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Washington's Forest Resources: Forest Inventory and Analysis, 2002–2011

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Technical Editors

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Cover: Subalpine larch and subalpine fir in the Pasayten Wilderness, eastern Washington, 2016. Photo by Brian Gasper.

Washington's Forest Resources: Forest Inventory and Analysis, 2002–2011

Justin Holgerson, Sharon Stanton, Karen Waddell, Marin Palmer, Olaf Kuegler, and Glenn Christensen, Technical Editors

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Abstract

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This report highlights key findings from data collected by the Forest Inventory and Analysis program across all forest land in the state of Washington from 2002 through 2011, updating previously published findings from data collected up to 2006. We summarize and interpret basic resource information such as forest area, composition, ownership, volume, biomass, and carbon stocks; forest structure and function topics such as biodiversity, forest age, and dead wood; disturbance information such as wildfire, root disease, and invasive plants; and include data on tree growth, mortality, and removals for timber products.

Keywords: Biomass, carbon, dead wood, fire, forest land, invasive plants, inventory, timber volume, timberland, monitoring.

Summary

Key Forest Inventory and Analysis Statistics, Washington 2002–2011:

- Number of forested plots measured by the Forest Inventory and Analysis program (2002–2011): 5,996
- Estimated total forest area: 22.4 million acres
- Estimated number of trees: 9.8 billion
- Estimated net live tree volume: 92.3 billion cubic feet
- Estimated aboveground biomass: 2.4 billion tons
- Estimated aboveground carbon: 1.1 billion megagrams
- Estimated forest area disturbed by wildfire (2002–2009): 1 million acres
- Total number of vascular plant species recorded: 977

Contents

Beginners Guide to Forest Inventory and Analysis

Inception of the Forest Inventory and Analysis Program

The U.S. Forest Service Forest Inventory and Analysis (FIA) program is a product of the McSweeney-McNary Forest Research Act of 1928 (USDA FS 2005). This legislation authorized a research program for the U.S. Forest Service and initiated "a comprehensive survey of the present and prospective requirements for timber and other forest products of the United States . . ." (fig. 1). During the 1930s, an initial inventory of forest lands was completed in each county in Washington. Subsequent legislative actions provided additional direction to the program, but the core component of FIA, which is to assess and report on the status and trends in our nation's forest resources, has remained the same.

Courtesy of the Forest History Society, Durham, NC. [Image ID#4339]

Figure 1—South side of Douglas-fir located in Clatsop County, Oregon, 1941. Height is 210 ft to broken top, estimated age is 1,000 to 1,200 years, and estimated volume is 105,650 board feet.

Forest Inventory and Analysis in Washington

In the 1950s, a grid of field locations was generated across all lands in Washington using U.S. Geological Survey (USGS) quadrangle base maps or other available mapping resources (Frayer and Furnival 1999). This was the start of the "periodic" sample-based FIA inventory in Washington in which all field monitoring sites were visited within 2 to 3 years and then revisited on an approximate 12-year cycle. Demand from the public for more current and timely forest resource information led to the passage of the Agriculture Research, Extension, and Education Reform Act in 1998 (the Farm Bill). This legislation mandated an annual measurement of 20 percent of all plots on all forest land every year (subsequently funded to 10 percent in Western States); a nationally consistent core set of measurements; and production of a state report every 5 years. The annualized FIA inventory was implemented in Washington starting in 2002, and the first full cycle of measurements was completed in 2011. The second cycle of annualized inventory (the same plots remeasured using the same field protocols) started in Washington in 2012.

Power of the annualized inventory—
Historically, each region of the country implemented inventory methods to best fit the forest conditions and client needs in the region, resulting in inconsistent national reporting (Gillespie 1999). The annualized design established nationally consistent sampling (fig. 2), plot design, field protocol, and estimation frameworks, making it possible to accurately monitor changes in forest conditions over time. Additionally, the scope of the inventory expanded to include nontimber forest components and a rigorous quality assurance program. In any given year, 15,000 to 20,000 FIA plots are measured across the United States and used to obtain forest population estimates. Regional and national trends in the nation's forests are available on an annual basis and are used by a wide variety of people to make informed resource management decisions. Annual estimates and reports at state, regional, and national levels are statistically valid owing to the nonbiased spatial and temporal sampling design used to measure permanent field sites.

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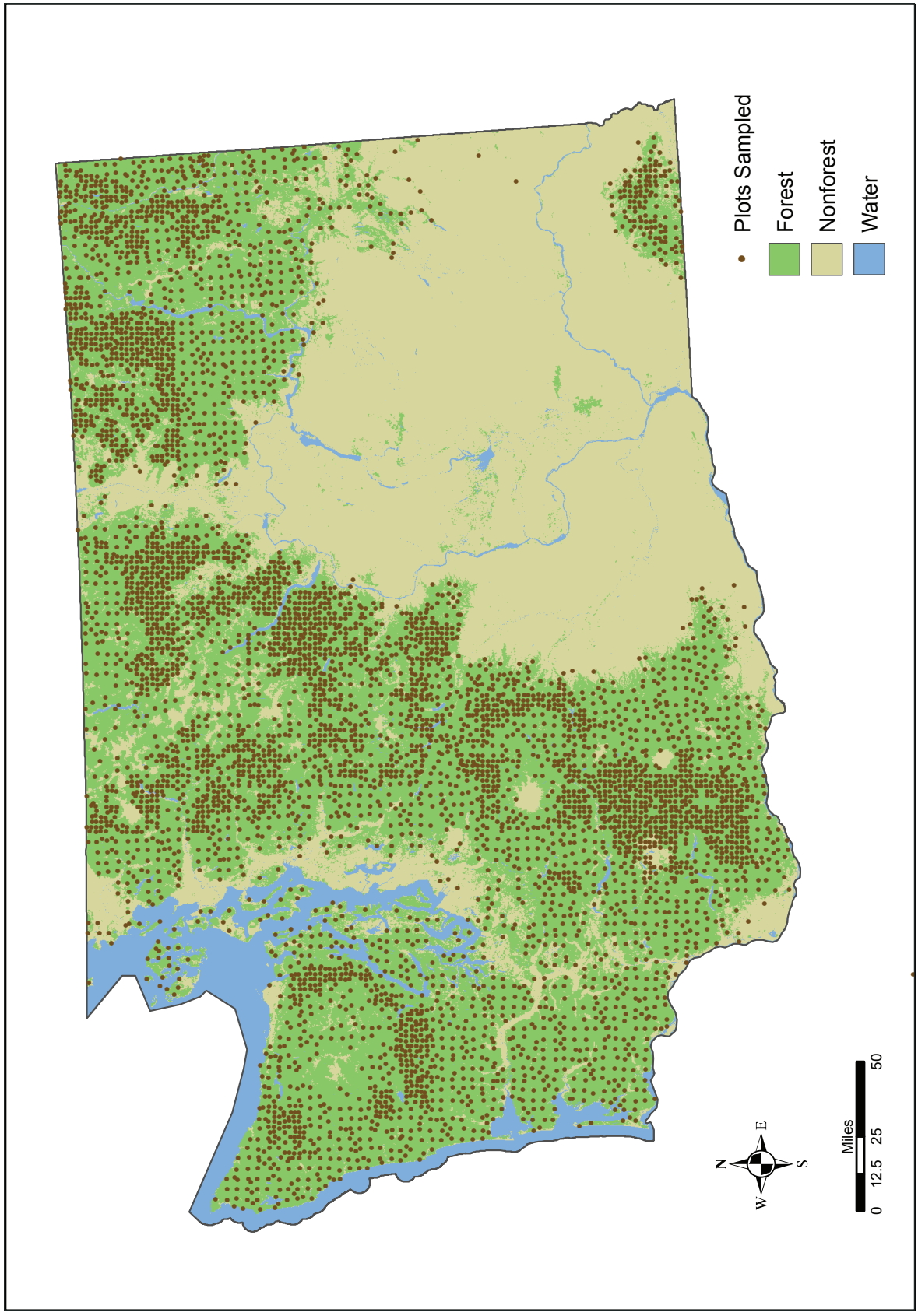

Figure 2—Forest inventory plots field sampled during the first annualized inventory of Washington, 2002–2011. An annualized inventory hexagonal grid and panel system is used to locate and sample Forest Inventory and Analysis plots. An additional intensified grid is measured on U.S. Forest Service lands outside wilderness. Locations are approximate (forest/nonforest geographic information system layer: Blackard et al. 2008).

Common FIA Terminology

What is a tree?—

The U.S. Forest Service defines a tree as a woody perennial plant, usually with a single well-defined stem carrying a crown, with a minimum height of 15 ft at maturity (USDA FS 2006).

What is a forest?—

Forests come in many shapes and sizes, varying from complex and species-diverse to monoculture plantations. For all data summarized in this report, the FIA program defines a forest as currently or formerly (within 30 years) at least 10 percent stocked by trees of any size and not currently developed for nonforest use (USDA FS 2006).[1] Forests must be at least 1 ac where a minimum width of 120 ft is maintained.

What is a forest type and forest type group?—

Most forests contain multiple tree species but are grouped into a single forest type; the functional characteristics of these tree species are then used to more broadly classify each forest type into a forest group.

- Forest type describes the species with the plurality of nonovertopped live trees (USDA FS 2006) (example: Douglas-fir forest type or red alder forest type).
- Forest type group is a combination of forest types that share closely associated species or site requirements (USDA FS 2006) (for example: western hemlock/Sitka spruce forest type group).

What are the differences between timberland, other forest land, and reserved forest land?—

Forests can be classified into three main categories based on their productivity and level of management (fig. 3):

- Timberland is forested land producing or capable of producing at least 20 ft^3 of wood per acre per year (USDA FS 2006).
- Other forest land is unproductive (not capable of producing 20 ft^3 of wood per acre per year) (USDA FS 2006).

Jessica Deans

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Figure 3—Forest land classification, (upper) Douglas-fir timberland, Trout Lake, Washington: (middle) high-elevation forest, Okanogan National Forest: (lower) Olympic National Park reserved forest.

[1] Note that starting in 2013 with the FIA database (FIADB ver. 6.0 and later), the FIA program switched to a forest definition based on 10 percent canopy cover rather than 10 percent stocking (see Azuma and Gray 2014).

- Reserved forest is permanently protected from management for the production of wood products through statute (USDA FS 2007). Examples include national parks, national wilderness areas, and state parks. Commercial harvest can occur in some areas for habitat or recreational purposes, but is incidental.

Forest Resources in Washington—
The state of Washington is located in the Pacific Northwest which is widely known for its moist and temperate climate. The diverse geography and terrain within the region create microclimates that support a variety of forested ecosystems. The two geographic features with the strongest influence on climate in the Pacific Northwest are the Pacific Ocean and Cascade Mountains. The Cascades run from north to south with elevations that exceed 10,000 ft and divide the state into eastern and western regions. The west side of the state has a heavy maritime influence with moderate temperatures and substantial precipitation. Most of the moisture coming from the Pacific Ocean is dropped as precipitation on the west side of the Cascades owing to orographic lift, leaving the east side of the state drier (fig. 4). Without the Pacific Ocean to moderate temperature, the eastern side of Washington experiences more severe temperature fluctuations annually (fig. 5). Temperature and precipitation are two critical drivers of plant community assemblages; therefore, forest composition and structure differ throughout the state. Ecosections have been developed that geographically delineate the state into units based on similar geography and climate, which drive these ecological communities (fig. 6).

Forest Area

Washington is the 18th largest state in the United States with 42.4 million acres of land area (excluding water), of which 53 percent (22.4 million acres) is covered by forest. Timberland represents 42.2 percent of state land area, unproductive or reserved forest is 10.5 percent of state area, and the remaining 47.3 percent is nonforest land (fig. 7). Sixty-six percent of western Washington is classified as forest land, while only 28 percent of total land area east of the Cascades is classified as forest land.

Most of Washington's forests are productive, with 81 percent classified as timberland (capable of adding wood at a rate of 20 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). In western Washington, private corporate ownerships manage the most timberland (30 percent), while in eastern Washington, the U.S. Forest Service manages the most timberland (33 percent) (fig. 8). There are almost 4 million acres of reserved forest in Washington (where management for production of wood products is precluded by statute). Reserved forest is primarily composed of U.S. Forest Service wilderness areas and national parks (fig. 9).

Forest Composition

The diverse geography of the state creates a spectrum of habitat, which in turn supports diverse vegetative communities. Almost 89 percent of Washington's forests are composed of coniferous (softwood) forest types, while broadleaf deciduous (hardwood) forest types cover the remaining 11 percent. Douglas-fir (see "Common and Scientific Plant Names" for Latin names and authorities of plant species), one of the world's most important and valuable timber trees (Burns and Honkala 1990), is the predominant forest type group in Washington, representing 46 percent of the total forested area (fig. 10). The alder/maple forest type group is the most dominant hardwood group and contains about 8 percent of total forest acreage (fig. 11). Douglas-fir forest is fairly evenly distributed across the state owing to its ability to grow under a wide variety of climatic conditions (Burns and Honkala 1990) (figs. 10 and 12). A balanced spatial distribution is also seen with the fir/spruce/mountain hemlock forest group, which is primarily found in higher elevations of the Cascades. Western hemlock/Sitka spruce forest is found almost exclusively in temperate rain forest on Washington's west side, while lodgepole and ponderosa pine forests are mostly limited to eastern Washington.

Forest age in Washington varies greatly and in even-aged forests depends upon the last major stand-replacing natural disturbance (e.g., wildfire or windthrow) or treatment (e.g., clearcut); in uneven-aged forest, it is defined as the age of the predominant tree size class. The oldest stand

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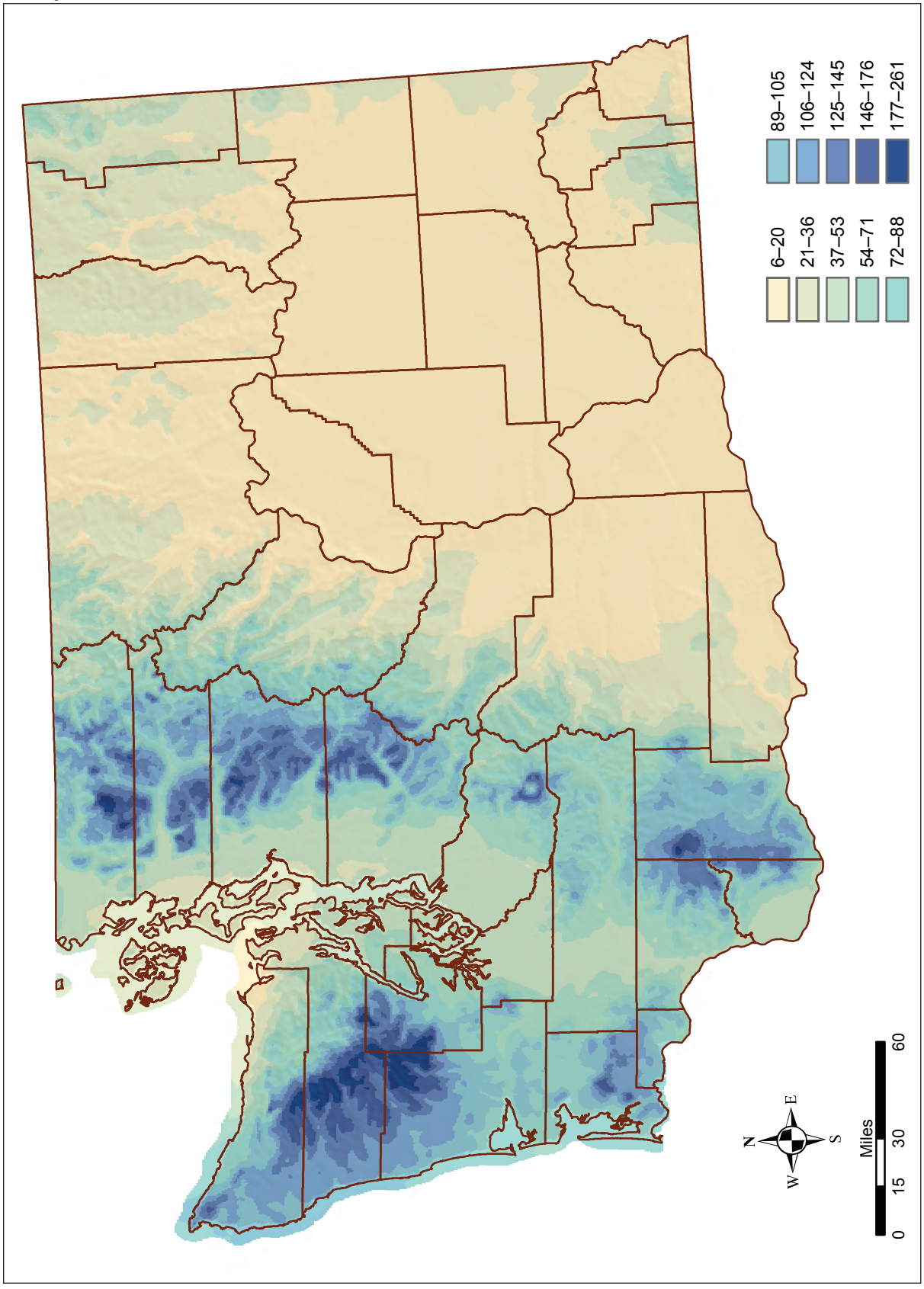

Figure 4—Mean annual precipitation (inches) in Washington (PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created 11 July 2012).

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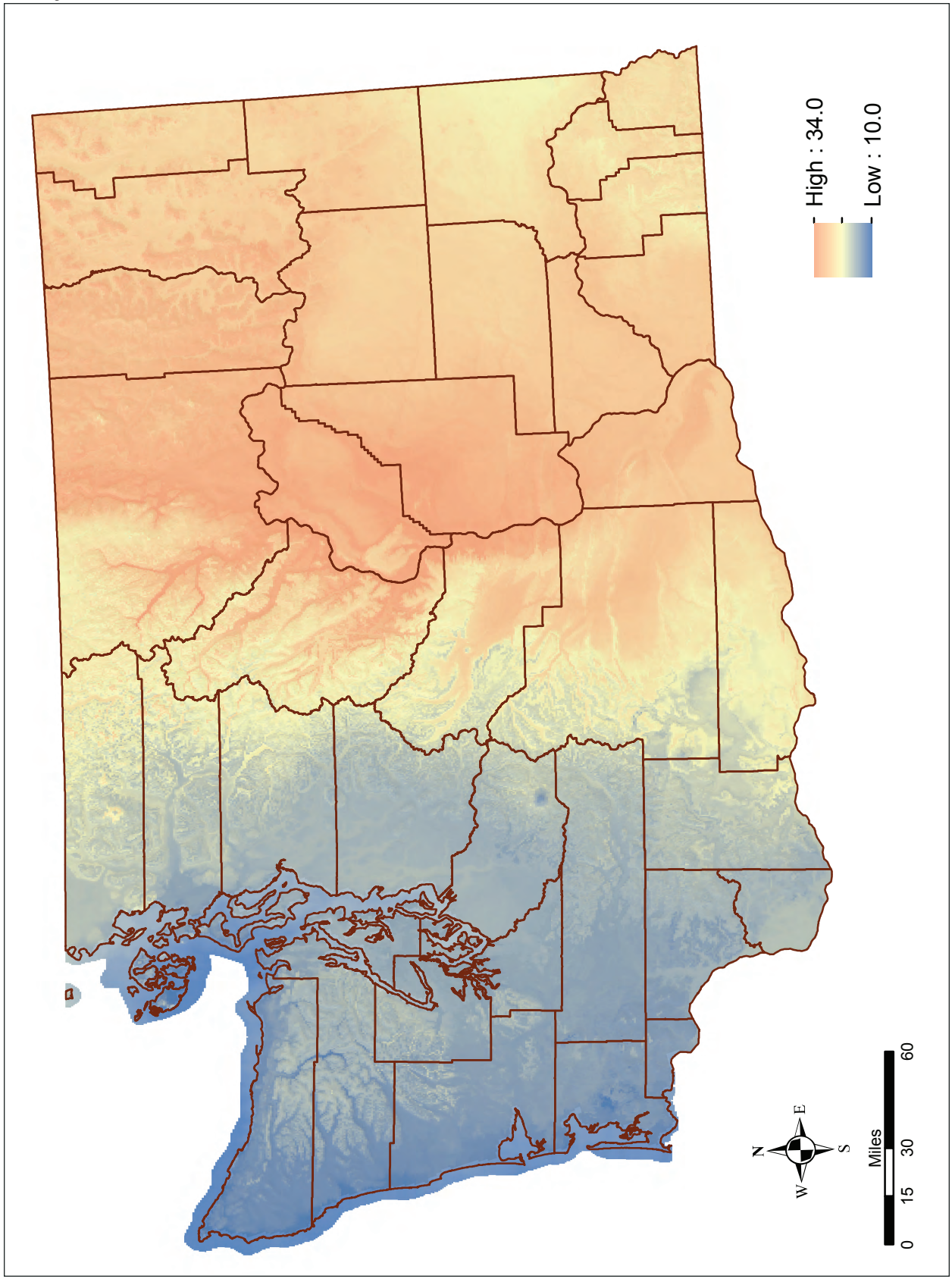

Figure 5—Seasonal temperature fluctuation in Washington (degrees Fahenheit). Difference between average minimum temperature in summer and winter (PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created 11 July 2012).

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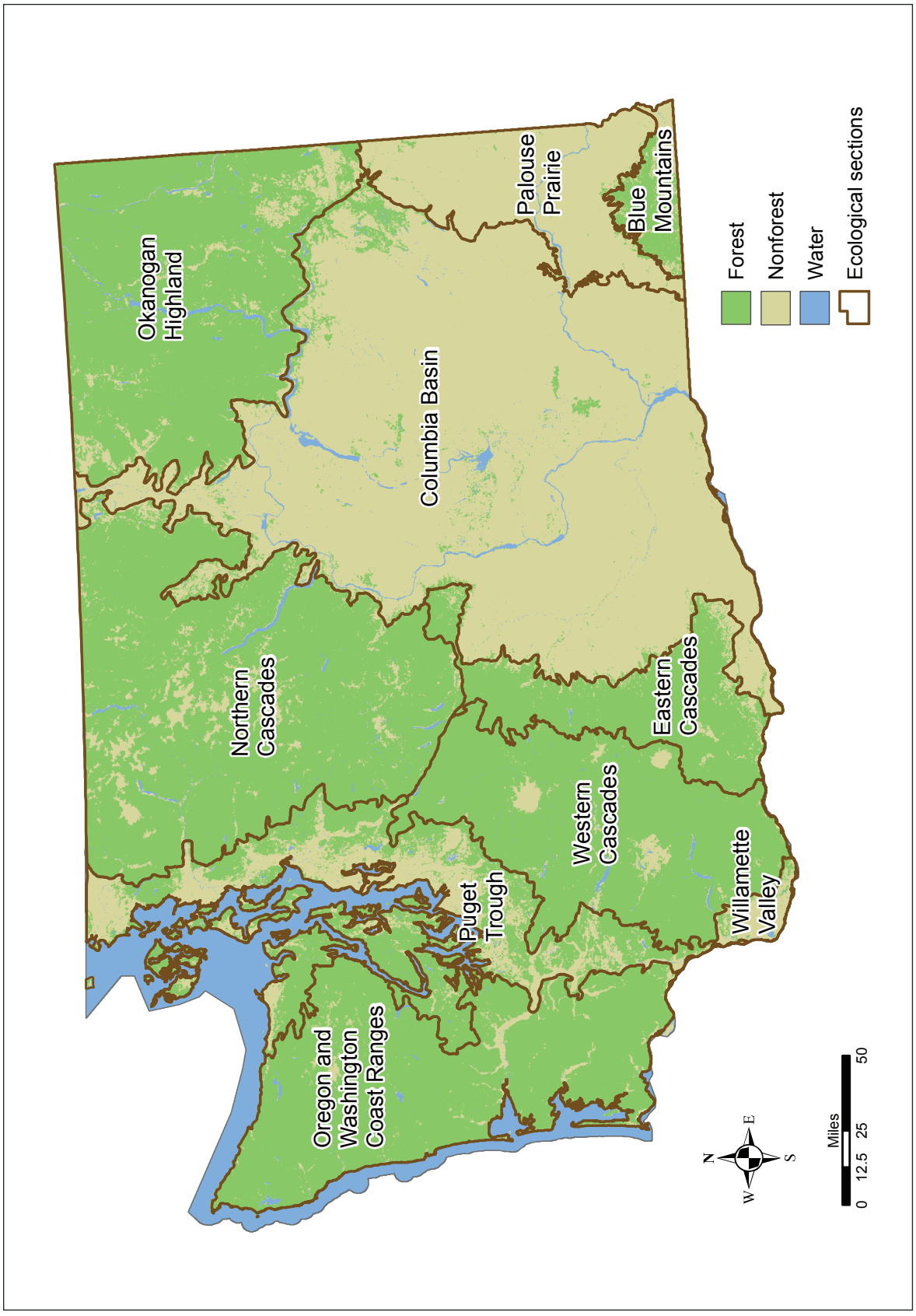

Figure 6—Washington ecosections—delineated on the basis of similar climate, geomorphic processes, stratigraphy, geologic origin, topography, and drainage systems (Cleland et al. 1997).

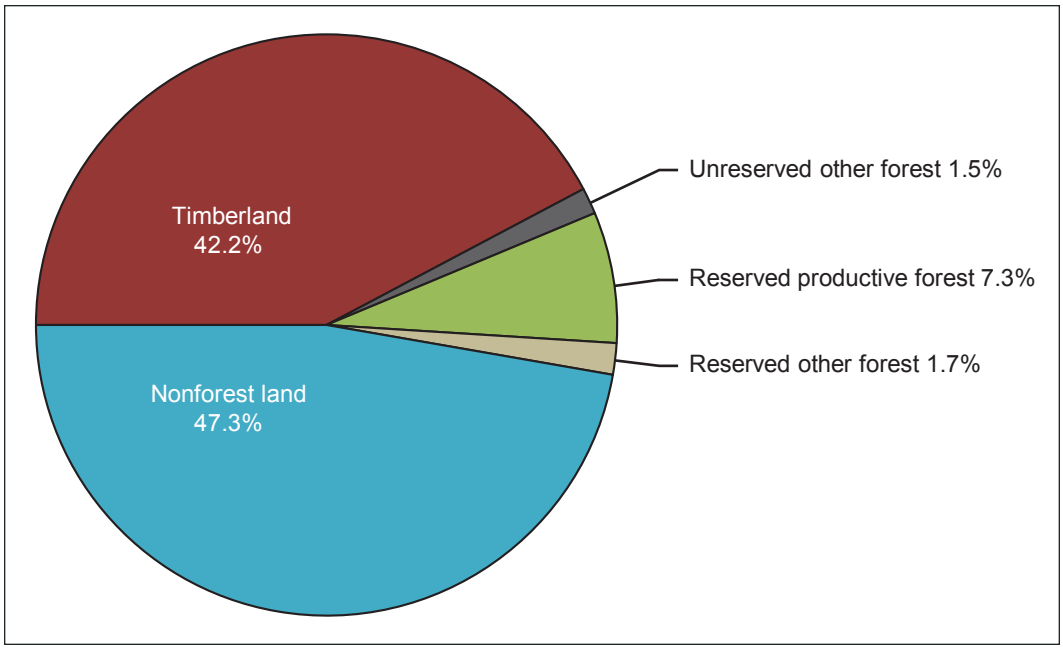

Figure 7—U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis area classification by land class category, Washington, 2002–2011.

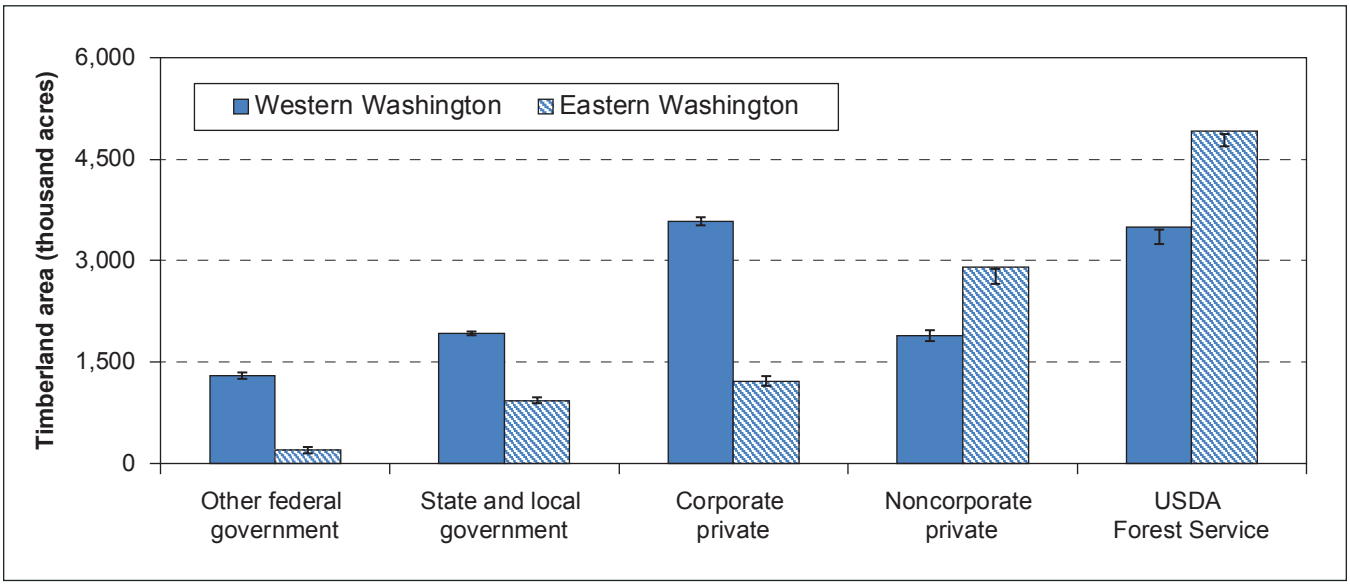

Figure 8—Estimated timberland (forest capable of adding 20 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) area by ownership, Washington, 2002–2011.

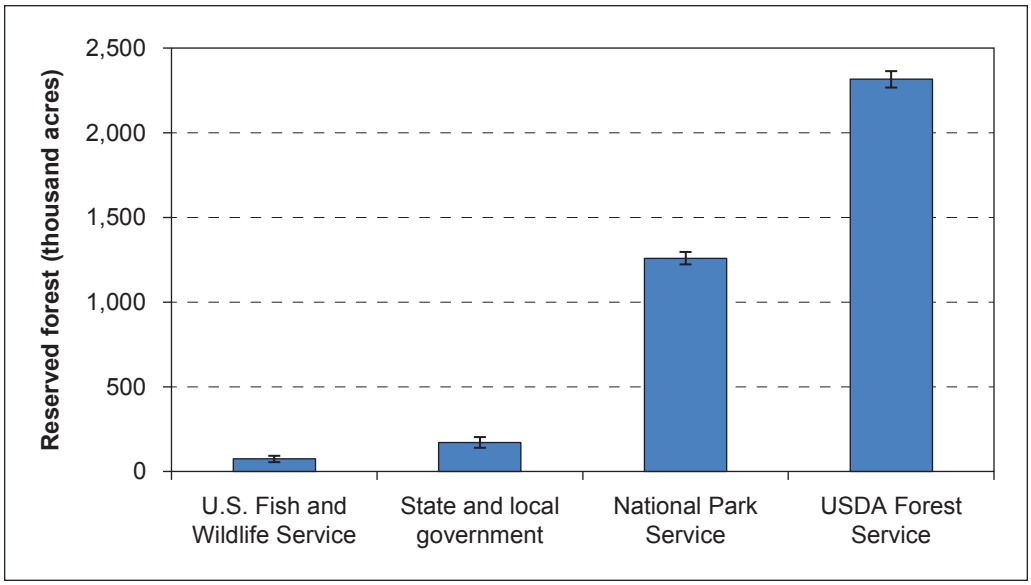

Figure 9—Total reserved forest area by ownership, Washington, 2002–2011.

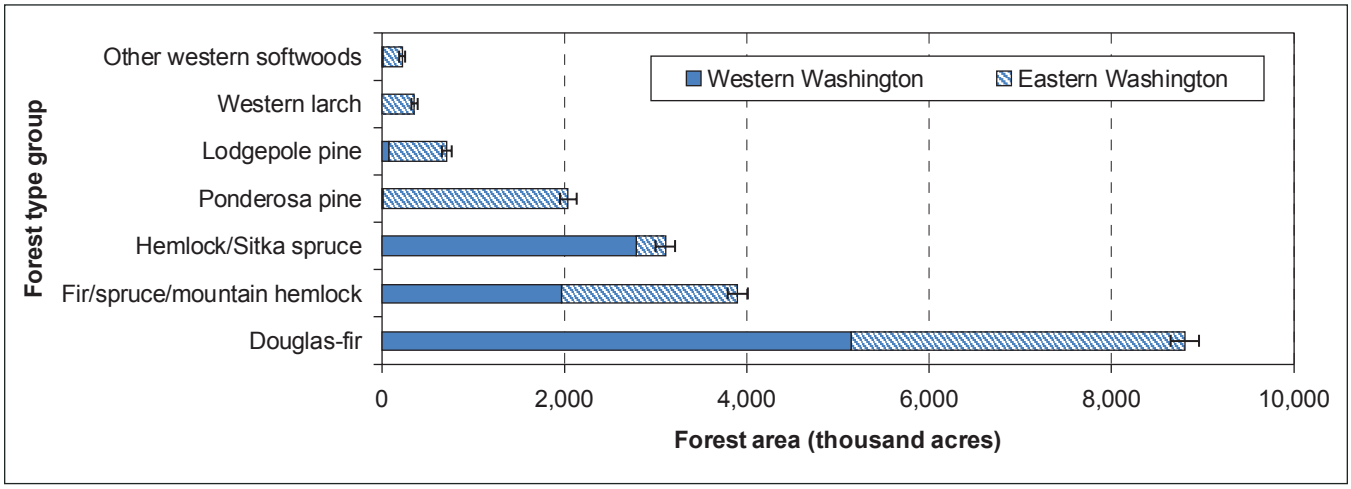

Figure 10—Area of softwood (coniferous) forest by forest type group, Washington 2002–2011. Standard errors shown are for state totals, not divided by east/west.

