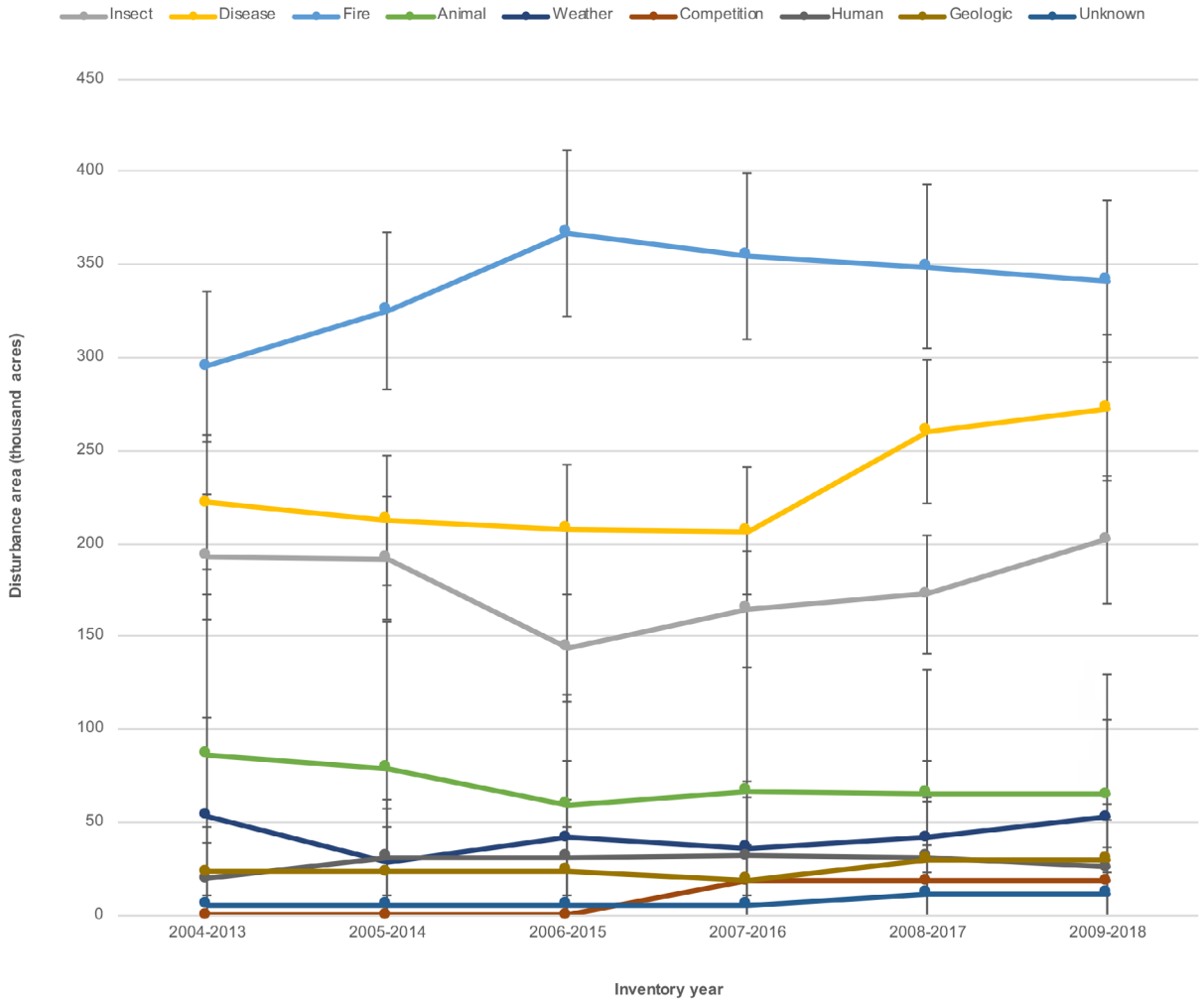

Figure 23—Primary forest disturbance area in acres by disturbance groups from Nevada's 2004–2013 inventory through the 2009–2018 inventory. Error bars indicate +/- one standard error of the estimate.

Special Section: Projecting Possible Forest Conditions

Although FIA has a long history of publishing State reports based on the most current inventory, little has been done to include likely future scenarios. The data and tools that are needed to create future scenarios have recently come together to allow for evaluation of these scenarios using the same data as are used for standard reporting. The Forest Vegetation Simulator (FVS; Dixon 2002) is the standard tool used by the Forest Service to create forest growth and treatment simulations. FVS can realistically simulate stand development and model a wide variety of silvicultural treatments and disturbance factors, such as fire (Rebain 2010). Data for all States covered by the RMRS-FIA program have recently been converted into FVS-ready format (Shaw and Gagnon 2019) and are now included in FIA Data Mart tables (https://apps.fs.usda.gov/fia/datamart/datamart_sqlite.html). The combination of FVS geographic coverage and FVS-ready FIA plot data availability, along with having FVS and FIA tables housed in a common database, provides projection capabilities that have not been available previously. This section will focus on a relatively simple scenario projecting forest conditions for 50 years under low, average, and high fire extent scenarios. See Appendix A for detailed information about the simulation and term definitions.

Simulation Summary

For this example, forest trajectories for the Pinyon/juniper woodland group were simulated for 50 years (2019–2069), with 10-year intervals, using the most recent cycle of plots (2009–2018) measured in Nevada. The Utah variant of FVS, which covers most of Nevada, was used (https://www.fs.fed.us/fvs/documents/index.shtml). Three fire extent scenarios (average, high, and low) were created, based on the recent average estimate of 267,475 acres disturbed by fire and an average expansion factor of 5,965 acres per plot. Fire was applied to approximately 45 plots per cycle in the average fire scenario, 67 plots (about 399,600 acres) per cycle in the high-fire scenario, and 22 plots (about 131,200 acres) in the low-fire scenario. FVS default fire weather conditions were used (see Appendix A for references), so variability of fire severity was determined primarily by plot data (stand density, composition, and structure from the tree tally and fuel loading values from downed woody material measurements). Stands were selected for fire effects randomly, based on their classification (field-determined forest type) in the Pinyon/juniper forest-type group at the time of most recent inventory. As a result, “recovering” stands will be allowed to (re)burn. Before any fire simulations were run, all stands were run for the 50-year simulation period without fire. Although not a primary purpose of this exercise, the no-fire scenario provides a basis for comparison of modeled FVS growth rates and current FIA growth estimates. See Appendix A for more simulation details.

Results

From the current Nevada inventory, average annual net growth of the Pinyon/juniper forest-type group is 28.7 million cubic feet (table C36) on 4,990 million cubic feet of live volume (table C15), or 0.58 percent. This estimate compares reasonably with FVS's no-fire net growth of 0.65 percent annually, since at least some disturbances have an effect on the actual current growth estimate and, because the base FVS model does not include disturbance, the FVS-modeled rate should be somewhat higher. Actual growth also falls in the range of FVS net growth rates for this time period in the scenarios that include some fires: 0.62 percent in the low-fire scenario, 0.55 percent in the medium-fire scenario, and 0.41 percent in the high-fire scenario. The closeness of these independent calculations suggests that FVS growth projections are realistic. Tree growth projections likely benefit from the inclusion of FIA remeasurement data for many plots used in the simulation, since these data inform the FVS self-calibration function.

The random stand selection process resulted in varying numbers of stands being burned in each cycle and in each scenario, but the simulations generally achieved the target number of plots over the total simulation period. The low-fire scenario target was 110 plots over the course of the simulation; the actual number of burned plots was 108, with between 16 and 26 plots burned per cycle. For the medium-fire scenario, 225 was the target and 224 were burned (35 to 57 per cycle); for the high-fire scenario, 335 was the target and 337 were burned (59 to 73 per cycle). This method added some decadal variability in fire extent to the stand-level variability of fire effects due to stand composition and structure. This variability can be seen in figure 24, which shows the varying effects of fire on stand-level live volume across the medium-fire treatment group. Note that the stands with the highest volume per acre tended to be the most severely affected by fire, owing to the large amount of fuel in the form of live trees. FVS can graphically depict individual stand conditions at various points in the simulation, so it is possible to examine inventory conditions, FVS-projected stand conditions before fire, and conditions after simulated fire (fig. 25). The example stand is somewhat typical of stands burned in the scenarios, experiencing stand-replacing fire.

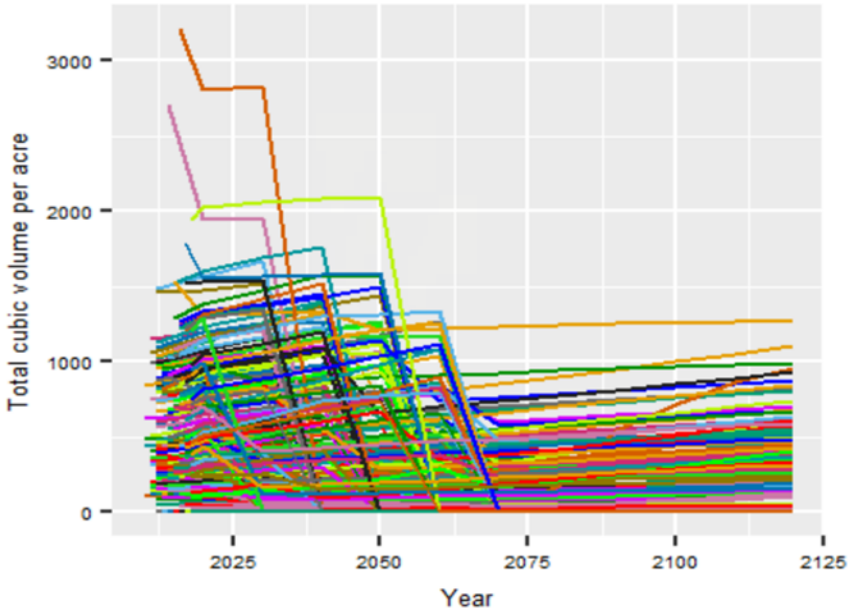

Figure 24—Stand trajectories for the medium-fire simulation in FVS. The last year fire was applied to any stand was 2070, so the right half of each trajectory represents undisturbed recovery of the affected stands.

This example focuses on the effects of various fire extents on population net growth and total live biomass, as expressed through live wood cubic-foot volume, though the effects can be examined from many angles. In all three scenarios, net annual growth remains positive for 50 years into the future (fig. 26). As would be expected, the projected increase in volume is inversely proportional to the simulated area burned, but the high-fire scenario used does not result in a net decrease in population live volume. This volume growth is allocated among residual trees that were not killed by fire and trees in unburned stands. No regeneration was modeled so no regeneration volume is included, though if included it would have likely had little impact on total growth because of the gradual establishment and slow growth of pinyon and juniper species. Seedlings established following simulated fires would not likely get large or numerous enough to register substantial volume over the 50-year period, as compared to trees that are already included in the inventory.

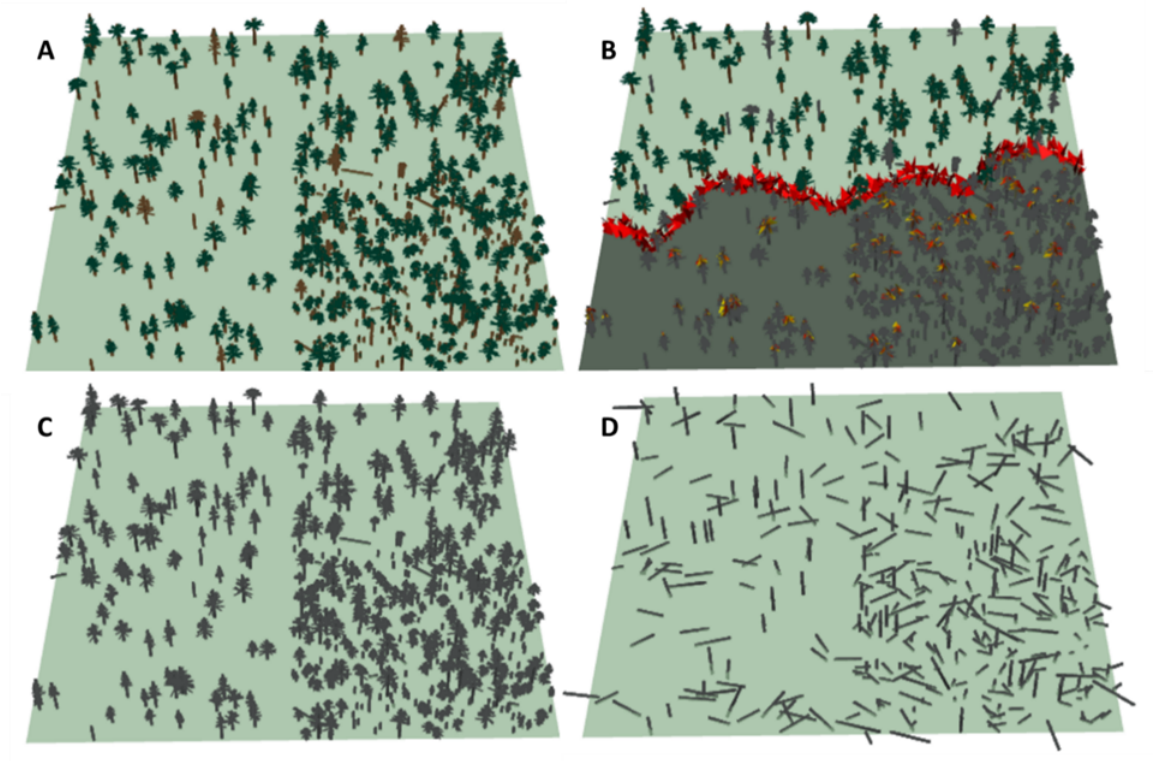

Figure 25—Graphical depiction of stand conditions at different points in the FVS simulation: (A) Pre-fire stand conditions; note the presence of live trees (green crowns), dead trees (brown crowns), older snags (no crown), and down woody material. The image also shows the varying density within the stand by depicting each subplot in a separate quadrant. (B) The number frames depicted during fire can be specified for illustration purposes. (C) Immediate post-fire conditions show no surviving trees. (D) At the time of the next simulation cycle (10 years later), the stand is a combination of down dead material and snags; no regeneration was programmed for this stand.

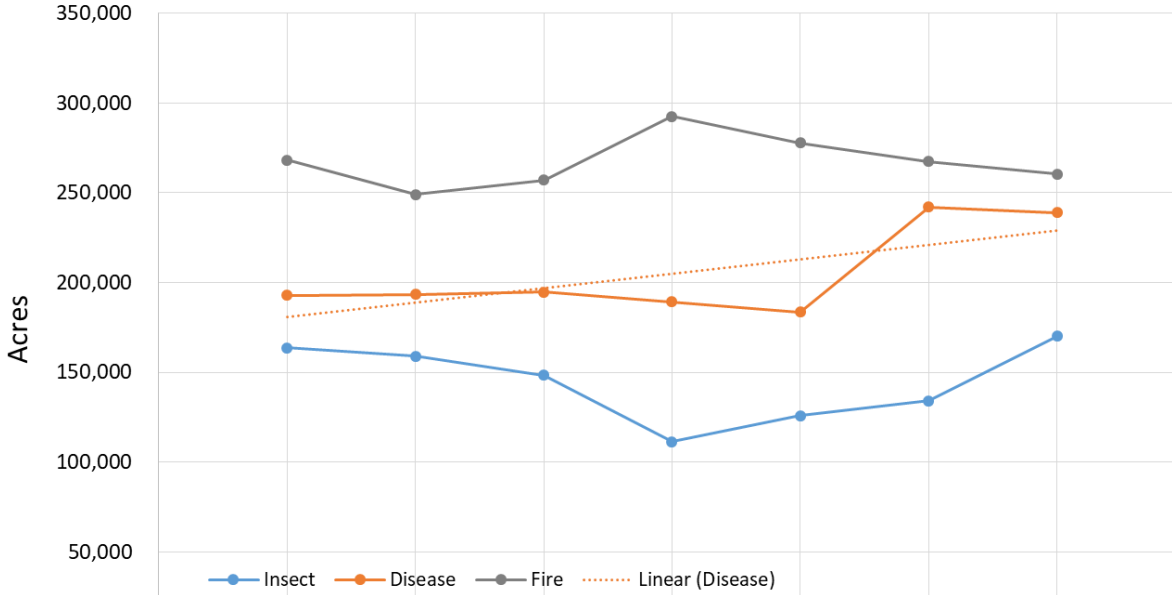

Figure 26—Change in mean volume per acre for low-, medium-, and high-fire scenarios in the Pinyon/juniper woodland group in Nevada.

Differences in rate of fire do have implications for future growth even though net volume growth remains positive for the duration of the simulation period. Percent growth declines through time in all scenarios (fig. 27). In the low-fire scenario, simulated net growth increases slightly over the first 2 decades, but decreases for the remainder of the simulation. The decrease in net growth begins immediately in the medium- and high-fire scenarios. Given that the medium-fire scenario is based on rates of disturbance measured over the most recent decade, this result suggests that the current fire regime might be acting to decrease net growth currently. This is difficult to determine conclusively from current inventory data, because annualized inventory has only been conducted on its regular schedule for about 10 years, and during the early- to mid-2000s singleleaf pinyon was heavily impacted by the pinyon ips beetle (*Ips confusus*) outbreak (Shaw et al. 2005). Therefore, the current fire regime might be amplifying the pinyon ips impact, due to the reduction of live trees from beetle-caused mortality in the recent past.

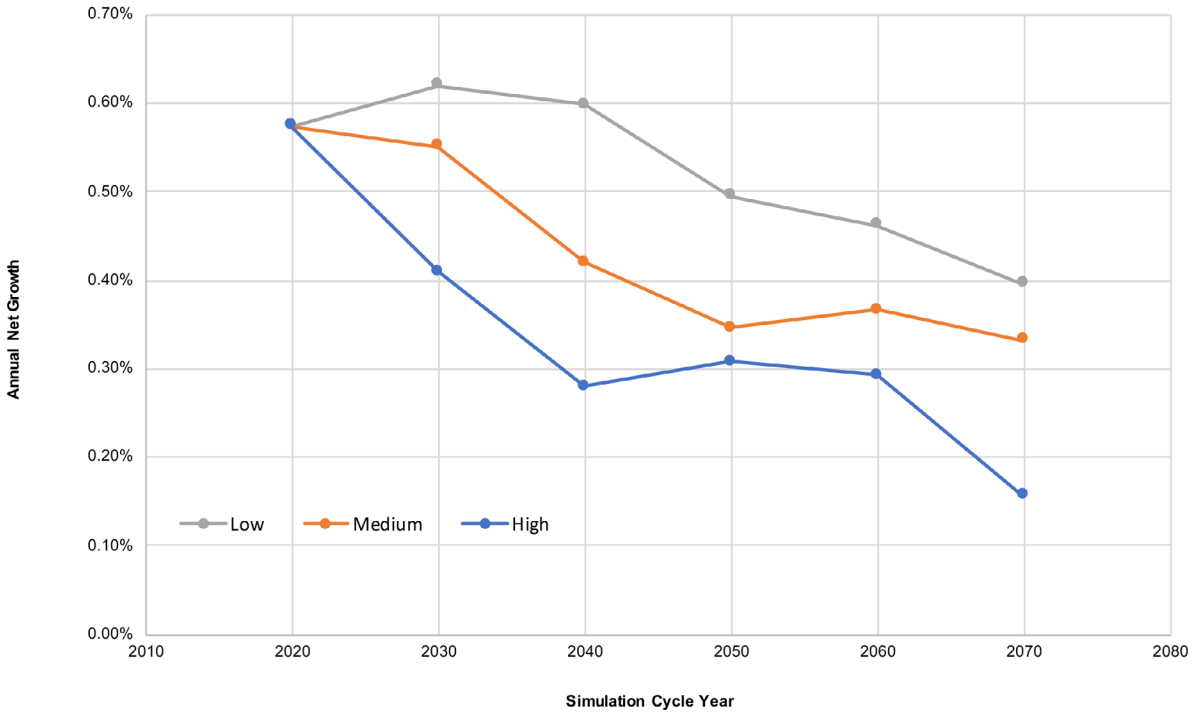

Figure 27—Simulated trends in net annual growth of Pinyon/juniper woodland volume in Nevada, expressed as a percentage of live volume. When annual net growth is positive, total live population volume is increasing; when it is negative, the live volume is being reduced. All three simulation scenarios show positive net volume over the next 50 years, but with volume increasing at decreasing rates due to fire.

Despite the decreasing growth trend, these simulation results suggest that negative net growth should not occur in the Pinyon/juniper woodland group for at least 50 years, even if fires were to increase to affect 50 percent more area than in recent history. It should also be noted that net increases in live volume cannot continue indefinitely; on the acreage currently occupied by Pinyon/juniper woodlands, there is a finite, albeit undetermined, limit to the amount of live biomass that can be sustained by current soil

and climate conditions. As a result, live forest biomass must fluctuate between periods of increasing and decreasing net growth; the constant influences of disturbance agents such as insects, disease, drought, and fire are such that periods of perfect equilibrium (i.e., zero net growth) are rare, if they ever occur at all. Ongoing remeasurement of established plots will provide data to verify the trends suggested in this range of simulation scenarios.

Quality Assurance

The FIA Quality Assurance (QA) program provides a framework to assure the production of complete, accurate, and unbiased forest information of known quality. There are two primary facets of the QA program: quality control and quality assessment. Quality control is intended to improve data quality by providing timely training and feedback to field crews, whereas the goal of quality assessment is to provide objective estimates of the repeatability of field measurements.

Quality Control

Quality control occurs throughout field data collection and compilation. The field aspect of quality control is conducted by data quality inspectors, who train all field crews, assess the quality of the data collected by individual crews, and then provide timely feedback to improve the quality of future measurements. Feedback is accomplished by means of "hot checks" and "cold checks." During a hot check, an inspector accompanies a field crew to a plot and provides immediate feedback on measurement quality. Cold checks occur when an inspector visits a recently completed plot, typically in possession of the original crew's data but without the crew present, and then verifies each measurement and provides the crew an overall score and feedback on measurements that did not meet FIA specifications. A key aspect of the quality control process is identifying why errors may be occurring and selecting a corrective action such as additional training. On average, hot checks are done on 2 percent of all field-sampled plots and cold checks are done on 5 percent of field-sampled plots. Quality control is also accomplished via programming of portable data recorders that check for complete, valid, and reasonable values during data collection. Following data collection, information management specialists conduct further logic checks to address errors and missing values.