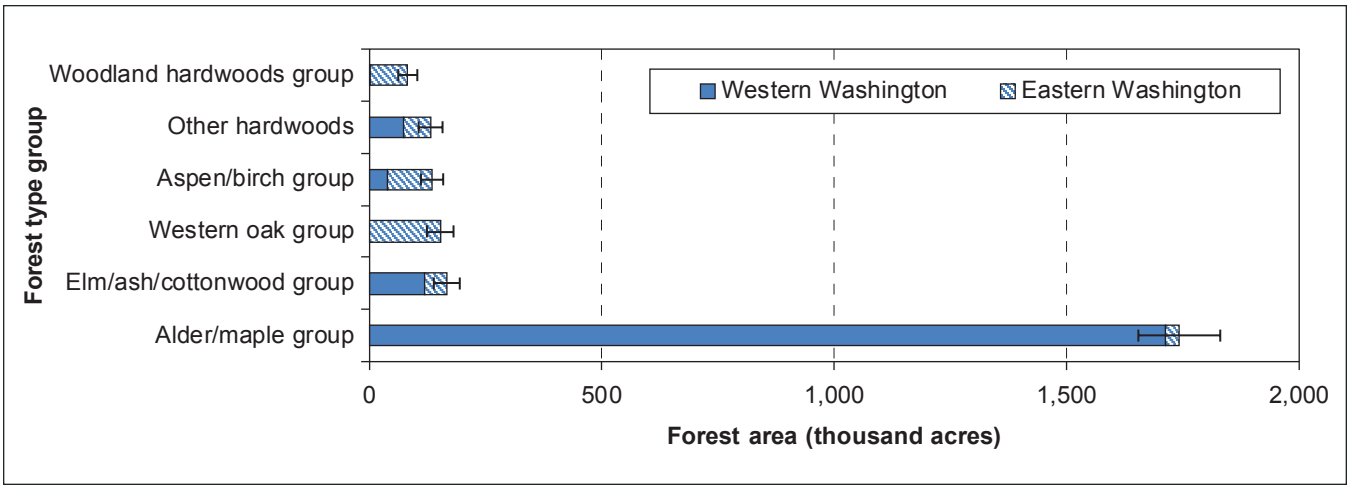

Figure 11—Area of hardwood (broadleaf deciduous) forest, Washington, 2002–2011. Standard errors shown are for state totals, not divided by east/west.

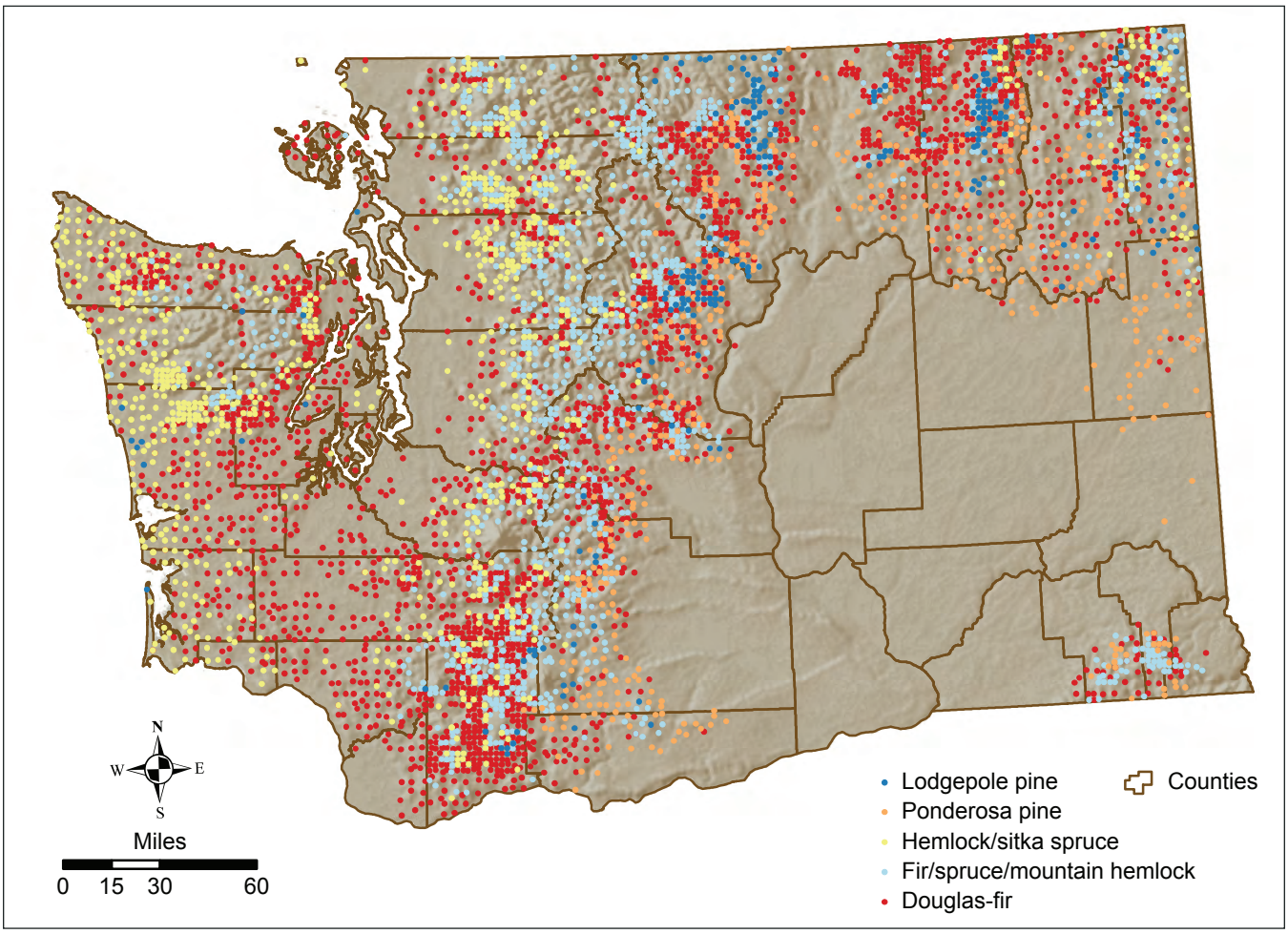

Figure 12—Distribution of forest type groups based on field observations at Forest Inventory and Analysis sample sites, 2002–2011.

age recorded by an FIA field crew in Washington was an 830-year-old Pacific silver fir forest located in the Gifford Pinchot National Forest. However, the majority of forests in Washington are relatively young, with 58 percent of stands age 80 or younger (fig. 13). Younger forests are dominated by the Douglas-fir forest type group, while old forest (stands greater than 200 years old) tend to be within the fir/spruce/mountain hemlock or western hemlock/Sitka spruce forest type groups (fig. 14). Western Washington contains a greater percentage of old forest compared to eastern Washington; 13 and 5 percent, respectively.

Trees in the Pacific Northwest are noted for their size (fig. 15). Certain areas within the state contain the ideal mix of precipitation, soil conditions, temperature, and time since severe disturbance to produce trees that are immense in diameter and height. The largest tree diameter recorded by a Washington FIA crew during the first annualized inventory (2002–2011) was a 139.5-inch western redcedar located in Olympic National Park. The tallest tree measured during this same time period was a 280-ft-tall Douglas-fir, also located in Olympic National Park. Although not all of Washington's forests contain large trees, 68 percent of forested stands have been classified as large diameter, defined as having a plurality of canopy cover composed of trees at least 11.0 inches diameter for hardwoods or at least 9.0 inches diameter for softwoods (fig. 16).

Just how many trees are in Washington's forests? It would be impossible to count every tree within the state, but an estimate can be generated based on the systematic and nonbiased sample used by FIA to inventory forests across all ownerships. About 9.8 billion trees are estimated to exist on forested lands in Washington, of which 94 percent are alive and 6 percent are standing dead (snags) (fig. 17). The forest type group with the most trees is Douglas-fir, and the landowner group with the most trees is the U.S. Forest Service.

Understory vegetation—

Understory vegetation refers to all vascular vegetation growing under a forest canopy (Helms 1998) or in recently disturbed forests (fig. 18). This includes all woody and non-woody herbaceous cover. The structure and composition of understory vegetation has a major role in the ecological functioning of a forest by influencing wildlife habitat, soil stability, wildfire behavior, and overall forest health (Moir 1993). Forest Inventory and Analysis field crews sample understory vegetation on all forested plots (fig. 19). Total cover is estimated for tree seedlings and saplings as well as the most common shrubs, forbs, and graminoids. Field crews in Washington identified 977 unique species of vascular understory plants during the first annualized inventory cycle (2002–2011), which included 45 trees, 165 shrubs, 616 forbs, and 151 graminoids. The most common understory vascular plant is western swordfern, which accounts for 57 percent of all forb cover within the state (fig. 20). Shrub cover is dominated by salal, vine maple, salmonberry, and common snowberry, which collectively make up 46 percent of all shrub cover. The average percentage cover of understory vegetation in Washington's hardwood forests tends to be greater than cover in softwood forests (figs. 21 and 22). Softwood forests have a slightly greater percentage of seedling and sapling cover, while hardwood forests have a higher percentage of shrub, forb, and graminoid cover (fig. 21).

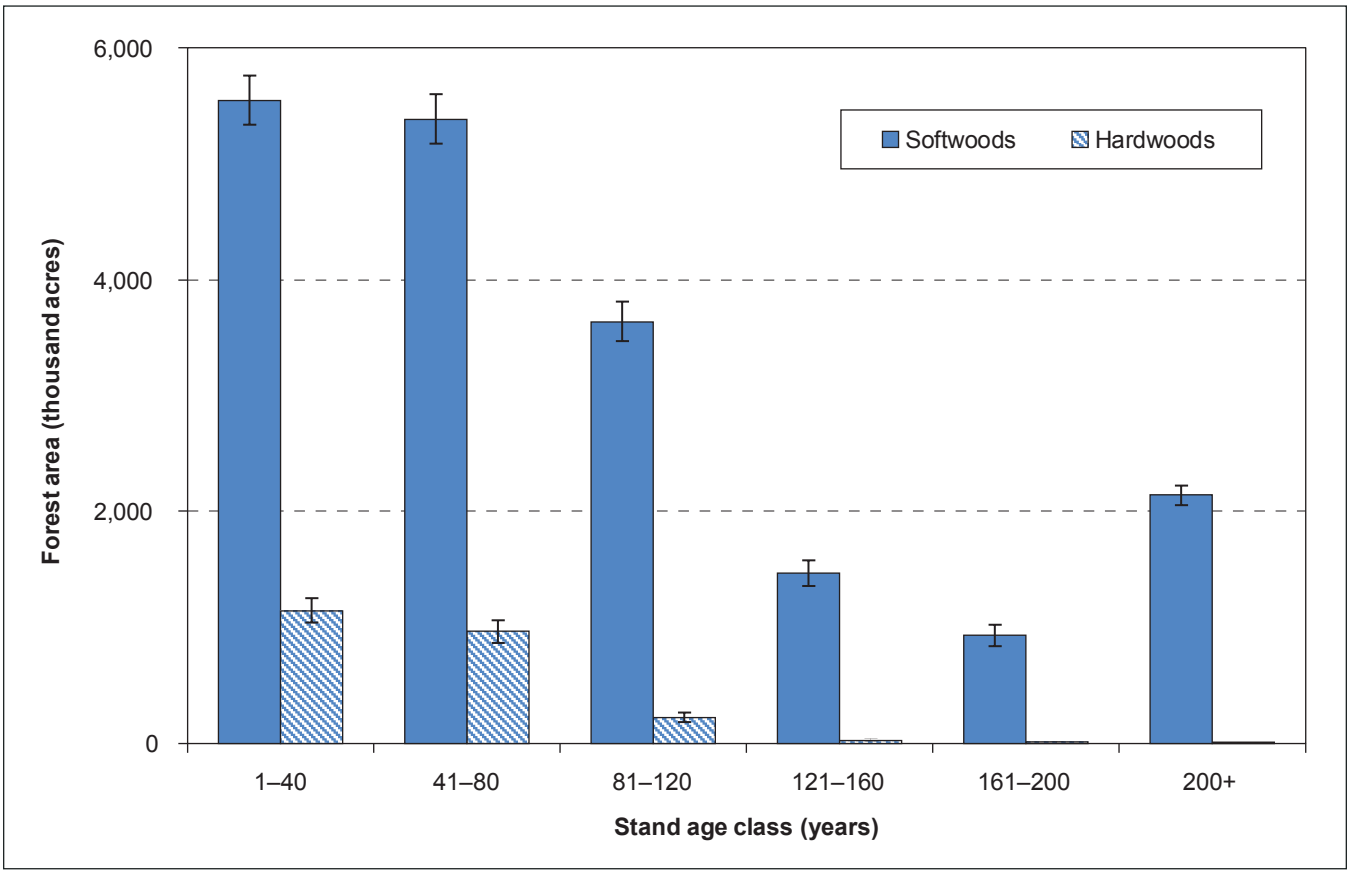

Figure 13—Forest area by stand age class for softwood and hardwood forest types, Washington, 2002–2011.

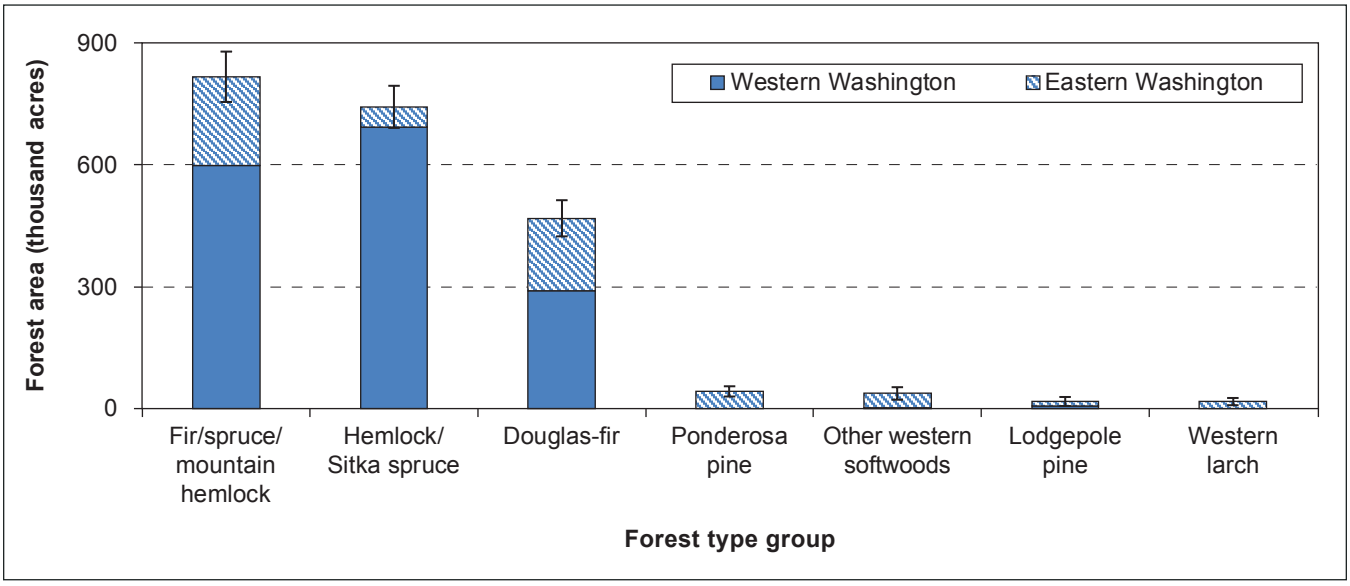

Figure 14—Forest area of stands greater than 200 years old by forest type group, Washington, 2002–2011.

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Figure 15—Large-diameter trees in Olympic National Park, Washington.

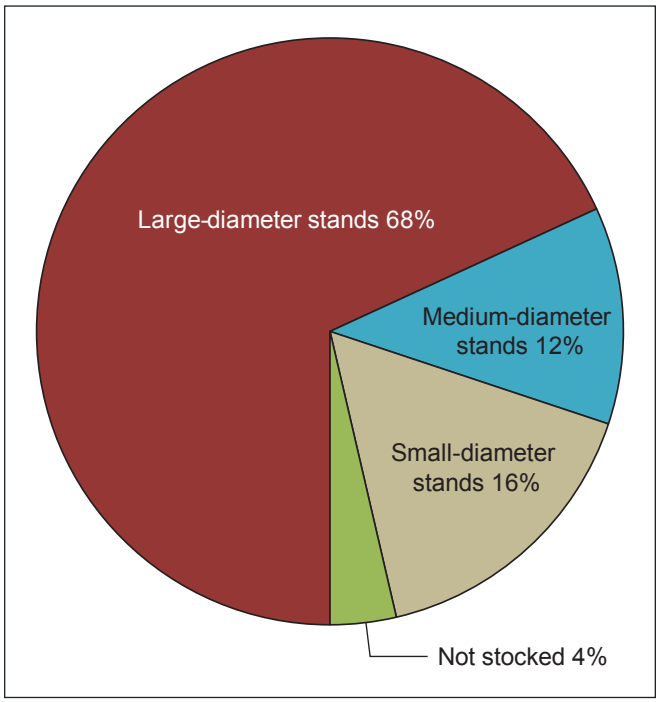

Figure 16—Percentage of forest stands by diameter class, Washington, 2002–2011. Diameter classes are defined as large diameter, ≥11.0 inches diameter at breast height (d.b.h) for hardwoods or ≥9.0 inches d.b.h for softwoods; medium diameter, 5.0 to 10.9 inches d.b.h. for hardwoods or 5.0 to 8.9 inches d.b.h. for softwoods; small diameter, <5.0 inches d.b.h.

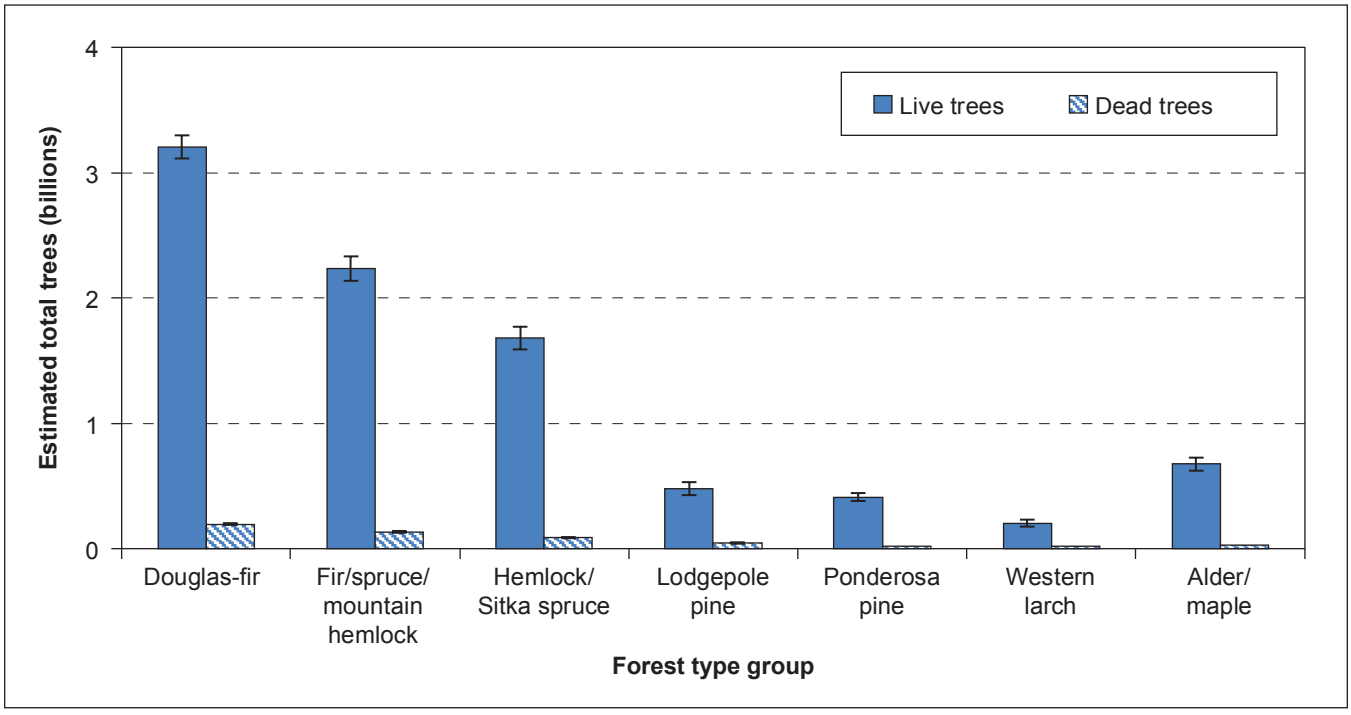

Figure 17—Total live and dead trees by forest type group, Washington, 2002–2011.

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Figure 18—Common understory vegetation in Washington (clockwise from top left: salal, Pacific trillium, western swordfern, vine maple).

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Figure 19—Field crew collecting vegetation data.

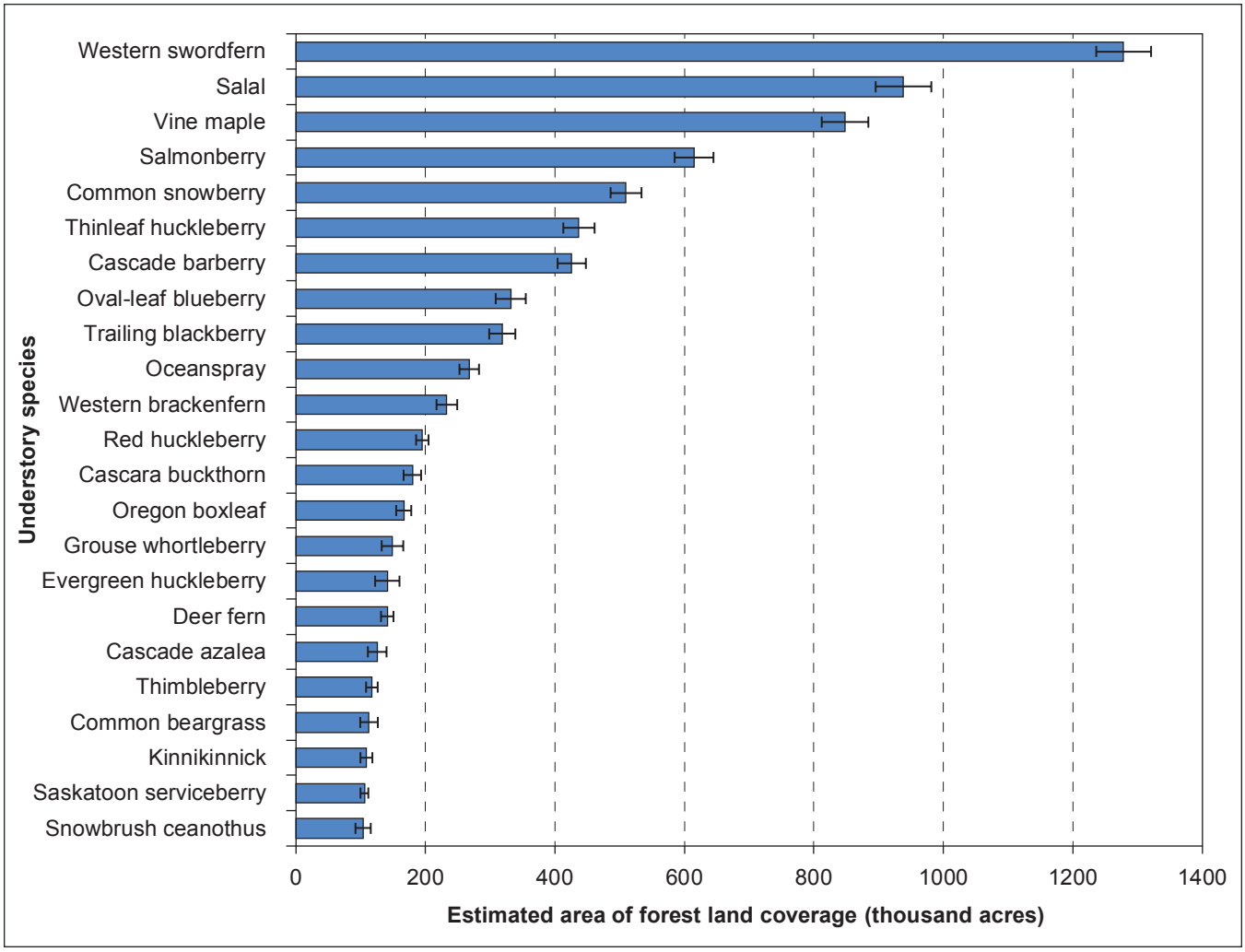

Figure 20—Total cover of forest land by understory species, Washington, 2002–2011. Species with at least 100,000 ac understory cover are shown.

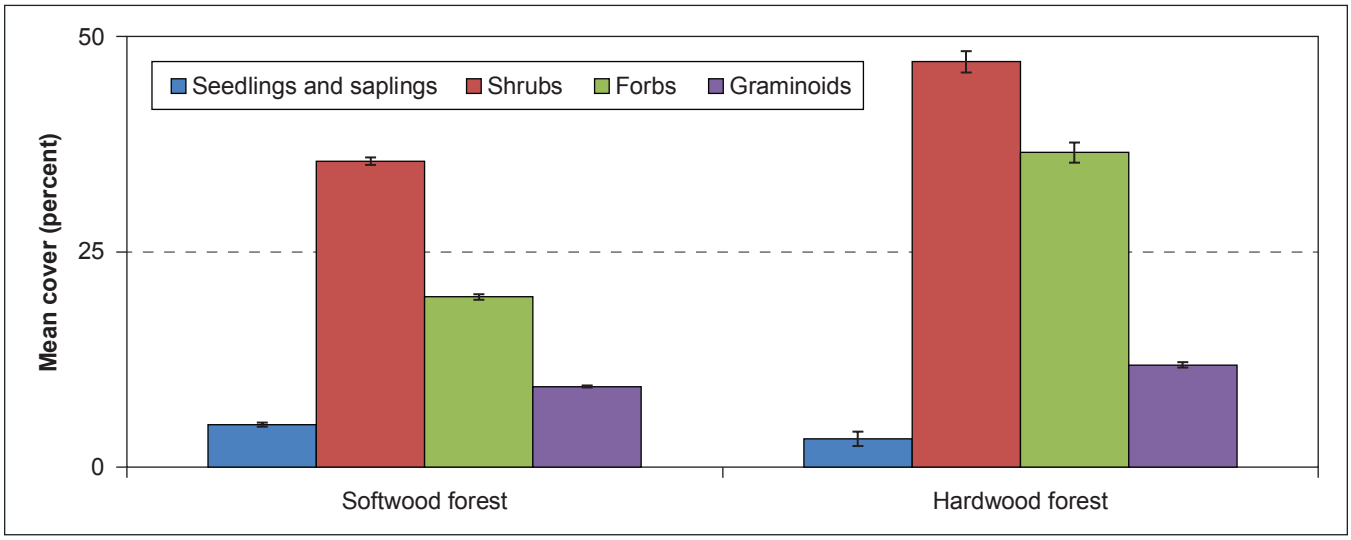

Figure 21—Mean cover of understory vegetation by life form in softwood and hardwood forests, Washington, 2002–2011.

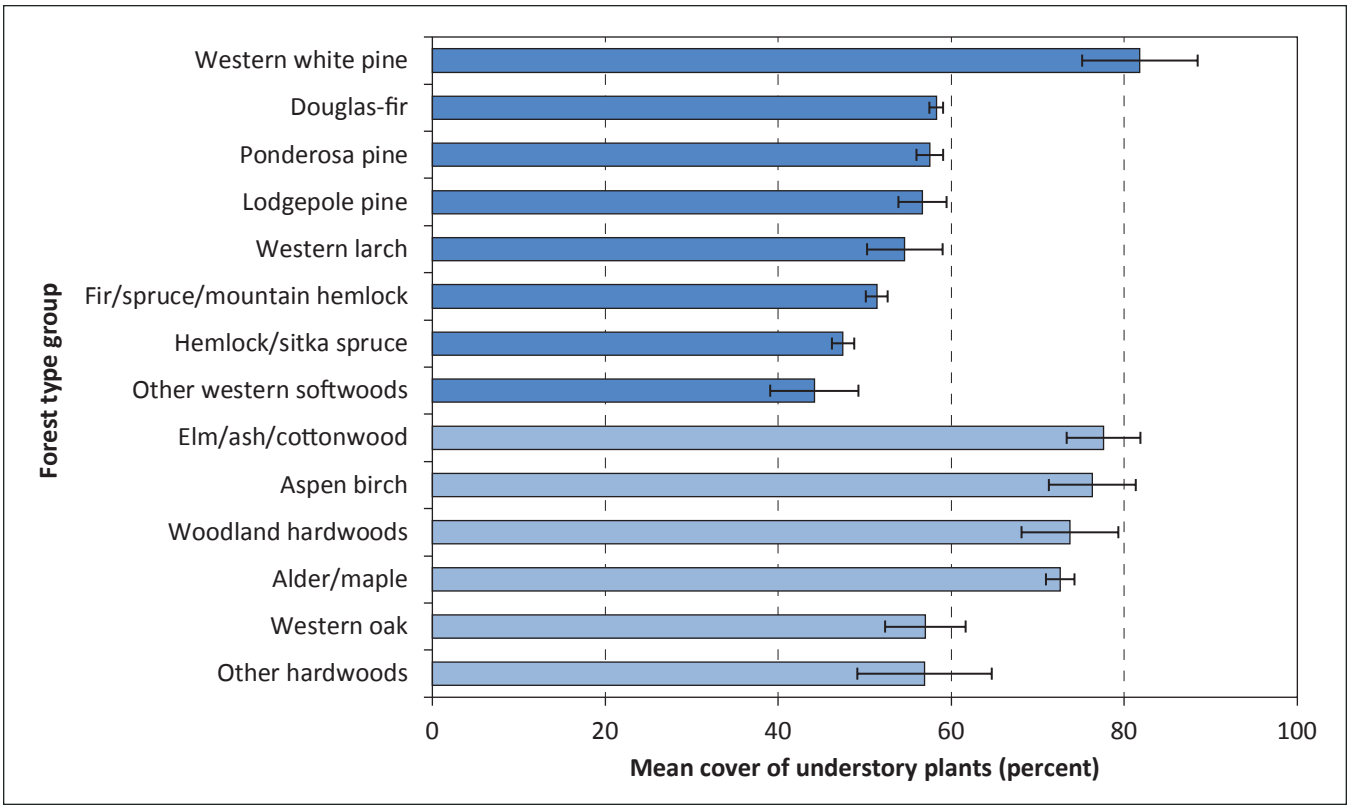

Figure 22—Mean total cover of understory vegetation by forest type group, Washington, 2002–2011.

Forest Ownership

The FIA program uses a nonbiased systematic sampling grid that includes all landowners: federal government, state and local government, private corporate, and private noncorporate. Just as Washington's forests are diverse, so too are the individuals and groups that own them. Ownership strongly influences management practices; identifying patterns and trends in forest land ownership helps project the current state and future direction of forested ecosystems within the state. In addition, FIA's National Woodland Owner Survey (NWOS) periodically collects survey data from individuals, families, and unincorporated groups who own forestlands or woodlands.

Washington contains a substantial amount of public land. More than 44 percent of the state's forest land is managed by federal agencies, and almost 13 percent of forest land is managed by state and local governments. Major federal forest land managers include the National Park Service and the U.S. Forest Service (figs. 23 and 24). Almost one-third of all federally managed land is held in reserved status, precluded by statute from management for the production of wood products (fig. 25). The Washington Department of Natural Resources is the primary state land management agency and oversees almost 3 million acres of forest land.

Amy Jesswein

Figure 23—The majority of forest land in Washington is publicly owned. The National Park Service is a major federal forest land manager.

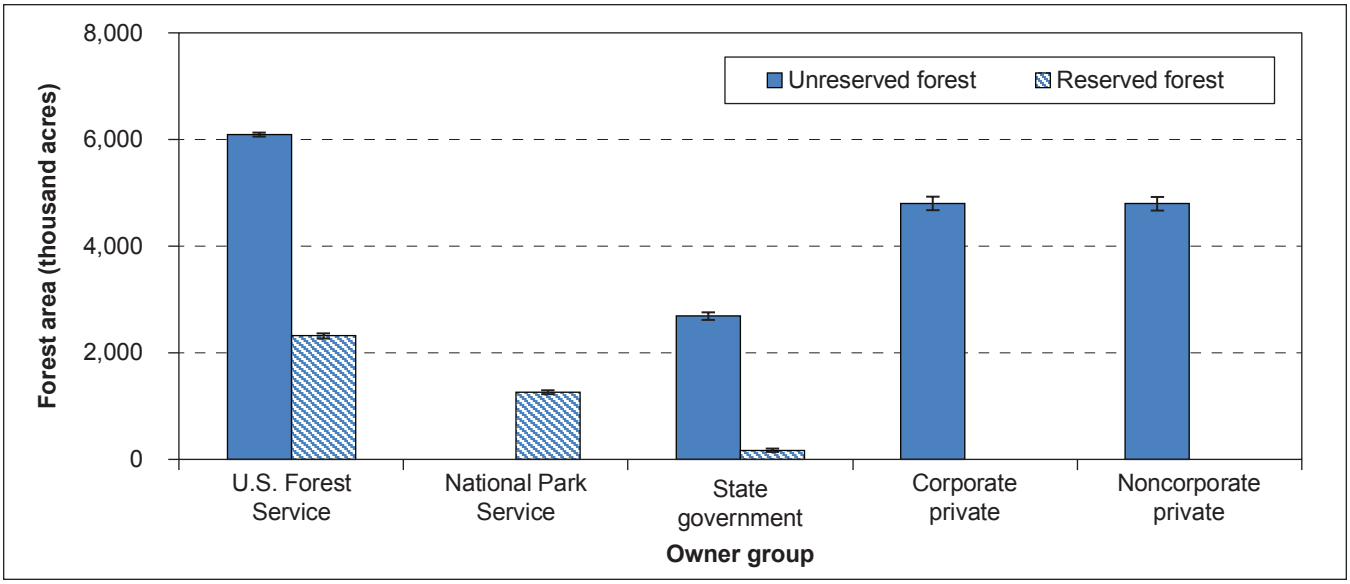

Figure 24—Reserved and unreserved forest area by owner group, Washington, 2002–2011.

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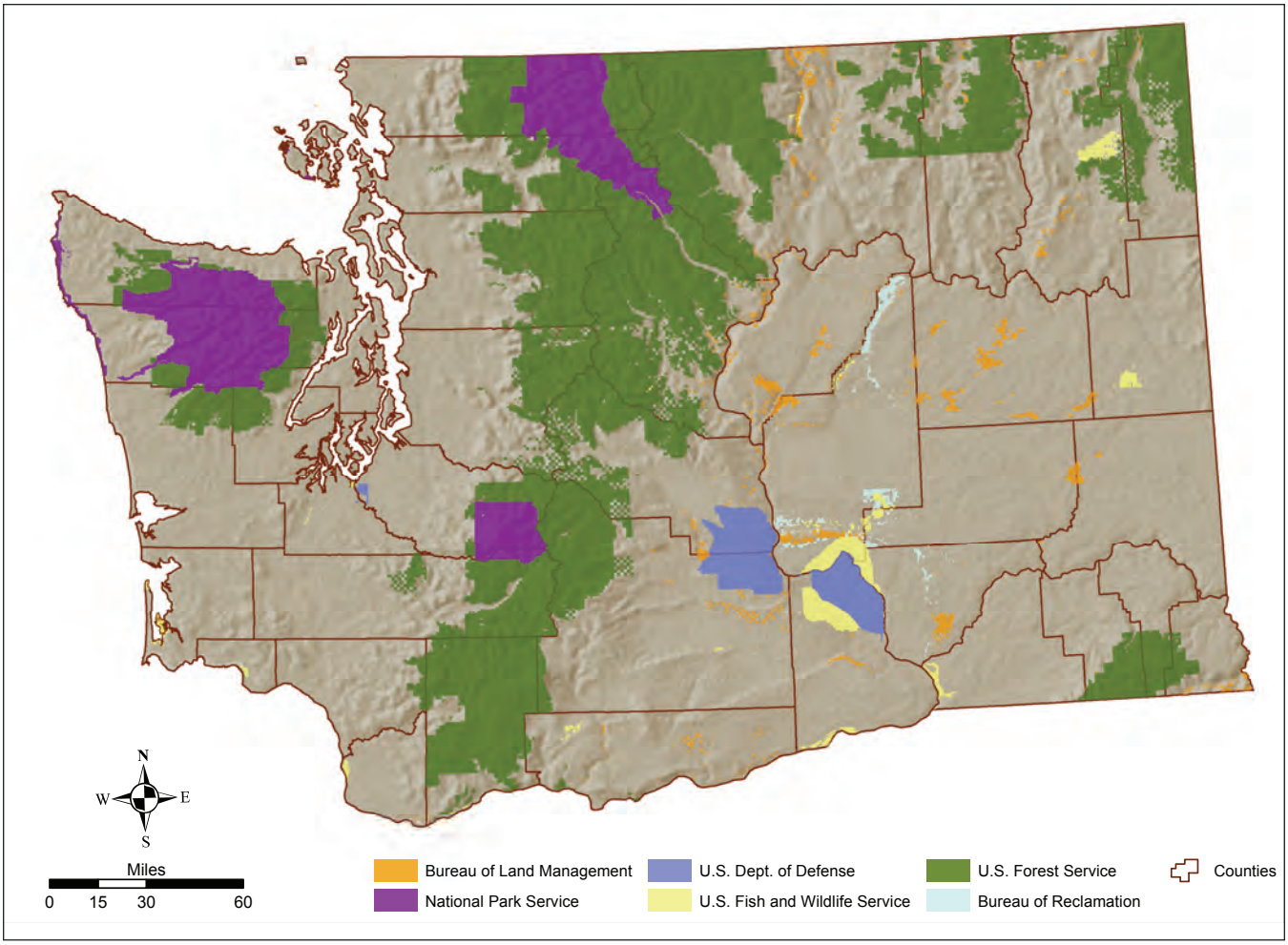

Figure 25—Federal land management agencies in Washington, 2011 (Bureau of Land Management, Oregon-Washington state office).

In Washington, 43 percent of forest is privately owned, of which half is managed by corporations focused on commercial timber production. Recently, some large, publicly owned timber companies reorganized into real estate investment trusts (REITs) and timberland investment management organizations (TIMOs). The REITs directly own forest land, whereas TIMOs manage lands owned by investors. The REITs and TIMOs own forest land as investment vehicles that compete with and complement alternative investments; these entities may or may not own wood-processing facilities. Noncommercial private landowners can be split into two groups: (1) family forest owners, which manage 11.7 percent of forest; and (2) non-governmental conservation organizations, unincorporated partnerships, clubs, and American Indian tribal ownerships that manage an estimated 9.7 percent of forest.

The NWOS focuses on family forest owners' attitudes, management objectives, and concerns related to current and future forest ownership and management (Butler et al. 2016). Washington responses indicate the average forest holding was 46 ac, tenure of ownership was 27 years, and age of primary owner was 61.8 years. The primary owner was usually male (78.4 percent) and white (98.6 percent). By total ownerships responding, the most common reasons for owning forest were as a primary residence, privacy, and to enjoy beauty or scenery (table 1). Timber sales during the 5 years preceding the survey occurred on 31 percent of family-owned forest acres. Primary forestry activities included the cut and removal of trees for personal use, reduction of invasive plants, and reduction of fire hazard. The most common concerns cited by this landowner group were high property taxes and wildfire (table 2). Washington NWOS results from the 2011 through 2013 survey are not statistically significant owing to small sample size.[2]

Volume, Biomass, and Carbon

Tree volume is a metric by which forest productivity and structure can be assessed and modeled to examine current forest conditions and project future forest status. Tree diameter and height measurements collected by ground-based field crews are used to produce volume estimates for single trees, which are then extrapolated to assess volume for entire forested stands. Volume estimates can then be used in additional models to study forest biomass and carbon storage. Forest volume, biomass, and carbon estimates in Washington are diverse and differ by forest type, ecological section, and management objectives (figs. 26 and 27).

Washington has an estimated 92.3 billion cubic feet of net merchantable volume in live trees on forest land, which equates to an average of 4,127 $ft^3 \cdot ac^{-1}$ (per acre). The western hemlock/Sitka spruce forest type has the greatest mean live tree net volume at 7,355 $ft^3 \cdot ac^{-1}$ (per acre). In contrast, western oak averages 955 $ft^3 \cdot ac^{-1}$ (per acre). Western Washington's forests contain greater mean live tree net volume per acre than eastern Washington's forests across all forest type groups (fig. 28). Overall, coniferous (softwood) forests contain 92 percent of live net cubic volume, of which Douglas-fir accounts for 40 percent (fig. 29).

The majority of total live tree volume is managed by the U.S. Forest Service, while the National Park Service has the greatest average net live tree volume per acre (fig. 30). Across all ownerships, two-thirds of forest volume is located on unreserved land, but the average volume per acre on reserved land is almost twice that of unreserved land. Forests managed by agencies such as the U.S. Forest Service and National Park Service have the majority of net live tree volume in larger diameter classes, while private and state- and local-managed lands have the majority of live tree volume in smaller diameter classes (fig. 31). These metrics are driven by location of forest (productive or unproductive sites), forest management objectives, and history of past disturbance.

Aboveground forest biomass is composed of standing live and dead trees as well as woody debris found on the forest floor. Biomass estimates derived from FIA data are used as inputs to quantify the distribution of carbon stocks and estimate net primary production. The total aboveground forested biomass in Washington is estimated at 2.4 billion tons, with softwood forest types having 12 times the amount of biomass as hardwood forest types. Douglas-fir contributes the most biomass across the state, while western hemlock/Sitka spruce forests contain the most carbon per unit area (fig. 32). Total biomass and carbon storage estimates in western Washington forests are more than twice those in eastern Washington forests (fig. 33).

[2] Butler, B.J.; Hewes, J.H.; Dickinson, B.J.; Andrejczyk, K.; Butler, S.M.; Markowski-Lindsay, M. Unpublished results from the USFS, National Woodland Owner Survey for family forest and woodland ownerships with 10+ acres, 2011–2013. On file with: USDA Forest Service, Northern Research Station, 11 Campus Blvd., Suite 200, Newtown Square, PA 19073.

Table 1—Estimated area and number of family forest and woodland ownerships (10+ acres) by reason for ownership, National Woodland Owner Survey Washington, 2011–2013[a]

	Totals				Percentages				
Reason[b]	Acres	SE	Ownerships	SE	Acres	SE	Ownerships	SE	Number of responses
	Thousands				*Percent*				
To enjoy beauty or scenery	1,600	141	35	6	74.1	8	71.9	15.5	63
To protect nature or biological diversity	1,346	140	30	5	62.4	7.5	63.1	14.3	53
To protect water resources	1,372	140	27	5	64.3	7.7	55.8	13	54
To protect or improve wildlife habitat	1,397	141	27	5	64.7	7.6	56.6	12.9	55
For land investment	1,270	139	24	5	58.1	7.2	49.6	12.8	50
It is part of my home site/ primary residence	1,397	141	40	7	64	7.5	83.7	18.2	55
It is part of my cabin or vacation home site	381	93	3	1	18.1	4.5	6	2.5	15
It is part of my farm or ranch	813	124	14	4	38.1	6.3	30.1	9.5	32
For privacy	1,295	139	37	7	61.4	7.7	76.9	17.6	51
To raise my family	914	129	26	6	43.4	6.7	53.5	14.6	36
To pass land on to my children or other heirs	1,524	141	28	5	69.8	7.7	58.7	13.3	60
For firewood	660	116	12	3	31	5.8	24.9	7.7	26
For timber products	1,092	135	14	4	50.6	7	29.1	9.1	43
For nontimber products	178	66	5	2	8.2	3.1	11.4	5.4	7
For hunting	483	102	8	3	22.6	5	16.7	7.8	19
For recreation, other than hunting	838	125	13	4	39.8	6.5	27.8	8.6	33
Other	76	44	3	2	3.5	2	5.8	4	3
No answer[c]	—	—	—	—	—	—	—	—	0

SE = standard error; — = not available.

[a] Numbers include ownerships that rated an objective as very important or important on a five-point Likert scale.

[b] Categories are not mutually exclusive.

[c] Includes only ownerships that responded to none of the items above. Number of ownerships not responding differs for each item and are excluded from the percentages accordingly.

Table 2—Estimated area and number of family forest and woodland ownerships (10+ acres) by ownership concern, Washington 2011–2013[a]

	Totals				Percentages				
Concern[b]	Acres	SE	Ownerships	SE	Acres	SE	Ownerships	SE	Number of responses
	Thousands				*Percent*				
Air pollution	524	110	12	4	25.3	5.6	26.6	10.2	19
Damage or noise from off-road vehicles	882	132	14	4	42.7	7	33.2	11.5	32
Damage from animals	441	103	7	3	20.8	5	15.8	8.1	16
Development of nearby lands	1,075	139	25	6	52	7.6	56.3	16.2	39
Drought or lack of water	689	122	13	4	33.8	6.4	29.7	10.8	25
Global climate change	661	120	13	4	31.2	6	30.3	10.7	24
High property taxes	1,571	146	36	7	75	8.6	82.4	20.1	57
Invasive plant species	1,543	146	29	6	72.7	8.3	65.1	16	56
Keeping land intact for future generations	1,681	145	29	5	78.2	8.3	64.4	15.4	61
Misuse of forest/woodland, such as dumping	1,599	146	32	6	75.3	8.4	72.3	18	58
Trespassing or poaching	1,599	146	32	6	74.4	8.2	71.1	17.1	58
Unwanted insects or diseases	1,488	146	26	5	71.1	8.4	58.9	14.7	54
Water pollution	1,185	142	20	5	56.6	7.8	45.5	12.7	43
Wildfire	1,819	144	33	6	84.6	8.5	73	16.8	66
Wind or ice storms	827	130	17	5	40	6.8	39	12.1	30
Other	138	61	1	1	6.4	2.8	3.3	2.6	5
No answer[c]							0		

SE = standard error.

[a] Numbers include ownerships that rated an issue a great concern or concern on a five-point Likert scale.

[b] Categories are not mutually exclusive.

[c] Includes only ownerships that responded to none of the items above. Number of ownerships not responding differs for each item and are excluded from the percentages accordingly.

Amy Jesswein

Figure 26—Washington old-growth forest.

Jessica Deans

Figure 27—Open, grown forest on the Colville Reservation, northeastern Washington.

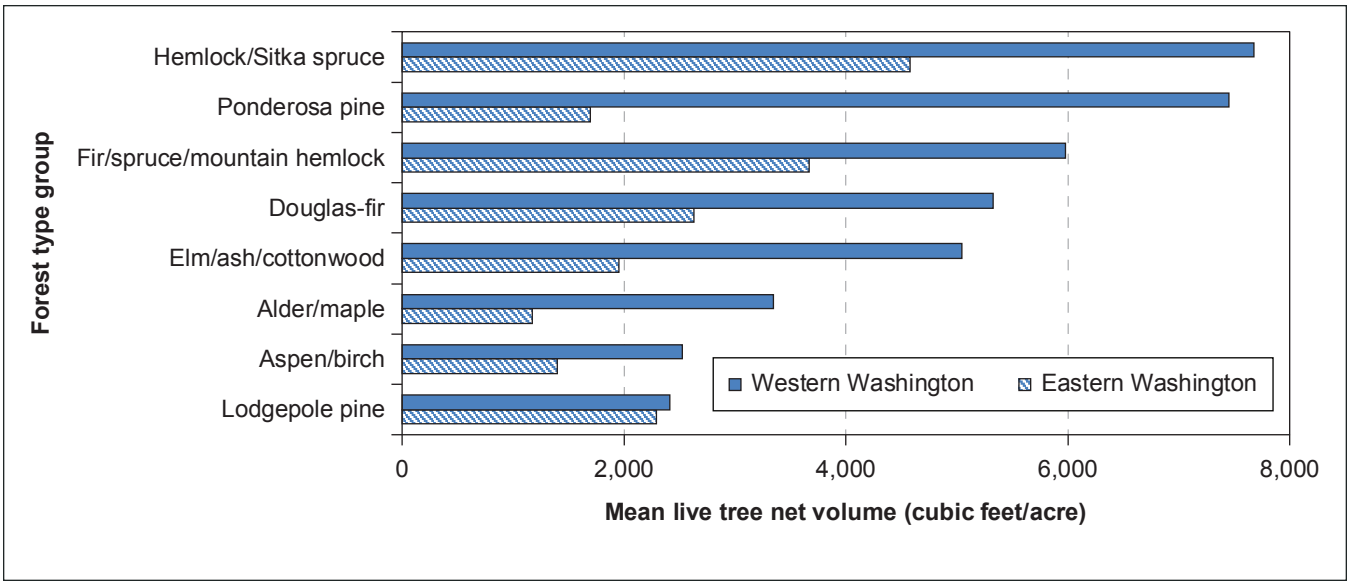

Figure 28—Mean net live tree volume per acre on forest land by forest type group, Washington, 2002–2011.

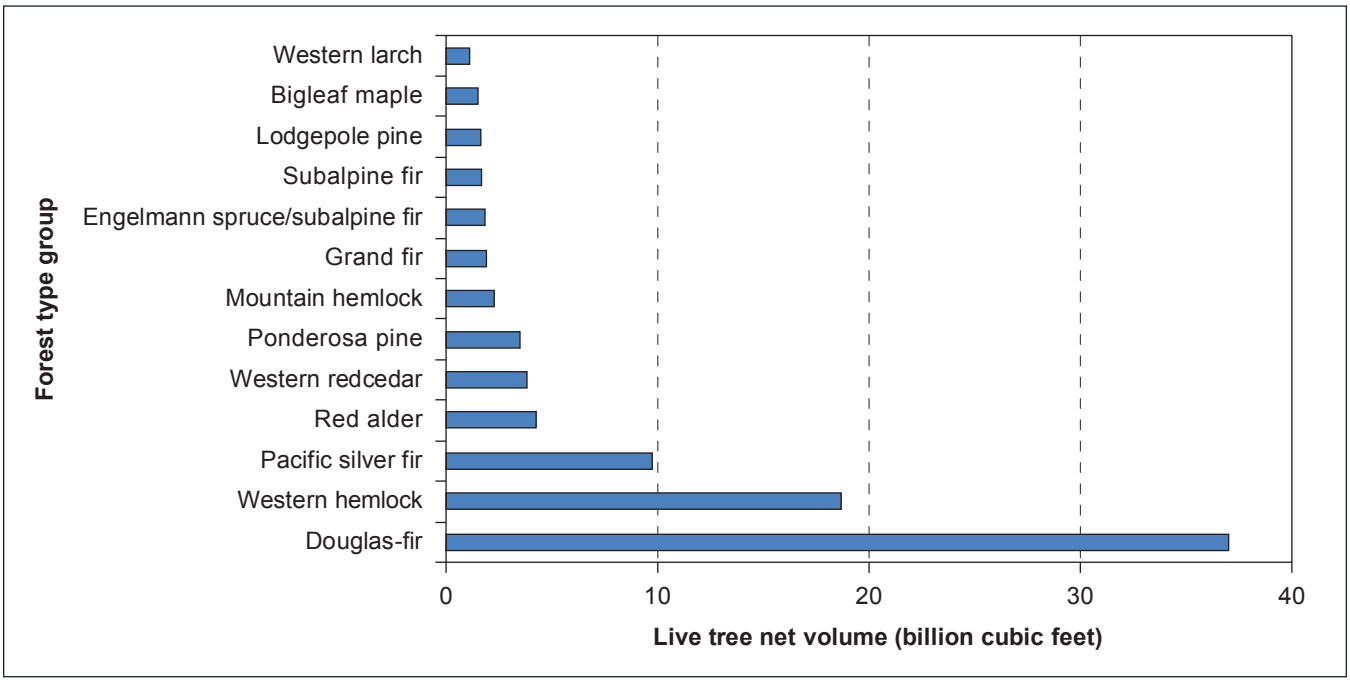

Figure 29—Total live tree net volume by forest type, Washington, 2002–2011. Forest types with less than 1 billion net cubic feet not shown.

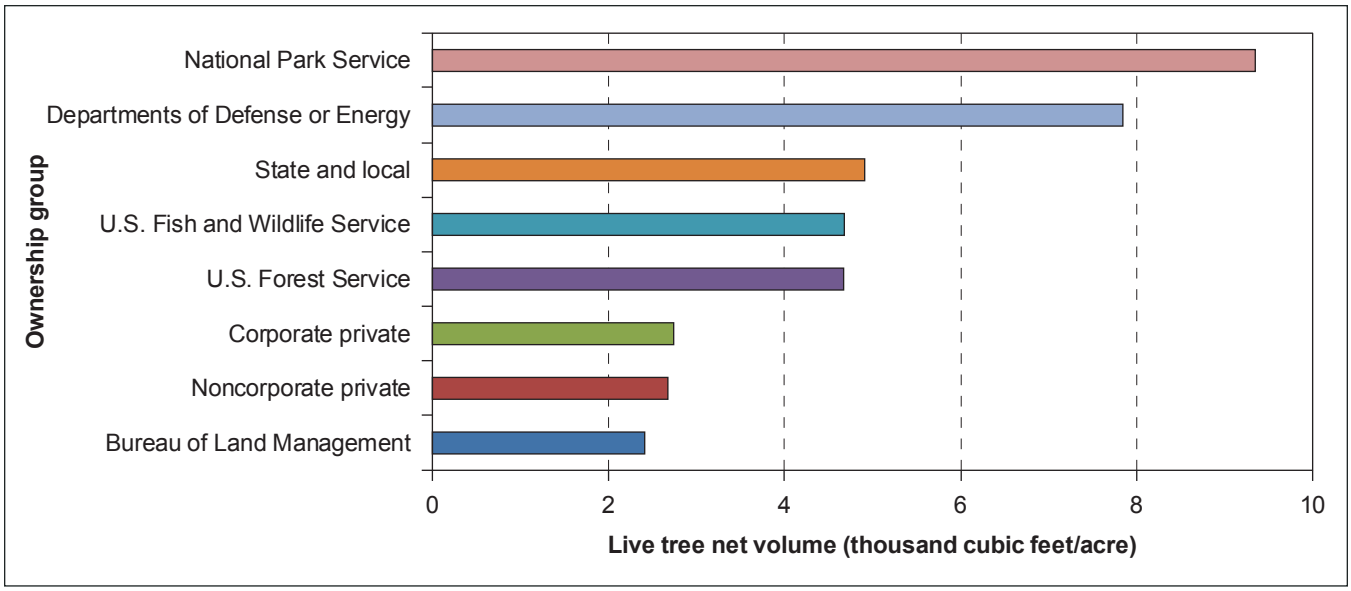

Figure 30—Live tree net volume per acre by ownership, Washington, 2002–2011.

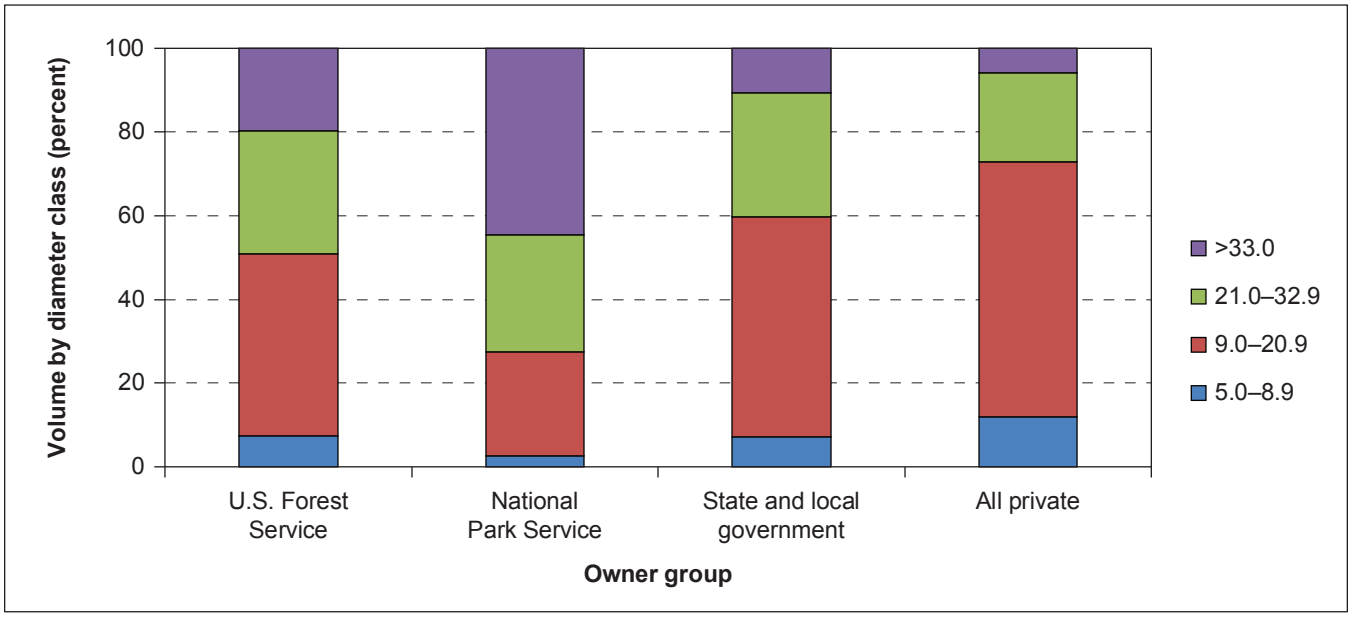

Figure 31—Percentage of live tree net volume by diameter class and owner group, Washington, 2002–2011.

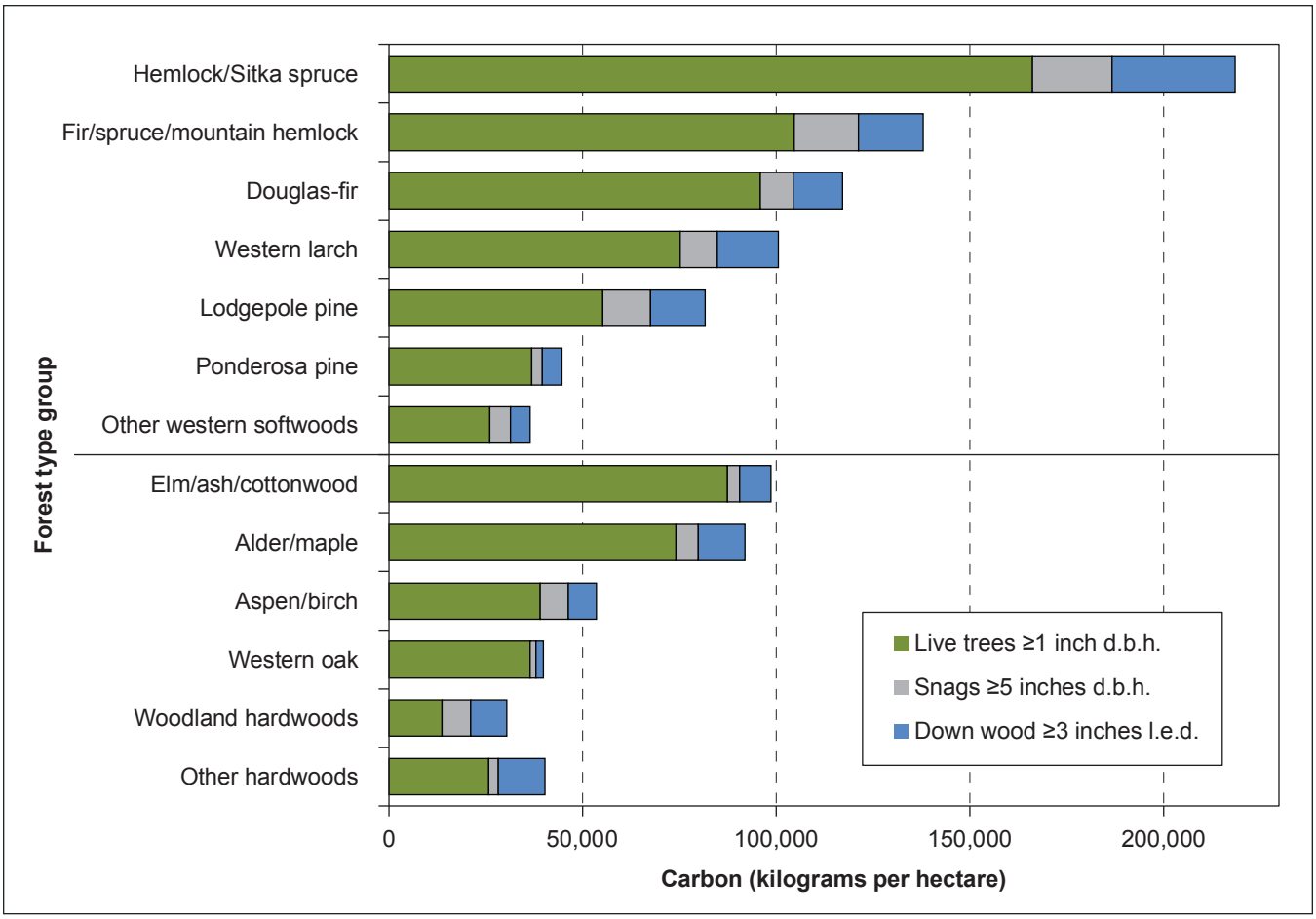

Figure 32—Average aboveground carbon per hectare by forest type group, Washington, 2002–2011; d.b.h = diameter at breast height; l.e.d. = large-end diameter.

J. Chase

Figure 33—Estimated live tree biomass (dry tons per acre) in Washington, 2002–2011 (forest/nonforest geographic information system layer: Blackard et al. 2008; landcover layer: U.S. Geological Survey (USGS) Multi-Resolution Land Characteristics Consortium National Land Cover Dataset, Homer et al. 2007; relief layer: USGS National Elevation Dataset, Gesch et al. 2002). Forest biomass represents the aboveground woody biomass of trees in tons per acre. This biomass is the accumulated oven-dry weight of the stem, bark, stump, top, and live woody branches. The biomass of foliage, cones, fruits, and roots was not calculated and is not included in this estimate of aboveground biomass.

Annual Tree Growth, Removals, and Mortality in Washington

Changes in wood volume over time are of interest as an aspect of sustainability and can be explained by examining growth, removals, and mortality of trees. These components are key factors in understanding how management, ecology, and climate change interact across the landscape. It is important to take into account that private forests are distinctly different from public forests in management practice as well as vegetation type, productivity, and topographic location. For example, the U.S. Forest Service manages vast areas of wilderness and other reserved land that cannot be compared directly with privately owned forests managed for production of wood products (fig. 34).

When the sum of all tree removals and mortality exceeds growth, total tree volume declines. In small areas, removals undertaken to reduce fire hazard or deter pest infestations may sometimes exceed growth in the short run. This trend, however, may be reversed in the long run by protecting against catastrophic mortality. Conversely, widespread mortality caused by bark beetles, for example, may offset growth gains and thus prevent or delay attainment of a stand's desired future condition and reduce the production of ecological benefits such as sequestration of carbon or economic benefits such as forest products.

Previously, FIA conducted a forest inventory between 2000 and 2001 on private, state, and local government timberland in Washington (Gray et al. 2005, 2006). Owing to numerous differences between the current inventory and those prior measurements, comparing this inventory's volume estimates with those published from previous inventories will not produce valid change estimates. Differences include, for example, sampling different areas (forest land vs. timberland, with or without reserved land) and using different definitions (e.g., growing stock). To estimate volume change despite these differences, we estimated net change based on revisited plots, relying on the algorithms and definitions of today's annual inventory. Between 2007 and

Glenn Burkhart

Figure 34—Timber harvest, Washington.

2011, FIA remeasured a subset of the 2000–2001 inventory (355 plots). The remeasurement period ranged from 6 to 11 years with an average of 8.5 years. We estimated growth, removals, and mortality using a subset of remeasured trees from the remeasured plots that were alive in 2000–2001 and 5 inches or more diameter at breast height (d.b.h.).

The U.S. Forest Service Pacific Northwest Region installed a separate grid of plots on national forest lands in Washington (i.e., not including lands administered by Idaho Panhandle National Forest) between 1993 and 1997 (Max et al. 1996), and remeasured them between 1998 and 2007. A change inventory was compiled using FIA procedures and classification from subsequent remeasurements using annualized FIA procedures (Gray and Whittier 2014). The mean remeasurement interval on the 3,224 plots used in this analysis was 7.1 years.

Privately Owned Timberland: Change Between 2000–2001 and 2007–2011

In western Washington, growth on private timberland was 131.2 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ (table 3). Industrial (corporate) timberland is more productive then noncorporate timberland (148.4 versus 93.6 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ of growth) (fig. 35). Although mortality rates are higher on noncorporate timberland (42.6 versus 33.5 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$, respectively), removals per acre are almost twice as high on corporate timberland (100.3 versus 65.7 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) and almost 3½ times in absolute terms (349 versus 105 million $ft^3 \cdot yr^{-1}$ (cubic feet per year)). Overall, growth exceeded mortality and removals on corporate private timberland (14.6 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$), but did not on noncorporate private timberland (-14.7 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). However, neither change is statistically significant.

Private timberland in eastern Washington is almost half as productive as timberland in western Washington (60.6 versus 131.19 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) (fig. 35). Noncorporate timberland and corporate timberland are similarly productive (59.0 versus 65.8 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) and have about the same amount of mortality (14.9 versus 13.9 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) and removals (34.1 versus 38.4 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). However, in absolute terms, noncorporate timberland has almost three times as much timber removal as corporate timberland in eastern Washington (76 versus 27 million $ft^3 \cdot yr^{-1}$) (table 4), likely because there is over twice as much noncorporate acreage. On corporate and noncorporate timberland, growth exceeded removals and mortality (13.5 versus 10.0 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). Neither change, however, is statistically significant.