Quality Assessment

Quality assessment quantifies the overall precision of field measurements by comparing two independent measurements of the same plots. The independent measurements are collected by means of blind checks, where measurements are collected by a regular field crew and then a second regular crew (alone), without knowledge of or access to the first crew's measurements (Pollard et al. 2006). Thus, these paired observations provide a means of objectively assessing field measurement repeatability.

Quality control and quality assessment both require a data quality standard that defines the target level of precision. FIA has specific Measurement Quality Objectives (MQOs) that enumerate data quality standards for individual field-measured variables. Each variable's MQO consists of two parts: a measurement tolerance (the acceptable range of differences between independent observations) and a compliance standard (the target percentage of independent observations that should be within the measurement tolerance; the observed percentage is the compliance rate). To assess whether measurements of a particular variable are meeting an MQO, we compare the compliance standard to the observed compliance rate. For example, the MQO for

tree height defines the tolerance as ±10 percent and the compliance standard as 90 percent. This means that at least 90 percent of paired, independent measurements of tree height should be within 10 percent of each other. For categorical variables (e.g., field-recorded forest type), the tolerance is often defined as "no errors," where the compliance standard represents the minimum percentage of independent measurements that should assign the same category. A previous version of the FIA field manual (USDA 2013) specifies the measurement tolerances and compliance standards for each variable; later versions present tolerances but not compliance standards in an appendix.

The results of the most recent quality assessment for Nevada are presented in tables 7 and 8. Between 2009 and 2018, quality assessment data were collected from 59 plots (with 67 conditions and 1,129 trees). Each variable and its associated MQO are followed by the percentage of total paired records that fall within one, two, three, and four times the tolerance. The last four columns show the number of observations that fell outside the tolerance. The compliance rates shown in tables 7 and 8 are similar to those reported by Menlove et al. (2016), indicating that FIA data quality has not changed appreciably in Nevada in the past 5 years.

Table 5 shows that the compliance rates of most condition-level variables are high enough to meet the MQOs. Exceptions include stand size (73 percent), disturbance (93 percent), and percent bare ground (61 percent). One condition-level regional variable that appears to be very repeatable is "forest type" (variable FLDTYPCD in FIADB; table 5). At the 1X tolerance level, its observed compliance rate was about 97 percent. In contrast, the compliance rate for "percent bare ground," which has a tolerance of ±10 percent, was only 61 percent. This low compliance rate warrants further investigation to come up with possible corrective action. For example, low repeatability may be due to the fact that different methods are allowed to evaluate bare ground cover (i.e., either using transects or ocular estimates), or due to the definition of "bare ground," which includes only substrate particles that are smaller than 0.75 inches in their longest dimension (USDA FS 2013) and changes here could be proposed. Users of FIA's stand-size variable should note that most FIA tools and tables, including the tables presented in the appendices of this report, rely on stand size as calculated post-hoc from actual tree measurements, whereas the stand-size variable shown here represents field-estimated stand-size.

Table 5—Results of quality assessment for condition-level variables in Nevada. Variables that did not have any non-null values recorded on any QA plots are not shown; these include secondary and tertiary disturbances and treatments, owner industrial status, and regeneration species.

Variable	Measurement Quality Objective (MQO)		Percentage of data within tolerance (compliance rate)				Number of times data exceeded tolerance				Number of conditions
National core variable	Tolerance	Compliance standard	@1x	@2x	@3x	@4x	@1x	@2x	@3x	@4x	
Condition status	No errors	At least 99% of the time	100%				0				67
Reserved status	No errors	At least 99% of the time	99%				1				67
Owner group	No errors	At least 99% of the time	100%				0				67
Forest type	No errors	At least 99% of the time in group At least 95% of the time in type	97%				2				59
Stand size	No errors	At least 99% of the time	73%				16				59
Regeneration status	No errors	At least 99% of the time	100%				0				59
Tree density	No errors	At least 99% of the time	100%				0				59
Stand age	±10%	At least 95% of the time	95%	97%	97%	97%	3	2	2	2	59
Disturbance 1	No errors	At least 99% of the time	93%				4				60
Disturbance Year 1	±2 yrs	At least 99% of the time	100%				0				1
Disturbance 2	No errors	At least 99% of the time	100%				0				1
Treatment 1	No errors	At least 99% of the time	98%				1				59
Physiographic class	No errors	At least 99% of the time	90%				6				60
Regional variable											
Percent crown cover	±10%	Not defined	93%	98%	98%	98%	4	1	1	1	58
Percent bare ground	±10%	Not defined	61%	78%	93%	98%	23	13	4	1	59

The tree measurements that have the biggest influence on estimates of forest volume are tree species, tree diameter, and tree height. As shown in table 6, the compliance rate for the variable "Species" was nearly 100 percent. The variables "d.b.h." and "d.r.c." represent the respective diameters of timber and woodland tree species. Whereas timber species are measured at breast height (4.5 feet above ground level), woodland species are measured near ground level at root collar. The 1X compliance rate was almost 89 percent for both d.b.h., which has a 0.1-inch tolerance, and d.r.c., which has a 0.2-inch per stem tolerance. The larger tolerance for d.r.c. is to allow for difficulty in determining the precise diameter measurement location on multi-stemmed woodland trees. Tree height is represented by the variables "total length" and "actual length." Both variables have a tolerance level of ±10 percent of the measured length, and compliance rates at the 1X level were about 81 percent and 80 percent, respectively.

Users are advised that the low compliance rate for tree age (45 percent) is based on field-measured ages only. A portion of tree cores used to assign ages in the field are now also measured using microscopes in a tree-ring laboratory to obtain more accurate age estimates. Though FIA has not yet determined the complete compliance rate of laboratory-recorded tree ages, preliminary results show that it is much closer to the compliance standard for tree age, thus data quality for tree and stand ages is substantially improved when tree cores are sent to a tree-ring laboratory for analysis.

Other tree variables generally met the MQOs defined in table 6. Notable exceptions include cause of death (50 percent) and sound dead (45 percent). Although the compliance rate for horizontal distance fell below the compliance standard (table 6), this variable does not affect any FIA estimates and is used only to help future field crews with tree identification; standards may be unnecessarily strict for this variable. Compliance rates that fall below standards, such as those of cause of death and sound dead, indicate variables for which either more intensive crew training is required, protocols should be clarified, or that the variable's MQO needs to be adjusted accordingly to better reflect the realistic expectation of quality for that variable.

Table 6—Results of quality assessment for tree-level variables in Nevada. The variable "form defect" is not shown because there were no non-null form defect values recorded on any QA plots.

Variable	Tolerance	Percentage of data within tolerance				Number of times data exceeded tolerance				Number of records
		@1x	@2x	@3x	@4x	@1x	@2x	@3x	@4x	
National core variable										
d.b.h.	±0.1/20 in.	89%	89%	94%	94%	4	4	2	2	35
d.r.c. using IW MQO	±0.2 in * #stems	89%	96%	97%	98%	88	32	21	14	791
Azimuth	±10º	96%	98%	98%	98%	33	17	14	13	828
Horizontal distance	±0.2/1.0 ft	60%	80%	82%	84%	36	18	16	14	90
Species	No errors	99%				6				828
Tree status	No errors	99.5%				4				828
Rotten/missing cull	±10%	97%	99%	99%	99%	26	11	8	5	780
Total length	±10%	80%	97%	99%	99.5%	170	27	6	4	828
Actual length	±10%	79%	97%	99%	99.6%	148	22	4	3	704
Compacted crown ratio	±10%	69%	91%	98%	99.7%	459	139	24	5	1482
Uncompacted crown ratio (P3)	±10%	93%	97%	99%	99%	56	19	11	5	744
Crown class	No tolerance	82%				264				1482
Decay class	±1 class	100%	100%	100%	100%	0	0	0	0	34
Cause of death	No errors	50%				3				6
Mortality year	±2 yr	83%	100%			1	0			6
Condition class	No errors	99.9%				1				828
Regional variables										
Mistletoe	±1 class	97%	99%	99.5%	99.9%	26	12	4	1	790
Number of stems	±1 stem	94%	97%	99%	99.7%	44	24	12	2	791
Percent missing top	±10%	99.7%	99.7%	99.7%	99.7%	2	2	2	2	780
Sound dead	±10%	45%	45%	45%	45%	432	432	432	432	780
Current tree class	No errors	96%				34				828
Tree age	±5%	25%	33%	42%	54%	88	79	68	54	118

Conclusions

Our inventory results show that Nevada is relatively sparsely forested. Eighty-seven percent of Nevada's forest land is either Pinyon-juniper woodland or Woodland hardwoods forest type, and about the same proportion of total trees are in the Woodland softwood and Woodland hardwood species groups (75 percent and 11 percent, respectively). Woodland softwood forest types, primarily Utah juniper and singleleaf pinyon, and Woodland hardwood forest types, mostly curlleaf mountain-mahogany, dominate the forest on the lower slopes and basins of Nevada.

Mortality rates in the current inventory are higher than in previous inventories, primarily due to recent increases in insect activity and fires. Several important nonwoodland trees species in Nevada had negative net growth. Analysis of plots common to multiple inventories suggests that live and dead woody biomass continues to accumulate across Nevada. This is not unexpected, because despite occasional disturbances, wood utilization is relatively low. The combination of recovery processes following 19th and 20th century extraction; woodland range expansion, whether created by altered disturbance regimes or other factors favorable to tree growth; and the relatively unhindered growth of undisturbed forests may all lead to increasing forest biomass in Nevada's future, though it is likely this growth will continue to be offset by mortality from fires and other causes.

This is the first FIA State report to include projections of possible future conditions using FIA plot data in the Forest Vegetation Simulator. Projections into the future with varying fire suggest that woodland net growth will likely remain positive but decrease by about half over the next 50 years, even assuming a 50 percent lower rate of disturbance by fire than has been observed during the past decade. Continued monitoring may reveal that other factors, such as the landscape-scale age-class diversification caused by stand-replacing fire, may alter trends compared to current simulations, which could then be further refined.

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Appendix A
Details About Forest Vegetation Simulator Projections

The Forest Vegetation Simulator (FVS; Dixon 2002) is the standard tool used by the Forest Service to create forest growth and treatment simulations. FVS can realistically simulate stand development and model a wide variety of silvicultural treatments and disturbance factors, such as fire (Rebain 2010). Data for all States covered by the RMRS-FIA program have recently been converted into FVS-ready format (Shaw and Gagnon 2019) and are now included in FIA Data Mart tables (https://apps.fs.usda.gov/fia/datamart/datamart_sqlite.html). The combination of FVS geographic coverage and FVS-ready FIA plot data availability, along with having FVS and FIA tables housed in a common database, provides projection capabilities that have not been available previously. This Appendix provides more detail on the simulations described in the *SPECIAL SECTION: Projecting Possible Forest Conditions*. It also describes considerations that should go into meaningful, more comprehensive simulations.

The terms "projection" and "simulation" are often used interchangeably, and their use in relationship to FVS has varied over time and with context. The predecessor to FVS was the Prognosis Model for Stand Development (Stage 1973), which performed stand growth projections, with and without silvicultural treatments. In the user's guide to Prognosis, Wyckoff et al. (1982) refer to "growth projections" at the tree and stand scale. When the Prognosis Model and other similar regional growth models, such as TWIGS (Hilt and Teck 1989), along with a wide variety of related model extension and post-processing tools were brought together under the Forest Vegetation Simulator name, Teck et al. (1996) referred to both "making projections" and "simulating management activities." The term "prediction" was also used in some contexts. For the purpose of FIA reporting, we will avoid using "prediction," because it implies an ability to describe the state of the forest at some specific time in the future. Because of the wide variety of factors that influence forests, prediction of a future state is not generally possible. Instead, we use FVS to evaluate possible future forest conditions under a variety of likely scenarios. In this context, the term "projection" is used primarily to describe the result of quantitative models, such as those within FVS variants that relate to tree and stand growth and mortality, whereas a "simulation" includes growth and mortality projections, management activities, the effects of natural disturbance agents such as insects and fire, and other components.

Setting Up a Simulation

A first step toward setting up a set of statewide simulations is deciding which FIA plot data will be used. The process by which FIA data are converted to FVS-ready format (Shaw and Gagnon 2019) includes all plots available in FIADB (Burrill et al. 2018) at the time of conversion. Because most States are now in remeasurement cycles under the annualized system, most plots will have data from multiple visits. For this type of exercise, the best approach would be to use the most recent visit to each plot in the State, which include all of the remeasurement data available (generally, from measurement years 2014 to 2018). Under ideal circumstances, every plot would have

been measured during its assigned inventory year, but for a variety of reasons it is common for some scheduled plot visits to have been missed during the most recent cycle or otherwise measured in an off-cycle year. This is true of many plots in Nevada.

A query of the POP_EVAL table in FIADB shows several evaluations for the most recent data year and a 10-year inventory cycle (inventory years 2009–2018; table A.1). A query of the PLOT table shows 1,931 plots with at least one forested condition, 9,877 plots with no forested conditions, and 119 nonsampled plots. Of the 119 nonsampled plots, 24 had at least one forested condition present at the time of the previous visit.

Table A.1—Starting and ending inventory years for the recent evaluations for Nevada.

EVALID	EVAL_DESCR	STATECD	START_INVYR	END_INVYR
321800	NEVADA 2018: 2009-2018: ALL AREA	32	2009	2018
321801	NEVADA 2018: 2009-2018: CURRENT AREA, CURRENT VOLUME	32	2009	2018
321803	NEVADA 2018: 2004-2008 to 2009-2018: GROWTH, MORTALITY	32	2009	2018
321807	NEVADA 2018: 2009-2018: DWM	32	2009	2018
321809	NEVADA 2018: 2009-2018: INVASIVE	32	2009	2018
321810	NEVADA 2018: 2009-2018: VEG PROFILE	32	2009	2018

FVS is designed such that in a simulation that includes inventory data measured over a period of several years, as is the case with annualized FIA inventories, FVS will project stands from the earlier years forward to a common, user-specified year. For example, in the ideal case where every plot is measured during its assigned inventory year, the most recent inventory year (2018) could be used as the common starting year. In the simulation, all forested conditions measured from 2009 to 2017 would be grown forward to 2018, and then all conditions would be processed and reported at the user-specified interval thereafter—e.g., 2023, 2028, and so on, for a 5-year simulation interval.

An important setup step is to review the FVS variant(s) to which the plots under consideration have been assigned. FVS variants are assigned to FIA plots using the FVS variant map and FIA public coordinates, and the values are stored in the FIADB PLOTGEOM table. Within each variant boundary there can be many FVS “locations,” which are geographic subdivisions of the area covered by a variant that may contain unique parameters for the various internal FVS submodels. FVS locations are generally based on National Forests and assigned the codes for those forests, but there are locations based on other land ownerships. The FVS variant map currently covers all of the coterminous 48 States and Alaska, so all FIA plots in these areas are assigned to FVS

variants and locations, regardless of ownership. The map is periodically updated and posted to the FVS web site (https://www.fs.fed.us/fvs/documents/index.shtml).

Examination of the PLOTGEOM table, or the FVS_StandInit_Cond or FVS_StandInit_Plot tables, shows that there are seven combinations of FVS variants and location codes in Nevada (table A.2). The vast majority are located in the Utah variant and the Humboldt and Toiyabe locations. Note that while many National Forests have been administratively combined, FVS still maintains model parameter resolution mostly for the proclaimed forest, and in some cases, even down to the district level. However, some mapped boundaries are imprecise and the combination of small boundary errors and fuzzed public coordinates can lead to mis-assignments. For example, the three Central Rockies variant assignments are located where the Central Rockies variant wraps around the southern tip of Nevada and includes some of southern California. These are map errors because public FIA coordinates always fall within the same State as the actual locations. The same is true for the two SORNEC variant assignments. These mis-assignments are of no consequence to the simulations being considered here, because most of the plots have no forested conditions present and the FVS variant map is characterized as showing "suggested" variant assignment, it is reasonable to reassign the small number of variant/location exceptions. Therefore, the FVS StandInit tables can be edited to reflect the appropriate Utah variant locations.

Table A.2—FVS variant and location assignments for FIA plots in Nevada, inventory years 2009–2018.

FVS variant	FVS location	Number of plots
Central Rockies (CR)	Tonto (312)	3
SORNEC (SO)	Plumas (511)	2
Utah (UT)	Humboldt (409)	7,036
Utah (UT)	Toiyabe (417)	4,192
Utah (UT)	Inyo (504)	2
Western Sierra (WS)	Toiyabe (417)	539
Western Sierra (WS)	Inyo (504)	153

The plots assigned to the Western Sierra variant represent a different situation, since the Western Sierra variant does cross into Nevada from California. In this case there are again two [equal] choices. FVS allows for selecting and running stands with only one variant at a time. Therefore, one option is to keep the variant assignments, run separate simulations with the Utah and Western Sierra variants, and combine simulation results at the end. However, both of the locations within the Western Sierra variant are also

included in the Utah variant, so the combination step can be avoided by changing only the variant assignment. So again, reassigning the variant is a reasonable approach. This may or may not be possible in other States covered by two or more variants, such as California, with five, and Oregon, with seven. FVS documentation should be consulted to evaluate whether or not variant re-assignments are appropriate.

Using Past Data to Project the Future

Setting up realistic simulation scenarios requires extensive knowledge of many factors, especially when the simulations are conducted at the scale of entire States. Forest products markets, different types of natural disturbances, and the mixtures of forest types, size classes, and age classes can be interacting factors. Being a woodland-dominated State, Nevada has very little industrial forestry (Keegan et al. 2006) and therefore harvest and subsequent regeneration is not a major consideration for simulation scenarios. Also, in contrast to most other States, the proportions of area in different forest types are heavily skewed to a few types, with over 80 percent of forest area in the Pinyon/juniper forest-type group and an additional 7 percent in the Woodland hardwoods group (see Appendix D in this report). When considered as a forest-type group, “nonstocked” is third largest in area.

Given this situation, this example will focus on the effects of disturbance on the area of nonstocked forest, as it relates to the area and live volume of Pinyon/juniper woodland type group in Nevada. In the current inventory, the estimate of area within the Pinyon/juniper woodland type group affected by some disturbance is 572,406 acres (fig. A.1a-c). Of that area, only 3.6 percent, or less than 21,000 acres, was recorded as having been disturbed by fire. This is somewhat surprising, because Shaw et al. (2017) found that over 8 million acres of Nevada burned during the period from 1984 to 2012, and over 10 percent of the burned area was forest land. Given the 29-year burned-area average and the fact that the current inventory accounts for disturbance that occurred over approximately a 10-year period, the area disturbed by fire should be close to 280,000 acres. This large discrepancy suggests that the dire-disturbed acreage might be found by using other combinations of variables.

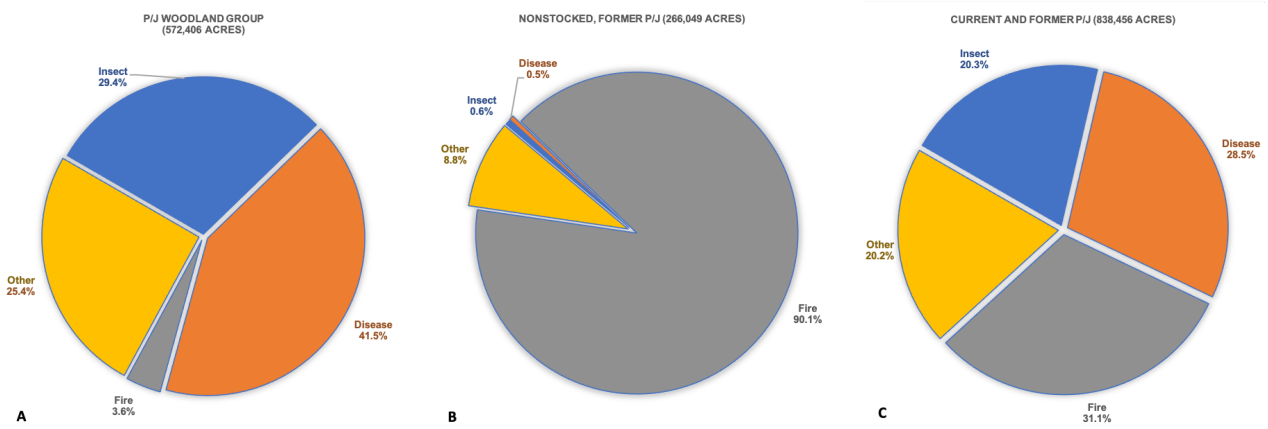

Figure A.1a-c—Disturbed area and proportions of area by disturbance type for the Pinyon/juniper woodlands group (a), nonstocked forest land identified as one of the group members by the forest type field call (b; FLDTYPCD1), and both categories combined (c).

Again looking into the current inventory, nonstocked area was broken into likely past/future forest types using the crew call of forest type, which cannot include nonstocked and instead is based on evidence of the forest type prior to becoming nonstocked. This showed that over 90 percent of the area classified as nonstocked and having a field-called forest type (FLDTYPCD) belonging to the Pinyon/juniper group was disturbed by fire (fig. A.1b). The estimate of area meeting those criteria is 239,709 acres, which when added to the area of Pinyon/juniper type group disturbed by fire, gives a total of 266,049 acres—very close to the historical average reported by Shaw et al. (2017).

The interpretation of these data suggest that fire is potentially a forest type-altering force, at least reducing stocking to a point where the forest type cannot be determined by the FIA forest-type algorithm (Arner et al. 2001) over large areas of forest land. The data also suggest that insects, disease, other nonfire disturbance agents, while being widespread and about as common as fire in the Pinyon/juniper forest-type group (fig. A.1c), do not have the same effect on stocking and forest classification.

Given this situation, FVS simulations can be used to evaluate possible futures for pinyon/juniper woodlands. One question that it raises is whether or not regeneration is adequate to allow nonstocked stands to be classified as a type in the Pinyon/juniper group or some other forest type at the same pace at which future fire converts stands currently in the Pinyon/juniper group into nonstocked acreage. A further evaluation of the major disturbance types shows that there have been no strong trends during the period spanning inventory years 2012 to 2018 (fig. A.2). While it is possible to extrapolate these short-term trends by fitting various models, such projections should be used with caution for simulations that might run several decades into the future. For example, the relatively modest trendline fitted to the disease category in figure A.2 would increase from the most recent estimate of about 240,000 acres to almost 640,000 acres in 2069, after a 50-year simulation. Given that this value would imply that by 2069 the decadal rate of disturbance would be over three times greater than recorded during the past decade, such a high rate might be unrealistic.