State and Local Government: Change Between 2000–2001 and 2007–2011

On average, state- and local- government owned timberland was as productive as corporate timberland in western Washington (147.4 compared to 148.4 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) and eastern Washington (63.8 compared to 65.8 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). Although growth exceeded removals and mortality by 7.2 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ in western Washington and 4.3 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ in eastern Washington, it was not statistically significant (fig. 35). Mortality rates were relatively high compared to private land (51.9 versus 28.4 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). Similar changes were detected in biomass (table 5).

U.S. Forest Service Timberland: Change Between 1993–1997 and 1998–2007

Growth on timberland managed by the U.S. Forest Service averages 85.0 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$, which was less productive than either state and local or private timber holdings (fig. 36). Forest Service timberland in western Washington was more productive (104.9 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) than in eastern Washington (57.0 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) (tables 6 and 7). Mortality on U.S. Forest Service timberland (42.7 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) was lower than state and local timberland (52.0 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) and comparable to private timberland mortality (28.5 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$). Removals on U.S. Forest Service timberland (4.5 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) was an order of magnitude lower than removals on state and local or private timberland, with a net result of large increases in wood volume on U.S. Forest Service lands. Geographic and land use patterns of change in biomass were similar to those of volume.

Table 3—Average annual volume (cubic feet) growth, removals, and mortality per acre per year on nonnational forest timberland, Washington, 2000–2001 and 2007–2011

	Other federal		State and local		Private					
					Corporate		Noncorporate		Total private	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Cubic feet per acre per year									
Eastern Washington timberland[a]:										
Growth	20.82	0	63.82	11.59	65.83	16.50	59.01	7.48	60.64	6.97
Mortality	—	—	35.81	14.11	13.93	4.93	14.91	3.18	14.68	2.67
Removals	—	—	23.73	21.71	38.41	25.06	34.14	16.17	35.16	12.62
Net change	20.82	0	4.28	25.92	13.49	34.79	9.96	18.33	10.8	15.58
Western Washington timberland:										
Growth	68.74	14.40	147.36	16.16	148.42	13.14	93.63	16.20	131.19	10.47
Mortality	15.99	21.39	60.51	13.38	33.5	8.04	42.62	15.77	36.37	7.36
Removals	11.67	15.60	79.65	41.28	100.28	25.86	65.7	36.98	89.41	21.19
Net change	41.08	35.22	7.20	43.80	14.64	32.06	-14.69	44.64	5.41	25.94
Total:										
Growth	50.23	16.74	118.42	11.53	134.59	11.5	73.48	8.08	105.42	7.14
Mortality	9.81	13.96	51.95	10.04	30.23	6.76	26.49	6.83	28.45	4.79
Removals	7.16	10.18	60.28	28.08	89.92	21.94	47.33	18.11	69.59	14.25
Net change	33.26	22.43	6.19	30.00	14.44	27.33	-0.34	21.49	7.38	17.42

— = not available; SE = standard error.

[a] Ingrowth trees and trees 5 inches or greater at first measurement.

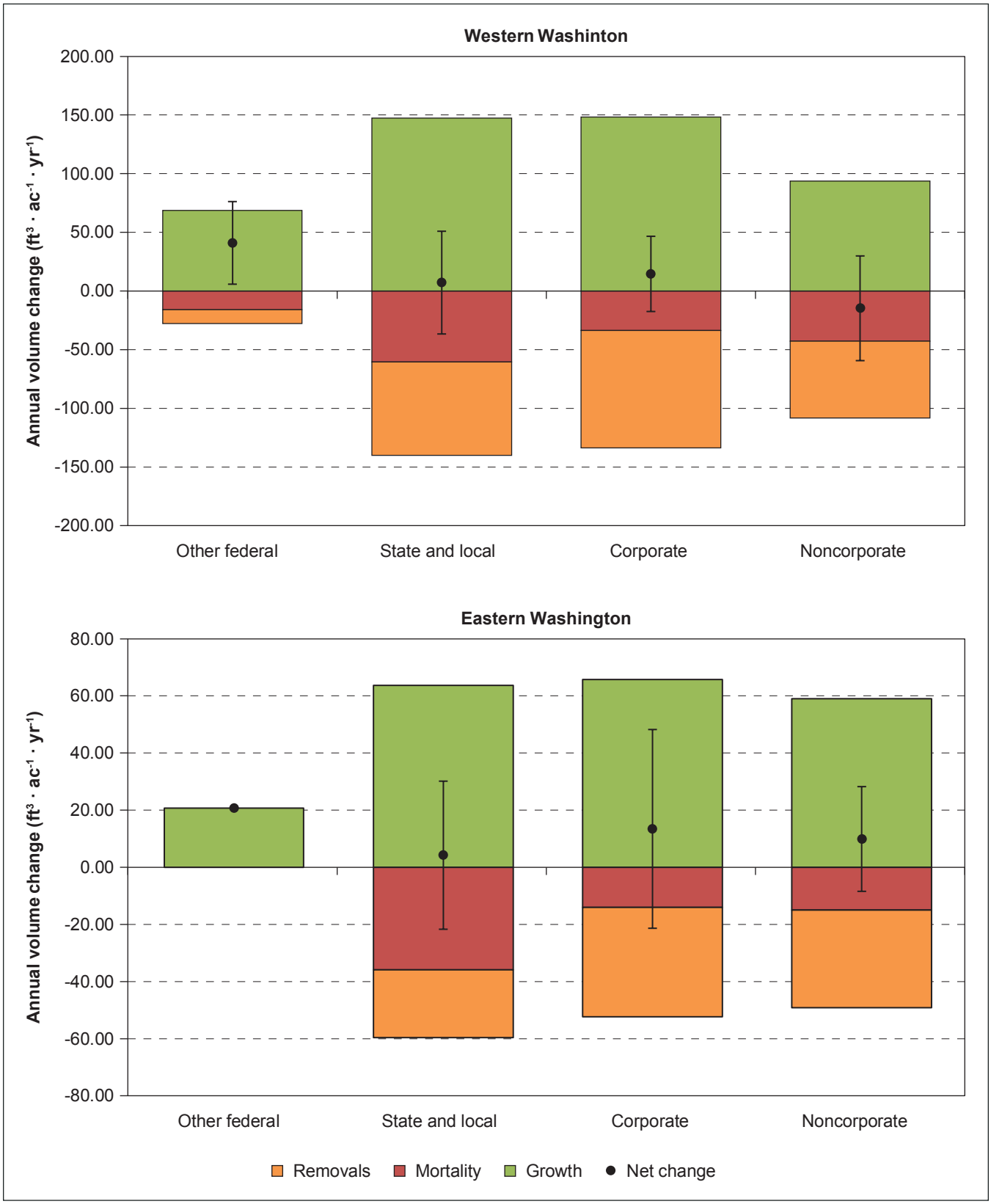

Figure 35—Average annual change in volume (cubic feet) of growth, removals and mortality per acre per year on nonnational forest timberland between 2000–2001 and 2007–2011 by ownership in Washington (error bars represent sampling error).

Table 4—Average annual volume (cubic feet) growth, removals, and mortality per year on nonnational forest timberland, Washington, 2000–2001 and 2007–2011

	Other federal		State and local		Private					
					Corporate		Noncorporate		Total private	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Thousand cubic feet per year									
Eastern Washington timberland[a]:										
Growth	701	770	55,308	10,793	46,044	14,209	131,067	18,922	177,111	23,391
Mortality	—	—	31,032	12,438	9,745	4,077	33,125	7,190	42,870	8,080
Removals	—	—	20,569	19,169	26,866	18,344	75,824	36,816	102,690	36,734
Net change	701	770	3,708	22,419	9,433	24,316	22,118	40,627	31,551	45,756
Western Washington timberland:										
Growth	3,674	2,329	240,979	28,506	516,298	50,850	149,342	28,920	665,641	54,306
Mortality	855	1,252	98,948	22,323	116,550	28,376	67,984	25,207	184,534	37,782
Removals	624	914	130,255	68,559	348,850	89,324	104,789	60,079	453,640	107,649
Net change	2,196	2,295	11,776	71,559	50,898	111,792	-23,431	71,234	27,467	131,626
Total:										
Growth	4,375	2,453	296,288	30,481	562,342	52,798	280,410	34,560	842,752	59,130
Mortality	855	1,252	129,980	25,554	126,295	28,668	101,110	26,212	227,404	38,636
Removals	624	914	150,823	71,188	375,716	91,189	180,613	70,462	556,330	113,744
Net change	2,896	2,421	15,484	74,989	60,331	114,405	-1,313	82,005	59,018	139,352

— = not available; SE = standard error.

[a] Ingrowth trees and trees 5 inches or greater at first measurement.

Table 5—Average annual biomass (tons) growth, removals, and mortality per acre per year on nonnational forest timberland, Washington, 2000–2001 and 2007–2011

	Other federal		State and local		Private					
					Corporate		Noncorporate		Total private	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Short tons per acre per year									
Eastern Washington timberland[a]:										
Growth	0.40	0.40	1.06	0.20	1.19	0.30	1.01	0.12	1.05	0.12
Mortality	—	—	0.59	0.24	0.29	0.11	0.29	0.06	0.29	0.05
Removals	—	—	0.35	0.32	0.64	0.41	0.57	0.26	0.59	0.20
Net change	0.40	0.40	0.11	0.38	0.25	0.58	0.14	0.30	0.17	0.26
Western Washington timberland[a]:										
Growth	1.34	0.30	2.73	0.30	2.81	0.25	1.79	0.31	2.49	0.20
Mortality	0.31	0.31	1.18	0.26	0.63	0.14	0.79	0.28	0.68	0.13
Removals	0.23	0.23	1.49	0.77	1.85	0.48	1.19	0.67	1.64	0.39
Net change	0.79	0.65	0.07	0.82	0.33	0.60	—	—	0.17	0.48
Total:										
Growth	0.97	0.33	2.15	0.21	2.54	0.22	1.33	0.15	1.96	0.14
Mortality	0.19	0.19	0.98	0.19	0.57	0.12	0.50	0.12	0.54	0.09
Removals	0.14	0.14	1.10	0.52	1.65	0.40	0.83	0.32	1.26	0.26
Net change	0.64	0.42	0.08	0.55	0.32	0.51	0.00	0.38	0.17	0.32

— = not available; SE = standard error.

[a] Ingrowth trees and trees 5 inches or greater at first measurement.

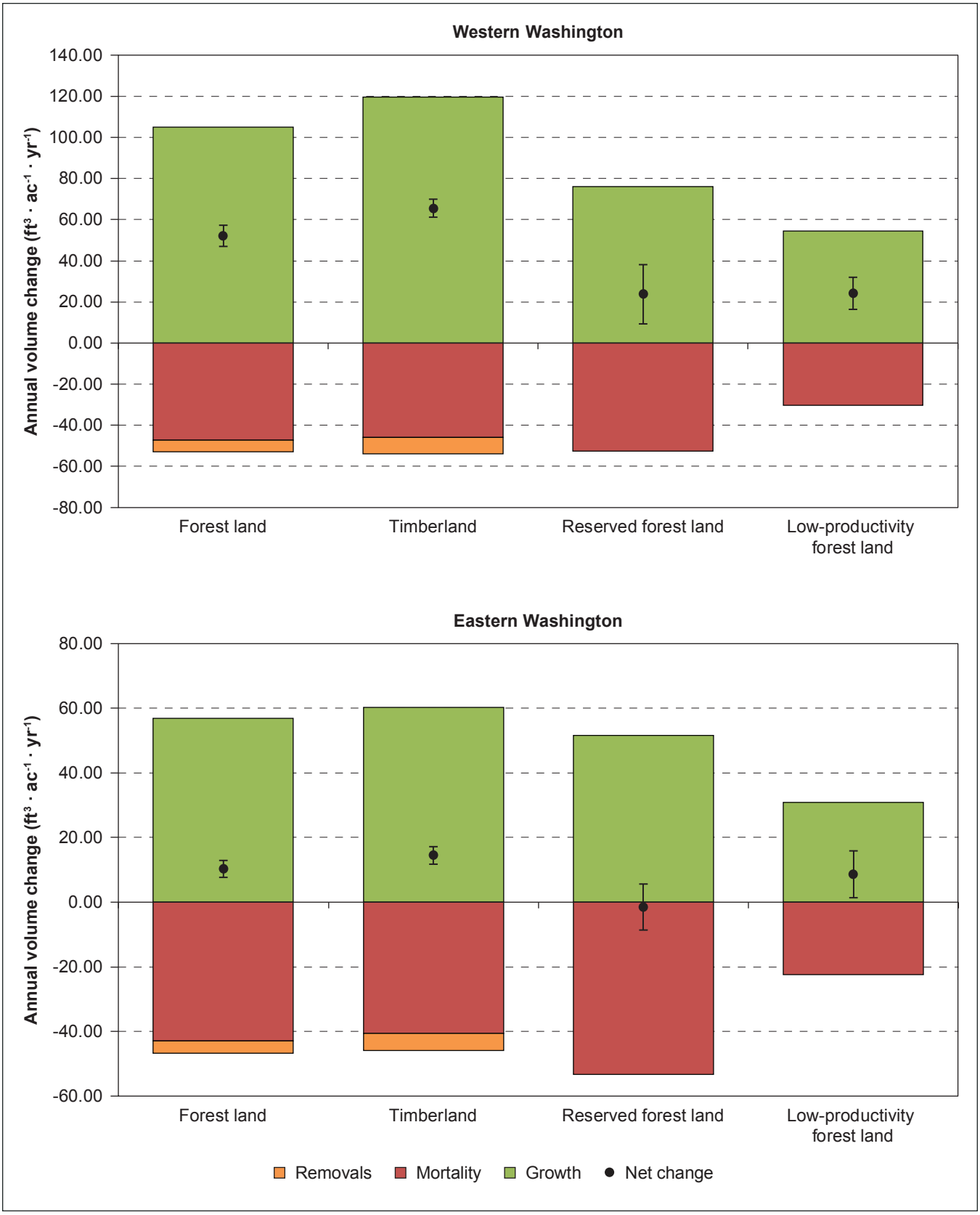

Figure 36—Average annual change in volume (cubic feet) of growth, removals, and mortality per acre per year on national forest land between 1993–1997 and 1998–2007 by ownership in Washington (error bars represent sampling error).

Table 6—Average annual volume (cubic feet) growth, removals, and mortality per acre per year on National Forest System land, Washington, 1993–1997 and 1998–2007

	Forest land		Timberland		Reserved forest land		Low-productivity forest land	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Cubic feet per acre per year							
Eastern Washington:								
Growth	56.95	1.00	60.33	0.99	51.71	2.85	30.98	2.80
Mortality	42.85	2.33	40.52	2.29	53.21	6.69	22.35	7.01
Removals	3.80	0.80	5.34	1.13	—	—	—	—
Net change	10.30[a]	2.62	14.47[a]	2.71	-1.50	7.12	8.63	7.25
Western Washington:								
Growth	104.90	1.70	119.50	1.93	76.14	3.44	54.33	5.58
Mortality	47.26	4.71	45.81	2.68	52.41	14.90	30.14	7.42
Removals	5.50	2.07	8.11	3.04	—	—	—	—
Net change	52.14[a]	5.15	65.58[a]	4.37	23.73[a]	14.40	24.19[a]	7.80
Total:								
Growth	77.53	0.93	85.04	1.01	63.23	2.25	39.06	2.82
Mortality	44.74	2.42	42.73	1.74	52.83	7.88	25.04	5.27
Removals	4.53	1.00	6.49	1.43	—	—	—	—
Net change	28.26[a]	2.68	35.82[a]	2.42	10.40	7.80	14.02[a]	5.49

— = not available; SE = standard error.

[a] Estimate is significant, different from zero at the 95 percent significance level.

Table 7—Average annual volume (cubic feet) growth, removals, and mortality per year on National Forest System land, Washington, 1993–1997 and 1998–2007

	Forest land		Timberland		Reserved forest land		Low-productivity forest land	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Thousand cubic feet per year							
Eastern Washington:								
Growth	259,908	5,257	195,926	3,614	57,888	3,975	6,093	843
Mortality	195,550	10,904	131,588	7,538	59,566	7,798	4,395	1,451
Removals	17,337	3,668	17,337	3,668	—	—	—	—
Net change	47,021[a]	11,961	47,001[a]	8,812	-1,679	7,970	1,698	1,439
Western Washington:								
Growth	360,029	6,504	278,299	5,158	76,076	4,396	5,654	956
Mortality	162,195	16,275	106,694	6,293	52,365	15,016	3,136	878
Removals	18,879	7,089	18,879	7,089	—	—	—	—
Net change	178,954[a]	17,699	152,726[a]	10,291	23,711[a]	14,416	2,518[a]	881
Total:								
Growth	619,936	7,951	474,225	6,205	133,963	5,470	11,748	1,274
Mortality	357,745	19,483	238,282	9,801	111,931	16,814	7,532	1,696
Removals	36,217	7,981	36,217	7,981	—	—	—	—
Net change	225,975[a]	21,406	199,727[a]	13,548	22,032	16,530	4,216[a]	1,688

— = not available; SE = standard error.
[a] Estimate is significant, different from zero at the 95 percent significance level.

U.S. Forest Service Reserved Forest Land: Change Between 1993–1997 and 1998–2007

Growth on reserved forests under U.S. Forest Service management averaged 76.1 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ in western Washington and 51.7 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ in eastern Washington. Western Washington reserved forest land growth was similar to growth seen on western Washington nonindustrial private timberland (93.6 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$) (fig. 37). There was no significant difference between growth and mortality on eastern Washington U.S. Forest Service reserved forest land, resulting in no net change in volume. Net volume change in western Washington U.S. Forest Service reserved forest was 23.7 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$, which is greater than western Washington state and local, and private timberlands (7.2 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$ and 5.4 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$, respectively). Similar changes were detected in biomass (table 8).

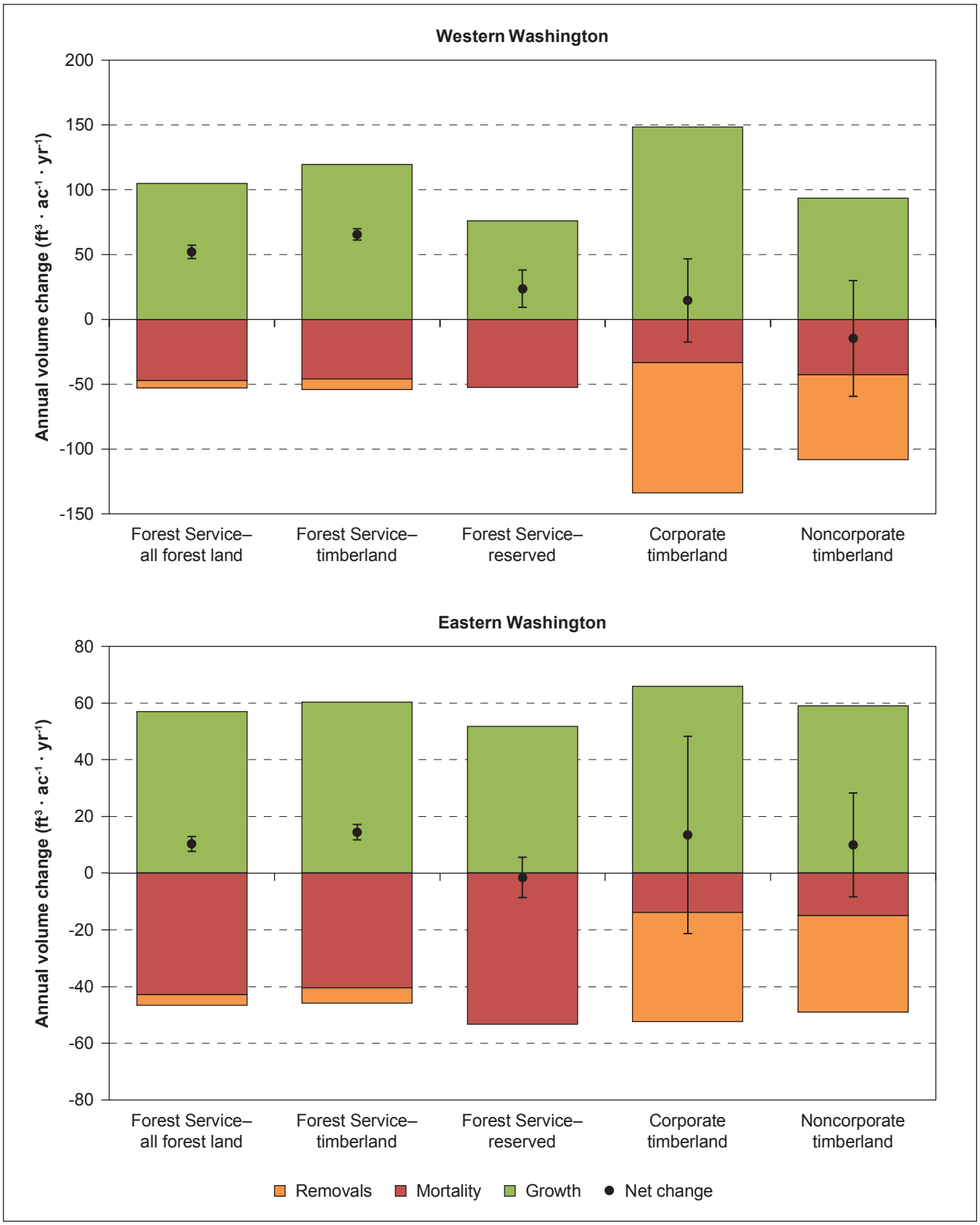

Figure 37—Combined average annual change in volume (cubic feet) of growth, removals, and mortality per acre per year on national forest land between 1993–1997 and 1998–2007 by land status compared to privately owned timberland between 2000–2001 and 2007–2011 in Washington (error bars represent sampling error). Note that although volume changes are on an annual per-acre basis, Forest Service estimates of change cover a different timeframe than private timberland.

Table 8—Average annual biomass (tons) growth, removals, and mortality per acre per year on National Forest System land, Washington, 1993–1997 and 1998–2007

	Forest land		Timberland		Reserved forest land		Low-productivity forest land	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Short tons per acre per year							
Eastern Washington:								
Growth	1.02	0.02	1.10	0.02	0.88	0.05	0.54	0.05
Mortality	0.81	0.04	0.78	0.04	0.97	0.12	0.42	0.11
Removals	0.07	0.01	0.10	0.02	—	—	—	—
Net change	0.13[a]	0.05	0.21[a]	0.05	-0.09	0.12	0.13	0.12
Western Washington:								
Growth	1.96	0.03	2.26	0.04	1.37	0.06	0.97	0.11
Mortality	0.97	0.09	0.96	0.05	1.05	0.29	0.62	0.14
Removals	0.10	0.03	0.15	0.05	—	—	—	—
Net change	0.89[a]	0.10	1.15[a]	0.08	0.33	0.27	0.35[a]	0.15
Total:								
Growth	1.42	0.02	1.58	0.02	1.11	0.04	0.69	0.05
Mortality	0.88	0.05	0.86	0.03	1.00	0.15	0.49	0.09
Removals	0.09	0.02	0.12	0.02	—	—	—	—
Net change	0.46[a]	0.05	0.60[a]	0.04	0.11	0.14	0.20[a]	0.09

— = not available; SE = standard error.
[a] Estimate is significant, different from zero at the 95 percent significance level.

Forest Health

Forests are complex ecosystems, composed of plants, animals, fungi, and nonbiotic elements. Trees dominate forested landscapes, but less obvious components such as fungi and soil microbes are also important (Molina 1994), with each piece of the system playing a role in creating a balanced and healthy environment. Healthy forests sequester carbon from the atmosphere and provide long-term carbon storage (Harmon et al. 1990) as well as remove pollutants to improve air quality (Nowak et al. 2013). In Washington, forests comprise nearly half of the land area, and the health of these forests affects the surrounding environments. Changing climate patterns, forest management activities, and growing human populations influence these forests. Some impacts on forest health such as wildfire are high profile, and clear lines can be drawn to how impacts affect the surrounding environment. Other forest health issues such as root disease are less discrete yet just as ubiquitous. Consistent monitoring and reporting of trends in forest health are important to ensure informed management decisions are made by local and regional forest managers.

Wildfire

Wildfire is a naturally occurring forest disturbance in Washington and is particularly important in eastern Washington where the historical fire regime in many areas consisted of frequent, low-intensity surface fires in forests dominated by widely spaced, fire-tolerant trees such as ponderosa pine (Cooper 1960). Land use and land management changes that began in the late 19th century (e.g., fire suppression, timber harvest, grazing, and road construction) have driven the development of a new fire regime in eastern Washington, consisting of higher intensity wildfire and tree mortality (Agee 1994, Everett et al. 2000) (fig. 38).

The FIA program estimates wildfire occurrence and impact on forested land by analyzing field crew measurements and associated year of wildfire disturbance. Between 1995 and 2009, the estimated average annual area of forest burned in Washington was 66,017 ac (<0.3 percent of forested land). Estimated annual area of forest disturbed by wildfire statewide ranged from 17,000 ac in 1996 to more than 261,000 ac in 2006 (fig. 39). Wildfire impact on forests in eastern Washington was greater, with annual mean area disturbed by wildfire at 64,228 ac, compared to 1,789 ac in western Washington.

Brian Gasper

Figure 38—Eastern Washington wildfire.

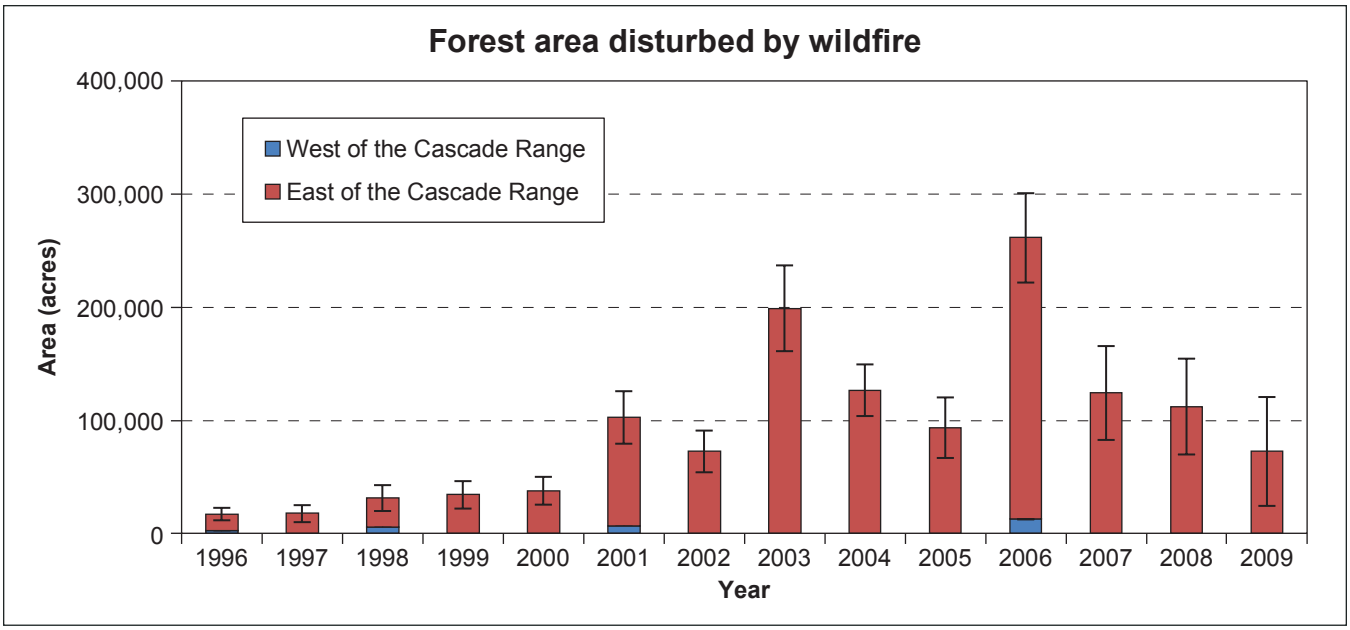

Figure 39—Estimated forest land area disturbed by wildfire based on Forest Inventory and Analysis field observations and associated year of disturbance, Washington, 1996–2009.

Root Disease

Four primary root diseases are responsible for most of the damage to timber in Washington state: laminated root rot, *Armillaria* root disease, annosus root disease, and black stain root disease (Hadfield et al. 1986) (fig. 40). All tree species are affected by one or more root-destroying fungi, and root disease is thought to be associated with at least 18 percent of the annual conifer mortality in the Western United States (Hadfield et al. 1986). Unlike insect infestation (e.g., bark beetles), it is often difficult to recognize that root disease is affecting a tree because root fungi are not easily seen. Root disease may be detected by symptoms in tree crowns such as yellowing of foliage or loss of needles but can only be accurately identified by digging to expose tree roots. These root diseases are naturally occurring and important for nutrient cycling. However, some of these diseases, such as annosus root disease, are causing more damage than in the past in response to human forest management activities (e.g., timber harvest and fire suppression).

In Washington, FIA field crews identified root disease on more than 22 percent of all sampled forested plots, resulting in an estimated 5.6 billion cubic feet of live tree gross volume with root disease damage. *Armillaria* was the most prevalent root disease, occurring on almost 15 percent of plots, followed by laminated root rot (5 percent of plots) and annosus root disease (1 percent of plots). Observations of root disease are evenly distributed across forested areas of the state (fig. 41). A little more than half of all observations were in Douglas-fir forest, despite Douglas-fir covering only 46 percent of Washington's forests (fig. 42).

Janelle Cossey

Figure 40—Laminated root rot.

J. Thompson

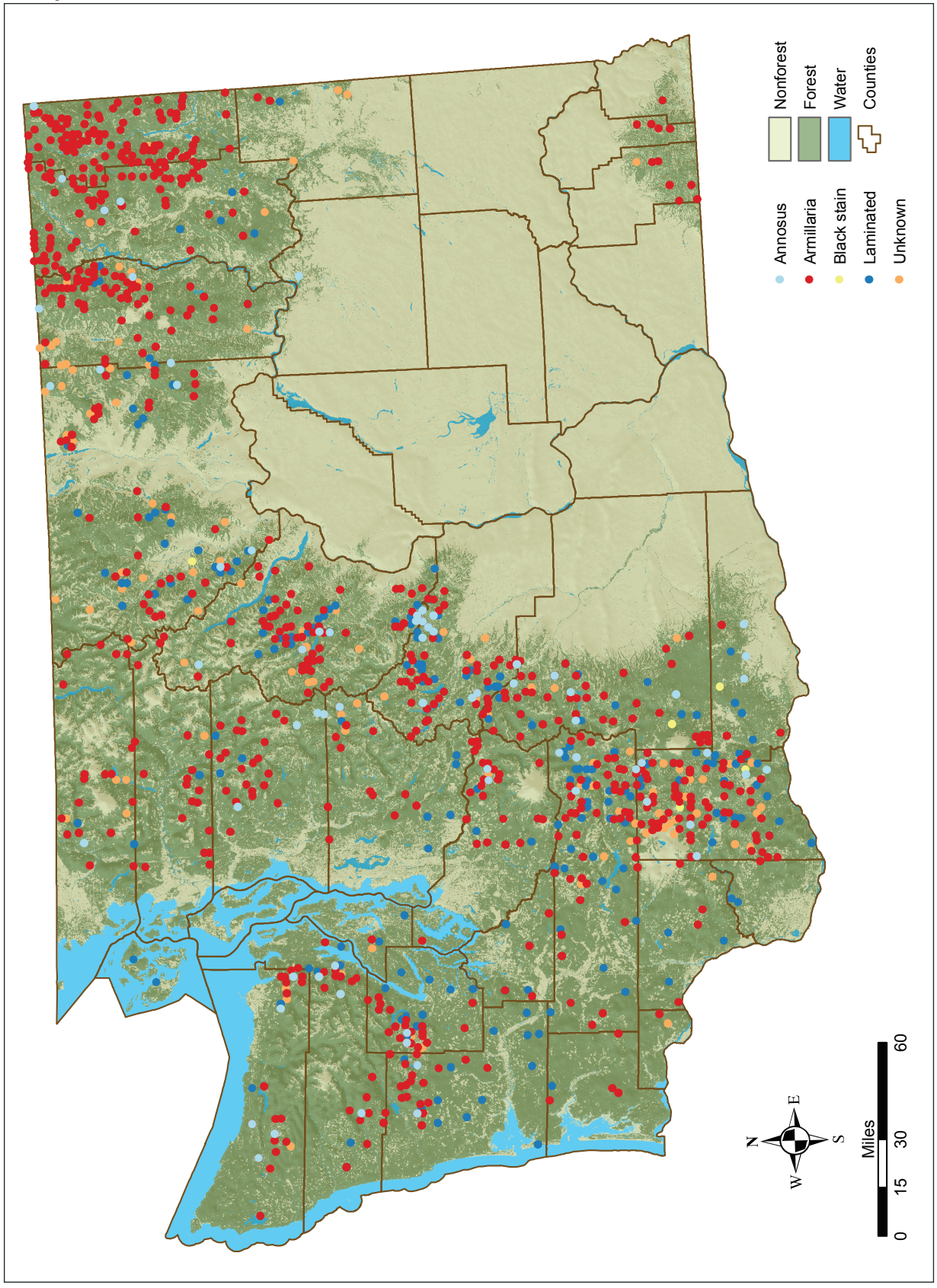

Figure 41—Distribution of root disease observations on Forest Inventory and Analysis plots in Washington, 2002–2011 (forest/nonforest geographic information system layer: Blackard et al. 2008).

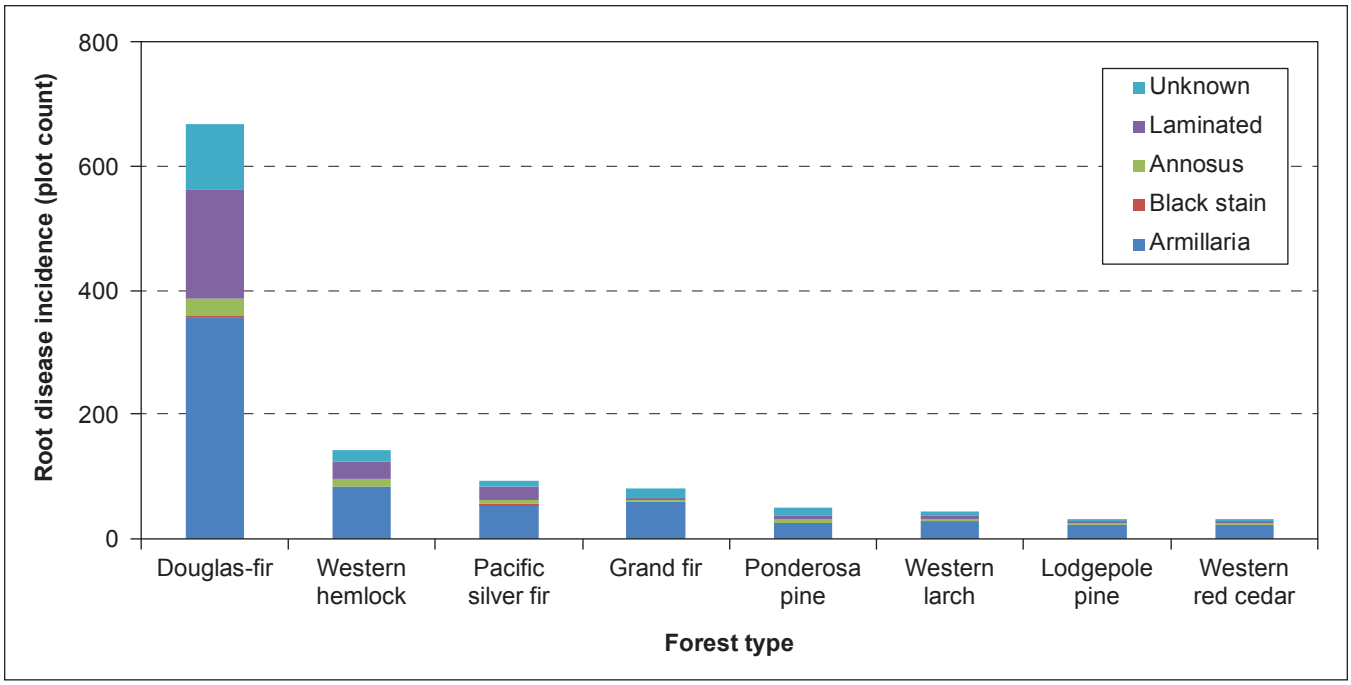

Figure 42—Percentage of forested plots with observed root disease, Washington, 2002–2011. The eight forest types where *Armillaria* was most prevalent are shown.

Invasive Vegetation

Nonnative invasive plants can potentially spread quickly and overtake native plant habitat, often outcompeting natives. As an example, Scotch broom (*Cytisus scoparius*) not only grows rapidly and is able to tolerate poor soil conditions, but the dense stands formed are both inaccessible and unpalatable to native wildlife (LeBlanc 2001). Altered vegetative composition on affected lands can have large economic impacts through lost or degraded land use coupled with eradication costs (Mooney and Hobbs 2000, Pimentel et al. 2005, Vitousek et al. 1996).

Native and nonnative species richness, quantified by the mean number of species per plot, showed that the average species richness derived from nonnative plants on forested land ranged from 1 to 12 nonnatives, depending on ecological section (fig. 43). The average nonnative cover per plot varied by ecological section from as little as 0.9 percent in the Blue Mountains of southeast Washington to 11 percent on the Coast Range (fig. 44). The most prevalent nonnative species were Himalayan blackberry (*Rubus armeniacus*) and cheatgrass (*Bromus tectorum*), covering an estimated 115,000 and 114,000 ac of forest land, respectively (fig. 45).

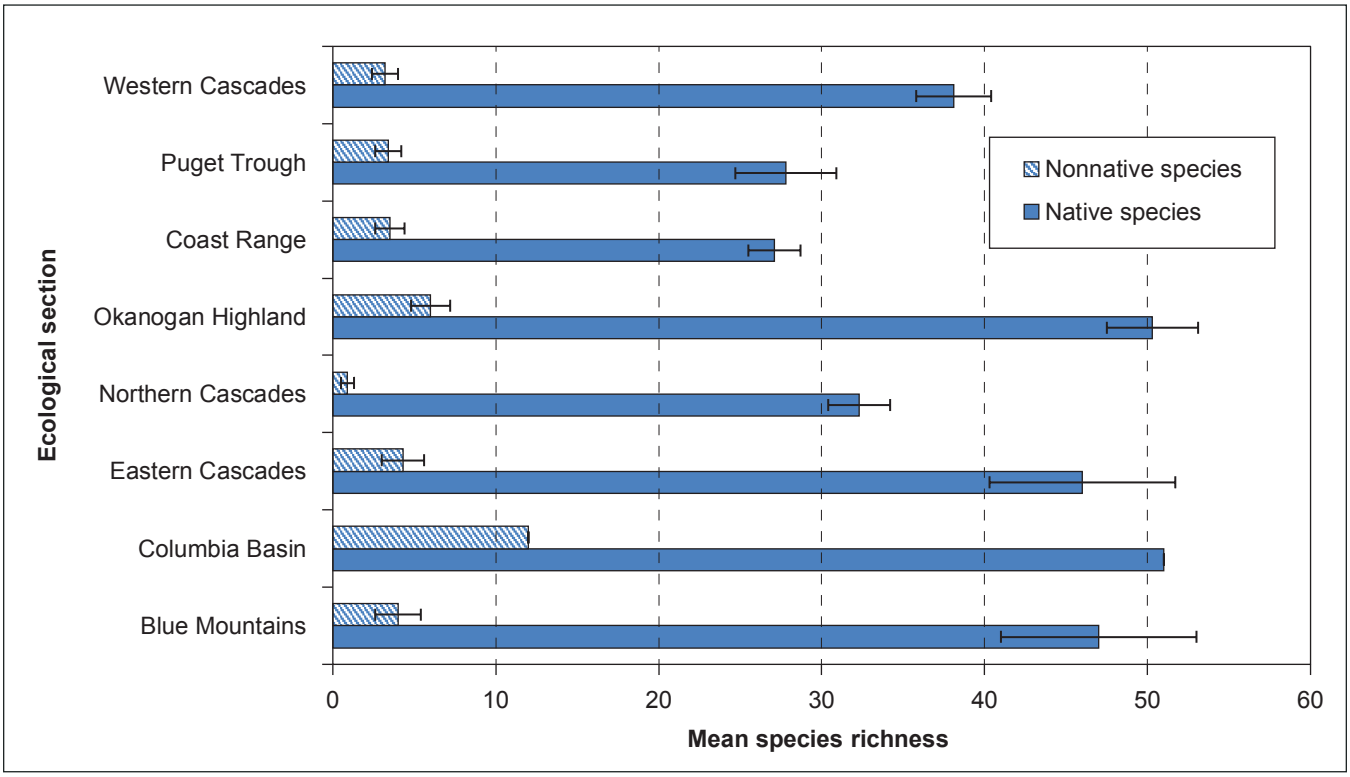

Figure 43—Mean species richness per forested plot by ecological section, Washington, 2002–2011.

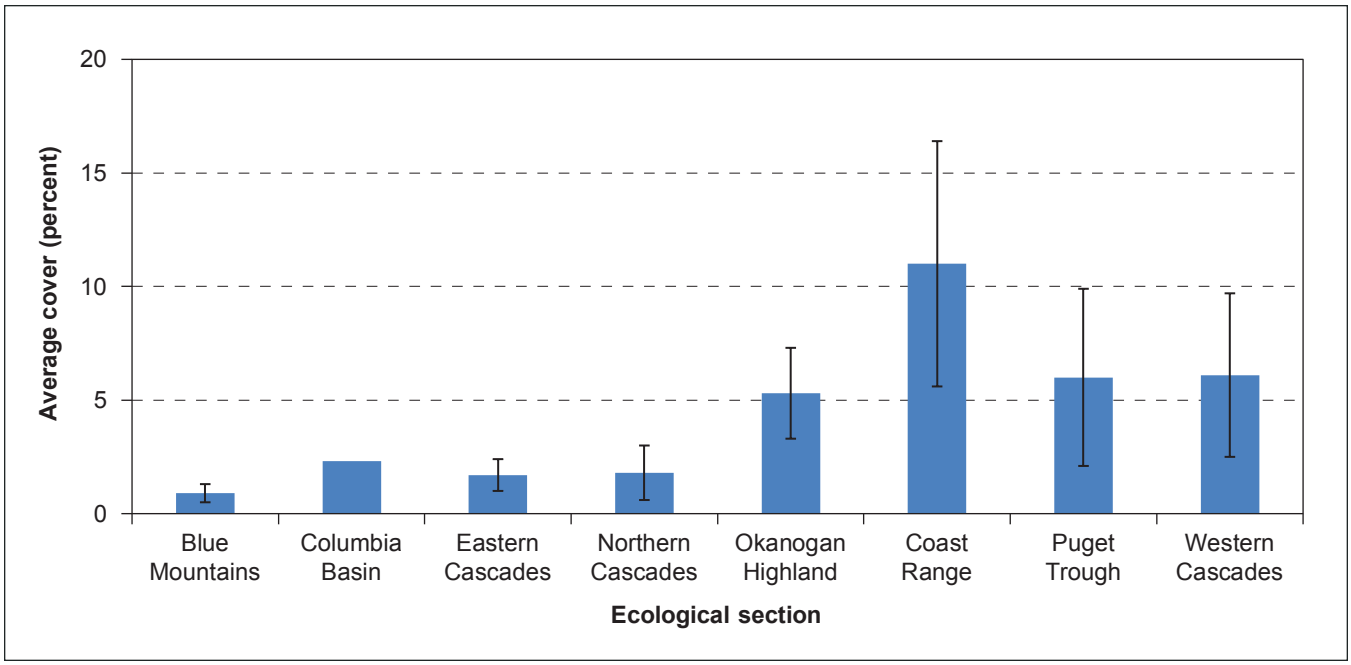

Figure 44—Estimated mean nonnative plant cover per forested plot by ecological section, Washington, 2002–2011.

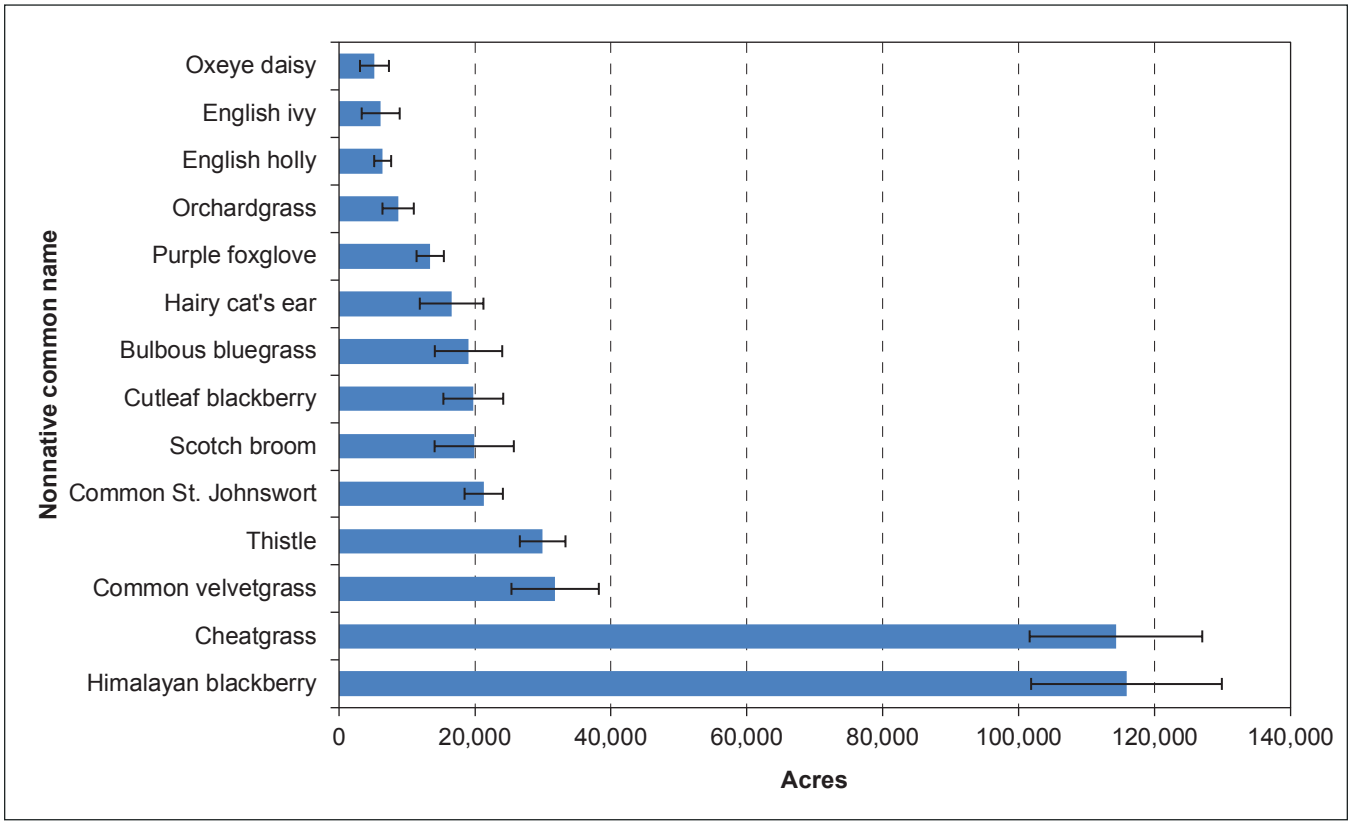

Figure 45—Estimated area covered by the most abundant nonnative plant species on forest land, Washington, 2002–2011.

Land Cover and Land Use Research Application—Changes in Land Use and Housing on Resource Lands in Washington state, 1976–2006[3]

Washington state has experienced substantial population growth recently, with 2.5 million more people living here in 2006 than in 1976, an increase of 77 percent. Most of the homes, businesses, and infrastructure to support those people needed to be built on land that was previously used for other purposes, like forestry or agriculture (fig. 46). How and where development occurs has wide-ranging social, economic, and ecological implications. Forest Inventory and Analysis' (FIA) mandate to monitor forests includes tracking changes in land use that lead to losses and gains of forest lands. While our inventory plots provide reliable and definitive statistics on those changes, the inventory plot grid is too sparse to make definitive assessments of county- or watershed-level changes and short time periods. To address this, we adopted techniques developed by FIA over the years that have been applied with great results in Oregon in collaboration with the Oregon Department of Forestry. We classified digital imagery from 1976, 1994, and 2006 to land use, assigned classifications to a systematic-random grid of 44,554 photointerpretation points on nonfederal lands, and identified houses within 80-ac circles around each nonurban point. We found that 1.16 million acres of forest and agricultural lands were converted to residential and urban land uses over this 30-year period. The greatest changes in land use were in western Washington, where nonfederal forest lands declined 4.7 percent over 30 years (an annual rate of 0.2 percent—the equivalent of losing an area of land the size of a football field every 42 minutes). Agricultural lands in western Washington declined at a rate of 0.7 percent per year, for a net loss of 22 percent over 30 years. Housing density on these resource lands also increased, particularly around agricultural areas. Low-density residential lands increased substantially, more than doubling over 30 years in eastern Washington. We hope to continue this work with newer imagery to assess how changes in regulation, economy, and population are affecting land use in the state

Gray, A.N.; Azuma, D.L.; Lettman, G.J.; Thompson, J.L.; McKay, N. 2013. Changes in land use and housing on resource lands in Washington State, 1976-2006. Gen. Tech. Rep. PNW-GTR-881. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

[3]Author: Andrew Gray.

Andrew Gray

Figure 46—Agricultural area near Sequim, Washington, with recent urbanization and dispersed housing development in the nearby forest.

Air Quality: Lichens

Air quality in many of Washington's forests is fair to excellent, but there are some forests near major metropolitan areas (e.g., Seattle) with evidence of degraded air quality (Eilers et al. 1994, Geiser and Neitlich 2007). Air quality impacts to vegetation depend on many factors, the most important being plant life stage, species, pollutants, site conditions, and degree of exposure. Effects of poor air quality in forests include decline in stand productivity and shifts in community composition when sensitive species are damaged or killed. The FIA program monitors two indicators for air quality: injury to ozone-sensitive plants and the composition of lichen communities. Air quality instrumentation is thinly distributed in Washington's forests (USEPA 2008) so monitoring using indicator species allows for a spatially comprehensive assessment of air quality and risks to forest health across the landscape. Ozone indicators have not been collected since Campbell et al. (2010), so are not included in this report.

Lichens—

Over 5,500 surveys of epiphytic lichen communities have been collected by the FIA program on phase 3 plots (see FIA Methods and Design in online supplement) across the country (1992–2012). An additional 2,972 surveys were collected by the USFS Air Resources Management Program, mostly in Oregon, Washington, and Alaska (1989 to present). Survey data on abundance and diversity are used to score air quality at each plot by examining the distribution of pollution indicator species; examining land use patterns; correlating scores to pollutant measurements; and in some cases, conducting laboratory analysis of nitrogen and sulfur accumulation in collected lichens. Results from 5 years of surveys (1998–2001 and 2003) in Washington's west-side forests provide strong evidence that nitrogen pollution is heavily affecting some stands (table 9). Results suggest that the Puget Trough ecoregion, which includes many of western Washington's agricultural and metropolitan areas, is part of a major nitrogen hotspot that extends into foothill forests of the Coast and Cascade Ranges. Beyond degrading air quality, the ecological and economic impacts of excessive nitrogen pose an increasing concern for terrestrial and aquatic ecosystems in the Pacific Northwest. Nitrogen pollution can cause accelerated accumulation of fuels, soil acidification, shifts in plant communities, and a decline in mycorrhizal fungi (Fenn et al. 2003).

Research Application–Epiphytic Macrolichen Indication of Air Quality and Climate in the Interior Forested Mountains of the Pacific Northwest[4]

As human populations in Washington continue to grow, so do the accompanying industrial, transportation, and agricultural support networks. These elements of a growing society can potentially negatively affect air quality. Lichen communities, which are sensitive to changes in air quality owing to their unique biology, can be used as indicators to monitor impacts to air quality across the landscape (fig. 47). Biomonitoring using Forest Inventory and Analysis (FIA) lichen community data has proven successful in western Washington (Geiser et al. 2010) (table 9), and this study sought to extend monitoring efforts farther east in the Pacific Northwest. To interpret climate and air quality patterns in the region, lichen community data collected by FIA and the National Forest System Region 6 Air Resources Management Program were compiled from 1,006 locations within the interior forested mountains of Washington, Oregon, Idaho, and parts of California and Montana (fig. 48).

First, the relationship between the presence of individual lichen species and concentrations of nitrogen in lichen tissue at each plot was used to develop a lichen community index. In the rain shadow of the Cascade Mountains, precipitation substantially influenced lichen community composition. By stratifying the sample to balance plots across a combination of nitrogen deposition zones, elevation, and presence of hardwood tree species, a lichen community index was developed independent of climate effects. The Lichen community index was

Kyle Dodson

Figure 47—Lichens.

Table 9—Forest Inventory and Analysis plots sampled for lichen community, climate index information, western Pacific Northwest (PNW) and western Washington, 1998–2001, 2003

	Western PNW	Western Washington	Northern Cascades	OR and WA Coast Ranges	Puget Trough	Western Cascades
			Number of plots			
Plots surveyed[a]	243	103	19	37	18	29
Air quality index category:[b]						
Best: -1.4 to -0.11	—	—	12	21	1	12
Good: -0.11 to 0.02	26	10	0	5	1	4
Fair: 0.02 to 0.21	40	17	2	6	5	4
Degraded: 0.21 to 0.35	21	8	2	3	0	3
Poor: 0.35 to 0.49	13	5	1	0	2	2
Worst: 0.49 to 2.00	32	17	2	2	9	4
			Air quality index score			
Air quality score extremes	-1.28 to 1.59	-1.22 to 1.59	-1.08 to 1.23	-1.22 to 1.59	-0.73 to 1.49	-1.07 to 0.81
Average score on air quality index	-0.06	-0.07	-0.28	-0.23	0.38	-0.02
Standard deviation on air quality index	0.49	0.56	0.63	0.52	0.46	0.45

— = not available; SE

[a] Plot totals do not include quality assurance surveys or plots without lichens present.

[b] Categories are based on the analysis of Geiser and Neitlich (2007).

calibrated with nitrogen concentration measured in $PM_{2.5}$ (particulate less than 2.5 µm in diameter) at 12 instrumented sites in the study area and used to derive a critical level. (Critical levels and critical loads are thresholds of pollution linked to negative effects on sensitive biota that managers use for land use planning). It was determined that the critical level for nitrogen was 0.37 $\mu g \cdot m^3 \cdot yr^{-1}$, corresponding with a concentration of 1.02 percent nitrogen in the lichen *Letharia vulpina*. Critical loads for nitrogen deposition were estimated to be 1.54 and 2.51 $kg \cdot ha \cdot yr^{-1}$ for harm to lichen communities and elevated nitrogen concentrations in lichens, respectively.

Plots were mapped throughout the interior mountains of the Pacific Northwest that were below, at, or above critical levels. Lichen communities above critical levels included more nitrogen-loving lichen species, whereas those below had a greater array of more sensitive species. This has ecological implications beyond mapping air quality because sensitive species frequently have different ecological functions such as providing important forage, nesting materials, and habitat for mammals, birds, and invertebrates.

Geiser, L.H.; Jovan, S.E.; Glavich, D.A.; Porter, M.K. 2010. Lichen-based critical loads for atmospheric nitrogen deposition in Western Oregon and Washington Forests, USA. Environmental Pollution. 158(7): 2412–2421.

Root, H.T.; Geiser, L.H.; Jovan, S.; Neitlich, P. 2015. Epiphytic macrolichen indication of air quality and climate in interior forested mountains of the Pacific Northwest, USA. Ecological Indicators. 53: 95–105.

[4] Author: Heather Root.

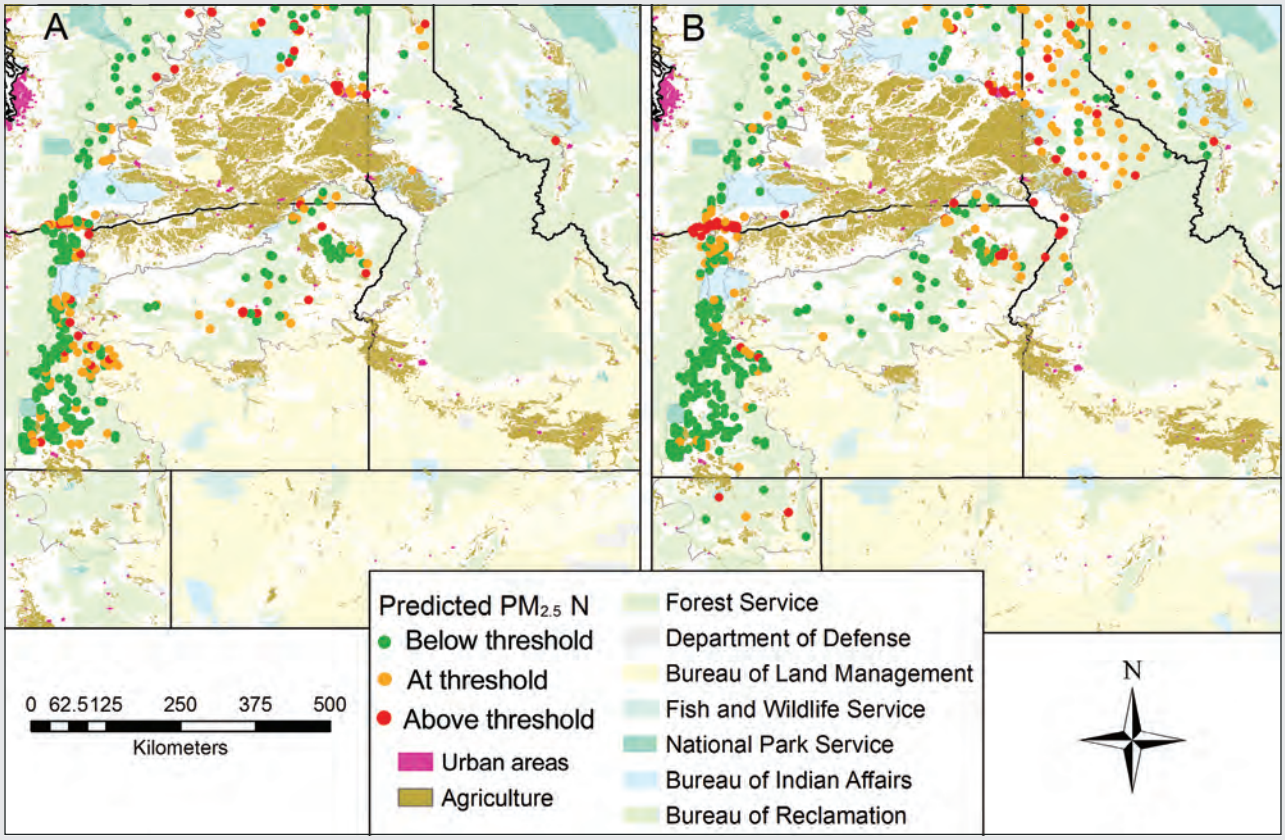

Figure 48—Estimated nitrogen (N) concentration in PM2.5 for plots sampled in 2003–2011 using the (A) lichen N concentration index and (B) lichen community index after correcting for climatic moisture deficit. The yellow plots are within the 95 percent confidence interval corresponding to the critical level of 0.37 (1) g · m3 · yr-1 (table 3? Should this be table 9 mentioned in the sidebar); red plots are higher than this interval and green are lower. The background agriculture layer is based on 2006 data from the Multi-Resolution Land Characterization (https://www.mrlc.gov/nlcd06 data.php; 6 August 2012).

Value of Washington's Forests

Forests have both tangible and intangible value. Measurable resources such as timber are well known, whereas boughs used in the floral industry are a less widely recognized forest product. These tangible resources can generally be extracted from the forest, processed, and sold on an open market, which makes their value relatively easy to quantify. Intangible resources such as wildlife habitat, clean water, human health, and recreation have value that is dependent upon the individual stakeholder (fig. 49). Although it is difficult to assign values to intangible resources, they serve an important role in supporting local communities and have a societal impact.

Forest Products

Timber and nontimber forest products are resources extracted from the forest and can generally be quantified. Timber comes from harvesting trees that are then milled to produce wood products used in the construction of buildings or pulped to produce paper and paper products. Nontimber forest products are materials or commodities obtained from the forest that do not require harvesting trees and may include nuts, seeds, berries, mushrooms, foliage, medicinal plants, fuelwood, game animals, or livestock forage (fig. 50).

Timberlands are defined as forests that are capable of producing at least $20 ft^3 \cdot ac \cdot yr^{-1}$ of wood volume annually and are not reserved, and site classes are used to indicate relative timberland productivity. A site class is a variable that indicates potential for annual growth within a specific

Brian Gasper

Figure 49—Forest recreation has tremendous value: horse packing, Pasayten, Washington.

Glenn Burkhart

Figure 50—Morels after a fire.

forested stand and varies based on factors such as climate, soil structure and composition, slope, aspect, and species interactions. Only about 13 percent of Washington's timberland can be classified as highly productive (capable of adding 165 $ft^3 \cdot ac \cdot yr^{-1}$ of wood volume). The vast majority of highly productive timberland (98 percent) is found in western Washington. Douglas-fir, western hemlock/Sitka spruce, and alder/maple forest groups all have at least 20 percent of their timberland acreage in a highly productive site class while ponderosa pine, lodgepole pine, and western larch all have less than 2 percent classified as highly productive (fig. 51).

In Washington, the U.S. Forest Service has more forest land under its management than any other government agency, but only 12 percent of Forest Service timberland is classified as highly productive (fig. 52). State forests have the greatest percentage of high productivity timberland at 31 percent, while private land contains 25 percent highly productive timberland.

Timber harvest in Washington occurs on private, state, and federal lands. Between 2002 and 2011, the mean annual harvest as recorded by Washington State Department of Natural Resources was 3.2 billion board feet Scribner (Washington DNR 2015). Of the timber harvested, Douglas-fir represented 43 percent of the total cut. Timber harvest during the 2002 to 2011 period was particularly dynamic, with total harvest volume falling more than 40 percent between the 2004 high and the 2009 low. The harvest reduction coincided with the economic downturn and collapse of new home construction in the United States during the same time period (2008-2009) and the rebound reflects the economic recovery beginning in 2010 (fig. 53).

The United States is the world's largest producer of softwood products, with yields in Washington state second only to Oregon among the states (fig. 54). Washington's forests generate nearly $5 billion annually in wood product sales, or 1.5 percent of the state's gross domestic product. Log and lumber commodities are ranked third among Washington's exports, according to the state's Department of Commerce (Smith 2012).

In 2011, Washington nontimber forest products accounted for almost $1 million in U.S. Forest Service special forest product permit sales (USDA FS 2015) (table 10). Bough and grass products led the way in permit sales, and, when combined, these two products account for almost 75 percent of total special forest product permit sales.

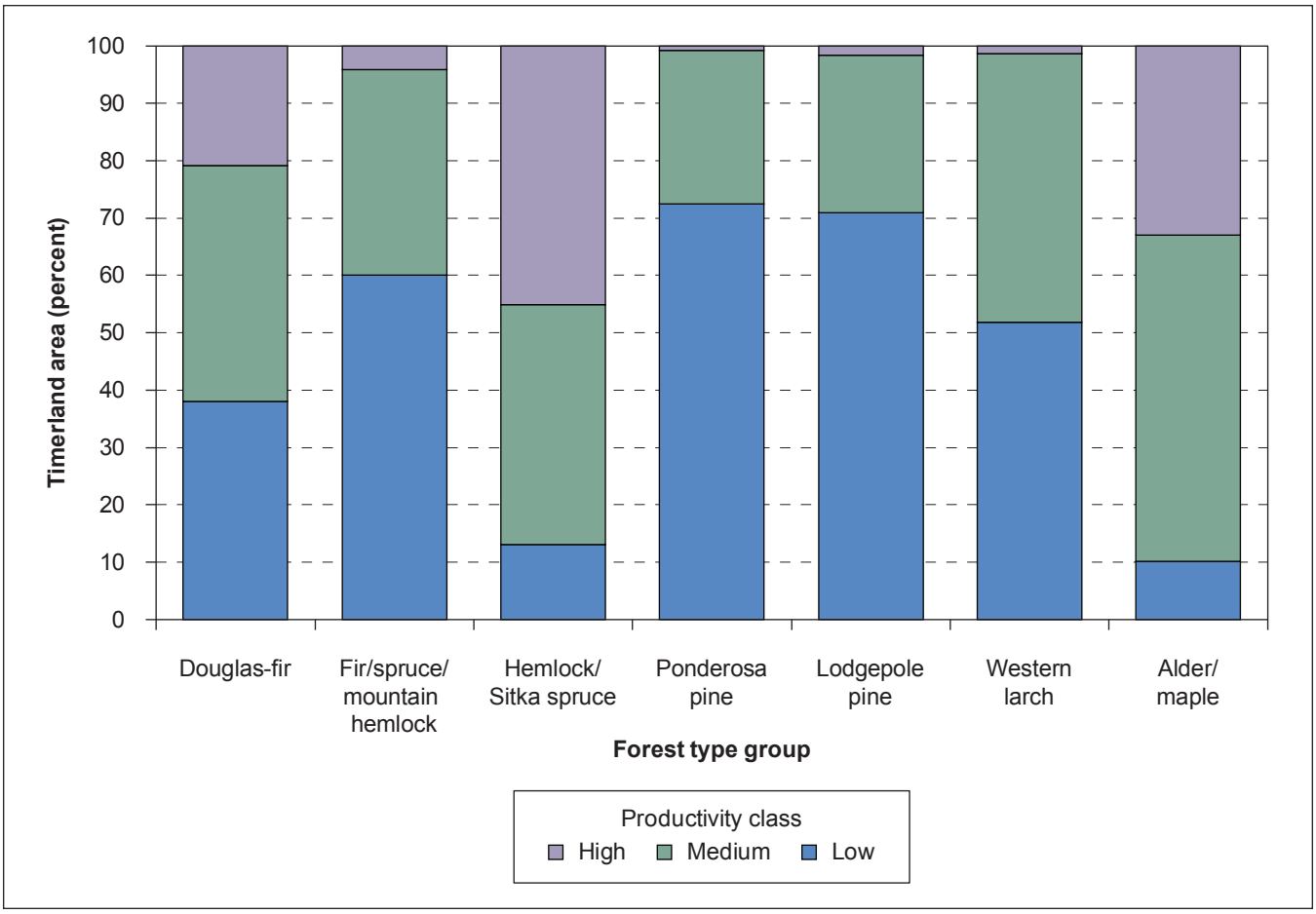

Figure 51—Timberland productivity by forest type group, Washington, 2002–2011. (Low productivity = less than 85 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$; medium productivity = 85 to 164 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$; high productivity = greater than 164 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$).