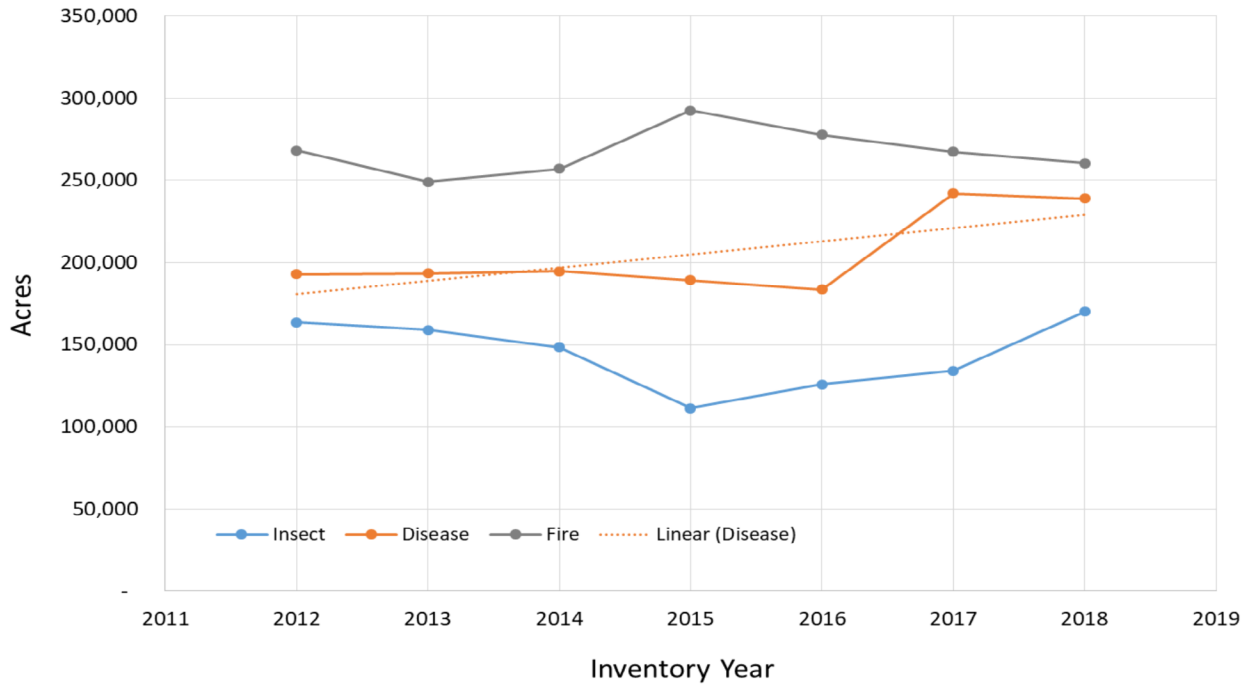

Figure A2—Recent trends of the major disturbance agents, showing a linear model fit to the annual estimates for area disturbed by disease. Although the trendline shows a moderate increase of 8,010 acres per year, in a 50-year simulation (2019–2069) such a linear extrapolation would result in a decadal disturbance area of over 640,000 acres by 2069.

Without additional evidence supporting a constant long-term increase in disturbances, a more prudent approach might be to use the short-term averages from the inventory years shown in figure A.2, and do FVS simulations for high-, average-, and low-acreage scenarios, with the high and low scenarios using values that are +/-50 percent of the average rates. FVS simulations based on these assumptions will therefore have the following properties:

- The most recent cycle of plots (2009–2018) measured in Nevada will be used. All plots will be brought up to the common starting year of 2019 as the start of the simulation period. Simulations will be run for 50 years (2019–2069) with 10-year intervals.
- Only fire will be programmed as a disturbance agent, given its disproportionate effect on changing Pinyon-juniper woodland into Nonstocked forest land. FVS default fire weather conditions will be used, so variability of fire severity will be determined primarily by plot data (stand density, composition, and structure from the tree tally and fuel loading values from downed woody material measurements). Default weather conditions are 20 mph windspeed, 70 °F air temperature, and very dry moisture conditions (Rebain 2010).
- Based on the recent average estimate of 267,475 acres disturbed by fire and an average expansion factor of 5,965 acres per plot, fire will be applied to approximately 45 plots per cycle in the average fire scenario, 67 plots (about

399,600 acres) per cycle in the high-fire scenario, and 22 plots (about 131,200 acres) in the low-fire scenario.

- Stands will be selected for fire effects randomly, based on their classification (FLDTYPCD) in the Pinyon/juniper forest-type group at the time of most recent inventory. As a result, "recovering" stands will be allowed to (re)burn.
- Before any fire simulations were run, all stands were run for the 50-year simulation period without fire. Although not a primary purpose of this exercise, the no-fire scenario provides a basis for comparison of modeled FVS growth rates and current FIA growth estimates.

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Appendix B
Standard Forest Inventory and Analysis Terminology

Note: For the FIA national glossary please go to https://www.nrs.fs.fed.us/fia/data-tools/state-reports/glossary/default.asp

Average annual mortality—The average annual volume of trees 5.0 inches d.b.h./d.r.c. and larger that died from natural causes.

Average annual net growth—Average annual net change in volume of trees 5.0 inches d.b.h./d.r.c. and larger in the absence of cutting (average annual gross growth minus average annual mortality).

Basal area (BA)—The cross-sectional area of a tree stem/bole (trunk) at the point where diameter is measured, inclusive of bark. BA is calculated for trees 1.0 inch and larger in diameter, and is expressed in square feet. For timber species, the calculation is based on d.b.h.; for woodland species, it is based on d.r.c.

Biomass—The quantity of wood fiber, for trees 1.0-inch d.b.h./d.r.c. and larger, expressed in terms of oven-dry weight. It includes aboveground portions of trees: bole/stem (trunk), bark, and branches. Biomass estimates can be computed for live and/or dead trees.

Board-foot volume—A unit of measure indicating the amount of wood contained in an unfinished board 1-foot wide, 1-foot long, and 1.0-inch thick. Board-foot volume is computed for the sawlog portion of a sawtimber-size tree; the sawlog portion includes the part of the bole on a sawtimber-size tree from a 1-foot stump to a minimum sawlog top of 7.0 inches d.o.b. for softwoods, or 9.0 inches d.o.b. for hardwoods. **Net board-foot volume** is calculated as the gross board-foot volume in the sawlog portion of a sawtimber-size tree, less deductions for cull (note: board-foot cull deductions are limited to rotten/missing material and form defect—referred to as the **merchantability factor—board-foot**). Board-foot volume estimates are computed in both Scribner and International ¼-inch rule, and can be calculated for live and/or dead (standing or down) trees.

Census water—Streams, sloughs, estuaries, canals, and other moving bodies of water 200 feet wide and greater, and lakes, reservoirs, ponds, and other permanent bodies of water 4.5 acres in area and greater.

Coarse woody debris—Down pieces of wood leaning more than 45 degrees from vertical with a diameter of at least 3.0 inches and a length of at least 3.0 feet.

Condition class—The combination of discrete landscape and forest attributers that identify, define, and stratify the area associated with a plot. Such attributes include reserved status, owner group, forest type, stand-size class, stand origin, and tree density.

Crown class—A classification of trees based on dominance in relation to adjacent trees in the stand as indicated by crown development and amount of sunlight received from above and the sides.

Crown cover (Canopy cover)—The percentage of the ground surface area covered by a vertical projection of plant crowns. Tree crown cover for a sample site includes the combined cover of timber and woodland trees 1.0 inch d.b.h./d.r.c. and larger. Maximum crown cover for a site is 100 percent; overlapping cover is not double counted.

Cubic-foot volume (merchantable)—A unit of measure indicating the amount of wood contained in a cube 1 by 1 by 1 foot. Cubic-foot volume is computed for the merchantable portion of timber and woodland species; the merchantable portion for timber species includes that part of a bole from a 1-foot stump to a minimum 4.0-inch top d.o.b, or above the place(s) of diameter measurement for any woodland tree with a single 5.0-inch stem or larger or a cumulative (calculated) d.r.c. of at least 5.0 inches to the 1.5-inch ends of all branches. **Net cubic-foot volume** is calculated as the gross cubic-foot volume in the merchantable portion of a tree, less deductions for cull.

Diameter at breast height (d.b.h.)—The diameter of a tree bole/stem (trunk) measured at breast height (4.5 feet above ground), measured outside the bark. The point of diameter measurement may vary for abnormally formed trees.

Diameter at root collar (d.r.c.)—The diameter of a tree stem(s) measured at root collar or at the point nearest the ground line (whichever is higher) that represents the basal area of the tree, measured outside the bark. For multi-stemmed trees, d.r.c. is calculated from an equation that incorporates the individual stem diameter measurements. The point of diameter measurement may vary for woodland trees with stems that are abnormally formed. With the exception of seedlings, woodland stems qualifying for measurement must be at least 1.0 inch in diameter or larger and at least 1.0 foot in length.

Diameter class—A grouping of tree diameters (d.b.h. or d.r.c.) into classes of a specified range. For some diameter classes, the number referenced (e.g., 4”, 6”, 8”) is designated as the midpoint of an individual class range. For example, if 2.0-inch classes are specified (the range for an individual class) and even numbers are referenced, the 6.0-inch class would include trees 5.0 to 6.9 inches in diameter.

Diameter outside bark (d.o.b.)—Tree diameter measurement inclusive of the outside perimeter of the tree bark. The d.o.b. measurement may be taken at various points on a tree (e.g., breast height, tree top) or log and is sometimes estimated.

Field plot/field location—A reference to the sample site or plot; an area containing the field location center and all sample points. A field location consists of four subplots and four microplots.

- **Subplot**—A 1/24-acre fixed-radius area (24-foot horizontal radius) used to sample trees 5.0 inches d.b.h./d.r.c. and larger and understory vegetation.
- **Microplot**—A 1/300-acre fixed-radius plot (6.8-foot radius), located 12 feet from the center of each subplot at an azimuth of 90 degrees, used to inventory seedlings and saplings.

Fixed-radius plot—A circular sample plot of a specified horizontal radius: 1/300 acre = 6.8-foot radius (microplot); 1/24 acre = 24.0-foot radius (subplot).

Forest land—Land that has at least 10 percent cover of live tally tree species of any size, or land formerly having such tree cover, and not currently developed for a nonforest use. The minimum area for classification as forest land is 1 acre. Roadside, stream side, and shelterbelt strips of trees must be at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams and other bodies of water, or natural clearings in forested areas are classified as forest if less than 120 feet in width or 1 acre in size. Grazed woodlands, reverting fields, and pastures that are not actively maintained are included if the above qualifications are satisfied.

Forest type—A classification of forest land based on the species forming a plurality of live-tree stocking.

Forest-type group: A combination of forest types that share closely associated species or site requirements.

Gross growth—The annual increase in volume of trees 5.0 inches d.b.h. and larger in absence of cutting and mortality. Gross growth includes survivor growth, ingrowth, growth on ingrowth, growth on removals before removal, and growth on mortality prior to death.

Growing-stock trees—A live timber species, 5.0 inches d.b.h. or larger, with less than two-thirds (67 percent) of the merchantable volume cull, and containing at least one solid 8-foot section, now or prospectively, reasonably free of form defect, on the merchantable portion of the tree.

Growing-stock volume—The cubic-foot volume of sound wood in growing-stock trees at least 5.0 inches d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. to the central stem.

Hardwood trees—Dicotyledonous trees, usually broadleaf and deciduous.

Industrial wood—All commercial roundwood products, excluding fuelwood.

Inventory year—The year in which a plot was scheduled to be completed. Within each subpanel, all plots have the same inventory year. Inventory year may differ from measurement year.

Land use—The classification of a land condition by use or type.

Litter—The uppermost layer of organic debris on a forest floor; that is, essentially the freshly fallen, or only slightly decomposed material, mainly foliage, but also bark fragments, twigs, flowers, fruits, and so forth. Humus is the organic layer, unrecognizable as to origin, immediately beneath the litter layer from which it is derived. Litter and humus together are often termed duff.

Logging residue—The unused sections within the merchantable portions of sound (growing-stock) trees cut or killed during logging operations.

Logging residue/products—Bolt—A short piece of pulpwood; a short log.

Mill or plant residue—Wood material from mills or other primary manufacturing plants that is not used for the mill's or plant's primary products. Mill or plant residue includes bark, slabs, edgings, trimmings, miscuts, sawdust, and shavings. Much of the mill and plant residue is used as fuel and as the raw material for such products as pulp, pelletized fuel, fiberwood, mulch, and animal bedding. Mill or plant residue includes bark and the following components: coarse residue (wood material suitable for chipping, such as slabs, edgings, and trim); fine residue (wood material unsuitable for chipping, such as sawdust and shavings); pulpwood (roundwood, whole-tree chips, or wood residues that are used for the production of wood pulp); roundwood (logs, bolts, or other round sections cut from trees).

Mapped-plot design—A sampling technique that identifies (delineates or maps) and separately classifies distinct "conditions" on the field location sample area. At the most basic level, condition class delineations include forest land, nonforest land, and water. Forest land conditions can be further subdivided into separate condition classes if there are distinct variations in reserved status, owner group, forest type, stand-size class, stand origin, and stand density, given that each distinct area meets minimum size requirements.

Measurement year—The year in which a plot was completed. Measurement year may differ from inventory year.

Merchantable portion—For trees measured at d.b.h. and 5.0-inches d.b.h. and larger, the merchantable portion (or "merchantable bole") includes the part of the tree bole from a 1-foot stump to a 4.0-inch top (d.o.b.). For trees measured at d.r.c., the merchantable portion includes all qualifying segments above the place(s) of diameter measurement for any tree with a single 5.0-inch stem or larger or a cumulative (calculated) d.r.c. of at least 5.0 inches to the 1.5-inch ends of all branches; sections below the place(s) of diameter measurement are not included. Qualifying segments are stems or branches that are a minimum of 1 foot in length and at least 1.0 inch in diameter; portions of stems or branches smaller than 1.0 inch in diameter, such as branch tips, are not included in the merchantable portion of the tree.

Mortality tree—All standing or down dead trees 5.0 inches d.b.h./d.r.c. and larger that were alive at the previous inventory, or within the previous 5 years for the initial annual measurement.

National Forest System (NFS) lands—Public lands administered by the Forest Service, U.S. Department of Agriculture, such as National Forests, National Grasslands, and some National Recreation Areas.

National Park lands—Public lands administered by the Park Service, U.S. Department of the Interior, such as National Parks, National Monuments, National Historic Sites (such as National Memorials and National Battlefields), and some National Recreation Areas.

Noncensus water—Portions of rivers, streams, sloughs, estuaries, and canals that are 30 to 200 feet wide and at least 1 acre in size; and lakes, reservoirs, and ponds 1 to 4.5 acres in size. Portions of rivers and streams not meeting the criteria for census water, but at least 30 feet wide and 1 acre in size, are considered noncensus water. Portions of braided streams not meeting the criteria for census water, but at least 30 feet in width and 1 acre in size, and more than 50 percent water at normal high-water level are also considered noncensus water.

Nonforest land—Land that does not support, or has never supported, forests, and lands formerly forested where tree regeneration is precluded by development for other uses. Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining rights-of-way, power line clearings of any width, and noncensus water. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide, and clearings, etc., more than 1 acre in size, to qualify as nonforest land.

Nonstocked stand—A formerly stocked stand that currently has less than 10 percent stocking but has the potential to again become 10 percent stocked. For example, recently harvested, burned, or windthrow-damaged areas.

Other Federal lands—Public lands administered by Federal agencies other than the Forest Service.

Poletimber-size trees—For trees measured at d.b.h., softwoods 5.0 to 8.9 inches d.b.h. and hardwoods 5.0 to 10.9 inches d.b.h. For trees measured at d.r.c., all live trees 5.0 to 8.9 inches d.r.c.

Primary wood processing plants—An industrial plant that processes roundwood products, such as sawlogs, pulpwood bolts, or veneer logs.

Private lands—All lands not owned or managed by a federal, state, or other public entity, including lands owned by corporations, trusts, or individuals, as well as Tribal lands.

Productive forest land—Forest land capable of producing 20 cubic feet per acre per year of wood from trees classified as timber species (see Appendix E) on forest land classified as a timber forest type (see Appendix D).

Productivity—The potential yield capability of a stand calculated as a function of site index (expressed in terms of cubic-foot growth per acre per year at age of culmination of mean annual increment). Productivity values for forest land provide an indication of biological potential. Timberland stands are classified by the potential net annual growth attainable in fully stocked natural stands. For FIA reporting, Productivity Class is a variable that groups stand productivity values into categories of a specified range. Productivity is sometimes referred to as "yield" or "mean annual increment."

Removals—The net volume of trees removed from the inventory by harvesting or other cultural operations (such as timber-stand improvement), by land clearing, or by changes in land use (such as a Wilderness designation).

Reserved land—Land withdrawn from management for production of wood products through statute or administrative designation; examples include Wilderness areas and National Parks and Monuments.

Sampling error—A statistical term used to describe the accuracy of the inventory estimates. Expressed on a percentage basis in order to enable comparisons between the precision of different estimates, sampling errors are computed by dividing the estimate into the square root of its variance.

Sapling—A live tree 1.0 to 4.9 inches d.b.h./d.r.c.

Sawlog portion—The part of the bole of sawtimber-size trees between a 1-foot stump and the sawlog top.

Sawlog top—The point on the bole of sawtimber-size trees above which a sawlog cannot be produced. The minimum sawlog top is 7.0 inches d.o.b. for softwoods, and 9.0 inches d.o.b. for hardwoods.

Sawtimber-size trees—Softwoods 9.0 inches d.b.h. and larger and hardwoods 11.0 inches and larger.

Sawtimber volume—The growing-stock volume in the sawlog portion of sawtimber-size trees in board feet.

Seedlings—Live trees less than 1.0 inch d.b.h./d.r.c. and at least 6.0 inches in length for softwoods or 12.0 inches for hardwoods.

Site index—A measure of forest productivity for a timberland tree/stand. Expressed in terms of the expected height (in feet) of trees on the site at an index age of 50 (or 80 years for aspen and cottonwood). Calculated from height-to-age equations.

Site tree—A tree used to provide an index of site quality. Timber species selected for site index calculations must meet specified criteria with regards to age, diameter, crown class, and damage.

Snag—A standing dead tree.

Softwood trees—Coniferous trees, usually evergreen, having needle- or scale-like leaves.

Stand—A community of trees that can be distinguished from adjacent communities due to similarities and uniformity in tree and site characteristics, such as age-class distribution, species composition, spatial arrangement, structure, etc.

Stand density—A relative measure that quantifies the relationship between trees per acre, stand basal area, average stand diameter, and stocking of a forested stand.

Stand density index (SDI)—A widely used measure developed by Reineke (1933) and is an index that expresses relative stand density based on a comparison of measured stand values with some standard condition; **relative stand density** is the ratio, proportion, or percent of absolute stand density to a reference level defined by some standard level of competition. For FIA reporting, the SDI for a site is usually presented as a percentage of the maximum SDI for the forest type. Site SDI values are sometimes grouped into SDI classes of a specified percentage range. Maximum SDI values vary by species and region.

Standing dead tree—A dead tally tree at least 5.0 inches in diameter has a bole that has an unbroken actual length of at least 4.5 feet, and leans less than 45 degrees from vertical as measured from the base of the tree to 4.5 feet. Portions of boles on dead trees that are separated greater than 50 percent (either above or below 4.5 feet) are considered severed and are included in down woody material (DWM) if they otherwise meet DWM tally criteria. For western woodland species with multiple stems, a tree is considered down if more than two-thirds of the volume is no longer attached or upright; without considering cut and removed volume. For western woodland species with single stems to qualify as a standing dead tally tree, dead trees must be at least 5.0 inches in diameter, be at least 1.0 foot in unbroken actual length, and lean less than 45 degrees from vertical.

Stand-size class—A classification of forest land based on the predominant diameter size of live trees presently forming the plurality of live-tree stocking. Classes are defined as follows:

- **Sawtimber stand (large-tree stand)**—A stand at least 10 percent stocked with live trees, in which half or more of the total stocking is from live trees 5.0 inches or larger in diameter, and with sawtimber (large tree) stocking equal to or greater than poletimber (medium tree) stocking.

- **Poletimber stand (medium-tree stand)**—A stand at least 10 percent stocked with live trees, in which half or more of the total stocking is from live trees 5.0 inches or larger in diameter, and with poletimber (medium tree) stocking exceeding sawtimber (large tree) stocking.
- **Sapling/seedling stand**—A stand at least 10 percent stocked with live trees, in which half or more of the total stocking is from live trees less than 5.0 inches in diameter.
- **Nonstocked stand**—A formerly stocked stand that currently has less than 10 percent stocking but has the potential to again become 10 percent stocked. For example, recently harvested, burned, or windthrow-damaged areas.

Stocking—An expression of the extent to which growing space is effectively utilized by live trees.

Timber species—Tally tree species traditionally used for industrial wood products. These include all species of conifers, except pinyon and most junipers. Diameters for timber species are measured at d.b.h.

Timber-stand improvement—A term comprising all intermediate cuttings or treatments, such as thinning, pruning, release cutting, girdling, weeding, or poisoning, made to improve the composition, health, and growth of the remaining trees in the stand.

Timberland—Unreserved forest land capable of producing 20 cubic feet per acre per year of wood from trees classified as a timber species (see Appendix E) on forest land designated as a timber forest type (see Appendix D).

Unproductive forest land—Forest land not capable of producing 20 cubic feet per acre per year of wood from trees classified as a timber species (see Appendix E) on forest land designated as a timber forest type and all forest lands designated as a woodland forest type (see Appendix D).

Unreserved forest land—Forest land not withdrawn from management for production of wood products through statute or administrative designation.

Wilderness area—An area of undeveloped land currently included in the Wilderness System, managed to preserve its natural conditions and retain its primeval character and influence.

Woodland species—Tally tree species that are not usually converted into industrial wood products. Common uses of woodland trees are fuelwood, fenceposts, and Christmas trees. These species include pinyon, juniper, mesquite, locust, mountain-mahogany (*Cercocarpus* spp.), Rocky Mountain maple, bigtooth maple, desert ironwood, and most western oaks (note: bur oak and chinkapin oak are classified as timber species). Because most woodland trees are extremely variable in form, diameter is measured at root collar (d.r.c.).

Appendix C
Standard Forest Resource Tables

Table C.1—Percentage of all area by land status; Nevada, 2009-2018.