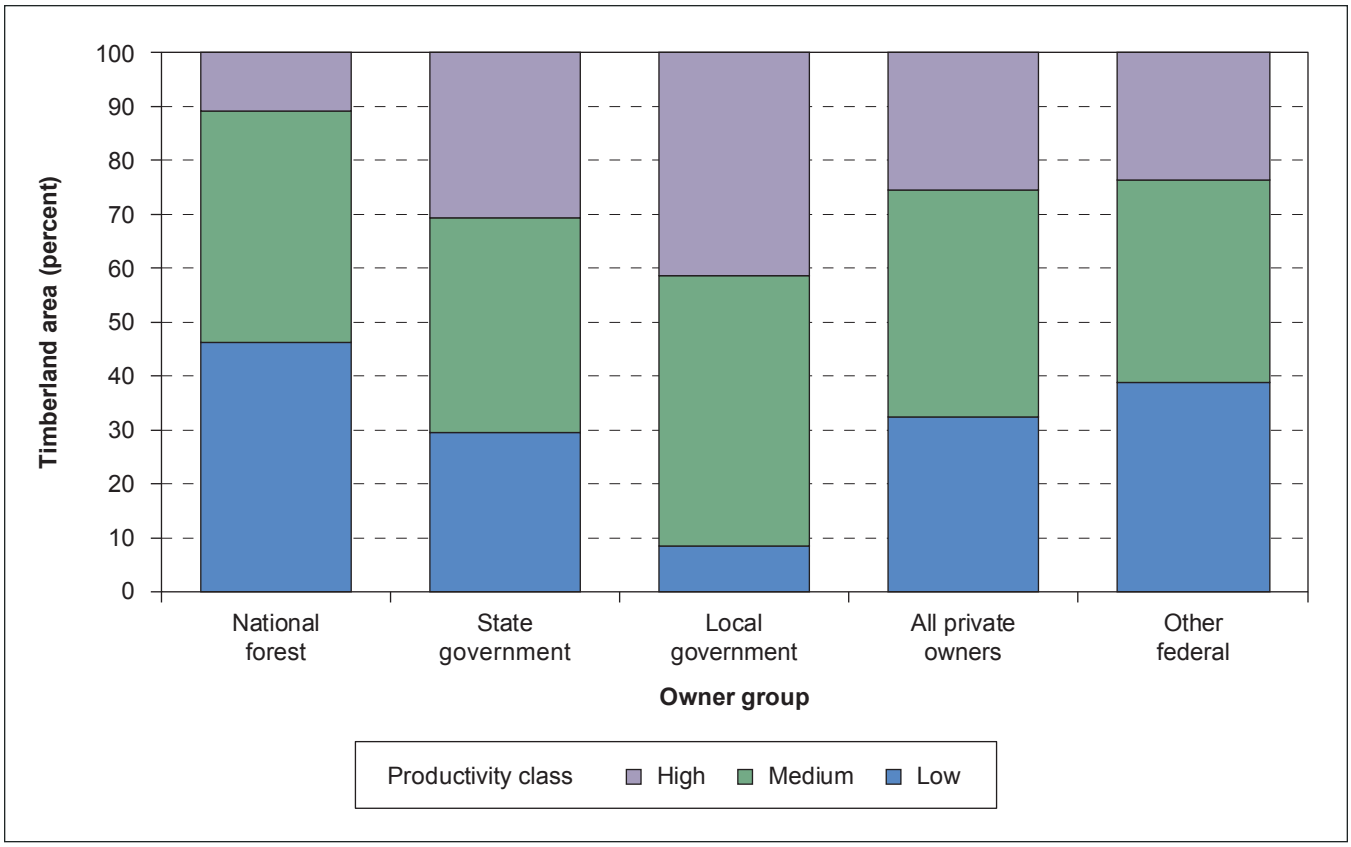

Figure 52—Timberland productivity by owner group, Washington, 2002–2011. (Low productivity = less than 85 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$; medium productivity = 85 to 164 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$; high productivity = greater than 164 $ft^3 \cdot ac^{-1} \cdot yr^{-1}$).

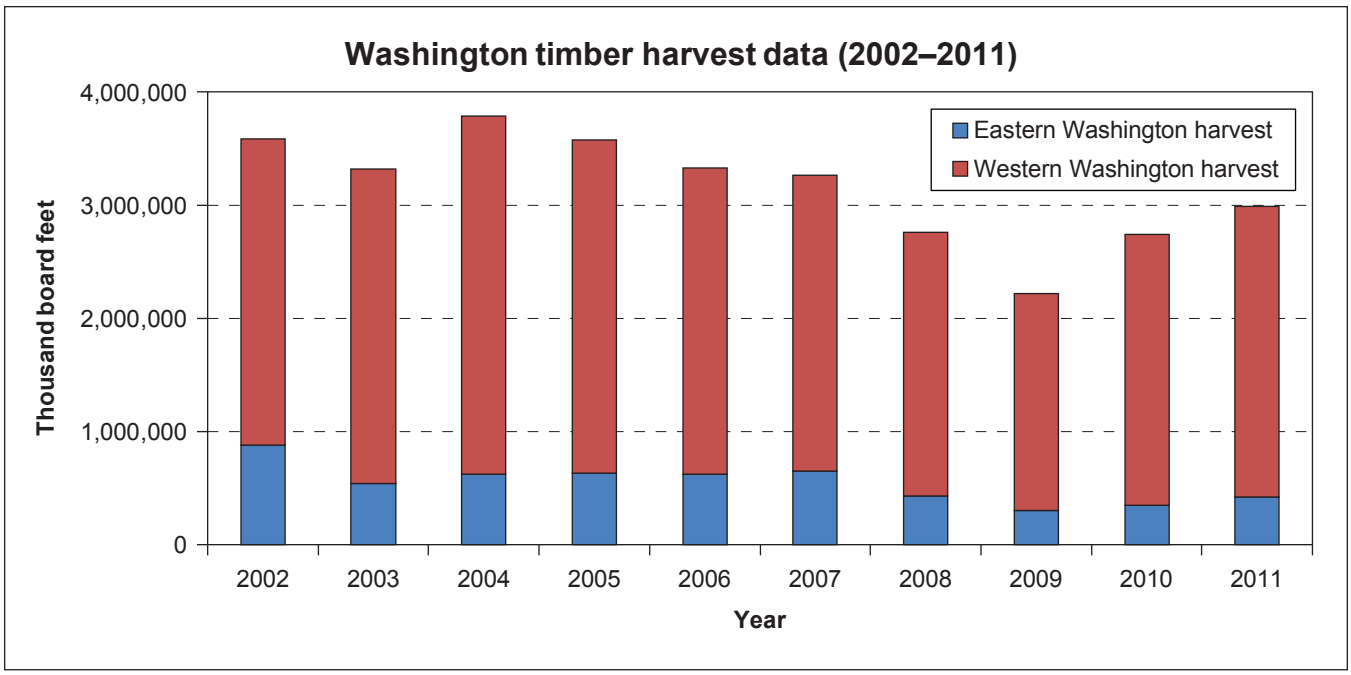

Figure 53—Annual timber harvest in Washington (Washington Department of Natural Resources data), 2002–2011.

Jessica Deans

Figure 54—Heavy thinning is a common silvicultural practice in Washington forests.

Table 10–U.S. Department of Agriculture Forest Service Special Forest Product Permit Sales, Washington, 2011

Product	Permit sales
Limb/bough	$597,740
Grass	$121,106
Foliage	$76,485
Fruits/berries	$70,650
Mushrooms	$50,370
Xmas tree	$34,943
Transplant	$11,560
Other plant	$4,107
Cones	$113
Seeds	$60
Herbs	$20
Total	$967,154

Removals for Timber Products[5]

Volume removed from forest inventory during the harvesting of timber is known as removals. Removals are an important indicator of the sustainability of timber harvest. Removals that exceed net growth for extended periods could indicate overharvesting and decreasing forest inventory. Removals can come from two sources: growing stock trees (live trees of commercial species meeting specified standards of quality or vigor), or dead trees and other nongrowing stock sources (e.g., tree limbs and tops).

The two general types of removals are timber products harvested for processing by mills and logging residue (i.e., volume cut or killed but not used). Removals, as reported here, are based on 2002 and 2010 surveys of Washington's primary forest products industry (Smith 2012, Smith and Hiserote 2005) and Washington Department of Revenue forest excise tax data (Larsen and Hguyen 2004, Largent et al. 2012). More detailed timber products and logging residue data for Washington and other states are available from Forest Inventory and Analysis' timber products outtput (TPO) web site: http://srsfia2.fs.fed.us/php/tpo_2009/tpo_rpa_int1.php

Removals from timberlands in Washington fluctuated substantially during the 2002 to 2011 period. Total removals exceeded 1.2 billion ft^3 in 2002 and were less than 940 million ft^3 in 2010 (tables 11 and 12). Growing-stock material accounted for the majority of removals in both 2002 and 2010. Total removals for timber products were 20 percent less in 2010 compared to 2002 (756 and 951 million cubic feet, respectively). Growing stock was the leading source for all products, with the exception of fuelwood, whereas logging residue primarily came from nongrowing stock sources. In both years, sawlogs[6]were the leading industrial product from both growing and nongrowing sources. Logging residue decreased substantially between 2002 and 2010, from both growing (51 percent reduction) and nongrowing (25 percent reduction) stock sources. The proportion of logging residue to industrial product was lower in 2010 relative to 2002. This proportional reduction may be a result of the dramatic increase in pulpwood between the two years (116 million cubic feet increase) and the subsequent use of smaller materials that would otherwise be left as logging residue.

Table 11—Volume (cubic feet) of removals by source of material and removal type, Washington, 2002–2010

	Source of material					
	2002			2010		
	Growing stock	Other sources	Total	Growing stock	Other sources	Total
	Thousand cubic feet					
Roundwood products						
Sawlogs	719,222	32,141	751,362	467,362	15,408	482,770
Veneer logs	53,986	2,413	56,399	33,611	477	34,088
Pulpwood	67,229	3,004	70,233	182,214	4,328	186,542
Post, poles, and pilings	5,527	247	5,774	8,114	126	8,239
Miscellaneous products	463	21	484	39	3	42
Total industrial products	846,426	37,825	884,251	691,340	20,342	711,682
Fuelwood	—	66,526	66,526	—	44,480	44,480
Total timber products	846,426	104,351	950,777	691,340	64,822	756,162
Logging residue	52,621	208,590	261,211	25,943	156,484	182,426
Total removals	899,047	312,940	1,211,987	717,283	221,305	938,588

— = not available.

Table 12—Volume (cubic feet) of removals by ownership and removal type, Washington, 2002–2010

	Ownership							
	2002				2010			
	U.S. Forest Service	Other public	Private	Total	U.S. Forest Service	Other public	Private	Total
	Thousand cubic feet							
Roundwood Products								
Sawlogs	9,819	99,639	641,905	751,362	18,128	139,513	325,129	482,770
Veneer logs	3,790	13,886	38,722	56,399	1,859	11,213	21,017	34,088
Pulpwood	2,607	10,510	57,116	70,233	12,090	50,649	123,802	186,542
Post, poles, and pilings	2,338	1,929	1,506	5,774	312	3,096	4,831	8,239
Miscellaneous products	—	—	484	484	—	42	—	42
Total Industrial Products	18,554	125,965	739,732	884,251	32,389	204,513	474,779	711,682
Fuelwood	3,034	9,213	54,279	66,526	4,781	5,955	33,744	44,480
Total Timber Products	21,587	135,178	794,012	950,777	37,171	210,468	508,523	756,162
Logging Residue	5,449	36,769	218,992	261,211	8,706	51,620	122,101	182,426
Total Removals	27,037	171,947	1,013,004	1,211,987	45,876	262,088	630,624	938,588

— = not available

The distribution of removals across public and private forest ownerships underwent notable changes from 2002 to 2010. Though total removals for timber products decreased, public removals increased for both U.S. Forest Service (21 to 37 million cubic feet) and other public (135 to 210 million cubic feet) ownerships (table 12). Conversely, private lands experienced a 36 percent decrease in total timber product removals. Sawlogs were the leading product across all ownerships, though 2010 removals for sawlogs were lower for each ownership than 2002 levels. However, pulpwood dramatically increased across all ownership types. Pulpwood removals on public lands increased more than fourfold while private pulpwood more than doubled.

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[5] Authors: Todd A. Morgan and Kate Marcille, Bureau of Business and Economic Research, University of Montana.

[6] Log volumes exported from Washington to other states and countries are included in the sawlog timber product category.

Urban Forest

In 2011, the FIA program installed 190 plots on the standard FIA grid within census defined urban areas of Washington (cities with a population of 50,000 or more). Data from these plots were compiled and run through a software package known as iTree Eco (Nowak et al. 2008) to determine the value of the trees to city inhabitants. The estimated compensatory value of Washington's urban forest is $58.8 billion. Carbon storage in Washington's urban forests is worth $1.8 billion, annual carbon sequestration is worth $44.9 million, and annual pollution removal $169 million per year. Washington's urban forests also decrease building energy usage by $10.6 million annually. Urban forests with larger and more numerous healthy trees tend to hold higher economic value.

Conclusion

This report presents an updated overview of Washington's forest resources, highlighting information that is new as well as confirming previously known information. We expect some readers will be eager to see more indepth research and analysis on selected topics to fully understand current statuses, changes, and relationships in Washington's forests. The values presented here cannot be compared to Campbell et al. 2010 to assess change in forest resources over the last decade; these data are a continuation of the full 10-year cycle. The first 10-year cycle is now complete for all forested plots measured from 2002 to 2011. All future measurements will be remeasurements assessing the change that occurred during the 10 years between visits. With these data, we can continue quantifying trends in Washington's forests at multiple scales, now with a consistent, nationally standardized sample across all forested lands.

Common and Scientific Names

Life form	Common name	Scientific name
Trees:	Alder	*Alnus* spp.
	Ash	*Fraxinus* spp.
	Aspen	*Populus* spp.
	Bigleaf maple	*Acer macrophyllum* Pursh
	Birch	*Betula* spp.
	Cedar	*Thuja* spp.
	Cottonwood	*Populus* spp.
	Douglas-fir	*Pseudotsuga menziesii* (Mirbel) Franco
	Elm	*Ulmus* spp.
	Engelmann spruce	*Picea engelmannii* Parry ex Engelm.
	Grand fir	*Abies grandis* (Dougl. ex D. Don) Lindl.
	Hemlock	*Tsuga* spp.
	Lodgepole pine	*Pinus contorta* Dougl. ex Loud.
	Maple	*Acer* spp.
	Mountain hemlock	*Tsuga mertensiana* (Bong.) Carr.
	Oak	*Quercus* spp.
	Pacific silver fir	*Abies amabilis* (Dougl. ex Loud.) Dougl. ex Forbes
	Pine	*Pinus* spp.
	Ponderosa pine	*Pinus ponderosa* P.& C. Lawson
	Red alder	*Alnus rubra* Bong.
	Sitka spruce	*Picea sitchensis* (Bong.) Carr.
	Spruce	*Picea* spp.
	Subalpine fir	*Abies lasiocarpa* (Hook.) Nutt.
	Subalpine larch	*Larix lyallii* Parl.
	True fir species	*Abies* spp.
	Western hemlock	*Tsuga heterophylla* (Raf.) Sarg.
	Western larch	*Larix occidentalis* Nutt.
	Western redcedar	*Thuja plicata* Donn ex D. Don
Shrubs:	Cascade azalea	*Rhododendron albiflorum* Hook.
	Cascade barberry	*Mahonia nervosa* (Pursh) Nutt.
	Cascara buckthorn	*Frangula purshiana* (DC.) A. Gray
	Common snowberry	*Symphoricarpos albus* (L.) S.F. Blake
	Cutleaf blackberry	*Rubus lacinatus* Willd.
	Dwarf mistletoe	*Arceuthobium* spp.
	Dwarf Oregon grape	*Mahonia nervosa* (Pursh) Nutt.
	English holly	*Ilex aquifolium* L.
	English ivy	*Hedera helix* L.

Life form	Common name	Scientific name
	Evergreen huckleberry	*Vaccinium ovatum* Pursh
	Grouse whortleberry	*Vaccinium scoparium* Leiberg ex Coville
	Himalayan blackberry	*Rubus discolor* Weihe & Nees
	Kinnikinnick	*Arctostaphylos uva-ursi* (L.) Spreng.
	Oceanspray	*Holodiscus discolor* (Pursh) Maxim.
	Oregon boxleaf	*Paxistima myrsinites* (Pursh) Raf.
	Oval-leaf blueberry	*Vaccinium ovalifolium* Sm.
	Red huckleberry	*Vaccinium parvifolium* Sm.
	Salal	*Gaultheria shallon* Pursh
	Salmonberry	*Rubus spectabilis* Pursh
	Saskatoon serviceberry	*Amelanchier alnifolia* Nutt. ex M. Roem.
	Scotch broom	*Cytisus scoparius* (L.) Link
	Snowbrush ceanothus	*Ceanothus velutinus* Dougl. ex Hook.
	Thimbleberry	*Rubus parviflorus* Nutt.
	Thinleaf huckleberry	*Vaccinium membranaceum* Dougl. ex Torr.
	Trailing blackberry	*Rubus ursinus* Cham. and Schltdl.
	Vine maple	*Acer circinatum* Pursh
Forbs:	Bull thistle	*Cirsium vulgare* (Savi) Ten.
	Canada thistle	*Cirsium arvense* (L.) Scop.
	Common beargrass	*Xerophyllum tenax* (Pursh) Nutt.
	Deer fern	*Blechnum spicant* (L.) Sm.
	Hairy cat's ear	*Hypochaeris radicata* L.
	Oxeye daisy	*Leucanthemum vulgare* Lam.
	Pacific trillium	*Trillium ovatum* Pursh
	Purple foxglove	*Digitalis purpurea* L.
	St. Johnswort	*Hypericum perforatum* L.
	Thistle spp.	*Cirsium* spp.
	Western brackenfern	*Pteridium aquilinum* (L.) Kuhn
	Western swordfern	*Polystichum munitum* (Kaulfuss) K. Presl
Graminoids:	Bulbous bluegrass	*Poa bulbosa* L.
	Cheatgrass	*Bromus tectorum* L.
	Common velvetgrass	*Holcus lanatus* L.
	Orchardgrass	*Dactylis glomerata* L.
Lichens:	Wolf lichen	*Letharia vulpina* (L.) Hue
Fungi:	Annosus root disease	Fomes annosus; Heterbastidion annosum
	Armillaria root disease	*Armillaria* obscura; *Armillaria* mellea
	Black stain root disease	Ceratocystis wagneri; Verticicladiella wagnerii
	Laminated root rot	Phellinus weirii; Poria weirii

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Metric Equivalents

When you know:	Multiply by:	To find:
Inches (in)	2.54	Centimeters
Feet (ft)	0.3048	Meters
Miles (mi)	1.609	Kilometers
Acres (ac)	0.405	Hectares
Board feet	0.0024	Cubic meters
Cubic feet (ft^3)	0.0283	Cubic meters
Cubic feet per acre (ft^3/ac)	0.06997	Cubic meters per hectare
Square feet (ft^2)	0.0929	Square meters
Square feet per acre (ft^2/ac)	0.229	Square meters per hectare

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Appendix 1: Summary Data Tables

The values presented here cannot be compared to the previous report (Campbell et al. 2010) or that dataset to assess change in forest resources over the past decade; these data are a continuation of the full 10-year cycle. The first 10-year cycle is now complete for all forested plots measured from 2002 to 2011. The following tables contain basic information about the forest resources of Washington as they relate to the discussions of current forest issues and basic resource information presented in this report. These tables aggregate data to a variety of levels, including county, ecosection, owner group, and forest type, allowing Pacific Northwest Research Station Forest Inventory and Analysis (FIA) inventory results to be applied at various scales and used for various analyses. Many other tables could be generated from the Washington annual data, but space limits us to just the key ones. Data are also available for download in nonsummarized form at www.fia.fs.fed.us. The national FIA website (http://www.fia.fs.fed.us/tools-data/default.asp) contains a tool for querying the Washington annual data and generating custom tables or maps. Some of the tables in this appendix contain summaries of regional variables; data for regional variables currently are not included in the national FIA database (FIADB). An additional 84 summary data tables have been published as an online supplement (app 2: tables A2-1 through A2-84), and information on regional variables, field manuals, and local contact information is available at: http://www.fs.fed.us/pnw/rma/index.php.

Please note that information in the tables presented and in those generated from the FIADB may differ. As new data are added each year to FIADB, any tables generated from it will be based on the current full set of data in FIADB (e.g., 2002–2011, 2003–2012, etc.), whereas tables in this publication contain data from only 2002–2011. The user can take a snapshot of data from FIADB by selecting the desired years and population tables to generate tables that are similar, but probably not identical, to those presented here owing to quality assurance updates.

List of Summary data tables

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National forest —

Table A1-40—Area of forest land, by national forest and land status, Washington, 2002–2011

Table A1-41—Net volume of live trees on forest land, by national forest and land status, Washington, 2002–2011

Table A1-42—Aboveground biomass of live trees on forest land, by national forest and land status, Washington, 2002–2011

Table A1-43—Biomass of down wood on forest land, by national forest and down wood diameter class, Washington, 2002–2011

Table A1-44—Average net volume per acre of live trees on forest land, by national forest and land status, Washington, 2002–2011

Table A1-45—Average aboveground biomass per acre of live trees on forest land, by national forest and land status, Washington, 2002–2011

Timber products output and removals—

Table A1-46—Total roundwood output by product, species group, and source of material, Washington, 2010

Table A1-47—Volume of timber removals by source of material, species group, and removal type, Washington, 2010

Understory vegetation—

Table A1-48—Estimated area of forest land covered by the most abundant vascular plant nontimber forest products, by plant group and species, Washington, 2002–2011

Table A1-49—Index of vascular plant species richness on forest land, by ecological section, Washington, 2011

Table A1-50—Estimated area of forest land covered by selected nonnative vascular plant species and number of sample plots, by life form and species, Washington, 2002–2011

Evidence of fire

Table A1-51—Forest land area on which evidence of fire was observed, by year, Washington 1996–2009

Table A1-1—Area of forest land, by county and land status, Washington, 2002–2011

County	Land status													
	Unreserved forests						Reserved forests						All forest land	
	Timberland		Other forest		Total		Productive		Other forest		Total			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres													
Western Washington:														
Clallam	720.0	57.3	10.6	5.7	730.6	57.5	296.9	38.8	26.1	11.8	323.0	40.1	1,053.6	70.1
Clark	188.9	32.9	3.9	3.1	192.8	33.2	3.5	4.3	—	—	3.5	4.3	196.3	33.5
Cowlitz	590.3	58.1	7.8	6.3	598.1	58.4	30.2	7.6	—	—	30.2	7.6	628.3	58.9
Grays Harbor	1,139.5	76.3	23.7	11.7	1,163.2	77.0	—	—	—	—	—	—	1,163.2	77.0
Island	43.9	14.9	—	—	43.9	14.9	4.3	4.0	—	—	4.3	4.0	48.2	15.5
Jefferson	504.7	49.3	6.5	5.2	511.2	49.5	390.1	42.6	57.8	19.0	447.9	45.2	959.1	67.2
King	670.4	56.3	30.8	10.5	701.2	57.6	131.8	30.1	25.6	13.6	157.4	32.5	858.6	65.7
Kitsap	161.6	30.4	—	—	161.6	30.4	—	—	—	—	—	—	161.6	30.4
Lewis	1,179.5	72.5	12.3	6.8	1,191.9	72.8	119.2	21.1	27.6	13.8	146.8	25.2	1,338.7	77.0
Mason	457.3	46.6	4.6	2.5	461.8	46.7	32.4	13.8	—	—	32.4	13.8	494.2	48.7
Pacific	544.9	55.3	14.0	7.9	558.9	56.2	19.1	10.6	4.4	5.4	23.4	11.8	582.4	57.4
Pierce	524.3	50.9	14.7	8.4	539.0	51.6	194.5	34.0	32.0	15.7	226.6	36.7	765.6	63.3
San Juan	58.1	16.5	—	—	58.1	16.5	13.3	8.8	—	—	13.3	8.8	71.4	18.7
Skagit	610.3	51.7	8.1	6.5	618.4	52.0	135.3	26.9	13.7	7.3	148.9	27.9	767.3	59.0
Skamania	843.9	39.6	11.4	4.4	855.3	39.7	89.3	19.6	18.9	9.2	108.2	20.7	963.5	43.8
Snohomish	575.9	47.7	33.0	12.9	608.9	47.5	183.1	32.5	62.7	21.3	245.8	37.0	854.8	59.0
Thurston	248.7	37.7	6.3	6.3	255.0	38.2	—	—	—	—	—	—	255.0	38.2
Wahkiakum	139.1	29.0	6.5	6.4	145.5	29.7	—	—	—	—	—	—	145.5	29.7
Whatcom	467.5	45.6	30.8	9.2	498.3	46.4	298.5	41.9	79.2	24.6	377.7	48.1	875.9	66.8
Total	9,668.7	122.3	225.0	30.3	9,893.7	122.0	1,941.4	66.5	348.0	45.1	2,289.4	64.6	12,183.2	132.4

Table A1-1—Area of forest land, by county and land status, Washington, 2002–2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousand acres							
Eastern Washington:														
Asotin	67.9	15.9	1.7	1.9	69.6	15.9	—	—	—	—	—	—	69.6	15.9
Chelan	781.3	39.4	79.1	12.1	860.4	40.5	293.1	42.4	110.5	26.6	403.6	48.4	1,264.0	63.1
Columbia	130.2	21.5	0.5	0.5	130.6	21.5	75.7	17.7	—	—	75.7	17.7	206.3	27.8
Douglas	4.9	4.8	—	—	4.9	4.8	—	—	—	—	—	—	4.9	4.8
Ferry	1,218.6	69.8	24.6	7.8	1,243.2	70.1	6.9	6.6	—	—	6.9	6.6	1,250.1	70.4
Garfield	77.4	13.9	2.9	2.3	80.3	14.1	36.9	15.9	—	—	36.9	15.9	117.2	21.2
Kittitas	690.4	51.5	31.7	7.9	722.1	52.0	28.9	11.8	4.6	4.3	33.4	14.0	755.5	53.9
Klickitat	510.7	54.4	74.6	20.8	585.3	58.1	2.0	2.3	—	—	2.0	2.3	587.4	58.3
Lincoln	63.5	19.6	—	—	63.5	19.6	—	—	—	—	—	—	63.5	19.6
Okanogan	1,567.2	73.8	101.7	16.2	1,668.9	74.8	419.1	48.9	197.5	35.9	616.7	55.1	2,285.5	92.5
Pend Oreille	722.2	44.8	15.4	5.0	737.6	44.8	25.2	14.1	7.3	7.7	32.4	16.0	770.0	47.5
Spokane	342.3	43.7	2.6	2.6	344.9	43.8	40.0	15.8	—	—	40.0	15.8	384.9	46.5
Stevens	1,148.0	73.2	12.1	6.9	1,160.1	73.4	50.4	16.9	—	—	50.4	16.9	1,210.6	74.7
Walla Walla	20.3	10.9	—	—	20.3	10.9	—	—	—	—	—	—	20.3	10.9
Whitman	28.0	12.4	—	—	28.0	12.4	—	—	—	—	—	—	28.0	12.4
Yakima	867.2	64.0	46.4	14.6	913.6	65.5	168.8	34.0	73.2	23.7	242.0	39.9	1,155.6	76.7
Total	8,240.1	130.7	393.3	35.1	8,633.3	130.6	1,147.0	61.0	393.1	46.2	1,540.0	54.0	10,173.3	137.3
All counties	17,908.7	118.2	618.3	46.3	18,527.0	113.6	3,088.4	78.7	741.1	63.8	3,829.4	68.3	22,356.5	117.7

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-2—Area of forest land, by county and ownership group, Washington, 2002–2011

	Ownership group									
	National forest		Other federal		State and local government		Private		Total	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres									
Western Washington:										
Clallam	215.0	19.9	302.5	38.2	163.6	30.9	372.6	46.1	1,053.6	70.1
Clark	2.0	2.0	3.5	4.3	64.2	19.9	126.6	26.6	196.3	33.5
Cowlitz	35.6	8.3	—	—	113.2	25.7	479.4	52.3	628.3	58.9
Grays Harbor	121.6	13.7	—	—	165.1	31.3	876.4	69.6	1,163.2	77.0
Island	—	—	—	—	10.9	7.6	37.4	13.5	48.2	15.5
Jefferson	146.5	21.9	403.4	41.5	188.6	31.6	220.6	35.6	959.1	67.2
King	302.6	34.7	1.7	1.7	244.1	37.7	310.2	41.8	858.6	65.7
Kitsap	—	—	6.3	6.3	34.1	14.3	121.2	26.1	161.6	30.4
Lewis	431.7	28.7	36.6	15.4	144.2	29.3	726.2	63.6	1,338.7	77.0
Mason	111.0	12.9	28.1	13.2	66.2	19.7	288.9	40.5	494.2	48.7
Pacific	—	—	19.1	10.6	87.6	22.8	475.7	51.6	582.4	57.4
Pierce	160.5	24.8	240.7	36.4	37.0	14.9	327.3	43.2	765.6	63.3
San Juan	—	—	2.9	3.6	12.3	8.2	56.2	16.4	71.4	18.7
Skagit	303.9	27.9	46.6	16.8	122.8	27.2	294.0	40.9	767.3	59.0
Skamania	782.3	29.0	1.5	1.8	82.3	22.4	97.4	24.1	963.5	43.8
Snohomish	519.1	40.3	7.4	6.5	186.8	32.4	141.5	27.6	854.8	59.0
Thurston	—	—	11.3	7.9	54.0	17.5	189.7	33.2	255.0	38.2
Wahkiakum	—	—	—	—	16.9	10.3	128.7	27.9	145.5	29.7
Whatcom	357.3	39.4	187.4	31.6	129.7	27.3	201.5	34.4	875.9	66.8
Total	3,489.1	47.1	1,298.9	43.9	1,923.7	72.5	5,471.5	113.6	12,183.2	132.4
Eastern Washington:										
Asotin	33.1	7.4	—	—	6.7	4.8	29.7	13.1	69.6	15.9
Chelan	1,091.4	54.4	71.5	20.8	32.6	14.1	68.6	19.7	1,264.0	63.1
Columbia	139.4	19.7	—	—	6.9	4.6	59.9	19.1	206.3	27.8
Douglas	—	—	—	—	—	—	4.9	4.8	4.9	4.8
Ferry	452.1	22.9	11.7	8.4	32.1	13.4	754.2	64.4	1,250.1	70.4
Garfield	97.0	17.9	—	—	—	—	20.2	11.3	117.2	21.2
Kittitas	432.9	31.6	—	—	122.4	27.1	200.2	34.5	755.5	53.9
Klickitat	4.0	2.8	5.3	4.7	99.8	24.6	478.2	52.4	587.4	58.3
Lincoln	—	—	—	—	5.9	6.0	57.6	18.7	63.5	19.6
Okanogan	1,475.3	62.4	16.7	10.1	266.3	38.6	527.2	55.6	2,285.5	92.5
Pend Oreille	503.9	28.2	4.6	2.6	25.3	12.0	236.3	36.4	770.0	47.5
Spokane	—	—	12.0	8.4	54.7	17.8	318.2	42.1	384.9	46.5
Stevens	212.3	18.4	68.8	17.8	187.6	32.1	741.9	62.2	1,210.6	74.7
Walla Walla	—	—	—	—	—	—	20.3	10.9	20.3	10.9
Whitman	—	—	—	—	—	—	28.0	12.4	28.0	12.4
Yakima	476.6	44.8	6.3	6.3	94.4	23.1	578.3	57.6	1,155.6	76.7
Total	4,918.0	47.4	196.9	28.2	934.7	59.9	4,123.7	115.7	10,173.3	137.3
All counties	8,407.0	48.6	1,495.8	43.2	2,858.4	70.3	9,595.2	113.8	22,356.5	117.7

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-3—Area of forest land, by ownership and land status, eastern and western Washington, 2002–2011

Eastern Washington ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres													
Forest Service:														
National forest	3,336.8	35.2	238.2	20.0	3,575.1	30.1	956.6	51.9	386.3	45.8	1,342.9	42.8	4,918.0	47.4
Total	3,336.8	35.2	238.2	20.0	3,575.1	30.1	956.6	51.9	386.3	45.8	1,342.9	42.8	4,918.0	47.4
Other federal government:														
Bureau of Land Management	42.8	15.1	7.7	6.6	50.5	16.3	—	—	—	—	—	—	50.5	16.3
National Park Service	—	—	—	—	—	—	78.8	21.9	—	—	78.8	21.9	78.8	21.9
Fish and Wildlife Service	—	—	—	—	—	—	50.3	16.3	—	—	50.3	16.3	50.3	16.3
Other federal government	10.9	6.8	—	—	10.9	6.8	6.4	6.6	—	—	6.4	6.6	17.3	9.5
Total	53.7	16.6	7.7	6.6	61.4	17.7	135.5	26.5	—	—	135.5	26.5	196.9	28.2
State and local government:														
Local	22.8	10.9	—	—	22.8	10.9	14.4	9.6	—	—	14.4	9.6	37.2	14.5
State	829.1	57.1	21.2	11.5	850.3	57.5	40.5	16.0	6.8	6.5	47.2	17.3	897.5	58.6
Total	851.9	58.2	21.2	11.5	873.1	58.5	54.9	18.6	6.8	6.5	61.6	19.8	934.7	59.9
Corporate private	1,189.9	79.6	29.7	13.0	1,219.6	80.5	—	—	—	—	—	—	1,219.6	80.5
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	17.7	10.4	2.2	2.1	19.9	10.6	—	—	—	—	—	—	19.9	10.6
Unicorporated partnerships, associations, or clubs	1.7	1.7	—	—	1.7	1.7	—	—	—	—	—	—	1.7	1.7
American Indian	1,581.6	88.3	30.1	12.9	1,611.7	89.1	—	—	—	—	—	—	1,611.7	89.1
Individual	1,206.7	77.7	64.1	18.0	1,270.8	79.7	—	—	—	—	—	—	1,270.8	79.7
Total	2,807.7	105.6	96.4	22.2	2,904.1	107.0	—	—	—	—	—	—	2,904.1	107.0
All private	3,997.6	114.5	126.1	25.6	4,123.7	115.7	—	—	—	—	—	—	4,123.7	115.7
All owners	8,240.1	130.7	393.3	35.1	8,633.3	130.6	1,147.0	61.0	393.1	46.2	1,540.0	54.0	10,173.3	137.3

Table A1-3—Area of forest land, by ownership and land status, Washington, 2002–2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
Western Washington Ownership	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousand acres							
USDA Forest Service:														
National Forest	2,414.3	30.4	102.5	16.8	2,516.8	28.1	784.2	46.8	188.0	34.4	972.3	46.4	3,489.1	47.1
Total	2,414.3	30.4	102.5	16.8	2,516.8	28.1	784.2	46.8	188.0	34.4	972.3	46.4	3,489.1	47.1
Other federal government:														
Departments of Defense or Energy	37.2	14.7	—	—	37.2	14.7	—	—	—	—	—	—	37.2	14.7
National Park Service	—	—	—	—	—	—	1,031.4	40.0	149.2	27.9	1,180.6	36.4	1,180.6	36.4
U.S. Fish and Wildlife Service	—	—	—	—	—	—	19.1	9.9	4.4	5.4	23.4	11.2	23.4	11.2
Other federal	47.7	16.8	6.5	6.4	54.2	18.0	3.5	4.3	—	—	3.5	4.3	57.7	18.5
Total	84.9	22.3	6.5	6.4	91.5	23.2	1,053.9	40.6	153.5	28.5	1,207.4	37.3	1,298.9	43.9
State and local government:														
Local	315.4	42.8	17.2	8.8	332.7	43.7	40.2	15.2	6.5	6.4	46.6	16.5	379.3	46.6
State	1,462.3	56.4	12.5	6.7	1,474.9	56.5	63.1	19.0	—	—	63.1	19.0	1,538.0	56.6
Other public	6.5	6.4	—	—	6.5	6.4	—	—	—	—	—	—	6.5	6.4
Total	1,784.3	70.3	29.7	11.1	1,814.0	71.0	103.2	24.3	6.5	6.4	109.7	25.1	1,923.7	72.5
Corporate private	3,534.1	109.9	46.9	16.2	3,581.0	110.7	—	—	—	—	—	—	3,581.0	110.7
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	243.2	37.9	—	—	243.2	37.9	—	—	—	—	—	—	243.2	37.9
Unicorporated partnerships, associations, or clubs	13.4	8.2	—	—	13.4	8.2	—	—	—	—	—	—	13.4	8.2
American Indian	272.3	40.5	6.3	6.3	278.6	41.0	—	—	—	—	—	—	278.6	41.0
Individual	1,322.1	76.6	33.1	13.2	1,355.2	77.3	—	—	—	—	—	—	1,355.2	77.3
Total	1,851.2	90.1	39.4	14.7	1,890.5	90.7	—	—	—	—	—	—	1,890.5	90.7
All private	5,385.2	113.0	86.3	21.8	5,471.5	113.6	—	—	—	—	—	—	5,471.5	113.6
All owners	9,668.7	122.3	225.0	30.3	9,893.7	122.0	1,941.4	66.5	348.0	45.1	2,289.4	64.6	12,183.2	132.4

Table A1-4—Area of forest land, by forest type group, ownership group, and land status, Washington, 2002–2011

Forest type group	Ownership group and land status																			
	Forest Service				Other federal				State and local government				Private corporate				Private noncorporate				All owners	
	Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres																					
Softwoods:																						
Douglas-fir	2,465.1	54.4	414.7	42.7	69.2	19.2	346.1	40.2	1,261.1	66.4	70.3	20.6	2,556.2	104.2	1.4	1.4	1,611.7	85.9	5.6	5.9	8,801.4	155.8
Fir/spruce/ mountain hemlock	1,225.1	45.1	1,476.8	69.6	21.0	10.5	467.7	43.1	169.6	31.1	3.9	2.9	246.1	36.9	12.7	8.9	264.7	38.8	12.6	8.9	3,900.1	110.5
Hemlock/Sitka spruce	812.8	33.9	147.5	28.1	13.7	9.0	447.4	42.1	447.0	46.2	37.8	14.5	786.9	63.4	14.6	8.7	393.5	46.2	4.2	4.1	3,105.3	107.3
Lodgepole pine	304.0	23.2	168.0	32.4	—	—	4.4	5.4	40.6	15.1	10.3	8.2	10.2	6.1	6.3	6.3	159.9	29.6	6.3	6.3	710.1	53.7
Ponderosa pine	336.0	23.7	46.7	16.0	6.0	4.7	42.0	14.1	223.4	33.5	18.5	10.9	326.3	43.7	4.3	4.1	1,031.5	70.8	8.2	6.5	2,042.9	91.6
Western larch	201.1	18.5	11.3	8.2	—	—	8.8	7.0	39.3	15.0	5.1	5.6	29.1	12.1	—	—	61.7	18.2	—	—	356.3	34.4
Other western softwoods	34.5	8.0	167.3	30.2	—	—	—	—	0.1	0.1	6.8	6.5	2.3	1.3	—	—	2.8	2.8	6.3	6.3	220.1	32.7
Total	5,378.6	46.0	2,432.2	57.8	109.9	24.4	1,316.4	39.2	2,181.1	70.1	152.7	29.9	3,957.1	120.4	39.3	15.1	3,525.8	116.9	43.2	15.9	19,136.3	146.2
Hardwoods:																						
Alder/maple	87.6	15.0	27.1	8.6	15.6	9.5	20.9	9.6	341.6	42.8	47.9	15.8	505.2	50.4	11.9	7.2	666.9	57.1	17.4	8.4	1,742.0	88.1
Aspen/birch	31.3	7.5	5.2	2.4	—	—	—	—	7.5	5.6	3.7	3.8	17.4	10.0	—	—	66.3	18.8	3.0	3.0	134.4	23.9
Elm/ash/ cottonwood	12.9	4.7	8.0	5.4	—	—	6.4	5.2	31.5	13.4	14.0	8.1	30.2	12.2	0.7	0.7	35.6	13.3	26.8	11.7	166.1	27.9
Western oak	1.3	1.3	—	—	—	—	3.3	4.1	6.0	5.8	—	—	38.8	14.6	24.7	12.3	32.3	12.8	45.5	15.6	151.9	28.6
Woodland hardwoods	21.6	8.7	14.8	9.9	—	—	—	—	5.3	4.7	—	—	4.6	3.4	—	—	35.9	14.7	—	—	82.1	20.5
Other hardwoods	7.7	4.0	6.1	3.0	3.7	3.8	—	—	—	—	—	—	53.4	17.4	—	—	60.3	18.0	—	—	131.2	25.7
Total	162.4	19.9	61.2	14.7	19.3	10.3	30.6	11.6	391.8	45.3	65.6	18.2	649.6	57.0	37.3	14.2	897.5	66.0	92.6	21.4	2,407.8	101.5
Nonstocked	210.1	18.7	162.5	30.0	9.4	7.6	10.2	7.6	63.2	17.9	4.0	3.3	117.3	23.7	—	—	235.6	36.5	—	—	812.4	59.7
All forest types	5,751.1	43.5	2,655.9	54.5	138.7	27.7	1,357.2	38.0	2,636.2	70.8	222.3	35.1	4,724.0	125.9	76.6	20.7	4,658.8	126.6	135.8	26.6	22,356.5	117.7

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-5—Area of forest land, by forest type group and stand age class, Washington, 2002–2011

Forest type group	Stand age class (years)													
	1–20		21–40		41–60		61–80		81–100		101–120		121–140	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres													
Softwoods:														
Douglas-fir	1,684.9	88.8	1,722.3	84.0	882.9	61.5	1,502.5	80.3	1,178.4	70.6	492.1	42.0	295.1	32.6
Fir/spruce/Mountain hemlock	280.4	34.5	366.4	38.8	287.2	40.0	469.5	48.3	489.8	47.7	257.6	33.2	225.1	33.2
Hemlock/Sitka spruce	342.2	40.8	575.2	53.4	526.5	51.4	405.6	42.4	177.7	27.7	71.3	17.0	59.9	15.2
Lodgepole pine	111.4	19.7	72.2	16.0	126.7	24.3	170.2	26.8	102.3	20.1	48.6	14.9	30.2	12.0
Ponderosa pine	122.9	24.6	189.9	31.4	294.7	39.8	462.0	48.2	541.0	52.9	161.3	29.4	81.8	19.7
Western larch	28.1	9.6	28.4	8.3	53.5	14.3	134.2	22.1	50.9	13.3	16.8	7.7	14.8	5.3
Other western softwoods	3.5	2.2	20.0	8.2	36.8	13.9	34.0	14.5	27.5	12.1	25.2	12.6	2.3	1.7
Total	2,573.4	104.8	2,974.6	107.0	2,208.2	99.4	3,178.0	113.9	2,567.6	104.7	1,072.9	65.6	709.3	53.8
Hardwoods:														
Alder/maple	560.3	53.3	404.3	44.1	366.0	42.2	277.1	37.8	104.6	24.0	9.7	5.6	—	—
Aspen/birch	37.3	13.7	8.5	6.3	20.1	7.6	43.5	14.4	17.7	8.1	—	—	0.1	0.1
Elm/ash/cottonwood	37.6	13.6	5.2	3.4	30.6	12.5	59.5	17.4	20.8	9.2	2.6	2.1	—	—
Western oak	5.5	5.5	5.7	5.7	9.8	6.9	76.0	21.1	30.2	11.9	6.0	6.1	1.6	1.6
Woodland hardwoods	0.9	0.9	15.8	8.7	4.6	4.3	25.0	12.0	21.4	11.3	2.0	2.0	—	—
Other hardwoods	50.3	15.6	16.9	9.1	35.6	14.1	17.2	9.5	11.2	7.1	—	—	—	—
Total	691.9	58.6	456.4	46.6	466.6	47.1	498.4	50.7	205.8	32.3	20.3	8.8	1.8	1.7
Nonstocked	—	—	—	—	—	—	—	—	—	—	—	—	—	—
All forest types	3,265.2	115.8	3,431.0	113.8	2,674.8	107.8	3,676.4	121.9	2,773.4	108.6	1,093.2	66.1	711.0	53.8

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-5—Area of forest land, by forest type group and stand age class, Washington, 2002–2011 (continued)

	Stand age class (years)											
	141–160		161–180		181–200		201 plus		Unknown		All classes	
Forest type group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres											
Softwoods:												
Douglas-fir	280.3	32.2	143.6	22.1	138.7	24.7	468.3	44.5	—	—	8,789.2	155.5
Fir/spruce/Mountain hemlock	270.7	36.2	188.9	32.0	246.1	36.4	816.5	62.0	—	—	3,898.2	110.5
Hemlock/Sitka spruce	98.3	21.7	25.1	8.9	81.7	19.1	740.8	51.8	—	—	3,104.2	107.3
Lodgepole pine	12.8	6.5	9.4	8.9	6.7	7.1	17.5	11.1	—	—	708.0	53.7
Ponderosa pine	75.2	17.7	25.5	7.9	42.8	14.1	42.3	12.6	—	—	2,039.5	91.6
Western larch	5.7	3.2	1.9	1.9	4.9	2.9	17.2	8.9	—	—	356.3	34.4
Other western softwoods	16.9	9.2	2.5	2.1	14.1	9.2	37.2	15.4	—	—	220.1	32.7
Total	759.8	56.8	396.9	41.6	535.0	50.8	2,139.9	84.4	—	—	19,115.5	146.4
Hardwoods:												
Alder/maple	9.0	7.0	2.5	2.1	—	—	—	—	—	—	1,733.4	87.9
Aspen/birch	—	—	—	—	—	—	1.7	1.9	—	—	128.9	23.6
Elm/ash/cottonwood	1.8	1.2	0.5	0.5	—	—	—	—	—	—	158.5	27.2
Western oak	11.1	6.9	—	—	6.0	6.1	—	—	—	—	151.9	28.6
Woodland hardwoods	6.3	6.3	3.0	3.0	—	—	1.4	1.8	—	—	80.5	20.4
Other hardwoods	—	—	—	—	—	—	—	—	—	—	131.2	25.7
Total	28.2	11.7	5.9	3.7	6.0	6.1	3.1	2.6	—	—	2,384.4	101.3
Nonstocked	—	—	—	—	—	—	—	—	812.4	59.7	812.4	59.7
All forest types	788.0	58.1	402.8	41.8	541.0	51.2	2,143.0	84.5	812.4	59.7	22,312.3	118.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-6—Number of live trees[a] on forest land, by county and land status, Washington, 2002–2011

County	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees													
Western Washington:														
Clallam	342,427.6	44,217.5	9,545.3	5,188.4	351,972.9	44,449.1	142,902.9	25,603.2	7,802.2	3,502.9	150,705.1	25,792.7	502,678.0	51,386.8
Clark	54,692.6	14,567.3	120.5	120.2	54,813.1	14,567.6	287.4	357.5	—	—	287.4	357.5	55,100.5	14,572.0
Cowlitz	237,431.0	31,886.3	437.9	352.1	237,868.9	31,888.2	11,060.9	7,114.7	—	—	11,060.9	7,114.7	248,929.8	32,672.0
Grays Harbor	510,683.2	53,116.1	11,205.9	7,470.5	521,889.1	53,572.5	—	—	—	—	—	—	521,889.1	53,572.5
Island	15,311.1	7,085.4	—	—	15,311.1	7,085.4	5,626.9	5,214.9	—	—	5,626.9	5,214.9	20,938.1	8,797.6
Jefferson	262,695.1	34,112.3	5,916.0	5,693.2	268,611.2	34,534.6	156,360.6	23,064.4	22,779.0	7,931.4	179,139.6	24,087.2	447,750.8	42,380.1
King	360,308.0	50,408.6	8,064.1	3,282.6	368,372.1	50,525.7	75,814.7	28,208.9	9,467.5	5,132.9	85,282.2	28,492.4	453,654.3	57,890.7
Kitsap	60,781.0	14,935.0	—	—	60,781.0	14,935.0	—	—	—	—	—	—	60,781.0	14,935.0
Lewis	492,608.8	42,511.3	3,017.7	1,390.6	495,626.6	42,535.5	75,432.1	17,055.7	4,709.2	3,046.2	80,141.3	17,384.7	575,767.9	45,924.9
Mason	172,021.9	21,377.9	2,235.3	1,349.5	174,257.2	21,441.2	14,495.2	6,125.1	—	—	14,495.2	6,125.1	188,752.4	22,291.2
Pacific	178,002.3	24,900.6	4,727.1	3,466.9	182,729.3	25,176.5	6,991.2	4,253.5	1,120.5	1,393.6	8,111.8	4,454.4	190,841.1	25,563.4
Pierce	208,088.2	25,754.2	5,753.0	4,119.0	213,841.2	26,075.1	73,366.6	15,012.4	34,039.8	21,085.1	107,406.4	25,724.0	321,247.6	36,628.3
San Juan	18,805.2	7,059.9	—	—	18,805.2	7,059.9	2,000.4	1,395.2	—	—	2,000.4	1,395.2	20,805.6	7,196.4
Skagit	362,578.4	45,155.6	4,433.1	3,559.1	367,011.5	45,284.6	65,882.6	15,376.6	5,650.5	3,632.2	71,533.2	16,032.2	438,544.7	48,005.3
Skamania	377,001.3	22,753.6	3,252.6	1,668.6	380,254.0	22,747.6	35,745.2	11,357.2	2,711.8	1,991.9	38,457.0	11,311.9	418,710.9	25,239.8
Snohomish	277,179.5	35,056.6	10,716.6	4,786.5	287,896.1	35,028.9	100,413.2	28,163.6	37,847.9	14,517.5	138,261.1	30,519.5	426,157.3	46,164.6
Thurston	88,335.6	18,711.5	2,731.8	2,735.8	91,067.4	18,903.7	—	—	—	—	—	—	91,067.4	18,903.7
Wahkiakum	38,882.4	10,451.7	324.2	321.1	39,206.6	10,455.0	—	—	—	—	—	—	39,206.6	10,455.0
Whatcom	232,177.9	29,530.9	27,720.8	11,170.5	259,898.7	31,495.5	184,301.9	32,641.6	72,011.8	36,795.7	256,313.7	48,178.1	516,212.4	57,538.1
Total	4,290,011.3	116,727.3	100,202.0	18,079.8	4,390,213.3	117,151.1	950,681.9	58,081.8	198,140.3	45,219.2	1,148,822.2	69,160.7	5,539,035.5	135,059.7

Table A1-6—Number of live trees[a] on forest land, by county and land status, Washington, 2002–2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees													
Eastern Washington:														
Asotin	25,127.2	9,988.0	30.5	34.6	25,157.7	9,987.4	—	—	—	—	—	—	25,157.7	9,987.4
Chelan	210,505.0	19,368.5	21,911.8	5,478.3	232,416.7	20,062.8	68,429.3	16,622.6	38,381.0	14,403.1	106,810.2	21,535.5	339,227.0	29,389.7
Columbia	22,428.5	6,391.3	—	—	22,428.5	6,391.3	21,532.5	7,716.4	—	—	21,532.5	7,716.4	43,960.9	10,019.5
Douglas	114.1	113.9	—	—	114.1	113.9	—	—	—	—	—	—	114.1	113.9
Ferry	455,130.3	39,311.5	7,716.7	4,159.7	462,847.0	39,550.9	1,347.1	1,286.2	—	—	1,347.1	1,286.2	464,194.1	39,566.0
Garfield	20,684.2	4,247.8	346.6	379.4	21,030.8	4,253.7	9,255.3	4,220.6	—	—	9,255.3	4,220.6	30,286.1	5,992.3
Kittitas	230,270.5	22,197.0	9,494.3	4,159.3	239,764.8	22,553.3	12,270.4	6,879.8	452.3	429.9	12,722.7	7,021.3	252,487.6	23,620.3
Klickitat	165,966.1	23,396.5	22,163.8	9,209.5	188,130.0	25,102.7	368.7	415.9	—	—	368.7	415.9	188,498.6	25,106.1
Lincoln	15,733.6	7,791.3	—	—	15,733.6	7,791.3	—	—	—	—	—	—	15,733.6	7,791.3
Okanogan	496,486.3	36,711.0	35,043.3	9,144.2	531,529.6	37,650.0	201,907.3	39,570.8	97,513.6	26,167.8	299,421.0	46,229.5	830,950.6	59,550.1
Pend Oreille	433,565.5	31,717.4	5,344.7	2,852.8	438,910.2	31,729.7	28,133.1	20,795.2	2,571.9	2,715.2	30,705.1	20,952.1	469,615.2	38,023.2
Spokane	129,217.6	24,725.0	266.3	265.7	129,484.0	24,726.4	7,909.5	4,430.5	—	—	7,909.5	4,430.5	137,393.4	25,112.1
Stevens	433,538.7	40,817.5	3,828.6	2,233.7	437,367.3	40,869.5	32,238.2	14,640.0	—	—	32,238.2	14,640.0	469,605.5	43,202.5
Walla Walla	5,873.6	3,601.0	—	—	5,873.6	3,601.0	—	—	—	—	—	—	5,873.6	3,601.0
Whitman	4,695.8	3,859.2	—	—	4,695.8	3,859.2	—	—	—	—	—	—	4,695.8	3,859.2
Yakima	292,796.6	30,554.7	16,306.3	9,320.7	309,102.9	31,894.0	80,982.9	18,575.8	15,279.4	5,353.0	96,262.3	18,886.5	405,365.2	37,066.5
Total	2,942,133.8	83,063.3	122,452.8	18,187.9	3,064,586.7	84,305.1	464,374.3	48,472.0	154,198.3	29,332.9	618,572.6	52,418.4	3,683,159.2	98,780.6
All counties	7,232,145.2	132,914.2	222,654.8	25,596.7	7,454,800.0	133,475.6	1,415,056.2	72,344.7	352,338.6	53,798.0	1,767,394.7	83,140.3	9,222,194.7	155,252.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = fewer than 50 trees were estimated.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-7—Number of live trees[a] on forest land, by species group and diameter class, Washington, 2002-2011

	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	
Species group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees											
Softwoods:												
Douglas-fir	629,002.9	29,682.8	358,221.1	17,943.5	267,666.5	9,033.3	231,793.4	7,627.2	177,849.4	5,733.3	129,391.2	4,060.7
Engelmann and other spruces	81,262.4	11,356.4	31,069.6	4,901.6	16,513.4	1,797.3	11,410.5	1,354.6	8,703.8	870.7	6,842.1	779.9
Lodgepole pine	163,222.4	27,181.4	86,944.2	11,502.5	74,417.8	7,655.7	54,219.3	4,346.0	27,722.5	2,203.5	15,181.0	1,424.5
Ponderosa and Jeffrey pines	145,071.8	18,196.7	68,784.6	8,011.5	38,455.1	2,544.8	28,590.2	2,057.9	23,687.6	1,658.5	17,869.7	1,234.5
Sitka spruce	19,643.0	5,070.0	9,079.2	3,094.6	5,028.5	916.1	3,697.9	823.0	3,404.2	873.6	2,503.9	640.2
True fir	1,026,823.0	47,585.5	379,073.9	19,006.2	214,298.5	8,157.9	133,710.0	5,188.4	87,375.3	3,427.5	58,351.8	2,367.3
Western hemlock	783,294.4	55,760.1	297,531.8	17,766.7	181,695.6	7,458.3	124,546.5	5,252.1	91,285.7	3,799.0	66,244.6	2,947.6
Western larch	41,969.2	6,827.9	21,808.1	3,278.3	20,779.3	2,080.4	15,341.1	1,426.3	12,431.2	1,020.8	9,417.4	717.8
Western redcedar	337,499.6	32,736.7	111,753.3	10,266.2	57,542.5	3,198.8	37,041.4	2,078.7	22,084.0	1,379.0	16,085.2	1,016.0
Western white pine	20,503.7	3,595.5	3,381.8	1,028.8	2,706.1	386.3	1,696.6	257.2	919.7	163.2	554.4	126.8
Other western softwoods	252,727.2	24,564.3	92,423.6	10,790.5	47,975.3	3,580.3	31,517.8	2,351.0	20,204.1	1,645.9	13,965.8	1,212.9
Total	3,501,019.5	103,221.7	1,460,071.3	40,200.5	927,078.5	17,965.8	673,564.8	12,101.8	475,667.5	8,344.8	336,407.1	6,015.6
Hardwoods:												
Cottonwood and aspen	18,558.9	5,992.0	6,159.0	1,736.7	5,121.8	881.1	3,842.6	685.0	2,465.7	416.9	1,729.7	361.3
Oak	17,102.6	4,823.8	23,361.3	7,307.5	13,016.1	3,323.0	4,267.2	1,087.4	1,661.1	413.0	776.8	261.9
Red alder	198,514.9	21,324.8	102,206.4	10,964.0	67,698.4	4,519.0	48,349.1	2,977.1	32,267.1	2,148.3	23,768.2	1,733.9
Woodland hardwoods	41,201.4	11,231.9	12,363.6	2,410.4	6,152.9	675.5	2,954.7	368.5	1,465.8	255.1	1,259.9	253.7
Other western hardwoods	217,018.8	31,654.7	56,193.6	7,700.1	38,754.3	3,443.2	19,292.7	1,757.2	12,671.0	1,185.4	7,790.0	799.5
Total	492,396.8	41,154.5	200,283.9	15,567.0	130,743.4	6,927.2	78,706.3	3,874.0	50,530.7	2,594.6	35,324.5	2,004.8
All species groups	3,993,416.3	111,931.1	1,660,355.2	43,316.9	1,057,821.9	19,100.3	752,271.1	12,559.5	526,198.1	8,547.4	371,731.6	6,198.4

Table A1-7—Number of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

	Diameter class (inches)											
	13.0–14.9		15.0–16.9		17.0–18.9		19.0–20.9		21.0–22.9		23.0–24.9	
Species group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees											
Softwoods:												
Douglas-fir	91,440.1	2,923.9	63,678.4	2,127.5	43,569.6	1,591.5	31,534.9	1,242.3	23,072.9	1,072.6	16,389.2	858.4
Engelmann and other spruces	4,944.2	557.0	3,571.7	425.2	2,445.9	336.2	2,369.2	353.0	1,422.5	269.4	1,124.4	218.5
Lodgepole pine	7,979.8	852.0	3,043.0	481.8	1,158.4	218.6	464.6	129.0	199.8	81.5	107.4	57.1
Ponderosa and Jeffrey pines	13,483.5	991.3	10,812.2	810.9	6,900.8	598.7	5,757.0	536.1	3,988.8	448.8	2,425.2	247.1
Sitka spruce	1,414.7	342.2	1,126.0	248.9	738.7	177.9	548.1	163.7	345.4	114.8	403.6	140.5
True fir	41,064.1	1,845.7	26,112.0	1,228.3	19,095.8	1,016.6	14,937.7	925.8	10,298.6	718.2	7,100.2	523.7
Western hemlock	46,882.3	2,214.6	31,583.5	1,577.8	21,164.1	1,086.7	14,154.3	877.6	9,590.4	682.1	7,509.3	605.5
Western larch	5,771.9	489.4	3,883.0	396.7	1,890.1	231.9	1,563.8	215.4	1,012.5	198.3	759.7	155.4
Western redcedar	11,307.9	851.3	8,712.9	672.5	6,057.3	522.1	5,034.6	499.4	3,285.6	386.4	2,738.5	334.9
Western white pine	598.5	127.7	431.8	105.1	154.5	42.8	158.3	84.7	174.8	83.0	40.2	19.1
Other western softwoods	9,726.9	887.3	6,066.6	620.1	4,922.5	512.2	4,720.4	566.7	3,527.9	429.8	2,480.9	360.4
Total	234,613.9	4,416.6	159,021.0	3,198.9	108,097.6	2,405.3	81,243.0	2,054.8	56,919.1	1,646.7	41,078.5	1,305.4
Hardwoods:												
Cottonwood and aspen	1,286.7	332.6	940.9	228.9	770.5	180.3	672.5	168.9	421.8	159.0	396.2	116.4
Oak	570.4	210.4	288.8	128.0	324.2	142.3	151.5	75.9	117.0	66.9	12.6	8.9
Red alder	14,316.4	1,114.7	9,502.2	830.8	6,722.7	728.9	3,118.7	429.2	1,433.5	260.9	919.7	206.6
Woodland hardwoods	364.5	92.0	207.7	83.9	79.8	43.7	48.5	43.3	--	--	37.7	35.9
Other western hardwoods	5,432.5	663.1	3,847.1	551.2	2,765.0	498.9	1,993.2	331.6	853.4	185.5	1,006.9	257.5
Total	21,970.4	1,396.5	14,786.7	1,068.4	10,662.2	940.5	5,984.4	583.8	2,825.7	360.3	2,373.1	348.7
All species groups	256,584.4	4,534.4	173,807.7	3,315.6	118,759.9	2,561.6	87,227.3	2,137.8	59,744.8	1,675.2	43,451.6	1,352.5

Table A1-7—Number of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)											
	25.0–26.9		27.0–28.9		29.0–30.9		31.0–32.9		33.0–34.9		35.0–36.9	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees											
Softwoods:												
Douglas-fir	12,400.8	711.1	8,647.5	595.7	5,606.6	359.1	4,041.5	216.3	3,289.6	190.4	2,425.8	153.4
Engelmann and other spruces	664.1	111.2	532.4	101.0	306.7	57.7	245.0	51.8	155.2	37.1	106.4	26.2
Lodgepole pine	91.2	51.5	14.7	12.9	—	—	6.3	6.3	6.3	6.3	—	—
Ponderosa and Jeffrey pines	1,858.8	129.3	1,231.7	92.9	939.0	80.5	626.6	66.1	313.8	48.5	277.0	40.5
Sitka spruce	603.9	151.8	226.8	92.6	76.3	41.0	148.2	33.4	72.4	21.8	85.6	25.6
True fir	5,247.9	442.1	3,448.5	319.6	2,512.0	256.8	1,893.0	143.6	1,527.3	117.2	1,034.5	99.7
Western hemlock	4,847.8	443.5	4,029.5	402.9	2,873.5	286.7	2,085.6	152.8	1,534.7	117.4	1,336.2	112.3
Western larch	478.5	74.7	301.9	47.0	236.5	43.4	160.3	32.8	65.0	18.0	60.3	18.8
Western redcedar	2,283.7	305.9	1,413.0	219.9	1,200.1	193.6	801.7	83.2	696.6	77.2	507.6	61.0
Western white pine	48.4	19.8	119.5	75.3	22.8	11.3	38.2	20.1	11.2	8.6	4.1	2.9
Other western softwoods	1,670.4	259.6	1,310.4	238.9	1,040.3	191.8	836.3	107.5	729.9	115.5	619.4	92.9
Total	30,195.6	1,069.8	21,275.9	869.7	14,813.8	608.3	10,882.7	346.0	8,402.1	294.1	6,456.9	249.3
Hardwoods:												
Cottonwood and aspen	399.0	143.8	379.1	135.3	292.6	117.7	98.6	28.0	99.6	29.2	43.5	15.8
Oak	10.1	8.1	32.0	26.1	—	—	—	—	—	—	12.2	8.8
Red alder	306.4	103.3	267.7	99.7	132.9	64.3	37.2	17.8	20.6	11.4	18.3	9.6
Woodland hardwoods	—	—	5.6	5.9	2.2	2.1	—	—	—	—	—	—
Other western hardwoods	596.1	171.5	293.8	102.0	228.6	73.8	165.9	38.8	76.0	23.6	62.4	19.7
Total	1,311.6	255.0	978.2	197.9	656.2	152.4	301.7	53.7	196.1	39.1	136.5	28.3
All species groups	31,507.2	1,094.4	22,254.1	896.1	15,470.0	631.5	11,184.4	351.4	8,598.2	297.4	6,593.4	251.7

Table A1-7—Number of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

	Diameter class (inches)															
	37.0-38.9		39.0-40.9		41.0-42.9		43.0-44.9		45.0-46.9		47.0-48.9		49.0 +		All classes	
Species group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	1,990.8	134.8	1,449.2	106.7	1,284.0	109.4	886.4	90.2	661.9	75.1	542.7	69.2	2,183.5	202.8	2,109,019.9	50,509.7
Engelmann and other spruces	96.6	24.1	38.2	14.4	26.9	13.5	27.3	14.4	3.6	2.7	9.2	7.9	—	—	173,891.3	16,776.4
Lodgepole pine	—	—	2.0	2.0	—	—	—	—	—	—	—	—	5.6	5.9	434,786.2	38,694.8
Ponderosa and Jeffrey pines	171.2	31.9	84.8	17.6	130.8	30.5	67.2	17.9	21.7	8.6	26.6	10.8	22.1	9.0	371,597.8	26,710.2
Sitka spruce	21.2	11.3	37.8	15.0	27.6	12.8	19.6	11.0	26.0	13.0	34.0	14.4	137.3	35.5	49,449.9	8,427.7
True fir	912.8	91.6	745.3	97.9	421.2	56.1	407.5	59.4	324.0	47.7	167.9	40.8	539.6	84.3	2,037,422.2	71,580.0
Western hemlock	1,301.4	109.4	1,017.8	97.8	810.8	94.7	577.7	67.3	577.8	79.1	385.5	51.3	1,255.0	152.4	1,698,115.8	74,914.5
Western larch	45.7	15.9	19.3	9.3	21.0	10.7	2.0	2.0	3.7	2.8	6.5	6.4	32.8	12.5	138,060.9	10,878.6
Western redcedar	479.3	58.2	475.6	63.8	391.7	53.4	282.2	45.3	241.9	39.9	155.0	28.8	1,658.0	210.2	629,729.2	44,662.8
Western white pine	—	—	1.9	2.0	—	—	—	—	—	—	—	—	6.3	6.3	31,572.7	4,140.8
Other western softwoods	417.1	70.1	337.9	62.7	192.5	47.3	193.1	44.1	118.3	36.4	97.9	26.7	168.5	40.3	497,991.1	37,547.3
Total	5,436.1	225.6	4,209.9	215.8	3,306.4	174.2	2,463.1	147.1	1,979.0	137.8	1,425.3	107.1	6,008.6	341.5	8,171,637.1	147,153.8
Hardwoods:																
Cottonwood and aspen	19.0	9.6	37.6	14.7	33.0	12.8	16.3	9.3	22.2	10.3	2.0	2.0	20.9	11.1	43,829.4	7,162.3
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	61,704.0	12,663.1
Red alder	6.5	6.4	7.7	7.1	—	—	—	—	—	—	—	—	—	—	509,614.5	31,474.3
Woodland hardwoods	2.2	2.1	—	—	—	—	—	—	—	—	—	—	—	—	66,146.5	11,980.5
Other western hardwoods	41.1	15.8	52.1	17.1	31.4	14.1	37.1	15.4	15.9	7.7	—	—	44.5	19.0	369,263.1	36,963.1
Total	68.8	19.7	97.4	23.6	64.3	19.0	53.4	18.0	38.1	15.7	2.0	2.0	65.3	25.3	1,050,557.6	52,767.0
All species groups	5,504.8	227.3	4,307.3	216.9	3,370.7	175.1	2,516.5	148.5	2,017.1	138.8	1,427.3	107.1	6,074.0	342.4	9,222,194.7	155,252.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = fewer than 50 trees were estimated.