Land status	Percent Sampling Error
Accessible forest land	
Unreserved forest land	
Timberland	0.4 (14.21)
Unproductive	12.4 (1.80)
Total	**12.7 (1.76)**
Reserved forest land	
Productive	0.4 (14.24)
Unproductive	2.1 (5.52)
Total	**2.5 (5.02)**
Total accessible forest land	**15.2 (1.41)**
Nonforest and other land	
Nonforest land water	83.3 (0.27)
Noncensus water	0.1 (33.34)
Census water	0.5 (12.52)
Total nonforest and other land	**83.9 (0.26)**
Nonsampled land	
Access denied	0.3 (15.76)
Hazardous conditions	0.3 (15.19)
Skipped visit	0.2 (20.96)
Other	0.0 (59.43)
Total nonsampled land	**0.8 (9.64)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.2—Area, in thousand acres, of forest land (percent sampling error) by owner group, owner class, reserved status, and forest land status.

Owner Group	Unreserved			Reserved			All Forest Land
	Timberland	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	166.3 (17.48)	2,083.0 (4.45)	2,249.3 (4.29)	172.0 (17.49)	777.0 (7.85)	949.0 (7.03)	3,198.4 (3.39)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	37.7 (39.17)	43.5 (37.39)	81.3 (26.98)	81.3 (26.98)
Bureau of Land Management	64.2 (29.53)	6,037.9 (2.41)	6,102.1 (2.40)	42.8 (36.11)	546.7 (9.79)	589.5 (9.44)	6,691.6 (2.18)
Fish and Wildlife Service	— (—)	— (—)	— (—)	1.5 (101.36)	109.9 (21.22)	111.4 (21.17)	111.4 (21.17)
Departments of Defense/ Energy	— (—)	141.9 (20.21)	141.9 (20.21)	— (—)	— (—)	— (—)	141.9 (20.21)
Other Federal	— (—)	6.6 (97.15)	6.6 (97.15)	— (—)	— (—)	— (—)	6.6 (97.15)
State and local government							
State	1.4 (102.53)	— (—)	1.4 (102.53)	11.0 (74.50)	6.0 (100.17)	17.0 (59.78)	18.5 (55.67)
Private							
Undifferentiated private and Native American	24.4 (44.30)	333.6 (12.62)	358.0 (12.13)	— (—)	— (—)	— (—)	358.0 (12.13)
Total	**256.4 (14.14)**	**8,602.9 (1.76)**	**8,859.3 (1.71)**	**265.0 (14.09)**	**1,483.2 (5.41)**	**1,748.2 (4.91)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.3—Area, in thousand acres, of forest land (percent sampling error) by forest-type group and site productivity class (cubic ft/acre/year).

Forest-type group	Site productivity class (cubic ft/acre/year)							Total all classes
	0-19	20-49	50-84	85-119	120-164	165-224	225+	
Pinyon / juniper group	8,480.0 (1.74)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	8,480.0 (1.74)
Douglas-fir group	— (—)	6.0 (100.17)	6.0 (100.17)	— (—)	— (—)	— (—)	— (—)	12.1 (70.72)
Ponderosa pine group	1.4 (106.50)	34.5 (40.09)	15.7 (54.01)	— (—)	— (—)	— (—)	— (—)	51.6 (31.37)
Fir/spruce/mountain hemlock group	12.1 (71.19)	130.9 (20.51)	32.7 (40.19)	13.4 (53.78)	12.0 (71.77)	— (—)	— (—)	201.1 (16.31)
Lodgepole pine group	— (—)	16.2 (59.63)	— (—)	— (—)	— (—)	— (—)	— (—)	16.2 (59.63)
Other western softwood group	86.7 (25.57)	50.7 (33.46)	— (—)	— (—)	— (—)	— (—)	— (—)	137.4 (20.27)
Elm/ash/cottonwood group	— (—)	5.8 (72.97)	— (—)	— (—)	— (—)	— (—)	— (—)	5.8 (72.97)
Aspen/birch/group	98.1 (23.31)	128.5 (19.61)	11.0 (74.80)	6.0 (100.17)	— (—)	1.4 (106.50)	— (—)	245.0 (14.41)
Woodland hardwoods group	714.8 (8.57)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	714.8 (8.57)
Nonstocked	693.2 (8.75)	33.3 (38.71)	2.9 (71.34)	14.3 (57.39)	— (—)	— (—)	— (—)	743.7 (8.40)
Total	**10,086.1 (1.44)**	**405.9 (11.27)**	**68.3 (28.10)**	**33.8 (39.30)**	**12.0 (71.77)**	**1.4 (106.50)**	**— (—)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.4—Area, in thousand acres, of forest land (percent sampling error) by forest-type group, ownership group, and forest land status.

Forest Group-Type	Forest Service			Other Federal			State and Local Government			Private and Native American			All forest land
	Timberland	Other forest land	Total	Timberland	Other forest land	Total	Timberland	Other forest land	Total	Timberland	Other forest land	Total	
Pinyon/juniper group	— (—)	2,186.4 (4.26)	2,186.4 (4.26)	— (—)	6,007.5 (2.41)	6,007.5 (2.41)	— (—)	6.0 (100.17)	6.0 (100.17)	— (—)	280.1 (13.95)	280.1 (13.95)	8,480.0 (1.74)
Douglas-fir group	— (—)	6.0 (100.17)	6.0 (100.17)	— (—)	6.0 (100.17)	6.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	12.1 (70.72)
Ponderosa pine group	28.4 (42.67)	11.5 (66.38)	40.0 (35.64)	— (—)	3.6 (85.19)	3.6 (85.19)	1.4 (102.53)	— (—)	1.4 (102.53)	6.6 (97.15)	— (—)	6.6 (97.15)	51.6 (31.37)
Fir/spruce/ mountain hemlock group	32.5 (40.22)	64.1 (28.83)	96.7 (23.40)	17.6 (58.67)	76.9 (26.80)	94.4 (24.28)	— (—)	5.5 (106.50)	5.5 (106.50)	4.5 (100.17)	— (—)	4.5 (100.17)	201.1 (16.31)
Lodgepole pine group	10.7 (72.45)	5.5 (106.50)	16.2 (59.63)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	16.2 (59.63)
Other western softwood group	— (—)	95.6 (24.30)	95.6 (24.30)	16.6 (57.91)	25.1 (48.03)	41.7 (36.97)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	137.4 (20.27)
Elm/ash/ cottonwood group	— (—)	2.7 (106.50)	2.7 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	3.0 (100.17)	— (—)	3.0 (100.17)	5.8 (72.97)
Aspen/birch/ group	68.1 (27.96)	136.9 (19.27)	204.9 (15.83)	17.9 (52.55)	12.0 (70.45)	29.9 (42.28)	— (—)	1.4 (106.50)	1.4 (106.50)	8.8 (75.94)	— (—)	8.8 (75.94)	245.0 (14.41)
Woodland hardwoods group	— (—)	382.4 (12.03)	382.4 (12.03)	— (—)	319.1 (12.78)	319.1 (12.78)	— (—)	— (—)	— (—)	— (—)	13.2 (56.04)	13.2 (56.04)	714.8 (8.57)
Nonstocked	26.6 (41.56)	140.9 (19.73)	167.5 (17.85)	12.1 (70.40)	518.2 (10.16)	530.3 (10.05)	— (—)	4.1 (106.50)	4.1 (106.50)	1.5 (98.40)	40.3 (36.97)	41.8 (35.80)	743.7 (8.40)
Total	**166.3 (17.48)**	**3,032.1 (3.49)**	**3,198.4 (3.39)**	**64.2 (29.53)**	**6,968.4 (2.13)**	**7,032.6 (2.12)**	**1.4 (102.53)**	**17.0 (59.78)**	**18.5 (55.67)**	**24.4 (44.30)**	**333.6 (12.62)**	**358.0 (12.13)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.5—Area, in thousand acres, of forest land (percent sampling error) by forest-type group and stand-size class.

Forest-type group	Stand-size class				All size classes
	Large diameter	Medium diameter	Small diameter	Nonstocked	
Pinyon/juniper group	7,725.4 (1.93)	525.1 (10.17)	229.4 (15.67)	— (—)	8,480.0 (1.74)
Douglas-fir group	6.0 (100.17)	— (—)	6.0 (100.17)	— (—)	12.1 (70.72)
Ponderosa pine group	51.6 (31.37)	— (—)	— (—)	— (—)	51.6 (31.37)
Fir/spruce/mountain hemlock group	172.7 (17.66)	22.2 (50.87)	6.2 (78.81)	— (—)	201.1 (16.31)
Lodgepole pine group	16.2 (59.63)	— (—)	— (—)	— (—)	16.2 (59.63)
Other western softwood group	122.6 (21.60)	10.0 (73.71)	4.7 (98.82)	— (—)	137.4 (20.27)
Elm/ash/cottonwood group	2.7 (106.50)	— (—)	3.0 (100.17)	— (—)	5.8 (72.97)
Aspen/birch/group	8.8 (71.20)	89.5 (23.45)	146.7 (18.73)	— (—)	245.0 (14.41)
Woodland hardwoods group	534.2 (9.91)	38.0 (38.65)	142.6 (19.52)	— (—)	714.8 (8.57)
Nonstocked	— (—)	— (—)	— (—)	743.7 (8.40)	743.7 (8.40)
Total	**8,640.2 (1.71)**	**684.9 (8.83)**	**538.7 (9.94)**	**743.7 (8.40)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.6—Area, in thousand acres, of forest land (percent sampling error) by forest-type group and stand-age class (years).

Forest-type group	Stand-age class (years)												All classes
	Nonstocked	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181-200	201+	
Pinyon/juniper group	— (—)	144.1 (19.99)	130.8 (20.84)	321.7 (12.92)	753.6 (8.52)	987.0 (7.45)	1,042.0 (7.25)	1,162.6 (6.83)	984.6 (7.46)	760.7 (8.59)	613.9 (9.52)	1,579.0 (5.75)	8,480.0 (1.74)
Douglas-fir group	— (—)	— (—)	6.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	6.0 (100.17)	12.1 (70.72)
Ponderosa pine group	— (—)	— (—)	— (—)	6.6 (97.15)	2.7 (106.50)	4.1 (106.50)	4.3 (102.53)	17.3 (54.41)	— (—)	6.1 (96.50)	— (—)	10.4 (66.94)	51.6 (31.37)
Fir/spruce/mountain hemlock group	— (—)	6.2 (78.81)	— (—)	6.6 (97.15)	5.6 (82.43)	32.7 (42.05)	13.6 (53.22)	42.2 (37.68)	6.0 (99.99)	22.6 (50.48)	22.6 (50.28)	42.9 (35.66)	201.1 (16.31)
Lodgepole pine group	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	5.5 (106.50)	6.6 (97.15)	— (—)	4.1 (106.50)	— (—)	— (—)	16.2 (59.63)
Other western softwood group	— (—)	— (—)	— (—)	4.7 (98.82)	7.5 (66.08)	— (—)	23.0 (51.33)	10.8 (70.75)	18.1 (57.62)	5.5 (99.99)	6.0 (99.64)	61.7 (30.70)	137.4 (20.27)
Elm/ash/cottonwood group	— (—)	3.0 (100.17)	— (—)	— (—)	— (—)	— (—)	2.7 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	5.8 (72.97)
Aspen/birch/group	— (—)	96.6 (23.34)	45.5 (34.16)	25.4 (41.15)	43.1 (35.35)	19.4 (50.37)	7.4 (83.81)	1.5 (100.07)	6.1 (80.11)	— (—)	— (—)	— (—)	245.0 (14.41)
Woodland hardwoods group	— (—)	87.8 (25.00)	25.1 (46.46)	15.0 (59.96)	11.4 (66.34)	47.0 (35.55)	88.6 (25.52)	110.5 (21.61)	169.0 (18.10)	87.4 (24.57)	41.2 (36.32)	20.6 (48.98)	714.8 (8.57)
Nonstocked	743.7 (8.40)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	743.7 (8.40)
Total	**743.7 (8.40)**	**337.7 (12.67)**	**207.4 (16.32)**	**379.9 (11.80)**	**824.0 (8.09)**	**1,090.2 (7.05)**	**1,187.1 (6.74)**	**1,351.4 (6.24)**	**1,183.8 (6.73)**	**886.5 (7.86)**	**683.7 (8.98)**	**1,720.7 (5.46)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.7—Area, in thousand acres, of forest land (percent sampling error) by forest-type group and stand origin.

Forest-type group	Stand origin		
	Natural stands	Artificial regeneration	All forest land
Pinyon/juniper group	8,480.0 (1.74)	— (—)	8,480.0 (1.74)
Douglas-fir group	12.1 (70.72)	— (—)	12.1 (70.72)
Ponderosa pine group	51.6 (31.37)	— (—)	51.6 (31.37)
Fir/spruce/mountain hemlock group	201.1 (16.31)	— (—)	201.1 (16.31)
Lodgepole pine group	16.2 (59.63)	— (—)	16.2 (59.63)
Other western softwood group	137.4 (20.27)	— (—)	137.4 (20.27)
Elm/ash/cottonwood group	5.8 (72.97)	— (—)	5.8 (72.97)
Aspen/birch/group	245.0 (14.41)	— (—)	245.0 (14.41)
Woodland hardwoods group	711.8 (8.59)	3.0 (100.07)	714.8 (8.57)
Nonstocked	743.7 (8.40)	— (—)	743.7 (8.40)
Total	**10,604.5 (1.35)**	**3.0 (100.07)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.8—Area, in thousand acres, of forest land (percent sampling error) by forest-type group and disturbance class.

Forest-type group	Disturbance class										All forest land
	Unavailable	Insect	Disease	Fire	Animal	Weather	Vegetation	Unknown	Human	Geologic	
Pinyon/juniper group	7,907.5 (1.89)	168.5 (18.72)	237.6 (15.64)	20.8 (51.13)	41.8 (38.04)	40.3 (38.67)	18.1 (58.01)	5.5 (105.08)	19.4 (51.94)	20.5 (50.90)	8,480.0 (1.74)
Douglas-fir group	6.0 (100.17)	6.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	12.1 (70.72)
Ponderosa pine group	51.6 (31.37)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	51.6 (31.37)
Fir/spruce/ mountain hemlock group	173.3 (17.50)	15.7 (59.70)	— (—)	6.0 (100.17)	6.0 (99.64)	— (—)	— (—)	— (—)	— (—)	— (—)	201.1 (16.31)
Lodgepole pine group	16.2 (59.63)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	16.2 (59.63)
Other western softwood group	131.3 (20.71)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	6.0 (99.64)	— (—)	— (—)	137.4 (20.27)
Elm/ash/ cottonwood group	5.8 (72.97)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	5.8 (72.97)
Aspen/birch group	191.9 (16.14)	4.5 (99.64)	28.8 (42.97)	15.7 (59.90)	— (—)	— (—)	— (—)	— (—)	— (—)	4.1 (105.08)	245.0 (14.41)
Woodland hardwoods group	664.4 (8.89)	6.0 (100.17)	5.1 (107.99)	22.1 (51.15)	6.0 (100.56)	6.0 (100.17)	— (—)	— (—)	— (—)	5.1 (107.99)	714.8 (8.57)
Nonstocked	440.5 (10.86)	1.6 (97.15)	1.3 (107.99)	276.9 (14.26)	11.2 (73.23)	6.3 (98.82)	— (—)	— (—)	6.0 (100.07)	— (—)	743.7 (8.40)
Total	**9,588.5 (1.55)**	**202.4 (16.92)**	**272.8 (14.50)**	**341.4 (12.80)**	**65.0 (30.42)**	**52.6 (33.88)**	**18.1 (58.01)**	**11.5 (72.30)**	**25.4 (46.17)**	**29.7 (42.29)**	**10,607.5 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.9—Area, in thousand acres, of timberland (percent sampling error) by forest-type group and stand-size class.

Forest-type group	Stand-size class				All size classes
	Large diameter	Medium diameter	Small diameter	Nonstocked	
Ponderosa pine group	36.4 (38.49)	— (—)	— (—)	— (—)	36.4 (38.49)
Fir/spruce/mountain hemlock group	54.6 (31.52)	— (—)	— (—)	— (—)	54.6 (31.52)
Lodgepole pine group	10.7 (72.45)	— (—)	— (—)	— (—)	10.7 (72.45)
Other western softwood group	12.1 (70.40)	4.5 (99.64)	— (—)	— (—)	16.6 (57.91)
Elm/ash/cottonwood group	— (—)	— (—)	3.0 (100.17)	— (—)	3.0 (100.17)
Aspen/birch group	5.5 (105.08)	38.7 (36.19)	50.6 (32.44)	— (—)	94.8 (23.45)
Nonstocked	— (—)	— (—)	— (—)	40.2 (34.89)	40.2 (34.89)
Total	**119.3 (20.93)**	**43.2 (34.04)**	**53.6 (31.13)**	**40.2 (34.89)**	**256.4 (14.14)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.10—Number of live trees (at least 1 in dia), in thousand trees, on forest land (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)															
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31+	All classes
Softwood species groups																	
Douglas-fir	1,809.1 (61.19)	1,356.8 (57.66)	472.0 (51.47)	399.4 (47.07)	326.8 (53.17)	181.5 (52.80)	72.6 (70.72)	108.9 (74.57)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	4,763.5 (41.85)
Ponderosa and Jeffrey pines	2,597.2 (60.25)	— (—)	457.1 (41.68)	772.8 (37.66)	390.8 (39.89)	517.2 (42.92)	693.2 (46.08)	512.7 (46.17)	442.2 (36.84)	181.2 (53.63)	214.2 (41.42)	246.2 (44.16)	70.9 (72.44)	72.5 (1.77)	36.3 (100.17)	— (—)	7,204.6 (30.39)
True fir	28,139.7 (20.42)	15,551.6 (21.53)	9,776.6 (18.09)	7,009.2 (17.21)	3,775.7 (16.94)	2,903.5 (21.61)	2,402.1 (19.92)	1,571.9 (21.00)	847.3 (24.97)	535.5 (30.64)	250.9 (37.86)	214.6 (72.55)	138.7 (51.49)	105.7 (59.14)	39.5 (97.15)	178.43 (45.17)	73,441.0 (16.52)
Western white pine	1,643.7 (83.65)	410.9 (106.50)	132.1 (83.65)	66.0 (106.50)	66.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	39.5 (97.15)	— (—)	— (—)	— (—)	2,358.2 (86.61)
Engelmann and other spruces	1,356.8 (74.57)	452.3 (100.17)	471.7 (47.99)	471.6 (47.99)	145.2 (61.27)	326.7 (59.85)	217.7 (74.65)	181.5 (52.88)	36.2 (99.99)	36.2 (99.99)	— (—)	72.5 (70.65)	— (—)	72.5 (99.99)	— (—)	36.31 (100.17)	3,877.2 (55.42)
Incense-cedar	— (—)	— (—)	66.0 (106.50)	39.5 (97.15)	— (—)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	33.02 (106.50)	171.5 (61.56)
Lodgepole pine	4,189.9 (67.15)	1,394.2 (75.36)	587.1 (61.16)	488.0 (54.14)	145.0 (71.77)	112.0 (75.36)	105.5 (75.92)	178.0 (61.44)	66.0 (106.50)	66.0 (74.50)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	7,364.7 (56.92)
Woodland softwoods	505,937.2 (4.55)	383,711.2 (4.47)	286,190.5 (2.72)	222,180.5 (2.62)	168,555.6 (2.58)	117,192.6 (2.72)	78,484.7 (3.03)	52,943.1 (3.54)	31,811.5 (4.27)	21,043.6 (4.87)	11,947.5 (6.34)	7,602.3 (7.77)	4,401.3 (9.85)	3,009.0 (11.32)	2,276.3 (13.06)	3,517.35 (12.30)	1,900,804.0 (2.53)
Other western softwoods	8,548.2 (34.58)	7,939.9 (37.22)	5,296.4 (23.93)	4,061.8 (21.98)	3,046.9 (20.72)	1,771.7 (24.21)	1,333.0 (30.25)	1,027.7 (26.09)	809.8 (26.93)	586.7 (32.82)	553.0 (30.27)	297.0 (42.71)	146.8 (49.81)	41.2 (95.09)	41.2 (95.09)	614.77 (43.41)	36,116.2 (20.79)
Subtotal	554,221.8 (4.36)	410,816.9 (4.30)	303,449.5 (2.61)	235,488.8 (2.50)	176,451.9 (2.47)	123,038.2 (2.63)	83,308.9 (2.93)	56,523.9 (3.40)	34,049.3 (4.10)	22,449.3 (4.70)	12,998.7 (6.04)	8,432.6 (7.50)	4,797.1 (9.34)	3,300.8 (10.88)	2,393.3 (12.72)	4,379.88 (11.75)	2,036,100.9 (2.42)

Table C.10 continued.

Species group type	Diameter class (inches)																
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31+	All classes
Hardwood species groups																	
Cottonwood and aspen	139,475.3 (19.26)	29,817.2 (23.36)	13,753.6 (21.58)	7,380.7 (21.60)	2,668.4 (26.43)	1,044.7 (32.31)	498.2 (40.97)	171.7 (68.34)	72.6 (70.64)	33.0 (106.50)	132.1 (83.65)	— (—)	— (—)	— (—)	— (—)	— (—)	195,047.5 (17.24)
Woodland hardwoods	115,947.8 (16.01)	55,224.1 (15.79)	35,706.8 (9.16)	29,127.1 (8.94)	19,437.9 (9.73)	12,359.5 (9.60)	8,966.6 (10.95)	5,024.2 (12.66)	2,999.4 (15.36)	1,078.0 (19.40)	942.0 (28.10)	470.3 (27.79)	325.9 (37.04)	145.5 (50.08)	36.2 (99.99)	41.20 (95.09)	287,832.6 (9.76)
Subtotal	255,423.1 (12.76)	85,041.3 (13.27)	49,460.4 (8.98)	36,507.8 (8.36)	22,106.2 (9.10)	13,404.2 (9.16)	9,464.8 (10.58)	5,195.9 (12.43)	3,072.0 (15.08)	1,111.0 (19.09)	1,074.1 (26.71)	470.3 (27.79)	325.9 (37.04)	145.5 (50.08)	36.2 (99.99)	41.20 (95.09)	482,880.0 (9.07)
Total	**809,644.9 (4.98)**	**495,858.2 (4.23)**	**352,909.9 (2.53)**	**271,996.6 (2.38)**	**198,558.1 (2.35)**	**136,442.4 (2.48)**	**92,773.7 (2.81)**	**61,719.8 (3.23)**	**37,121.2 (3.91)**	**23,560.3 (4.54)**	**14,072.8 (5.90)**	**8,903.0 (7.23)**	**5,123.1 (9.09)**	**3,446.3 (10.62)**	**2,429.5 (12.62)**	**4,421.07 (11.65)**	**2,518,980.9 (2.54)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.11—Number of standing-dead trees (at least 5 in dia), in thousand trees, on forest land (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)																	
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																		
Douglas-fir	254.2 (87.00)	290.5 (68.46)	181.5 (72.13)	145.2 (79.12)	217.8 (46.97)	72.6 (70.72)	72.6 (70.72)	— (—)	36.3 (100.17)	108.9 (74.57)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	1,416.0 (53.24)
Ponderosa and Jeffrey pines	— (—)	36.3 (101.36)	36.3 (101.36)	77.4 (69.28)	— (—)	— (—)	— (—)	36.3 (101.36)	78.9 (67.31)	— (—)	— (—)	— (—)	33.3 (100.00)	— (—)	— (—)	— (—)	35.6 (99.95)	334.2 (32.47)
True fir	2,572.7 (38.28)	1,971.2 (35.94)	1,357.1 (25.58)	1,336.6 (28.40)	722.4 (32.57)	288.8 (39.60)	178.3 (45.23)	75.8 (69.74)	39.5 (97.15)	— (—)	74.0 (70.48)	— (—)	— (—)	33.3 (100.00)	— (—)	— (—)	39.5 (97.15)	8,689.3 (28.39)
Western white pine	— (—)	33.0 (106.50)	33.0 (106.50)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	99.1 (106.50)
Engelmann and other spruces	— (—)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	72.6 (70.72)
Lodgepole pine	118.4 (97.15)	105.5 (59.12)	151.4 (79.44)	39.5 (97.15)	33.0 (106.50)	39.5 (97.15)	— (—)	— (—)	99.1 (106.50)	— (—)	— (—)	— (—)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	619.3 (68.60)
Woodland softwoods	28,832.3 (8.16)	24,606.2 (6.28)	18,075.2 (6.60)	12,312.5 (6.70)	7,546.7 (8.23)	3,719.1 (11.17)	2,472.5 (12.49)	1,431.5 (17.40)	813.4 (21.11)	284.9 (35.71)	71.4 (70.68)	36.1 (100.56)	69.3 (72.75)	37.9 (98.82)	36.4 (99.64)	— (—)	— (—)	100,345.3 (5.13)
Other western softwoods	1,162.7 (45.41)	1,265.5 (54.18)	814.2 (40.31)	717.7 (26.50)	610.9 (30.60)	224.1 (47.10)	145.3 (49.90)	36.3 (100.17)	145.2 (49.96)	— (—)	72.6 (71.07)	72.5 (99.99)	— (—)	36.2 (99.99)	— (—)	— (—)	— (—)	5,303.3 (32.68)
Subtotal	32,940.3 (7.96)	28,344.5 (6.50)	20,648.8 (6.37)	14,661.9 (6.43)	9,130.9 (7.75)	4,344.2 (10.41)	2,868.7 (11.66)	1,579.9 (16.41)	1,248.7 (18.87)	393.8 (33.01)	254.3 (37.82)	108.6 (74.66)	135.6 (51.55)	107.4 (57.56)	36.4 (99.64)	— (—)	75.1 (69.68)	116,879.1 (5.21)
Hardwood species groups																		
Cottonwood and aspen	3,770.4 (25.78)	1,325.7 (25.82)	433.2 (35.58)	362.1 (42.22)	68.8 (72.30)	35.7 (99.62)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	5,995.8 (20.89)
Woodland hardwoods	9,918.6 (10.69)	8,398.4 (11.20)	5,344.8 (12.06)	2,596.7 (13.29)	1,058.3 (22.31)	579.1 (26.54)	300.4 (34.67)	171.6 (46.00)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	28,404.2 (9.12)
Subtotal	13,689.0 (10.45)	9,724.0 (10.24)	5,778.0 (11.44)	2,958.8 (12.74)	1,127.2 (21.40)	614.8 (25.66)	300.4 (34.67)	171.6 (46.00)	36.3 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	34,400.0 (8.31)
Total	**46,629.2 (6.61)**	**38,068.6 (5.67)**	**26,426.8 (5.57)**	**17,620.7 (5.80)**	**10,258.1 (7.33)**	**4,959.0 (9.67)**	**3,169.2 (11.11)**	**1,751.5 (15.45)**	**1,285.0 (18.55)**	**393.8 (33.01)**	**254.3 (37.82)**	**108.6 (74.66)**	**135.6 (51.55)**	**107.4 (57.56)**	**36.4 (9.64)**	**— (—)**	**75.1 (69.68)**	**151,279.2 (4.61)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.12—Number of growing-stock trees (at least 5 in), in thousand trees, on timberland (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)																
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																		
Ponderosa and Jeffrey pines	285.4 (50.30)	561.9 (43.45)	252.4 (47.67)	302.8 (58.03)	481.9 (58.37)	331.6 (63.33)	300.2 (45.50)	72.5 (71.77)	72.5 (71.77)	213.2 (48.50)	33.0 (106.50)	72.5 (71.77)	— (—)	— (—)	— (—)	— (—)	— (—)	2,979.8 (36.26)
True fir	2,810.7 (33.90)	2,123.1 (38.02)	1,002.4 (33.85)	1,109.1 (47.08)	855.6 (38.86)	557.3 (39.31)	347.0 (45.40)	174.1 (52.64)	69.4 (72.50)	— (—)	33.0 (106.50)	33.0 (106.50)	39.5 (97.15)	33.3 (100.00)	— (—)	— (—)	39.5 (97.15)	9,227.0 (33.28)
Western white pine	99.1 (106.50)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	39.5 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	171.5 (84.99)
Incense-cedar	— (—)	39.5 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	39.5 (97.15)
Lodgepole pine	422.0 (69.08)	190.9 (65.40)	78.9 (97.15)	78.9 (97.15)	39.5 (97.15)	112.0 (75.36)	— (—)	33.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	955.2 (67.22)
Other western softwoods	473.9 (43.95)	576.4 (42.64)	394.0 (41.91)	247.9 (47.77)	36.3 (100.17)	36.3 (100.17)	148.4 (49.60)	72.7 (70.40)	72.7 (70.64)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	2,058.5 (33.61)
Subtotal	4,091.1 (27.12)	3,524.8 (26.96)	1,727.7 (6.44)	1,738.7 (34.35)	1,413.3 (32.11)	1,037.2 (31.40)	795.6 (29.72)	352.3 (34.52)	214.6 (41.34)	213.2 (48.50)	105.5 (59.12)	105.5 (59.12)	39.5 (7.15)	33.3 (100.00)	— (—)	— (—)	39.5 (97.15)	15,431.6 (23.74)
Hardwood species groups																		
Cottonwood and aspen	2,726.0 (37.70)	2,397.7 (43.20)	786.4 (49.89)	463.3 (55.64)	181.5 (82.58)	36.3 (100.17)	72.6 (70.64)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	6,663.9 (37.61)
Subtotal	2,726.0 (37.70)	2,397.7 (43.20)	786.4 (49.89)	463.3 (55.64)	181.5 (82.58)	36.3 (100.17)	72.6 (70.64)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	6,663.9 (37.61)
Total	**6,817.1 (24.22)**	**5,922.5 (24.31)**	**2,514.1 (24.67)**	**2,202.0 (30.69)**	**1,594.8 (29.95)**	**1,073.5 (30.52)**	**868.2 (27.86)**	**352.3 (34.52)**	**214.6 (41.34)**	**213.2 (8.50)**	**105.5 (59.12)**	**105.5 (59.12)**	**39.5 (97.15)**	**33.3 (100.00)**	**— (—)**	**— (—)**	**39.5 (97.15)**	**22,095.4 (21.23)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.13—Net volume of live trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

	Unreserved			Reserved			
Ownership group	**Timberland**	**Unproductive**	**Total**	**Productive**	**Unproductive**	**Total**	**All forest land**
Forest Service							
National forest	217.1 (24.75)	1,348.7 (5.77)	1,565.8 (6.04)	283.5 (27.37)	465.9 (12.63)	749.4 (12.80)	2,315.2 (5.64)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	52.8 (48.00)	18.8 (44.41)	71.7 (37.19)	71.7 (37.19)
Bureau of Land Management	42.8 (46.44)	3,038.3 (3.41)	3,081.1 (3.40)	57.5 (38.67)	359.5 (13.21)	417.0 (12.58)	3,498.1 (3.15)
Fish and Wildlife Service	— (—)	— (—)	— (—)	0.6 (101.36)	43.3 (27.62)	43.9 (27.69)	43.9 (27.69)
Departments of Defense/Energy	— (—)	71.4 (24.90)	71.4 (24.90)	— (—)	— (—)	— (—)	71.4 (24.90)
Other Federal	— (—)	2.3 (97.15)	2.3 (97.15)	— (—)	— (—)	— (—)	2.3 (97.15)
State and local government							
State	4.1 (102.53)	— (—)	4.1 (102.53)	23.5 (76.66)	6.9 (100.17)	30.4 (63.52)	34.5 (57.29)
Private							
Undifferentiated private and Native American	32.9 (66.93)	153.0 (15.96)	185.9 (17.56)	— (—)	— (—)	— (—)	185.9 (17.56)
Total	**296.9 (20.62)**	**4,613.7 (2.54)**	**4,910.6 (2.63)**	**417.9 (20.58)**	**894.5 (8.39)**	**1,312.4 (8.52)**	**6,223.0 (2.49)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.14—Net volume of standing-dead trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

	Unreserved			Reserved			All forest land
Ownership group	Timberland	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	43.6 (43.74)	89.1 (12.18)	132.7 (16.50)	50.6 (36.83)	50.0 (28.29)	100.7 (23.21)	233.4 (13.67)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	33.1 (49.33)	0.9 (49.87)	34.0 (48.00)	34.0 (48.00)
Bureau of Land Management	5.4 (54.07)	229.8 (6.89)	235.1 (6.83)	25.9 (47.81)	40.0 (29.76)	65.9 (26.00)	301.1 (7.71)
Fish and Wildlife Service	— (—)	— (—)	— (—)	— (—)	6.0 (40.32)	6.0 (40.32)	6.0 (40.32)
Departments of Defense/ Energy	— (—)	4.9 (36.33)	4.9 (36.33)	— (—)	— (—)	— (—)	4.9 (36.33)
Other Federal	— (—)	0.4 (97.15)	0.4 (97.15)	— (—)	— (—)	— (—)	0.4 (97.15)
State and local government							
State	0.3 (102.53)	— (—)	0.3 (102.53)	0.0 (106.50)	— (—)	0.0 (106.50)	0.4 (91.45)
Private							
Undifferentiated private and Native American	3.7 (69.26)	18.8 (29.53)	22.4 (27.06)	— (—)	— (—)	— (—)	22.4 (27.06)
Total	**52.9 (36.71)**	**343.0 (5.70)**	**396.0 (6.82)**	**109.7 (25.08)**	**96.9 (19.11)**	**206.6 (15.96)**	**602.5 (6.97)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (**—**) indicates no sample for the cell; 0 indicates a value greater than 0 but less than 0.1.

Table C.15—Net volume of live trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by forest-type group and stand-size class.

Forest-type group	Stand-size class				
	Large diameter	Medium diameter	Small diameter	Nonstocked	All size classes
Pinyon/juniper group	4,809.9 (2.47)	164.7 (12.87)	15.5 (19.51)	— (—)	4,990.1 (2.35)
Douglas-fir group	6.5 (100.17)	— (—)	0.0 (100.17)	— (—)	6.5 (99.78)
Ponderosa pine group	106.9 (32.85)	— (—)	— (—)	— (—)	106.9 (32.85)
Fir/spruce/mountain hemlock group	364.5 (20.96)	15.6 (62.07)	1.2 (70.81)	— (—)	381.3 (20.19)
Lodgepole pine group	49.7 (61.54)	— (—)	— (—)	— (—)	49.7 (61.54)
Other western softwood group	244.2 (30.39)	8.1 (101.98)	— (—)	— (—)	252.3 (29.60)
Elm/ash /cottonwood group	6.0 (106.50)	— (—)	1.0 (100.17)	— (—)	7.1 (91.97)
Aspen/birch /group	19.1 (71.79)	75.3 (33.34)	10.8 (34.26)	— (—)	105.3 (27.35)
Woodland hardwoods group	303.3 (11.81)	8.4 (41.61)	3.5 (43.54)	— (—)	315.2 (11.41)
Nonstocked	— (—)	— (—)	— (—)	8.7 (31.97)	8.7 (31.97)
Total	**5,910.1 (2.64)**	**272.1 (12.94)**	**32.1 (16.16)**	**8.7 (31.97)**	**6,223.0 (2.49)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.16—Net volume of standing-dead trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by forest-type group and stand-size class

Forest-type group	Stand-size class				
	Large diameter	Medium diameter	Small diameter	Nonstocked	All size classes
Pinyon/juniper group	235.2 (5.62)	12.5 (26.27)	5.6 (43.14)	— (—)	253.3 (5.39)
Douglas-fir group	6.8 (100.17)	— (—)	— (—)	— (—)	6.8 (100.17)
Ponderosa pine group	5.0 (72.15)	— (—)	— (—)	— (—)	5.0 (72.15)
Fir/spruce/mountain hemlock group	80.3 (28.30)	5.0 (99.99)	0.8 (98.82)	— (—)	86.1 (27.00)
Lodgepole pine group	22.1 (76.16)	— (—)	— (—)	— (—)	22.1 (76.16)
Other western softwood group	15.5 (49.09)	— (—)	— (—)	— (—)	15.5 (49.09)
Elm/ash/cottonwood group	— (—)	— (—)	— (—)	— (—)	— (—)
Aspen/birch/group	0.3 (105.08)	21.5 (56.65)	23.1 (58.10)	— (—)	45.0 (40.36)
Woodland hardwoods group	21.6 (19.94)	9.7 (95.74)	8.1 (39.01)	— (—)	39.5 (27.13)
Nonstocked	— (—)	— (—)	— (—)	129.4 (13.60)	129.4 (13.60)
Total	**386.8 (8.44)**	**48.8 (33.73)**	**37.6 (37.32)**	**129.4 (13.60)**	**602.5 (6.97)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.17—Net volume of live trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by species group type and species group and ownership group

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Douglas-fir	0.0 (100.17)	16.6 (52.15)	— (—)	— (—)	16.6 (52.09)
Ponderosa and Jeffrey pines	77.1 (30.37)	15.1 (53.14)	4.3 (98.71)	21.2 (97.15)	117.6 (28.08)
True fir	199.8 (22.61)	111.3 (24.17)	14.9 102.46)	4.0 (100.17)	330.0 (16.54)
Western white pine	3.8 (81.43)	— (—)	0.0 (106.50)	— (—)	3.8 (80.86)
Engelmann and other spruces	48.1 (65.39)	6.5 (94.23)	— (—)	— (—)	54.6 (58.68)
Incense-cedar	7.4 (103.96)	— (—)	— (—)	0.2 (97.15)	7.6 (101.84)
Lodgepole pine	27.9 (64.13)	— (—)	2.2 (106.50)	— (—)	30.0 (59.82)
Woodland softwoods	1,486.8 (5.21)	3,343.5 (3.08)	6.9 (100.17)	150.2 (16.17)	4,987.3 (2.28)
Other western softwoods	211.1 (31.38)	75.7 (38.68)	— (—)	1.6 (100.17)	288.4 (25.08)
Subtotal	2,062.1 (5.99)	3,568.6 (3.13)	28.2 (62.53)	177.1 (18.16)	5,836.0 (2.59)
Hardwood species groups					
Cottonwood and aspen	81.8 (28.04)	7.4 (59.34)	6.2 (106.50)	6.0 (81.35)	101.3 (24.35)
Woodland hardwoods	171.4 (13.64)	111.4 (11.83)	— (—)	2.8 (44.95)	285.6 (9.29)
Subtotal	253.2 (12.90)	118.8 (11.68)	6.2 (106.50)	8.8 (57.64)	3 (9.31)
Total	**2,315.2 (5.64)**	**3,687.4 (3.07)**	**34.5 (57.29)**	**185.9 (17.56)**	**6,223.0 (2.49)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.18—Net volume of standing-dead trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by species group type and species group and ownership group

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Douglas-fir	— (—)	28.0 (46.09)	— (—)	— (—)	28.0 (46.09)
Ponderosa and Jeffrey pines	3.0 (71.98)	9.7 (95.33)	— (—)	0.3 (97.15)	13.1 (72.98)
True fir	44.2 (36.20)	25.3 (36.18)	0.3 (102.53)	1.9 (100.17)	71.8 (25.76)
Western white pine	1.0 (106.50)	— (—)	— (—)	— (—)	1.0 (106.50)
Engelmann and other spruces	2.4 (100.17)	0.2 (100.17)	— (—)	— (—)	2.6 (93.61)
Lodgepole pine	17.1 (83.96)	— (—)	0.0 (106.50)	— (—)	17.1 (83.73)
Woodland softwoods	97.5 (11.38)	241.6 (6.54)	— (—)	17.8 (30.47)	356.9 (5.46)
Other western softwoods	39.7 (39.10)	17.3 (44.11)	— (—)	0.4 (100.17)	57.4 (30.12)
Subtotal	204.9 (15.12)	322.1 (8.61)	0.4 (91.45)	20.4 (28.76)	547.8 (7.50)
Hardwood species groups					
Cottonwood and aspen	9.3 (28.73)	2.9 (68.73)	— (—)	1.3 (79.82)	13.5 (25.84)
Woodland hardwoods	19.2 (19.15)	21.3 (14.49)	— (—)	0.7 (59.10)	41.2 (11.53)
Subtotal	28.5 (15.95)	24.2 (15.15)	— (—)	2.0 (54.86)	54.7 (10.74)
Total	**233.4 (13.67)**	**346.3 (8.16)**	**0.4 (91.45)**	**22.4 (27.06)**	**602.5 (6.97)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.19—Net volume of live trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by species group type and species group and diameter class (inches)

Species group type	Diameter class (inches)																
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																		
Douglas-fir	0.8 (52.17)	1.7 (47.62)	3.3 (53.66)	3.0 (58.18)	2.1 (70.87)	3.6 (70.88)	2.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	16.6 (52.09)
Ponderosa and Jeffrey pines	0.4 (39.90)	2.5 (37.69)	2.3 (40.30)	5.9 (47.61)	12.8 (48.33)	15.7 (49.71)	16.2 (37.76)	8.7 (56.77)	13.3 (42.67)	20.4 (47.06)	4.8 (76.87)	9.3 (72.32)	5.4 (100.17)	— (—)	— (—)	— (—)	— (—)	117.6 (28.08)
True fir	11.9 (19.87)	24.4 (17.74)	25.3 (17.69)	36.0 (23.00)	42.9 (20.92)	40.0 (22.69)	28.1 (27.65)	22.3 (33.26)	13.4 (38.83)	16.8 (69.88)	12.0 (52.95)	10.3 (62.17)	6.3 (97.15)	15.7 (59.29)	— (—)	7.2 (106.50)	17.5 (97.15)	330.0 (16.54)
Western white pine	0.2 (92.53)	0.3 (106.50)	0.3 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	3.1 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	3.8 (80.86)
Engelmann and other spruces	0.8 (50.51)	2.2 (47.37)	1.2 (73.66)	5.6 (60.77)	7.6 (74.76)	8.3 (56.61)	2.4 (99.99)	2.8 (99.99)	— (—)	5.6 (70.93)	— (—)	9.2 (99.99)	— (—)	— (—)	8.8 (100.17)	— (—)	— (—)	54.6 (58.68)
Incense-cedar	0.2 (106.50)	0.2 (97.15)	— (—)	0.2 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	7.0 (106.50)	7.6 (101.84)
Lodgepole pine	1.2 (56.23)	3.0 (51.80)	2.1 (73.38)	2.4 (79.92)	3.1 (76.56)	7.1 (61.55)	3.6 (106.50)	4.6 (75.01)	2.9 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	30.0 (59.82)
Woodland softwoods	252.3 (2.94)	447.4 (2.80)	620.9 (2.75)	691.3 (2.93)	666.4 (3.24)	590.5 (3.76)	463.4 (4.45)	365.6 (5.29)	240.6 (6.82)	176.7 (8.40)	125.3 (10.58)	93.8 (12.30)	77.8 (13.96)	53.5 (18.87)	34.8 (24.75)	22.7 (27.49)	64.1 (27.00)	4,987.3 (2.28)
Other western softwoods	6.2 (28.41)	14.1 (23.65)	21.7 (22.31)	19.8 (27.29)	21.8 (33.15)	25.4 (27.36)	28.3 (27.46)	21.6 (36.42)	22.5 (32.47)	16.1 (43.21)	10.4 (50.39)	3.2 (95.09)	3.0 (95.09)	12.9 (63.06)	31.7 (43.34)	— (—)	29.7 (77.35)	288.4 (25.08)
Subtotal	273.9 (2.88)	495.8 (2.74)	677.2 (2.68)	764.3 (3.00)	756.7 (3.36)	690.7 (3.87)	544.0 (4.55)	425.6 (5.44)	292.6 (6.74)	235.7 (9.55)	155.5 (10.40)	125.9 (14.01)	92.5 (14.99)	82.0 (19.40)	75.4 (24.46)	29.9 (33.07)	118.3 (28.92)	5,836.0 (2.59)
Hardwood species groups																		
Cottonwood and aspen	16.1 (25.05)	25.0 (24.88)	21.4 (31.71)	14.4 (36.36)	9.8 (44.73)	3.2 (69.06)	2.6 (70.66)	1.3 (106.50)	7.5 (89.43)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	101.3 (24.35)
Woodland hardwoods	19.4 (9.64)	33.5 (9.05)	39.6 (10.29)	40.3 (9.89)	43.8 (11.39)	32.4 (13.30)	25.7 (16.27)	12.0 (20.83)	14.1 (32.00)	9.2 (28.54)	7.5 (40.33)	4.6 (51.92)	1.4 (99.99)	— (—)	2.2 (95.09)	— (—)	— (—)	285.6 (9.29)
Subtotal	35.4 (12.53)	58.5 (11.82)	61.1 (12.91)	54.7 (11.95)	53.6 (12.34)	35.6 (13.57)	28.3 (16.11)	13.3 (21.52)	21.6 (37.41)	9.2 (28.54)	7.5 (40.33)	4.6 (51.92)	1.4 (99.99)	— (—)	2.2 (95.09)	— (—)	— (—)	387.0 (9.31)
Total	**309.4 (2.97)**	**554.3 (2.74)**	**738.3 (2.63)**	**819.0 (2.90)**	**810.3 (3.25)**	**726.3 (3.73)**	**572.3 (4.37)**	**438.9 (5.30)**	**314.2 (6.74)**	**244.9 (9.24)**	**163.0 (10.09)**	**130.5 (13.63)**	**93.9 (14.85)**	**82.0 (19.40)**	**77.5 (23.87)**	**29.9 (33.07)**	**118.3 (28.92)**	**6,223.0 (2.49)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.20—Net volume of standing-dead trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by species group type and species group and diameter class (inches)

Species group type	Diameter class (inches)																
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																		
Douglas-fir	0.3 (95.87)	1.2 (64.87)	1.4 (70.72)	2.0 (80.61)	3.4 (51.43)	2.3 (72.77)	3.2 (70.72)	— (—)	2.4 (100.17)	8.3 (71.63)	3.4 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	28.0 (46.09)
Ponderosa and Jeffrey pines	— (—)	0.1 (101.36)	0.0 (101.36)	0.7 (69.28)	— (—)	— (—)	— (—)	0.2 (101.36)	2.7 (78.54)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	9.3 (99.95)	13.1 (72.98)
True fir	3.4 (45.26)	7.9 (45.32)	9.1 (30.31)	16.5 (32.15)	10.4 (35.81)	5.2 (41.09)	6.7 (47.13)	2.0 (72.72)	2.5 (97.15)	— (—)	4.6 (74.72)	— (—)	— (—)	0.3 (100.00)	— (—)	— (—)	3.0 (97.15)	71.8 (25.76)
Western white pine	— (—)	0.2 (106.50)	0.4 (106.50)	0.5 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	1.0 (106.50)
Engelmann and other spruces	— (—)	0.2 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	2.4 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	2.6 (93.61)
Lodgepole pine	0.2 (97.15)	0.3 (64.06)	1.8 (77.80)	1.0 (97.15)	1.1 (106.50)	1.5 (97.15)	— (—)	— (—)	6.6 (106.50)	— (—)	— (—)	— (—)	4.6 (106.50)	— (—)	— (—)	— (—)	— (—)	17.1 (83.73)
Woodland softwoods	24.1 (9.92)	42.0 (7.30)	56.5 (7.59)	61.2 (8.30)	54.9 (9.66)	34.5 (12.65)	32.4 (14.25)	19.7 (18.25)	15.6 (24.00)	6.0 (37.50)	1.6 (71.38)	1.4 (100.56)	4.8 (72.92)	0.9 (98.82)	1.3 (99.64)	— (—)	— (—)	356.9 (5.46)
Other western softwoods	1.8 (54.66)	5.6 (63.07)	5.9 (50.31)	7.7 (30.01)	8.9 (33.49)	5.9 (53.22)	3.8 (54.00)	1.2 (100.17)	4.6 (54.31)	— (—)	2.3 (73.61)	5.9 (99.99)	— (—)	3.7 (99.99)	— (—)	— (—)	— (—)	57.4 (30.12)
Subtotal	29.9 (10.28)	57.4 (10.43)	75.0 (8.60)	89.6 (9.00)	78.7 (10.02)	49.4 (13.60)	46.2 (14.51)	23.2 (17.52)	37.0 (27.33)	14.2 (44.43)	12.0 (44.07)	7.2 (83.41)	9.4 (63.97)	4.9 (78.02)	1.3 (99.64)	— (—)	12.3 (79.12)	547.8 (7.50)
Hardwood species groups																		
Cottonwood and aspen	3.3 (32.20)	3.6 (29.68)	2.2 (40.48)	2.7 (49.28)	0.8 (72.86)	0.8 (99.62)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	13.5 (25.84)
Woodland hardwoods	4.7 (11.81)	7.6 (12.12)	9.4 (13.86)	7.1 (14.84)	4.1 (23.77)	3.4 (26.91)	2.5 (37.33)	2.0 (47.52)	0.5 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	41.2 (11.53)
Subtotal	8.1 (14.98)	11.2 (12.56)	11.6 (13.56)	9.8 (17.28)	4.9 (23.04)	4.2 (29.03)	2.5 (37.33)	2.0 (47.52)	0.5 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	54.7 (10.74)
Total	**37.9 (9.01)**	**68.6 (9.18)**	**86.7 (7.69)**	**99.4 (8.31)**	**83.6 (9.53)**	**53.6 (12.75)**	**48.6 (13.97)**	**25.2 (16.55)**	**37.4 (27.02)**	**14.2 (44.43)**	**12.0 (44.07)**	**7.2 (83.41)**	**9.4 (63.97)**	**4.9 (78.02)**	**1.3 (99.64)**	**— (—)**	**12.3 (79.12)**	**602.5 (6.97)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.21—Net volume of live trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by forest-type group and stand origin.

Forest-type group	Stand origin		
	Natural stands	Artificial regeneration	All forest land
Pinyon/juniper group	4,990.1 (2.35)	— (—)	4,990.1 (2.35)
Douglas-fir group	6.5 (99.78)	— (—)	6.5 (99.78)
Ponderosa pine group	106.9 (32.85)	— (—)	106.9 (32.85)
Fir/spruce/mountain hemlock group	381.3 (20.19)	— (—)	381.3 (20.19)
Lodgepole pine group	49.7 (61.54)	— (—)	49.7 (61.54)
Other western softwood group	252.3 (29.60)	— (—)	252.3 (29.60)
Elm/ash/cottonwood group	7.1 (91.97)	— (—)	7.1 (91.97)
Aspen/birch/group	105.3 (27.35)	— (—)	105.3 (27.35)
Woodland hardwoods group	314.4 (11.44)	0.9 (100.07)	315.2 (11.41)
Nonstocked	8.7 (31.97)	— (—)	8.7 (31.97)
Total	**6,222.1 (2.49)**	**0.9 (100.07)**	**6,223.0 (2.49)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1

Table C.22—Net volume of standing-dead trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by forest-type group and stand origin.

Forest-type group	Stand origin		
	Natural stands	Artificial regeneration	All forest land
Pinyon/juniper group	253.3 (5.39)	— (—)	253.3 (5.39)
Douglas-fir group	6.8 (100.17)	— (—)	6.8 (100.17)
Ponderosa pine group	5.0 (72.15)	— (—)	5.0 (72.15)
Fir/spruce/mountain hemlock group	86.1 (27.00)	— (—)	86.1 (27.00)
Lodgepole pine group	22.1 (76.16)	— (—)	22.1 (76.16)
Other western softwood group	15.5 (49.09)	— (—)	15.5 (49.09)
Elm/ash/cottonwood group	— (—)	— (—)	— (—)
Aspen/birch/group	45.0 (40.36)	— (—)	45.0 (40.36)
Woodland hardwoods group	39.5 (27.13)	— (—)	39.5 (27.13)
Nonstocked	129.4 (13.60)	— (—)	129.4 (13.60)
Total	**602.5 (6.97)**	**— (—)**	**602.5 (6.97)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.23—Net volume of growing-stock trees (at least 5 in dia), in million cubic feet, on timberland (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)																
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																		
Ponderosa and Jeffrey pines	0.2 (49.79)	1.9 (45.67)	1.7 (47.04)	3.7 (63.81)	9.8 (60.33)	10.0 (69.43)	11.9 (46.06)	3.5 (72.13)	5.7 (71.79)	18.0 (51.56)	3.0 (106.50)	9.3 (72.32)	— (—)	— (—)	— (—)	— (—)	— (—)	78.7 (37.11)
True fir	4.3 (38.69)	7.9 (36.12)	7.8 (34.07)	15.8 (45.36)	16.4 (39.53)	17.0 (39.44)	11.0 (54.08)	8.3 (60.14)	4.9 (73.03)	— (—)	2.6 (106.50)	4.7 (106.50)	6.3 (97.15)	6.3 (100.00)	— (—)	— (—)	17.5 (97.15)	130.9 (29.61)
Western white pine	0.2 (106.50)	0.2 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	3.1 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	3.4 (88.03)
Incense-cedar	— (—)	0.2 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.2 (97.15)
Lodgepole pine	0.8 (67.96)	1.5 (72.14)	1.4 (97.15)	1.9 (97.15)	1.1 (97.15)	4.4 (75.34)	— (—)	2.6 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	13.7 (72.46)
Other western softwoods	0.7 (42.99)	1.8 (42.96)	2.3 (43.55)	2.2 (48.57)	0.4 (100.17)	0.7 (100.17)	5.7 (52.80)	1.4 (70.47)	2.3 (75.88)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	17.6 (32.26)
Subtotal	6.2 (30.88)	13.4 (26.65)	13.3 (27.68)	23.6 (33.82)	27.7 (32.68)	32.1 (32.65)	28.6 (31.62)	15.8 (39.72)	12.9 (44.20)	18.0 (51.56)	8.8 (59.26)	14.0 (59.53)	6.3 (97.15)	6.3 (100.00)	— (—)	— (—)	17.5 (97.15)	244.6 (23.01)
Hardwood species groups																		
Cottonwood and aspen	5.0 (46.06)	9.5 (44.71)	7.3 (53.55)	7.5 (57.74)	4.0 (85.30)	1.0 (100.17)	2.6 (70.66)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	37.0 (45.96)
Subtotal	5.0 (46.06)	9.5 (44.71)	7.3 (53.55)	7.5 (57.74)	4.0 (85.30)	1.0 (100.17)	2.6 (70.66)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	37.0 (45.96)
Total	**11.2 (31.43)**	**23.0 (25.11)**	**20.6 (27.55)**	**31.2 (30.83)**	**31.7 (30.50)**	**33.1 (31.82)**	**31.2 (29.57)**	**15.8 (39.72)**	**12.9 (44.20)**	**18.0 (51.56)**	**8.8 (59.26)**	**14.0 (59.53)**	**6.3 (97.15)**	**6.3 (100.00)**	**— (—)**	**— (—)**	**17.5 (97.15)**	**281.6 (21.31)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.24—Net volume of growing-stock trees (at least 5 in dia), in million cubic feet, on timberland (percent sampling error) by species group type and species group and ownership group.

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Ponderosa and Jeffrey pines	53.5 (36.23)	— (—)	4.1 (102.53)	21.2 (97.15)	78.7 (37.11)
True fir	106.2 (33.38)	24.2 (65.20)	— (—)	0.5 (100.17)	130.9 (29.61)
Western white pine	3.4 (88.03)	— (—)	— (—)	— (—)	3.4 (88.03)
Incense-cedar	— (—)	— (—)	— (—)	0.2 (97.15)	0.2 (97.15)
Lodgepole pine	13.7 (72.46)	— (—)	— (—)	— (—)	13.7 (72.46)
Other western softwoods	5.1 (54.26)	10.9 (43.13)	— (—)	1.6 (100.17)	17.6 (32.26)
Subtotal	181.9 (27.00)	35.1 (52.20)	4.1 (102.53)	23.5 (88.76)	244.6 (23.01)
Hardwood species groups					
Cottonwood and aspen	28.2 (57.00)	2.9 (93.84)	— (—)	5.9 (82.19)	37.0 (45.96)
Subtotal	28.2 (57.00)	2.9 (93.84)	— (—)	5.9 (82.19)	37.0 (45.96)
Total	**210.1 (25.26)**	**38.0 (48.79)**	**4.1 (102.53)**	**29.4 (72.79)**	**281.6 (21.31)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.25—Net volume of sawtimber trees, in million board feet (International 1/4-inch rule), on timberland (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)															
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																
Ponderosa and Jeffrey pines	5.4 (51.27)	15.1 (68.00)	47.6 (61.43)	52.0 (71.15)	62.3 (46.32)	16.4 (73.39)	32.5 (71.79)	97.3 (52.86)	16.9 (106.50)	50.5 (72.84)	— (—)	— (—)	— (—)	— (—)	— (—)	396.1 (38.05)
True fir	25.9 (35.12)	69.6 (45.19)	79.7 (39.96)	88.8 (39.67)	57.9 (55.57)	45.9 (61.07)	27.1 (73.05)	— (—)	14.0 (106.50)	29.5 (106.50)	35.2 (97.15)	40.7 (100.00)	— (—)	— (—)	116.3 (97.15)	630.6 (31.43)
Western white pine	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	24.3 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	24.3 (97.15)
Lodgepole pine	5.8 (97.15)	9.3 (97.15)	5.7 (97.15)	24.2 (75.34)	— (—)	14.2 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	59.3 (73.03)
Other western softwoods	6.6 (44.09)	8.2 (48.72)	1.3 (100.17)	3.3 (100.17)	31.3 (53.54)	6.1 (70.41)	12.2 (79.18)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	69.1 (35.83)
Subtotal	43.7 (28.89)	102.2 (34.09)	134.3 (33.16)	168.4 (33.02)	151.5 (31.98)	82.7 (41.33)	71.7 (44.68)	97.3 (52.86)	55.2 (59.86)	80.1 (60.13)	35.2 (97.15)	40.7 (100.00)	— (—)	— (—)	116.3 (97.15)	1,179.3 (24.45)
Hardwood species groups																
Cottonwood and aspen	— (—)	35.4 (59.87)	20.3 (88.31)	3.9 (100.17)	14.2 (70.77)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	73.8 (63.15)
Subtotal	— (—)	35.4 (59.87)	20.3 (88.31)	3.9 (100.17)	14.2 (70.77)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	73.8 (63.15)
Total	**43.7 (28.89)**	**137.6 (31.53)**	**154.6 (31.04)**	**172.3 (32.35)**	**165.7 (29.85)**	**82.7 (41.33)**	**71.7 (44.68)**	**97.3 (52.86)**	**55.2 (59.86)**	**80.1 (60.13)**	**35.2 (97.15)**	**40.7 (100.00)**	**— (—)**	**— (—)**	**116.3 (97.15)**	**1,253.1 (23.46)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.26—Net volume of sawtimber trees, in million board feet (International 1/4-inch rule), on forest land (percent sampling error) by species group type and species group and ownership group.

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Douglas-fir	— (—)	66.7 (56.69)	— (—)	— (—)	66.7 (56.69)
Ponderosa and Jeffrey pines	364.5 (31.50)	79.3 (54.40)	22.3 (101.17)	110.5 (97.15)	576.5 (29.15)
True fir	901.9 (24.81)	407.7 (27.99)	83.8 (103.90)	0.3 (100.17)	1,393.7 (19.00)
Western white pine	24.9 (94.62)	— (—)	— (—)	— (—)	24.9 (94.62)
Engelmann and other spruces	209.0 (69.38)	25.7 (100.17)	— (—)	— (—)	234.7 (62.74)
Incense-cedar	33.2 (106.50)	— (—)	— (—)	— (—)	33.2 (106.50)
Lodgepole pine	131.2 (66.73)	— (—)	4.7 (106.50)	— (—)	135.8 (64.46)
Other western softwoods	673.3 (35.74)	266.2 (42.92)	— (—)	9.1 (100.17)	948.6 (28.04)
Subtotal	2,338.1 (18.59)	845.5 (23.70)	110.7 (81.62)	119.9 (89.88)	3,414.1 (14.51)
Hardwood species groups					
Cottonwood and aspen	118.8 (44.26)	12.5 (77.26)	21.9 (106.50)	3.9 (100.17)	157.1 (37.08)
Subtotal	118.8 (44.26)	12.5 (77.26)	21.9 (106.50)	3.9 (100.17)	157.1 (37.08)
Total	**2,456.9 (17.96)**	**858.0 (23.38)**	**132.6 (71.36)**	**123.7 (87.12)**	**3,571.2 (14.04)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.27—Aboveground dry weight of live trees (at least 1 in dia.), in million tons, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

	Unreserved			Reserved			
Ownership group	Timber land	Unproductive	Total	Productive	Unproductive	Total	All forest land
Forest Service							
National forest	3.9 (23.23)	21.8 (5.67)	25.7 (5.97)	5.0 (26.90)	8.3 (12.46)	13.3 (12.53)	39.0 (5.63)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	1.0 (46.63)	0.3 (42.85)	1.3 (36.61)	1.3 (36.61)
Bureau of Land Management	0.8 (43.03)	55.2 (3.33)	56.1 (3.32)	1.0 (38.84)	6.4 (12.97)	7.5 (12.41)	63.5 (3.07)
Fish and Wildlife Service	— (—)	— (—)	— (—)	0.0 (101.36)	0.8 (26.38)	0.8 (26.43)	0.8 (26.43)
Departments of Defense/ Energy	— (—)	1.3 (23.54)	1.3 (23.54)	— (—)	— (—)	— (—)	1.3 (23.54)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.1 (102.53)	— (—)	0.1 (102.53)	0.4 (75.87)	0.1 (100.17)	0.5 (62.26)	0.6 (55.99)
Private							
Undifferentiated private and Native American	0.7 (61.41)	2.7 (15.40)	3.3 (17.26)	— (—)	— (—)	— (—)	3.3 (17.26)
Total	**5.5 (19.26)**	**81.0 (2.50)**	**86.5 (2.58)**	**7.4 (20.18)**	**16.0 (8.26)**	**23.4 (8.33)**	**109.9 (2.44)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.28—Aboveground dry weight of standing-dead trees (at least 5 in dia), in million tons, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status .

Ownership group	Unreserved			Reserved			All forest land
	Timber land	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	0.6 (42.82)	1.4 (11.34)	2.1 (15.44)	0.7 (37.22)	0.8 (26.17)	1.5 (22.38)	3.6 (12.95)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	0.6 (49.08)	0.0 (49.70)	0.6 (47.92)	0.6 (47.92)
Bureau of Land Management	0.1 (49.91)	3.9 (6.78)	4.0 (6.71)	0.4 (50.86)	0.6 (29.13)	1.0 (26.33)	5.0 (7.42)
Fish and Wildlife Service	— (—)	— (—)	— (—)	— (—)	0.1 (38.57)	0.1 (38.57)	0.1 (38.57)
Departments of Defense/ Energy	— (—)	0.1 (46.41)	0.1 (46.41)	— (—)	— (—)	— (—)	0.1 (46.41)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.0 (102.53)	— (—)	0.0 (102.53)	0.0 (106.50)	— (—)	0.0 (106.50)	0.0 (91.90)
Private							
Undifferentiated private and Native American	0.0 (69.89)	0.3 (28.29)	0.4 (26.12)	— (—)	— (—)	— (—)	0.4 (26.12)
Total	**0.8 (35.96)**	**5.8 (5.54)**	**6.5 (6.40)**	**1.7 (25.69)**	**1.5 (18.16)**	**3.2 (15.88)**	**9.7 (6.64)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.29—Aboveground dry weight of live trees (at least 1 in dia.), in million tons, on forest land (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)																		
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																				
Douglas-fir	0.0 (86.04)	0.0 (59.72)	0.0 (52.19)	0.0 (47.57)	0.1 (53.67)	0.1 (58.18)	0.0 (70.87)	0.1 (70.88)	0.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.4 (49.75)
Ponderosa and Jeffrey pines	0.0 (59.69)	— (—)	0.0 (39.79)	0.0 (37.61)	0.0 (40.24)	0.1 (47.54)	0.2 (48.22)	0.3 (49.57)	0.3 (37.74)	0.2 (56.88)	0.2 (42.64)	0.4 (47.07)	0.1 (76.70)	0.2 (72.32)	0.1 (100.17)	— (—)	— (—)	— (—)	— (—)	2.1 (28.01)
True fir	0.1 (23.67)	0.2 (22.04)	0.2 (19.72)	0.4 (17.51)	0.4 (17.50)	0.6 (22.42)	0.7 (20.83)	0.6 (22.30)	0.4 (26.61)	0.4 (33.37)	0.2 (38.39)	0.3 (70.40)	0.2 (52.75)	0.2 (61.52)	0.1 (97.15)	0.3 (59.28)	— (—)	0.1 (106.50)	0.3 (97.15)	5.6 (16.17)
Western white pine	0.0 (75.79)	0.0 (106.50)	0.0 (92.43)	0.0 (106.50)	0.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.0 (97.15)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.1 (76.66)
Engelmann and other spruces	0.0 (70.76)	0.0 (100.17)	0.0 (50.55)	0.0 (47.37)	0.0 (73.58)	0.1 (60.76)	0.1 (74.77)	0.1 (56.58)	0.0 (99.99)	0.0 (99.99)	— (—)	0.1 (70.93)	— (—)	0.1 (99.99)	— (—)	— (—)	0.1 (100.17)	— (—)	— (—)	0.8 (58.53)
Incense-cedar	— (—)	— (—)	0.0 (106.50)	0.0 (97.15)	— (—)	0.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.1 (106.50)	0.1 (101.52)
Lodgepole pine	0.0 (61.51)	0.0 (77.34)	0.0 (56.25)	0.0 (51.77)	0.0 (73.36)	0.0 (79.87)	0.0 (76.54)	0.1 (61.55)	0.1 (106.50)	0.1 (75.01)	0.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.5 (58.95)
Woodland softwoods	1.5 (4.69)	3.4 (4.55)	3.9 (2.96)	6.9 (2.79)	9.6 (2.70)	10.8 (2.85)	10.6 (3.18)	9.6 (3.66)	7.6 (4.30)	6.2 (5.08)	4.3 (6.59)	3.2 (7.96)	2.2 (10.18)	1.7 (11.82)	1.5 (13.62)	1.0 (18.13)	0.7 (24.18)	0.5 (27.49)	1.3 (27.00)	86.2 (2.25)
Other western softwoods	0.0 (37.94)	0.1 (38.99)	0.1 (29.52)	0.3 (24.05)	0.4 (22.58)	0.3 (27.51)	0.4 (33.89)	0.5 (27.55)	0.5 (27.42)	0.4 (36.85)	0.4 (32.49)	0.3 (43.11)	0.2 (50.79)	0.1 (95.09)	0.1 (95.09)	0.2 (62.81)	0.6 (44.10)	— (—)	0.5 (77.33)	5.2 (25.09)
Subtotal	1.6 (4.51)	3.8 (4.41)	4.3 (2.93)	7.7 (2.76)	10.6 (2.67)	12.0 (2.96)	12.1 (3.36)	11.3 (3.83)	9.0 (4.45)	7.2 (5.30)	5.1 (6.55)	4.1 (9.12)	2.7 (10.02)	2.2 (13.04)	1.7 (14.27)	1.5 (18.68)	1.3 (23.73)	0.6 (30.19)	2.2 (27.82)	100.9 (2.56)
Hardwood species groups																				
Cottonwood and aspen	0.4 (19.47)	0.6 (22.83)	0.3 (25.02)	0.5 (24.88)	0.4 (31.47)	0.2 (36.46)	0.2 (44.95)	0.0 (68.22)	0.0 (70.66)	0.0 (106.50)	0.1 (90.83)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	2.8 (18.60)
Woodland hardwoods	0.6 (16.19)	0.9 (15.84)	0.3 (9.68)	0.5 (9.04)	0.6 (10.29)	0.7 (9.89)	0.7 (11.39)	0.5 (13.30)	0.4 (16.27)	0.2 (20.83)	0.2 (32.00)	0.1 (28.54)	0.1 (40.33)	0.1 (51.92)	0.0 (99.99)	— (—)	0.0 (95.09)	— (—)	— (—)	6.1 (8.55)
Subtotal	1.0 (12.44)	1.5 (13.31)	0.6 (13.48)	1.0 (12.48)	1.0 (13.38)	0.9 (12.27)	0.9 (12.48)	0.6 (13.43)	0.5 (16.13)	0.2 (21.22)	0.3 (37.50)	0.1 (28.54)	0.1 (40.33)	0.1 (51.92)	0.0 (99.99)	— (—)	0.0 (95.09)	— (—)	— (—)	9.0 (8.28)
Total	**2.6 (5.50)**	**5.3 (4.91)**	**4.9 (3.16)**	**8.7 (2.83)**	**11.6 (2.66)**	**12.9 (2.88)**	**13.0 (3.26)**	**11.8 (3.68)**	**9.4 (4.27)**	**7.4 (5.16)**	**5.5 (6.54)**	**4.3 (8.85)**	**2.9 (9.74)**	**2.3 (12.71)**	**1.8 (14.15)**	**1.5 (18.68)**	**1.4 (23.20)**	**0.6 (30.19)**	**2.2 (27.82)**	**109.9 (2.44)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.30—Aboveground dry weight of standing-dead trees (at least 5 in dia), in million tons, on forest land (percent sampling error) by species group type and species group and diameter class (inches).

Species group type	Diameter class (inches)																		
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0-30.9	31.0-32.9	33.0-34.9	35.0-36.9	37+	All classes
Softwood species groups																				
Douglas-fir	— (—)	— (—)	0.0 (95.87)	0.0 (64.87)	0.0 (70.73)	0.0 (80.57)	0.1 (52.70)	0.0 (72.78)	0.1 (70.72)	— (—)	0.0 (100.17)	0.1 (71.63)	0.1 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.5 (45.96)
Ponderosa and Jeffrey pines	— (—)	— (—)	— (—)	0.0 (101.36)	0.0 (101.36)	0.0 (69.30)	— (—)	— (—)	— (—)	0.0 (101.36)	0.0 (82.58)	— (—)	— (—)	— (—)	0.0 (100.00)	— (—)	— (—)	— (—)	0.1 (99.95)	0.2 (64.74)
True fir	0.0 (105.08)	— (—)	0.0 (45.06)	0.1 (46.81)	0.1 (32.82)	0.2 (33.10)	0.1 (38.86)	0.1 (42.62)	0.1 (49.21)	0.0 (80.53)	0.0 (97.15)	— (—)	0.1 (74.71)	— (—)	— (—)	0.0 (100.00)	— (—)	— (—)	0.0 (97.15)	0.9 (26.85)
Western white pine	— (—)	— (—)	— (—)	0.0 (106.50)	0.0 (106.50)	0.0 (106.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.0 (106.50)
Engelmann and other spruces	— (—)	— (—)	— (—)	0.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.0 (94.29)
Lodgepole pine	— (—)	— (—)	0.0 (97.15)	0.0 (64.14)	0.0 (77.80)	0.0 (97.15)	0.0 (106.50)	0.0 (97.15)	— (—)	— (—)	0.1 (106.50)	— (—)	— (—)	— (—)	0.1 (106.50)	— (—)	— (—)	— (—)	— (—)	0.3 (83.35)
Woodland softwoods	0.0 (27.33)	0.1 (30.24)	0.4 (9.72)	0.7 (7.23)	0.9 (7.50)	1.0 (7.85)	0.9 (9.14)	0.5 (12.54)	0.5 (14.00)	0.3 (17.78)	0.3 (22.66)	0.1 (36.40)	0.0 (71.38)	0.0 (100.56)	0.1 (72.92)	0.0 (98.82)	0.0 (99.64)	— (—)	— (—)	5.8 (5.32)
Other western softwoods	0.0 (99.64)	— (—)	0.0 (58.27)	0.1 (65.56)	0.1 (53.89)	0.1 (31.56)	0.1 (34.27)	0.1 (54.04)	0.1 (53.72)	0.0 (100.17)	0.1 (54.59)	— (—)	0.0 (81.52)	0.1 (99.99)	— (—)	0.1 (99.99)	— (—)	— (—)	— (—)	0.9 (30.36)
Subtotal	0.0 (27.35)	0.1 (30.24)	0.5 (10.16)	0.9 (10.36)	1.2 (8.82)	1.4 (8.62)	1.2 (9.82)	0.8 (13.55)	0.7 (14.43)	0.4 (17.16)	0.5 (26.39)	0.2 (44.10)	0.2 (44.98)	0.1 (80.24)	0.2 (54.92)	0.1 (77.11)	0.0 (99.64)	— (—)	0.2 (88.01)	8.6 (7.28)
Hardwood species groups																				
Cottonwood and aspen	0.0 (47.06)	0.1 (37.22)	0.0 (30.09)	0.1 (31.17)	0.0 (41.33)	0.0 (52.40)	0.0 (72.88)	0.0 (99.62)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.3 (24.99)
Woodland hardwoods	0.0 (35.18)	0.1 (37.04)	0.1 (11.76)	0.1 (12.14)	0.2 (13.78)	0.1 (14.84)	0.1 (23.77)	0.1 (26.91)	0.0 (37.33)	0.0 (47.52)	0.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.9 (12.51)
Subtotal	0.1 (29.62)	0.2 (27.46)	0.1 (13.17)	0.2 (12.50)	0.2 (13.26)	0.2 (17.38)	0.1 (23.06)	0.1 (28.97)	0.0 (37.33)	0.0 (47.52)	0.0 (100.17)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	1.1 (11.32)
Total	0.1 (21.88)	0.3 (22.48)	0.6 (8.75)	1.1 (9.06)	1.4 (7.85)	1.5 (7.96)	1.3 (9.33)	0.8 (12.68)	0.8 (13.88)	0.4 (16.21)	0.5 (26.06)	0.2 (44.10)	0.2 (44.98)	0.1 (80.24)	0.2 (54.92)	0.1 (77.11)	0.0 (99.64)	— (—)	0.2 (88.01)	9.7 (6.64)

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.31—Aboveground carbon in live trees (at least 1 in dia.), in million tons, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

Ownership group	Unreserved			Reserved			All forest land
	Timber land	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	2.0 (23.23)	10.9 (5.67)	12.9 (5.97)	2.5 (26.90)	4.2 (12.46)	6.7 (12.53)	19.5 (5.63)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	0.5 (46.63)	0.2 (42.85)	0.6 (36.61)	0.6 (36.61)
Bureau of Land Management	0.4 (43.03)	27.6 (3.33)	28.0 (3.32)	0.5 (38.84)	3.2 (12.97)	3.7 (12.41)	31.8 (3.07)
Fish and Wildlife Service	— (—)	— (—)	— (—)	0.0 (101.36)	0.4 (26.38)	0.4 (26.43)	0.4 (26.43)
Departments of Defense/ Energy	— (—)	0.6 (23.54)	0.6 (23.54)	— (—)	— (—)	— (—)	0.6 (23.54)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.0 (102.53)	— (—)	0.0 (102.53)	0.2 (75.87)	0.1 (100.17)	0.3 (62.26)	0.3 (55.99)
Private							
Undifferentiated private and Native American	0.3 (61.41)	1.3 (15.40)	1.7 (17.26)	— (—)	— (—)	— (—)	1.7 (17.26)
Total	**2.8 (19.26)**	**40.5 (2.50)**	**43.3 (2.58)**	**3.7 (20.18)**	**8.0 (8.26)**	**11.7 (8.33)**	**54.9 (2.44)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.32—Aboveground carbon in standing-dead trees (at least 5 in dia), in million tons, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

Ownership group	Unreserved			Reserved			All forest land
	Timber land	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	0.3 (42.82)	0.7 (11.34)	1.0 (15.44)	0.4 (37.22)	0.4 (26.17)	0.8 (22.38)	1.8 (12.95)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	0.3 (49.08)	0.0 (49.70)	0.3 (47.92)	0.3 (47.92)
Bureau of Land Management	0.0 (49.91)	2.0 (6.78)	2.0 (6.71)	0.2 (50.86)	0.3 (29.13)	0.5 (26.33)	2.5 (7.42)
Fish and Wildlife Service	— (—)	— (—)	— (—)	— (—)	0.0 (38.57)	0.0 (38.57)	0.0 (38.57)
Departments of Defense/ Energy	— (—)	0.1 (46.41)	0.1 (46.41)	— (—)	— (—)	— (—)	0.1 (46.41)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.0 (102.53)	— (—)	0.0 (102.53)	0.0 (106.50)	— (—)	0.0 (106.50)	0.0 (91.90)
Private							
Undifferentiated private and Native American	0.0 (69.89)	0.2 (28.29)	0.2 (26.12)	— (—)	— (—)	— (—)	0.2 (26.12)
Total	**0.4 (35.96)**	**2.9 (5.54)**	**3.3 (6.40)**	**0.8 (25.69)**	**0.8 (18.16)**	**1.6 (15.88)**	**4.9 (6.64)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.33—Average annual net growth of trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

	Unreserved			Reserved			
Ownership group	Timber land	Unproductive	Total	Productive	Unproductive	Total	All forest land
Forest Service							
National forest	1.1 (167.95)	5.4 (30.37)	6.5 (38.56)	-3.3 (-96.03)	0.4 (385.04)	-2.9 (-122.99)	3.6 (118.58)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	-2.8 (-59.20)	0.1 (96.58)	-2.7 (-60.75)	-2.7 (-60.75)
Bureau of Land Management	0.4 (48.05)	10.5 (23.33)	10.9 (22.46)	-1.2 (-85.97)	1.1 (58.94)	-0.1 (-1300.86)	10.8 (25.33)
Fish and Wildlife Service	— (—)	— (—)	— (—)	0.0 (101.36)	-0.3 (-123.65)	-0.3 (-124.35)	-0.3 (-124.35)
Departments of Defense/Energy	— (—)	0.3 (74.73)	0.3 (74.73)	— (—)	— (—)	— (—)	0.3 (74.73)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.1 (102.53)	— (—)	0.1 (102.53)	0.4 (75.12)	-0.1 (-100.17)	0.3 (90.57)	0.4 (73.33)
Private							
Undifferentiated private and Native American	0.2 (153.18)	-2.8 (-58.96)	-2.6 (-66.42)	— (—)	— (—)	— (—)	-2.6 (-66.42)
Total	**1.9 (103.07)**	**13.3 (25.33)**	**15.2 (25.86)**	**-6.9 (-53.75)**	**1.2 (140.28)**	**-5.6 (-72.64)**	**9.5 (59.40)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.34—Average annual net growth of trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by forest-type group and stand-size class.

Forest-type group	Stand-size class				
	Large diameter	Medium diameter	Small diameter	Nonstocked	All size classes
Pinyon/juniper group	26.9 (7.15)	2.2 (17.44)	-0.4 (-98.80)	— (—)	28.7 (6.96)
Douglas-fir group	-0.9 (-100.17)	— (—)	0.0 (100.17)	— (—)	-0.8 (-101.24)
Ponderosa pine group	1.8 (38.20)	— (—)	— (—)	— (—)	1.8 (38.20)
Fir/spruce/mountain hemlock group	-2.2 (-114.77)	-0.2 (-292.11)	0.0 (83.11)	— (—)	-2.4 (-108.89)
Lodgepole pine group	-1.6 (-82.13)	— (—)	— (—)	— (—)	-1.6 (-82.13)
Other western softwood group	0.3 (330.85)	0.1 (94.17)	— (—)	— (—)	0.4 (244.40)
Elm/ash/cottonwood group	0.1 (106.50)	— (—)	0.0 (100.17)	— (—)	0.1 (82.00)
Aspen/birch/group	0.4 (71.89)	0.7 (137.94)	-3.5 (-75.71)	— (—)	-2.4 (-118.70)
Woodland hardwoods group	2.3 (14.81)	0.2 (40.83)	-1.6 (-65.14)	— (—)	0.8 (133.02)
Nonstocked	— (—)	— (—)	— (—)	-15.1 (-18.31)	-15.1 (-18.31)
Total	**27.2 (13.95)**	**3.0 (40.42)**	**-5.5 (-52.60)**	**-15.1 (-18.31)**	**9.5 (59.40)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.35—Average annual net growth of trees (at least 5 in dia), in million cubic feet, on forest land (percent sampling error) by species group type and species group and ownership group.

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Douglas-fir	0.0 (100.17)	-3.0 (-52.73)	— (—)	— (—)	-3.0 (-52.75)
Ponderosa and Jeffrey pines	1.4 (35.79)	0.1 (47.89)	0.1 (99.85)	0.2 (97.15)	1.9 (32.33)
True fir	-0.8 (-345.17)	-0.2 (-406.41)	0.2 (111.91)	-0.2 (-100.17)	-1.1 (-275.34)
Western white pine	0.0 (587.70)	— (—)	0.0 (106.50)	— (—)	0.0 (333.71)
Engelmann and other spruces	0.0 (1371.55)	0.1 (87.05)	— (—)	— (—)	0.1 (367.26)
Incense-cedar	0.1 (88.59)	— (—)	— (—)	0.0 (97.15)	0.1 (83.86)
Lodgepole pine	-1.3 (-89.21)	— (—)	0.0 (106.50)	— (—)	-1.2 (-92.42)
Woodland softwoods	5.6 (28.67)	11.3 (21.21)	0.0 (100.17)	-2.8 (-58.90)	14.1 (23.52)
Other western softwoods	-2.1 (-83.41)	-1.0 (-73.01)	— (—)	0.0 (100.17)	-3.1 (-61.56)
Subtotal	3.0 (136.37)	7.4 (42.69)	0.4 (61.35)	-2.9 (-59.65)	7.8 (69.44)
Hardwood species groups					
Cottonwood and aspen	0.9 (55.08)	0.2 (78.71)	0.1 (106.50)	0.2 (96.77)	1.5 (39.64)
Woodland hardwoods	-0.2 (-305.99)	0.5 (56.38)	-0.1 (-100.17)	0.0 (90.29)	0.2 (337.44)
Subtotal	0.6 (139.08)	0.7 (46.02)	0.1 (264.05)	0.3 (84.81)	1.7 (58.48)
Total	**3.6 (118.58)**	**8.1 (39.78)**	**0.4 (73.33)**	**-2.6 (-66.42)**	**9.5 (59.40)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.36—Average annual net growth of growing-stock trees (at least 5 in dia), in million cubic feet, on timberland (percent sampling error) by species group type and species group and ownership group

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Ponderosa and Jeffrey pines	1.2 (40.77)	— (—)	0.1 (102.53)	0.2 (97.15)	1.5 (38.45)
True fir	1.4 (83.89)	0.3 (55.64)	0.0 (-102.53)	-0.2 (-100.17)	1.4 (83.48)
Western white pine	0.0 (72.90)	— (—)	— (—)	— (—)	0.0 (72.90)
Incense-cedar	— (—)	— (—)	— (—)	0.0 (97.15)	0.0 (97.15)
Lodgepole pine	-1.4 (-78.26)	— (—)	— (—)	— (—)	-1.4 (-78.26)
Other western softwoods	-0.4 (-111.51)	0.1 (51.09)	— (—)	0.0 (100.17)	-0.4 (-129.73)
Subtotal	0.7 (254.88)	0.4 (50.43)	0.1 (102.53)	0.0 (-899.02)	1.2 (162.68)
Hardwood species groups					
Cottonwood and aspen	0.3 (139.64)	0.0 (492.15)	— (—)	0.3 (84.04)	0.6 (80.29)
Subtotal	0.3 (139.64)	0.0 (492.15)	— (—)	0.3 (84.04)	0.6 (80.29)
Total	**1.0 (193.11)**	**0.4 (49.51)**	**0.1 (102.53)**	**0.2 (156.08)**	**1.7 (114.93)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.37—Average annual mortality of trees (at least 5 in dia), in million trees, on forest land (percent sampling error) by ownership group, owner class, reserved status, and forest land status.

Ownership group	Unreserved			Reserved			All forest land
	Timber land	Unproductive	Total	Productive	Unproductive	Total	
Forest Service							
National forest	3.7 (46.19)	7.4 (20.20)	11.1 (20.38)	6.6 (47.95)	3.7 (40.54)	10.3 (34.01)	21.4 (19.47)
Other Federal							
National Park Service	— (—)	— (—)	— (—)	3.4 (53.36)	0.1 (94.19)	3.5 (52.41)	3.5 (52.41)
Bureau of Land Management	0.2 (67.49)	17.6 (12.65)	17.7 (12.55)	1.7 (65.37)	1.6 (38.43)	3.3 (38.86)	21.0 (12.16)
Fish and Wildlife Service	— (—)	— (—)	— (—)	— (—)	0.7 (49.54)	0.7 (49.54)	0.7 (49.54)
Departments of Defense/Energy	— (—)	0.3 (59.89)	0.3 (59.89)	— (—)	— (—)	— (—)	0.3 (59.89)
Other Federal	— (—)	0.0 (97.15)	0.0 (97.15)	— (—)	— (—)	— (—)	0.0 (97.15)
State and local government							
State	0.0 (102.53)	— (—)	0.0 (102.53)	0.0 (106.50)	0.1 (100.17)	0.1 (87.28)	0.2 (71.23)
Private							
Undifferentiated private and Native American	0.4 (78.05)	4.4 (38.67)	4.7 (36.01)	— (—)	— (—)	— (—)	4.7 (36.01)
Total	**4.2 (40.64)**	**29.6 (10.52)**	**33.9 (10.33)**	**11.8 (32.38)**	**6.2 (26.76)**	**18.0 (23.08)**	**51.9 (10.39)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.38—Average annual mortality of trees (at least 5 in dia), in million trees, on forest land (percent sampling error) by forest-type group and stand-size class.

Forest-type group	Stand-size class				
	Large diameter	Medium diameter	Small diameter	Nonstocked	All size classes
Pinyon/juniper group	14.4 (11.07)	0.8 (33.52)	0.8 (57.67)	— (—)	15.9 (10.46)
Douglas-fir group	0.9 (100.17)	— (—)	— (—)	— (—)	0.9 (100.17)
Ponderosa pine group	0.2 (62.78)	— (—)	— (—)	— (—)	0.2 (62.78)
Fir/spruce/mountain hemlock group	7.5 (35.02)	0.6 (92.71)	0.0 (98.82)	— (—)	8.1 (32.98)
Lodgepole pine group	2.1 (71.85)	— (—)	— (—)	— (—)	2.1 (71.85)
Other western softwood group	1.5 (59.91)	— (—)	— (—)	— (—)	1.5 (59.91)
Elm/ash/cottonwood group	— (—)	— (—)	— (—)	— (—)	— (—)
Aspen/birch/group	0.1 (99.64)	1.5 (56.49)	4.0 (67.57)	— (—)	5.5 (51.07)
Woodland hardwoods group	0.6 (25.02)	0.0 (94.86)	1.7 (62.20)	— (—)	2.4 (44.97)
Nonstocked	— (—)	— (—)	— (—)	15.3 (18.08)	15.3 (18.08)
Total	**27.3 (13.23)**	**2.9 (36.12)**	**6.4 (45.16)**	**15.3 (18.08)**	**51.9 (10.39)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.39—Average annual mortality of trees (at least 5 in dia), in million trees, on forest land (percent sampling error) by species group type and species group and ownership group.

Species group type	Ownership group				All owners
	Forest Service	Other Federal	State and local government	Private and Native American	
Softwood species groups					
Douglas-fir	— (—)	3.2 (52.25)	— (—)	— (—)	3.2 (52.25)
Ponderosa and Jeffrey pines	— (—)	— (—)	— (—)	0.1 (97.15)	0.1 (97.15)
True fir	4.9 (56.52)	1.6 (51.88)	0.0 (102.53)	0.3 (100.17)	6.8 (42.70)
Western white pine	0.0 (106.50)	— (—)	— (—)	— (—)	0.0 (106.50)
Engelmann and other spruces	0.5 (100.17)	— (—)	— (—)	— (—)	0.5 (100.17)
Lodgepole pine	1.6 (76.46)	— (—)	0.0 (106.50)	— (—)	1.6 (75.47)
Woodland softwoods	7.5 (19.66)	18.5 (11.59)	0.1 (100.17)	4.3 (39.08)	30.4 (10.02)
Other western softwoods	3.9 (44.55)	1.5 (52.38)	— (—)	— (—)	5.4 (35.33)
Subtotal	18.4 (21.54)	24.7 (12.47)	0.1 (62.32)	4.7 (36.40)	47.9 (10.86)
Hardwood species groups					
Cottonwood and aspen	1.3 (29.68)	0.1 (62.05)	— (—)	0.0 (91.50)	1.4 (27.29)
Woodland hardwoods	1.8 (41.46)	0.8 (30.99)	0.1 (100.17)	0.0 (105.08)	2.6 (29.45)
Subtotal	3.0 (27.22)	0.9 (28.45)	0.1 (100.17)	0.1 (75.04)	4.0 (21.46)
Total	**21.4 (19.47)**	**25.6 (12.32)**	**0.2 (71.23)**	**4.7 (36.01)**	**51.9 (10.39)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.40—Average annual mortality of growing-stock trees (at least 5 in dia), in million trees, on timberland (percent sampling error) by species group type and species group and ownership group.

Species group type	Ownership group				
	Forest Service	Other Federal	State and local government	Private and Native American	All owners
Softwood species groups					
Ponderosa and Jeffrey pines	— (—)	— (—)	— (—)	0.1 (97.15)	0.1 (97.15)
True fir	1.1 (63.07)	0.1 (87.45)	0.0 (102.53)	0.2 (100.17)	1.5 (51.03)
Lodgepole pine	1.6 (76.46)	— (—)	— (—)	— (—)	1.6 (76.46)
Other western softwoods	0.5 (97.15)	0.0 (100.17)	— (—)	— (—)	0.6 (92.07)
Subtotal	3.2 (51.57)	0.1 (91.13)	0.0 (102.53)	0.3 (77.42)	3.7 (45.48)
Hardwood species groups					
Cottonwood and aspen	0.4 (60.90)	0.1 (95.92)	— (—)	0.0 (105.08)	0.5 (54.65)
Subtotal	0.4 (60.90)	0.1 (95.92)	— (—)	0.0 (105.08)	0.5 (54.65)
Total	**3.6 (46.37)**	**0.2 (68.07)**	**0.0 (102.53)**	**0.3 (76.64)**	**4.2 (40.94)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.41—Area, in million acres, of forest land (percent sampling error) by inventory unit, county, ownership group, and forest land status.

Inventory unit	Forest Service			Other Federal			State and local government			Private and Native American			All forest land
	Timber land	Other forest land	Total	Timber land	Other forest land	Total	Timber land	Other forest land	Total	Timber land	Other forest land	Total	
Nevada													
Churchill	— (—)	— (—)	— (—)	— (—)	0.2 (8.71)	0.2 (8.71)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.2 (8.71)
Clark	— (—)	0.2 (11.80)	0.2 (11.80)	— (—)	0.2 (15.86)	0.2 (15.86)	— (—)	— (—)	— (—)	— (—)	0.0 (99.95)	0.0 (99.95)	0.4 (6.14)
Douglas	0.0 (37.15)	0.0 (35.11)	0.1 (22.96)	— (—)	0.1 (23.26)	0.1 (23.26)	0.0 (102.53)	— (—)	0.0 (102.53)	0.0 (97.15)	0.1 (30.20)	0.1 (28.17)	0.2 (9.45)
Elko	0.1 (31.13)	0.2 (16.38)	0.2 (14.27)	0.0 (105.08)	0.8 (6.94)	0.8 (6.89)	— (—)	— (—)	— (—)	0.0 (75.94)	0.1 (21.43)	0.1 (20.84)	1.2 (5.04)
Esmeralda	— (—)	0.1 (29.37)	0.1 (29.37)	— (—)	0.2 (14.49)	0.2 (14.49)	— (—)	— (—)	— (—)	— (—)	0.0 (95.09)	0.0 (95.09)	0.2 (9.62)
Eureka	— (—)	0.1 (23.73)	0.1 (23.73)	0.0 (107.99)	0.4 (8.09)	0.4 (8.05)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.5 (6.02)
Humboldt	0.0 (82.50)	0.0 (45.15)	0.0 (39.59)	0.0 (97.78)	0.1 (32.06)	0.1 (29.81)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	0.1 (22.65)
Lander	0.0 (103.58)	0.1 (17.09)	0.1 (17.06)	0.0 (99.62)	0.3 (10.41)	0.3 (10.35)	— (—)	— (—)	— (—)	— (—)	0.0 (70.38)	0.0 (70.38)	0.5 (6.65)
Lincoln	— (—)	0.0 (40.66)	0.0 (40.66)	— (—)	1.8 (3.11)	1.8 (3.11)	— (—)	— (—)	— (—)	— (—)	0.0 (71.02)	0.0 (71.02)	1.9 (2.92)
Lyon	— (—)	0.1 (16.99)	0.1 (16.99)	— (—)	0.0 (35.27)	0.0 (35.27)	— (—)	— (—)	— (—)	0.0 (98.40)	0.0 (113.84)	0.0 (89.33)	0.2 (11.35)
Mineral	— (—)	0.2 (12.20)	0.2 (12.20)	— (—)	0.2 (14.21)	0.2 (14.21)	— (—)	— (—)	— (—)	— (—)	0.0 (48.18)	0.0 (48.18)	0.5 (6.12)
Nye	0.0 (81.42)	1.2 (4.79)	1.2 (4.74)	— (—)	0.8 (7.57)	0.8 (7.57)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	2.0 (2.61)

Table C.41 continued.

Inventory unit	Forest Service			Other Federal			State and local government			Private and Native American			All forest land
	Timber land	Other forest land	Total	Timber land	Other forest land	Total	Timber land	Other forest land	Total	Timber land	Other forest land	Total	
Pershing	— (—)	— (—)	— (—)	— (—)	0.1 (15.31)	0.1 (15.31)	— (—)	— (—)	— (—)	— (—)	0.0 (53.97)	0.0 (53.97)	0.1 (14.77)
Storey	— (—)	— (—)	— (—)	— (—)	0.0 (100.00)	0.0 (100.00)	— (—)	— (—)	— (—)	— (—)	0.0 (56.15)	0.0 (56.15)	0.0 (47.61)
Washoe	0.0 (39.00)	0.0 (32.79)	0.1 (23.93)	0.0 (44.67)	0.2 (15.70)	0.2 (14.73)	— (—)	0.0 (74.50)	0.0 (74.50)	— (—)	0.0 (36.40)	0.0 (36.40)	0.4 (10.78)
White Pine	0.0 (70.72)	0.6 (8.62)	0.6 (8.50)	0.0 (58.22)	1.6 (4.51)	1.6 (4.46)	— (—)	0.0 (100.17)	0.0 (100.17)	0.0 (72.13)	0.0 (50.45)	0.0 (41.62)	2.2 (2.72)
Carson City	0.0 (54.23)	— (—)	0.0 (54.23)	— (—)	0.0 (54.23)	0.0 (54.23)	— (—)	— (—)	— (—)	— (—)	0.0 (100.00)	0.0 (100.00)	0.0 (30.40)
Subtotal	0.2 (17.48)	3.0 (3.49)	3.2 (3.39)	0.1 (29.53)	7.0 (2.13)	7.0 (2.12)	0.0 (102.53)	0.0 (59.78)	0.0 (55.67)	0.0 (44.30)	0.3 (12.62)	0.4 (12.13)	10.6 (1.35)
Total	**0.2 (17.48)**	**3.0 (3.49)**	**3.2 (3.39)**	**0.1 (29.53)**	**7.0 (2.13)**	**7.0 (2.12)**	**0.0 (102.53)**	**0.0 (59.78)**	**0.0 (55.67)**	**0.0 (44.30)**	**0.3 (12.62)**	**0.4 (12.13)**	**10.6 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.42—Area, in million acres, of forest land (percent sampling error) by inventory unit, county, reserved status, and forest land status.

Inventory unit	Unreserved			Reserved			All forest land
	Timber land	Unproductive	Total	Productive	Unproductive	Total	
Nevada							
Churchill	— (—)	0.2 (8.71)	0.2 (8.71)	— (—)	— (—)	— (—)	0.2 (8.71)
Clark	— (—)	0.0 (34.20)	0.0 (34.20)	0.0 (47.93)	0.3 (7.71)	0.4 (6.78)	0.4 (6.14)
Douglas	0.0 (33.61)	0.2 (12.89)	0.2 (9.45)	— (—)	— (—)	— (—)	0.2 (9.45)
Elko	0.1 (27.61)	1.0 (5.79)	1.1 (5.42)	0.0 (32.78)	0.0 (36.49)	0.1 (24.51)	1.2 (5.04)
Esmeralda	— (—)	0.2 (12.88)	0.2 (12.88)	0.0 (95.09)	0.0 (44.60)	0.0 (38.97)	0.2 (9.62)
Eureka	0.0 (107.99)	0.5 (6.06)	0.5 (6.02)	— (—)	— (—)	— (—)	0.5 (6.02)
Humboldt	0.0 (63.49)	0.0 (37.66)	0.1 (31.92)	0.0 (100.07)	0.0 (38.32)	0.0 (35.86)	0.1 (22.65)
Lander	0.0 (79.82)	0.5 (6.67)	0.5 (6.65)	— (—)	— (—)	— (—)	0.5 (6.65)
Lincoln	— (—)	1.5 (3.97)	1.5 (3.97)	0.0 (91.82)	0.3 (12.53)	0.3 (12.39)	1.9 (2.92)
Lyon	0.0 (98.40)	0.2 (11.43)	0.2 (11.35)	— (—)	— (—)	— (—)	0.2 (11.35)
Mineral	— (—)	0.5 (6.12)	0.5 (6.12)	— (—)	— (—)	— (—)	0.5 (6.12)
Nye	0.0 (81.42)	1.7 (3.58)	1.7 (3.55)	0.0 (42.37)	0.3 (13.86)	0.3 (12.99)	2.0 (2.61)
Pershing	— (—)	0.1 (14.77)	0.1 (14.77)	— (—)	— (—)	— (—)	0.1 (14.77)
Storey	— (—)	0.0 (47.61)	0.0 (47.61)	— (—)	— (—)	— (—)	0.0 (47.61)
Washoe	0.1 (29.66)	0.3 (13.60)	0.3 (11.97)	0.0 (38.50)	0.0 (83.56)	0.0 (35.84)	0.4 (10.78)
White Pine	0.0 (38.45)	1.6 (4.32)	1.7 (4.21)	0.1 (21.73)	0.4 (10.42)	0.6 (9.05)	2.2 (2.72)
Carson City	0.0 (54.23)	0.0 (45.37)	0.0 (30.40)	— (—)	— (—)	— (—)	0.0 (30.40)
Subtotal	0.3 (14.14)	8.6 (1.76)	8.9 (1.71)	0.3 (14.09)	1.5 (5.41)	1.7 (4.91)	10.6 (1.35)
Total	**0.3 (14.14)**	**8.6 (1.76)**	**8.9 (1.71)**	**0.3 (14.09)**	**1.5 (5.41)**	**1.7 (4.91)**	**10.6 (1.35)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.43—Area, in million acres, of timberland (percent sampling error) by inventory unit and county and stand-size class.

Inventory unit	Large diameter	Medium diameter	Small diameter	Nonstocked	All size classes
Nevada					
Douglas	0.0 (34.44)	— (—)	— (—)	0.0 (97.15)	0.0 (33.61)
Elko	0.0 (55.81)	0.0 (46.25)	0.0 (45.15)	0.0 (99.64)	0.1 (27.61)
Eureka	— (—)	— (—)	0.0 (107.99)	— (—)	0.0 (107.99)
Humboldt	— (—)	0.0 (100.07)	0.0 (69.98)	— (—)	0.0 (63.49)
Lander	— (—)	0.0 (99.62)	— (—)	0.0 (103.58)	0.0 (79.82)
Lyon	— (—)	— (—)	— (—)	0.0 (98.40)	0.0 (98.40)
Nye	— (—)	0.0 (98.82)	0.0 (98.82)	— (—)	0.0 (81.42)
Washoe	0.0 (39.79)	0.0 (99.64)	— (—)	0.0 (51.61)	0.1 (29.66)
White Pine	0.0 (50.19)	0.0 (100.17)	0.0 (72.13)	— (—)	0.0 (38.45)
Carson City	0.0 (100.00)	— (—)	— (—)	0.0 (68.60)	0.0 (54.23)
Subtotal	0.1 (20.93)	0.0 (34.04)	0.1 (31.13)	0.0 (34.89)	0.3 (14.14)
Total	**0.1 (20.93)**	**0.0 (34.04)**	**0.1 (31.13)**	**0.0 (34.89)**	**0.3 (14.14)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.44—Area, in million acres, of timberland (percent sampling error) by inventory unit and county and stocking class of growing-stock trees.

Inventory unit	Nonstocked	Poorly stocked	Medium stocked	Fully stocked	Overstocked	All size classes
Nevada						
Douglas	0.0 (97.15)	0.0 (56.18)	0.0 (47.66)	— (—)	— (—)	0.0 (33.61)
Elko	0.0 (65.20)	0.0 (99.64)	0.0 (43.16)	0.0 (51.91)	0.0 (82.15)	0.1 (27.61)
Eureka	— (—)	— (—)	— (—)	0.0 (107.99)	— (—)	0.0 (107.99)
Humboldt	— (—)	0.0 (100.07)	0.0 (97.78)	0.0 (100.07)	— (—)	0.0 (63.49)
Lander	0.0 (103.58)	0.0 (99.62)	— (—)	— (—)	— (—)	0.0 (79.82)
Lyon	0.0 (98.40)	— (—)	— (—)	— (—)	— (—)	0.0 (98.40)
Nye	— (—)	0.0 (98.82)	0.0 (98.82)	— (—)	— (—)	0.0 (81.42)
Washoe	0.0 (51.61)	0.0 (46.23)	0.0 (76.17)	0.0 (106.50)	— (—)	0.1 (29.66)
White Pine	— (—)	0.0 (71.45)	0.0 (71.51)	0.0 (59.94)	— (—)	0.0 (38.45)
Carson City	0.0 (68.60)	— (—)	0.0 (100.00)	— (—)	— (—)	0.0 (54.23)
Subtotal	0.0 (31.58)	0.1 (28.47)	0.1 (24.65)	0.0 (33.64)	0.0 (82.15)	0.3 (14.14)
Total	**0.0 (31.58)**	**0.1 (28.47)**	**0.1 (24.65)**	**0.0 (33.64)**	**0.0 (82.15)**	**0.3 (14.14)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Table C.45—Net volume of growing-stock trees (at least 5 in dia), in million cubic feet, on timberland (percent sampling error) by inventory unit and county and spgrpgrpnm2.

Inventory unit	Hard hardwoods	Other softwoods	Soft hardwoods	Pine	All size classes
Nevada					
Douglas	— (—)	47.6 (51.34)	— (—)	68.8 (42.82)	116.3 (36.02)
Elko	— (—)	36.5 (57.14)	14.8 (52.36)	— (—)	51.3 (45.20)
Humboldt	— (—)	0.6 (97.78)	2.9 (72.84)	— (—)	3.5 (64.16)
Lander	— (—)	— (—)	2.7 (99.62)	— (—)	2.7 (99.62)
Nye	— (—)	0.0 (98.82)	0.8 (89.04)	— (—)	0.9 (85.19)
Washoe	— (—)	14.6 (53.34)	— (—)	23.0 (53.66)	37.6 (42.63)
White Pine	— (—)	32.8 (53.63)	15.7 (93.73)	— (—)	48.4 (51.65)
Carson City	— (—)	16.7 (96.68)	— (—)	4.2 (100.00)	20.8 (97.33)
Subtotal	— (—)	148.7 (27.40)	37.0 (45.96)	95.9 (33.57)	281.6 (21.31)
Total	**— (—)**	**148.7 (27.40)**	**37.0 (45.96)**	**95.9 (33.57)**	**281.6 (21.31)**

Numbers in rows and columns may not sum to totals due to rounding.
A dash (—) indicates no sample for the cell; 0 indicates a value of greater than 0 but less than 0.1.

Appendix D
Nevada Forest-Type Groups and Forest Types, with Descriptions and Timber (T) or Woodland (W) Designations

Forest types are usually named for the predominant species (or group of species) on the condition. In order to determine the forest type, the stocking (site occupancy) of trees is estimated by softwoods and hardwoods. If softwoods predominate, then the forest type will be one of the softwood types and if hardwoods predominate, then the forest type will be one of the hardwood types (Arner et al. 2001). Some other special stocking rules apply to individual forest types and are described below.

Associate species are defined as those that regularly form the majority of the nonpredominant species stocking of mixed-species conditions. These descriptions are applicable to the current inventory; species importance, including predominance in some cases, will vary for other States or inventory years. When species are listed, they are in decreasing order of overall forest-type stocking.

ASPEN/BIRCH GROUP (T)

Aspen

Predominant species: quaking aspen

Associate species: subalpine fir, limber pine, white fir

Other species: curlleaf mountain-mahogany, Rocky Mountain juniper, California red fir, singleleaf pinyon, whitebark pine, incense-cedar, western juniper, lodgepole pine

DOUGLAS-FIR GROUP (T)

Douglas-fir

Predominant species: Douglas-fir

Associate species: none identified

Other species: white fir, Engelmann spruce, limber pine, Great Basin bristlecone pine, quaking aspen

ELM/ASH/COTTONWOOD GROUP (T)

Cottonwood

Predominant species: black cottonwood

Associate species: none identified

Other species: curlleaf mountain-mahogany

Special rules: Stocking of cottonwoods must be at least 50 percent of total stocking.

FIR/SPRUCE/MOUNTAIN HEMLOCK GROUP (T)

Engelmann spruce

Predominant species: Engelmann spruce

Associate species: quaking aspen

Other species: limber pine

Special rules: In order to use Engelmann spruce stocking predominance, subalpine fir stocking must be less than 5 percent of the total. If subalpine fir stocking is 5 percent or more, Engelmann spruce stocking must be at least 75 percent of the total.

Red fir

Predominant species: California red fir

Associate species: none identified

Other species: western white pine, lodgepole pine, western juniper, Jeffrey pine, white fir

Subalpine fir

Predominant species: subalpine fir

Associate species: limber pine

Other species: quaking aspen, whitebark pine

Special rules: In order to use subalpine fir stocking predominance, Engelmann spruce stocking must be less than 5 percent of the total. If Engelmann spruce stocking is 5 percent or more, subalpine fir stocking must be at least 75 percent of the total.

White fir

Predominant species: white fir

Associate species: curlleaf mountain-mahogany, limber pine, Douglas-fir, Rocky Mountain juniper, Great Basin bristlecone pine, ponderosa pine, quaking aspen

Other species: singleleaf pinyon, Utah juniper, Jeffrey pine, Engelmann spruce

LODEPOLE PINE GROUP (T)

Lodgepole pine

Predominant species: lodgepole pine

Associate species: California red fir

Other species: Jeffery pine, whitebark pine, western white pine, limber pine, mountain hemlock, white fir

NONSTOCKED

Nonstocked

Predominant species: Most nonstocked conditions have no live-tree stocking. Where live trees are present, they are most often Utah juniper and/or singleleaf pinyon.

Associate species: Seldom more than one species on a condition.

Other species (complete species list): Utah juniper, singleleaf pinyon, curlleaf mountain-mahogany, western juniper, Jeffrey pine, limber pine

Special rules: Used when all live stocking is less than 10 percent. Implies disturbance but may be used for sparse stands with no disturbance, especially with woodland species.

OTHER WESTERN SOFWOODS GROUP (T)

Foxtail pine/bristlecone pine

Predominant species: Great Basin bristlecone pine

Associate species: limber pine

Other species: Engelmann spruce, white fir, curlleaf mountain-mahogany, quaking aspen

Special rules: This is mostly an “either/or” forest type. Foxtail pine does not occur in Nevada, so this will always be Great Basin bristlecone pine predominance.

Note: In the previous periodic inventory, Great Basin bristlecone pine was not distinguished from Rocky Mountain bristlecone pine. The species code used for all bristlecone pines in that inventory was retained for Rocky Mountain bristlecone pine. Therefore, species-based reports using Nevada 1989 data may return results for “Rocky Mountain bristlecone pine.” These are almost certainly Great Basin bristlecone pines.

Limber pine

Predominant species: limber pine

Associate species: white fir

Other species: quaking aspen, Great Basin bristlecone pine, Engelmann spruce, Douglas-fir, curlleaf mountain-mahogany, subalpine fir

Western juniper

Predominant species: western juniper

Associate species: none identified

Other species: curlleaf mountain-mahogany, Utah juniper, western white pine, quaking aspen

Whitebark pine

Predominant species: whitebark pine

Associate species: none identified

Other species: quaking aspen, mountain hemlock

PINYON/JUNIPER GROUP (W)

Juniper woodland

Predominant species: Utah juniper

Associate species: none identified

Other species: white fir, western juniper, curlleaf mountain-mahogany

Special rules: Predominance of any combination of junipers other than Rocky Mountain juniper or western juniper, and live pinyons are NOT present.

Pinyon/juniper woodland

Predominant species: singleleaf pinyon, Utah juniper, common or two-needle pinyon

Associate species: curlleaf mountain-mahogany

Other species: white fir, Gambel oak, Rocky Mountain juniper, quaking aspen, ponderosa pine

Special rules: Any combination of pinyons and junipers other than Rocky Mountain juniper or western juniper predominate. Pinyons must be present.

Rocky Mountain juniper

Predominant species: Rocky Mountain juniper

Associate species: none identified

Other species: quaking aspen, ponderosa pine, curlleaf mountain-mahogany, white fir, whitebark pine, subalpine fir

PONDEROSA PINE GROUP (T)

Jeffrey pine

Predominant species: Jeffrey pine

Associate species: white fir

Other species: curlleaf mountain-mahogany, western white pine, whitebark pine, incense-cedar

Ponderosa pine

Predominant species: ponderosa pine

Associate species: none identified

Other species: singleleaf pinyon, white fir, curlleaf mountain-mahogany

WOODLAND HARDWOODS GROUP (W)

Cercocarpus (mountain brush) woodland

Predominant species: curlleaf mountain-mahogany

Associate species: singleleaf pinyon, Utah juniper, white fir, limber pine

Other species: Rocky Mountain juniper, quaking aspen, Great Basin bristlecone pine, Jeffrey pine, western juniper, Douglas-fir

Deciduous oak woodland

Predominant species: Gambel oak

Associate species: singleleaf pinyon

Other species: curlleaf mountain-mahogany, Utah juniper

Mesquite woodland

Predominant species: screwbean mesquite, honey mesquite

Associate species: none identified

Other species: none identified

Appendix E

Tree Species Groups and Tree Species Measured in Nevada's Annual Inventory, with Common Name, Scientific Name, and Timber (T) or Woodland (W) Designation

HARDWOODS

Cottonwood and aspen group (T)

Black cottonwood (*Populus balsamifera*)

Quaking aspen (*Populus tremuloides*)

Woodland hardwoods group (W)

Curlleaf mountain-mahogany (*Cercocarpus ledifolius*)

Gambel oak (*Quercus gambelii*)

Honey mesquite (*Prosopis glandulosa*)

Screwbean mesquite (*Prosopis pubescens*)

SOFTWOODS

Douglas-fir group (T)

Douglas-fir (*Pseudotsuga menziesii*)

Engelmann and other spruces group (T)

Engelmann spruce (*Picea engelmannii*)

Incense-cedar group (T)

Incense-cedar (*Calocedrus decurrens*)

Lodgepole pine group (T)

Lodgepole pine (*Pinus contorta*)

Other western softwoods group (T)

Great Basin bristlecone pine (*Pinus longaeva*)

Limber pine (*Pinus flexilis*)

Mountain hemlock (*Tsuga mertensiana*)

Western juniper (*Juniperus occidentalis*)

Whitebark pine (*Pinus albicaulis*)

Ponderosa and Jeffrey pines group (T)

Jeffrey pine (*Pinus jeffreyi*)

Ponderosa pine (*Pinus ponderosa*)

True fir group (T)

California red fir (*Abies magnifica*)

Subalpine fir (*Abies lasiocarpa*)

White fir (*Abies concolor*)

Western white pine group (T)

Western white pine (*Pinus monticola*)

Woodland softwoods group (W)

Common or two-needle pinyon (*Pinus edulis*)

Rocky Mountain juniper (*Juniperus scopulorum*)

Singleleaf pinyon (*Pinus monophylla*)

Utah juniper (*Juniperus osteosperma*)

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