[a] Includes all live trees ≥ 1 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-8—Number of dead trees[a] on forest land, by species group and diameter class, Washington, 2002–2011

Species group	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	52,541.7	2,315.8	30,095.3	1,351.9	18,282.0	976.1	13,246.8	769.0	8,937.0	585.8	6,588.8	496.4	5,120.8	413.5	4,164.8	379.8
Engelmann and other spruces	4,214.0	686.2	3,299.1	530.4	3,158.0	620.9	2,180.0	400.3	1,625.6	396.2	1,402.1	324.3	556.0	130.0	405.2	107.2
Lodgepole pine	31,672.1	2,630.9	18,988.4	1,803.5	12,132.3	1,497.7	5,677.0	889.7	2,980.9	413.9	1,667.2	343.2	482.0	161.8	331.1	113.0
Ponderosa and Jeffrey pines	4,135.7	486.5	4,361.9	475.4	2,665.2	335.3	1,586.2	237.6	1,404.4	233.5	1,179.0	213.2	793.2	167.0	489.5	130.6
Sitka spruce	712.3	213.1	276.2	100.7	297.0	97.3	155.5	94.4	107.1	63.6	—	—	68.5	52.2	77.2	54.2
True fir	36,951.4	2,236.8	25,866.6	1,723.0	17,482.4	1,169.1	12,604.7	956.4	9,547.5	796.6	6,578.7	551.9	4,519.7	446.6	2,728.8	340.0
Western hemlock	24,117.9	1,749.0	11,669.5	896.1	7,052.9	627.0	4,543.4	431.8	3,153.7	358.6	2,824.5	308.5	1,746.8	226.8	1,572.4	228.9
Western larch	8,460.5	848.9	4,800.2	533.2	2,407.3	345.2	1,543.5	238.8	1,215.6	234.4	783.4	144.1	566.8	138.5	293.9	86.8
Western redcedar	5,157.3	647.8	2,083.2	337.9	1,266.6	222.5	1,251.8	205.1	1,050.4	193.0	762.3	177.0	829.8	167.2	699.3	151.0
Western white pine	908.6	191.4	1,458.1	329.7	1,040.4	256.1	902.8	221.7	470.4	120.2	605.6	177.9	148.0	57.2	111.7	53.0
Other western softwoods	5,393.3	699.9	4,727.7	625.5	3,456.4	551.0	3,244.1	387.6	2,283.6	358.7	1,471.4	222.9	1,352.3	289.1	953.4	204.2
Total	174,264.9	5,144.4	107,626.2	3,385.9	69,240.6	2,633.5	46,935.7	1,779.8	32,776.1	1,344.7	23,863.0	1,023.2	16,184.0	801.4	11,827.2	640.4
Hardwoods:																
Cottonwood and aspen	1,000.4	268.3	576.1	197.0	275.9	97.0	159.2	64.1	218.8	86.7	125.2	69.1	98.1	56.2	23.8	17.0
Oak	950.9	354.5	347.5	145.1	141.5	73.4	97.7	61.5	—	—	62.3	49.1	—	—	—	—
Red alder	8,417.7	809.6	4,838.6	571.8	3,868.7	470.3	2,210.3	295.0	1,479.2	238.4	869.1	194.0	377.3	110.9	234.1	92.9
Woodland hardwoods	282.1	102.2	188.4	85.7	99.4	56.6	—	—	23.8	17.0	—	—	—	—	—	—
Other western hardwoods	5,130.6	607.1	2,476.9	390.2	1,374.5	246.3	655.1	177.1	173.9	77.7	155.0	74.6	87.4	55.3	77.6	54.5
Total	15,781.8	1,111.9	8,427.6	738.9	5,760.0	548.6	3,122.2	356.9	1,895.7	265.1	1,211.6	224.0	562.7	146.3	335.5	108.7
All species groups	190,046.6	5,245.8	116,053.8	3,453.9	75,000.6	2,689.1	50,057.9	1,810.3	34,671.8	1,367.6	25,074.6	1,046.0	16,746.8	814.4	12,162.6	648.7

Table A1-8—Number of dead trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	3,306.2	339.1	2,573.6	294.5	1,707.3	197.4	2,078.5	237.0	1,450.8	173.1	965.9	86.9	789.7	81.9	811.7	75.8
Engelmann and other spruces	347.4	108.9	199.5	80.4	204.6	42.1	170.7	38.0	122.9	34.8	91.8	26.9	73.4	40.6	22.8	10.0
Lodgepole pine	212.8	91.0	2.0	2.0	28.6	14.2	25.7	13.3	8.2	6.6	1.7	1.9	—	—	—	—
Ponderosa and Jeffrey pines	414.2	113.9	225.5	53.1	188.1	33.2	141.1	23.8	88.4	20.1	80.0	18.3	87.0	25.2	84.3	22.5
Sitka spruce	26.1	32.5	38.9	38.5	8.9	8.5	77.4	54.2	45.9	39.2	13.1	9.1	14.9	9.1	16.6	10.4
True fir	2,103.5	257.2	1,728.4	262.4	1,234.6	185.4	929.0	156.1	516.1	93.2	451.3	54.6	346.5	44.5	300.2	42.3
Western hemlock	1,221.9	191.0	1,400.8	215.8	891.8	167.2	971.7	176.4	928.7	155.6	774.8	77.1	682.9	70.6	550.7	64.2
Western larch	337.2	91.0	217.5	75.8	129.2	24.2	95.8	19.1	76.5	25.2	71.7	18.5	29.8	11.8	39.3	15.1
Western redcedar	430.6	115.9	290.3	98.6	340.1	102.7	419.6	118.5	197.8	61.3	229.2	38.6	158.3	29.8	157.7	31.5
Western white pine	120.1	60.6	91.5	59.2	32.7	14.4	27.0	15.7	65.3	53.1	8.1	4.1	2.2	2.1	6.1	3.5
Other western softwoods	683.0	164.3	542.3	133.1	374.7	95.1	319.8	101.4	308.0	70.5	265.2	47.3	126.0	30.5	130.6	30.9
Total	9,203.0	541.8	7,310.3	504.3	5,140.7	353.9	5,256.3	372.9	3,808.6	278.6	2,952.8	149.7	2,310.8	135.2	2,120.1	123.2
Hardwoods:																
Cottonwood and aspen	31.4	34.5	12.4	8.6	3.9	2.8	1.7	1.9	—	—	2.0	2.0	2.0	2.0	1.9	2.0
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Red alder	211.4	89.5	—	—	—	—	—	—	—	—	6.3	6.3	—	—	—	—
Woodland hardwoods	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other western hardwoods	38.7	38.5	—	—	31.4	34.5	11.8	12.0	37.0	37.7	—	—	6.0	6.1	6.5	6.4
Total	281.5	103.1	12.4	8.6	35.3	34.6	13.5	12.2	37.0	37.7	8.3	6.6	8.0	6.4	8.5	6.7
All species groups	9,484.5	554.8	7,322.7	504.4	5,176.0	355.5	5,269.8	373.5	3,845.6	281.9	2,961.1	149.8	2,318.7	135.3	2,128.5	123.4

Table A1-8—Number of dead trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	37.0–38.9		39.0–40.9		41.0–42.9		43.0–44.9		45.0–46.9		47.0–48.9		49.0 +		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	623.3	62.5	547.9	59.4	422.3	48.2	364.3	48.5	346.8	47.4	278.7	41.6	1,430.0	136.3	156,673.9	4,899.3
Engelmann and other spruces	41.8	20.9	19.1	10.4	2.0	2.0	25.8	14.7	—	—	20.4	12.6	3.9	2.8	18,186.1	2,476.5
Lodgepole pine	—	—	—	—	—	—	—	—	—	—	—	—	8.0	4.0	74,217.8	5,982.6
Ponderosa and Jeffrey pines	24.7	10.7	29.3	14.1	9.1	4.4	1.8	1.9	1.8	1.9	6.0	3.5	14.0	7.4	18,010.4	1,213.1
Sitka spruce	31.9	17.4	14.7	9.3	19.3	11.0	16.7	10.5	23.2	12.2	10.8	8.4	90.0	25.0	2,142.5	409.9
True fir	244.3	38.7	180.7	31.4	90.7	20.6	78.8	21.6	95.4	24.3	73.8	17.7	170.5	33.5	124,823.5	5,861.9
Western hemlock	502.9	56.6	434.2	58.9	320.7	43.6	389.5	56.3	248.0	39.0	191.8	33.4	739.2	81.6	66,930.9	3,231.7
Western larch	11.6	4.8	13.5	8.7	10.3	4.6	16.1	9.7	8.4	6.7	—	—	3.8	2.8	21,132.0	1,660.9
Western redcedar	173.8	30.8	161.3	29.4	178.6	36.8	156.1	32.0	130.3	27.2	66.2	17.9	1,195.2	126.1	17,385.7	1,304.5
Western white pine	—	—	2.0	2.0	—	—	—	—	—	—	—	—	2.0	2.0	6,002.4	1,029.9
Other western softwoods	89.2	21.3	87.6	19.7	81.7	18.7	52.9	14.8	41.2	14.3	28.5	12.8	168.2	31.8	26,181.2	2,157.9
Total	1,743.4	106.7	1,490.3	98.9	1,134.7	81.9	1,101.9	86.6	895.0	75.4	676.3	63.2	3,824.7	221.5	531,686.5	11,726.6
Hardwoods:																
Cottonwood and aspen	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,532.7	465.2
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,600.0	499.9
Red alder	—	—	—	—	—	—	—	—	—	—	—	—	12.9	12.8	22,525.6	1,613.8
Woodland hardwoods	—	—	—	—	—	—	—	—	—	—	—	—	—	—	593.6	156.1
Other western hardwoods	—	—	—	—	2.0	2.0	—	—	—	—	—	—	2.0	2.0	10,266.3	1,075.7
Total	—	—	—	—	2.0	2.0	—	—	—	—	—	—	14.9	13.0	37,518.2	2,085.1
All species groups	1,743.4	106.7	1,490.3	98.9	1,136.7	81.9	1,101.9	86.6	895.0	75.4	676.3	63.2	3,839.6	222.6	569,204.6	11,877.5

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = fewer than 50 trees were estimated.

[a] Includes all dead trees ≥ 5 inches in diameter at breast height; smaller dead trees were not measured in this inventory.

Table A1-9—Number of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011

	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	
Species group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	252,275.0	8,714.5	220,065.0	7,513.7	168,465.0	5,632.3	121,195.8	3,928.0	84,568.5	2,823.2	56,910.8	1,976.6	38,349.6	1,465.6	27,325.6	1,137.1
Engelmann and other spruces	10,998.8	1,050.9	7,542.9	740.5	5,649.6	595.5	4,140.0	451.9	2,945.7	374.3	2,196.3	279.6	1,461.0	229.1	1,118.2	202.5
Lodgepole pine	50,175.3	4,809.9	37,919.6	2,830.4	19,637.3	1,401.7	10,425.5	960.2	5,052.5	552.2	1,957.7	293.4	786.3	157.6	233.4	74.9
Ponderosa and Jeffrey pines	36,037.1	2,470.3	27,562.2	2,033.7	22,426.2	1,623.2	17,109.7	1,203.0	12,773.2	956.9	10,204.5	765.3	6,458.1	570.5	5,167.5	516.6
Sitka spruce	4,713.4	896.2	3,266.2	805.6	2,932.7	850.5	2,339.2	633.6	1,356.5	338.8	890.0	223.0	555.8	146.0	453.5	151.7
True fir	126,863.1	6,167.3	76,038.2	3,377.7	49,780.7	2,214.9	31,384.6	1,416.1	20,019.5	1,006.2	13,232.3	710.6	9,286.6	554.8	6,810.6	447.5
Western hemlock	151,140.5	6,864.5	105,941.4	4,992.8	77,546.8	3,578.4	56,075.1	2,793.4	38,575.7	1,985.6	25,666.7	1,428.3	16,546.6	964.2	10,298.4	726.8
Western larch	20,366.9	2,072.2	14,928.7	1,407.4	11,747.6	956.2	8,624.1	640.7	5,447.2	457.7	3,322.5	340.4	1,759.1	221.9	1,421.3	200.8
Western redcedar	49,544.4	2,897.8	31,023.5	1,832.9	18,511.7	1,236.1	13,801.3	910.6	9,380.7	719.4	6,702.9	555.2	5,161.3	482.9	3,856.9	411.1
Western white pine	2,327.6	358.9	1,537.2	245.1	829.8	151.8	543.9	126.3	507.5	114.1	420.0	104.4	143.8	41.2	158.3	84.7
Other western softwoods	12,285.1	1,539.4	8,484.5	1,105.1	5,613.8	723.7	3,142.4	470.5	2,349.3	381.0	1,483.0	235.0	1,103.7	204.3	1,024.5	206.5
Total	716,727.1	15,239.7	534,309.2	10,482.8	383,141.0	7,415.4	268,781.4	5,251.6	182,976.2	3,802.0	122,986.7	2,765.3	81,612.1	2,028.2	57,868.0	1,651.4
Hardwoods:																
Cottonwood and aspen	4,646.7	865.0	3,153.5	599.3	2,138.7	388.2	1,608.4	351.8	1,123.0	323.5	777.5	208.9	670.3	170.1	518.2	150.6
Oak	6,172.9	1,669.2	2,310.4	664.3	953.7	307.4	425.7	211.4	321.6	153.4	102.6	63.0	141.1	90.9	37.4	38.2
Red alder	61,811.2	4,279.2	45,398.0	2,902.7	29,553.4	2,059.8	21,895.5	1,686.8	12,986.4	1,069.7	8,622.8	809.8	6,339.8	713.5	2,801.0	405.6
Other western hardwoods	36,224.1	3,367.5	17,436.0	1,675.9	11,342.3	1,102.7	6,907.4	771.9	4,551.2	594.4	3,558.6	540.4	2,466.4	479.9	1,803.1	307.6
Total	108,854.9	6,082.2	68,297.8	3,648.9	43,988.1	2,455.7	30,837.1	1,927.9	18,982.2	1,318.2	13,061.6	1,028.4	9,617.6	907.5	5,159.7	543.2
All species groups	825,582.0	16,383.9	602,607.0	10,994.0	427,129.1	7,655.9	299,618.5	5,460.1	201,958.5	3,936.3	136,048.2	2,904.9	91,229.7	2,207.5	63,027.7	1,742.8

Table A1-9—Number of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	19,260.3	940.0	13,870.8	773.7	9,878.6	619.3	7,090.8	530.8	4,556.2	312.8	3,086.0	174.1	2,441.3	157.1	1,712.0	112.6
Engelmann and other spruces	558.0	124.7	555.9	124.6	281.5	45.0	176.5	33.1	147.4	31.8	73.8	22.2	60.1	15.4	24.5	8.8
Lodgepole pine	199.8	81.5	38.2	17.2	21.7	10.9	14.7	12.9	—	—	6.3	6.3	6.3	6.3	—	—
Ponderosa and Jeffrey pines	3,695.6	433.3	2,340.6	245.3	1,703.6	121.1	1,148.9	89.5	881.8	78.6	580.1	62.6	258.2	39.6	259.3	38.9
Sitka spruce	264.0	100.0	266.4	119.4	379.5	119.7	226.8	92.6	60.3	39.5	100.0	26.8	30.9	14.0	61.8	22.3
True fir	4,606.2	354.9	3,083.9	270.7	2,472.2	224.0	1,546.8	152.6	1,073.9	127.1	751.7	70.7	690.1	68.1	473.5	54.4
Western hemlock	7,275.4	563.3	4,983.7	468.1	3,324.7	365.0	2,235.7	246.0	1,832.8	222.6	1,042.6	90.2	830.2	76.7	638.7	62.7
Western larch	969.0	192.9	637.0	133.2	397.8	54.8	259.0	42.1	202.0	40.2	139.4	28.2	51.3	14.9	58.4	18.7
Western redcedar	2,734.5	351.5	1,967.5	272.1	1,726.9	257.8	1,110.3	194.3	955.6	173.5	541.7	58.6	560.2	64.1	388.7	51.4
Western white pine	74.7	43.5	7.6	3.9	42.0	18.5	79.9	61.2	9.9	6.9	5.9	3.5	3.9	4.0	4.1	2.9
Other western softwoods	795.0	149.7	499.7	117.5	385.7	123.1	205.7	84.6	321.6	73.2	146.5	26.6	125.5	25.3	147.8	32.0
Total	40,432.4	1,317.1	28,251.5	1,030.2	20,614.1	845.8	14,095.1	656.4	10,041.7	464.6	6,474.0	239.3	5,058.1	211.3	3,768.8	164.2
Hardwoods:																
Cottonwood and aspen	231.8	108.9	312.6	102.9	264.1	107.5	206.3	95.2	245.0	111.0	75.3	22.6	61.8	23.0	37.2	14.5
Oak	37.4	38.2	—	—	10.1	8.1	—	—	—	—	—	—	—	—	6.1	6.3
Red alder	1,351.7	255.6	799.7	195.8	306.4	103.3	191.3	83.8	131.2	64.3	37.2	17.8	12.8	9.0	12.0	7.3
Other western hardwoods	740.7	173.9	851.7	232.5	543.9	158.7	205.1	85.1	180.4	62.8	155.0	37.9	64.0	21.9	58.1	18.9
Total	2,361.6	326.9	1,964.1	318.1	1,124.4	227.4	602.6	152.7	556.6	142.1	267.6	49.9	138.6	32.9	113.5	25.6
All species groups	42,794.0	1,347.6	30,215.5	1,081.0	21,738.5	872.7	14,697.7	676.9	10,598.3	491.2	6,741.6	245.7	5,196.7	215.1	3,882.3	167.5

Table A1-9—Number of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	37.0–38.9		39.0–40.9		41.0–42.9		43.0–44.9		45.0–46.9		47.0–48.9		49.0 +		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand trees															
Softwoods:																
Douglas-fir	1,300.7	94.3	949.9	76.4	728.9	69.3	513.9	53.1	378.6	45.2	300.4	36.1	1,141.3	116.0	1,036,365.0	22,102.9
Engelmann and other spruces	33.0	11.3	21.4	9.7	10.3	6.9	—	—	1.7	1.9	1.9	2.0	—	—	37,998.4	3,001.2
Lodgepole pine	—	—	2.0	2.0	—	—	—	—	—	—	—	—	5.6	5.9	126,482.0	8,633.0
Ponderosa and Jeffrey pines	147.8	29.2	72.8	16.2	86.5	20.7	55.9	15.4	21.7	8.6	26.6	10.8	22.1	9.0	149,039.9	7,396.1
Sitka spruce	21.2	11.3	16.9	9.5	20.5	10.8	8.2	6.7	6.5	6.4	34.0	14.4	70.0	25.7	18,074.2	3,132.1
True fir	380.2	45.9	249.4	33.3	159.3	25.8	152.1	23.5	139.2	24.7	51.2	17.6	162.6	32.9	349,407.8	12,654.6
Western hemlock	596.5	55.8	438.5	44.1	340.9	41.4	247.0	31.9	195.5	25.5	176.0	27.3	468.1	63.7	506,417.2	18,143.2
Western larch	38.4	13.9	11.7	4.9	13.3	7.2	2.0	2.0	3.7	2.8	6.5	6.4	32.8	12.5	70,439.7	4,568.8
Western redcedar	284.8	40.3	296.5	44.8	254.8	36.2	189.5	36.5	137.6	24.6	89.7	19.6	670.0	78.9	149,891.0	7,102.0
Western white pine	—	—	1.9	2.0	—	—	—	—	—	—	—	—	6.3	6.3	6,704.3	725.9
Other western softwoods	87.5	20.3	97.5	27.3	28.9	11.1	33.1	10.4	23.6	8.8	29.2	10.2	59.3	17.2	38,472.8	4,019.5
Total	2,890.0	138.5	2,158.4	112.7	1,643.4	99.4	1,201.6	81.8	908.0	65.5	715.6	59.6	2,638.0	170.2	2,489,292.4	32,374.3
Hardwoods:																
Cottonwood and aspen	12.7	7.3	18.6	9.8	20.4	9.6	10.0	6.9	12.1	7.7	2.0	2.0	14.6	9.1	16,160.8	2,039.4
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10,519.0	2,579.9
Red alder	6.5	6.4	—	—	—	—	—	—	—	—	—	—	—	—	192,257.0	9,582.6
Other western hardwoods	34.5	14.5	40.6	14.7	25.0	12.6	24.2	12.4	9.6	4.4	—	—	31.8	14.2	87,253.6	6,423.4
Total	53.7	17.4	59.2	17.7	45.4	15.8	34.2	14.2	21.6	8.9	2.0	2.0	46.4	16.8	306,190.3	12,570.5
All species groups	2,943.7	140.9	2,217.7	114.0	1,688.8	100.4	1,235.8	83.5	929.6	66.3	717.6	59.6	2,684.4	170.9	2,795,482.8	33,390.3

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = fewer than 50 trees were estimated.

[a] Includes live growing stock trees of commercial species that are ≥ 5 inches in diameter at breast height; excludes trees that are classified as rough or rotten cull.

Table A1-10—Net volume of live trees[a] on forest land, by ownership and land status, Washington, 2002–2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Forest Service:														
National forest	27,652.2	428.4	742.3	111.9	28,394.6	422.5	9,513.9	522.3	1,367.7	252.3	10,881.6	502.1	39,276.1	629.0
Total	27,652.2	428.4	742.3	111.9	28,394.6	422.5	9,513.9	522.3	1,367.7	252.3	10,881.6	502.1	39,276.1	629.0
Other federal government:														
Bureau of Land Management	113.7	51.1	8.1	7.8	121.8	51.6	—	—	—	—	—	—	121.8	51.6
Department of Defense or Energy	291.8	124.6	—	—	291.8	124.6	—	—	—	—	—	—	291.8	124.6
National Park Service	—	—	—	—	—	—	11,274.1	528.2	499.2	149.2	11,773.3	500.3	11,773.3	500.3
Fish and Wildlife Service	—	—	—	—	—	—	344.0	107.2	0.9	1.1	344.9	107.2	344.9	107.2
Other federal government	307.7	124.2	71.9	70.6	379.5	142.8	46.9	37.6	—	—	46.9	37.6	426.5	147.6
Total	713.2	182.9	80.0	71.0	793.2	195.9	11,665.0	531.9	500.1	149.3	12,165.1	503.9	12,958.3	536.7
State and local government:														
Local	1,721.8	281.3	69.7	41.6	1,791.5	285.2	310.3	113.8	12.3	12.2	322.6	114.4	2,114.1	306.3
State	11,153.4	511.2	53.9	24.2	11,207.3	510.3	662.0	184.6	3.5	3.4	665.6	184.6	11,872.9	510.9
Other public	50.8	50.3	—	—	50.8	50.3	—	—	—	—	—	—	50.8	50.3
Total	12,926.0	583.7	123.6	48.1	13,049.6	584.8	972.3	216.5	15.9	12.7	988.1	216.8	14,037.8	592.2
Corporate private	13,021.6	544.8	137.4	61.8	13,159.0	547.2	—	—	—	—	—	—	13,159.0	547.2
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	733.5	156.4	9.3	8.9	742.8	156.6	—	—	—	—	—	—	742.8	156.6
Unicorporated partnerships, associations, clubs	103.6	83.3	—	—	103.6	83.3	—	—	—	—	—	—	103.6	83.3
American Indian	4,448.6	334.8	68.8	47.9	4,517.3	337.6	—	—	—	—	—	—	4,517.3	337.6
Individual	7,296.3	451.9	166.1	59.7	7,462.4	455.0	—	—	—	—	—	—	7,462.4	455.0
Total	12,582.0	548.1	244.1	76.9	12,826.2	551.3	—	—	—	—	—	—	12,826.2	551.3
All private	25,603.6	638.4	381.6	98.3	25,985.2	639.7	—	—	—	—	—	—	25,985.2	639.7
All owners	66,895.1	907.6	1,327.5	171.8	68,222.6	904.7	22,151.1	775.5	1,883.7	293.4	24,034.8	742.9	92,257.4	1,130.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all live trees ≥5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-11—Net volume of dead trees[a] on forest land, by ownership and land status, Washington, 2002–2011

Ownership	Land status													
	Unreserved forests						Reserved forests						All forest land	
	Timberland		Other forest		Total		Productive		Other forest		Total			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Forest Service:														
National forest	3,889.0	107.2	175.8	32.8	4,064.9	109.6	2,031.7	165.2	332.8	74.4	2,364.5	168.9	6,429.4	199.5
Total	3,889.0	107.2	175.8	32.8	4,064.9	109.6	2,031.7	165.2	332.8	74.4	2,364.5	168.9	6,429.4	199.5
Other federal government:														
Bureau of Land Management	12.2	9.1	0.9	1.2	13.2	9.2	—	—	—	—	—	—	13.2	9.2
Departments of Defense or Energy	16.8	8.3	—	—	16.8	8.3	—	—	—	—	—	—	16.8	8.3
National Park Service	—	—	—	—	—	—	1,515.9	111.0	136.1	39.4	1,652.0	108.7	1,652.0	108.7
Fish and Wildlife Service	—	—	—	—	—	—	31.7	13.3	—	—	31.7	13.3	31.7	13.3
Other federal government	30.3	14.6	0.8	0.8	31.1	14.6	4.8	4.9	—	—	4.8	4.9	35.9	15.4
Total	59.3	19.1	1.7	1.4	61.0	19.1	1,552.4	111.3	136.1	39.4	1,688.5	109.0	1,749.5	110.4
State and local government:														
Local	127.7	31.9	5.0	3.2	132.6	32.0	22.9	10.7	6.5	6.4	29.3	12.4	162.0	34.3
State	1,010.1	87.6	6.9	4.9	1,017.0	87.7	63.3	21.9	—	—	63.3	21.9	1,080.3	88.6
Other public	0.9	0.9	—	—	0.9	0.9	—	—	—	—	—	—	0.9	0.9
Total	1,138.6	93.1	11.9	5.9	1,150.6	93.2	86.1	24.3	6.5	6.4	92.6	25.2	1,243.2	94.6
Corporate private	802.8	55.2	9.0	4.6	811.8	55.3	—	—	—	—	—	—	811.8	55.3
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	40.0	10.2	—	—	40.0	10.2	—	—	—	—	—	—	40.0	10.2
Unicorporated partnerships, associations, or clubs	3.8	3.0	—	—	3.8	3.0	—	—	—	—	—	—	3.8	3.0
American Indian	598.7	69.1	15.4	10.8	614.0	69.8	—	—	—	—	—	—	614.0	69.8
Individual	427.0	42.1	6.0	2.7	433.0	42.2	—	—	—	—	—	—	433.0	42.2
Total	1,069.5	79.7	21.4	11.1	1,090.8	80.3	—	—	—	—	—	—	1,090.8	80.3
All private	1,872.2	92.0	30.4	12.0	1,902.6	92.4	—	—	—	—	—	—	1,902.6	92.4
All owners	6,959.2	168.0	219.9	35.5	7,179.0	169.8	3,670.3	200.7	475.3	84.4	4,145.6	202.6	11,324.6	261.8

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory.

Table A1-12—Net cubic volume of live trees[a] on forest land, by county and land status, Washington, 2002–2011

County	Land status													
	Unreserved forests						Reserved forests						All forest land	
	Timberland		Other forest		Total		Productive		Other forest		Total			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Western Washington:														
Clallam	3,831.5	362.5	25.5	15.2	3,856.9	362.6	3,413.3	488.7	71.2	37.4	3,484.5	488.9	7,341.4	608.2
Clark	897.2	201.1	6.2	6.2	903.5	201.2	22.3	27.8	—	—	22.3	27.8	925.8	203.1
Cowlitz	1,989.6	255.8	5.8	4.6	1,995.4	255.9	116.8	54.1	—	—	116.8	54.1	2,112.2	261.5
Grays Harbor	4,505.8	409.4	106.5	60.7	4,612.3	413.6	—	—	—	—	—	—	4,612.3	413.6
Island	185.9	73.3	—	—	185.9	73.3	12.3	11.4	—	—	12.3	11.4	198.2	74.1
Jefferson	2,832.7	341.1	25.0	19.4	2,857.7	341.5	4,598.6	568.0	306.1	137.7	4,904.7	576.3	7,762.4	672.1
King	3,351.3	339.0	133.3	51.1	3,484.5	343.8	896.3	256.2	178.1	128.2	1,074.3	280.9	4,558.9	442.1
Kitsap	801.2	202.5	—	—	801.2	202.5	—	—	—	—	—	—	801.2	202.5
Lewis	5,344.2	399.5	43.7	31.5	5,387.9	400.9	1,245.5	256.0	31.7	24.4	1,277.2	258.8	6,665.1	474.8
Mason	1,431.6	207.9	24.6	17.6	1,456.2	208.7	409.7	186.6	—	—	409.7	186.6	1,865.9	278.6
Pacific	2,278.6	305.1	11.1	7.9	2,289.7	305.5	108.9	68.6	0.9	1.1	109.8	68.5	2,399.5	312.7
Pierce	2,458.8	316.6	79.1	70.9	2,537.9	324.1	1,786.9	345.9	103.7	62.8	1,890.5	347.2	4,428.4	475.0
San Juan	280.5	97.1	—	—	280.5	97.1	128.1	92.7	—	—	128.1	92.7	408.6	134.2
Skagit	3,193.5	315.1	7.6	5.6	3,201.2	315.2	1,278.5	305.0	8.8	5.6	1,287.3	305.1	4,488.5	438.4
Skamania	5,897.2	357.9	28.6	21.2	5,925.8	357.9	493.7	146.0	66.9	72.9	560.6	155.2	6,486.5	388.4
Snohomish	4,041.9	405.6	132.6	84.9	4,174.4	404.8	1,324.2	292.1	214.2	105.0	1,538.4	302.1	5,712.8	499.0
Thurston	1,001.6	213.7	42.5	42.5	1,044.1	217.8	—	—	—	—	—	—	1,044.1	217.8
Wahkiakum	730.3	214.5	11.1	11.0	741.4	214.8	—	—	—	—	—	—	741.4	214.8
Whatcom	2,643.0	288.2	85.8	33.6	2,728.8	289.8	1,989.0	317.0	62.5	28.4	2,051.5	317.7	4,780.3	429.7
Total	47,696.3	904.8	769.1	154.5	48,465.3	904.0	17,824.0	733.6	1,044.1	233.9	18,868.1	700.1	67,333.5	1,114.7

Table A1-12—Net cubic volume of live trees[a] on forest land, by county and land status, Washington, 2002–2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Eastern Washington:														
Asotin	123.8	32.6	0.1	0.2	124.0	32.6	—	—	—	—	—	—	124.0	32.6
Chelan	2,041.3	159.7	144.1	34.6	2,185.4	162.7	1,017.1	239.9	203.3	68.8	1,220.5	246.7	3,405.9	295.1
Columbia	253.2	41.9	—	—	253.2	41.9	349.0	110.9	—	—	349.0	110.9	602.2	118.6
Douglas	2.8	2.8	—	—	2.8	2.8	—	—	—	—	—	—	2.8	2.8
Ferry	2,711.2	190.9	25.4	9.5	2,736.6	191.0	13.0	12.4	—	—	13.0	12.4	2,749.6	191.3
Garfield	185.0	34.6	0.3	0.3	185.4	34.6	148.0	74.1	—	—	148.0	74.1	333.4	81.8
Kittitas	2,065.7	173.9	60.6	22.2	2,126.2	175.1	124.7	63.7	0.3	0.3	125.0	63.8	2,251.2	186.3
Klickitat	1,226.9	184.9	54.4	17.5	1,281.4	186.0	12.8	14.4	—	—	12.8	14.4	1,294.1	186.6
Lincoln	70.9	25.1	—	—	70.9	25.1	—	—	—	—	—	—	70.9	25.1
Okanogan	2,808.2	163.8	135.3	32.0	2,943.5	166.0	1,130.9	199.4	258.1	79.5	1,389.0	209.1	4,332.5	266.3
Pend Oreille	2,122.2	133.1	25.2	9.3	2,147.4	133.0	135.1	78.7	21.9	23.1	157.0	81.9	2,304.3	156.2
Spokane	572.0	107.6	2.2	2.2	574.2	107.6	122.5	62.2	—	—	122.5	62.2	696.7	124.1
Stevens	2,239.5	170.7	16.7	9.5	2,256.1	170.9	221.3	83.9	—	—	221.3	83.9	2,477.4	187.0
Walla Walla	33.9	22.8	—	—	33.9	22.8	—	—	—	—	—	—	33.9	22.8
Whitman	40.0	26.5	—	—	40.0	26.5	—	—	—	—	—	—	40.0	26.5
Yakima	2,702.2	256.4	94.2	49.6	2,796.4	260.8	1,052.8	227.9	355.9	150.1	1,408.7	262.0	4,205.1	369.7
Total	19,198.8	450.9	558.5	75.4	19,757.2	452.3	4,327.1	359.7	839.5	177.2	5,166.7	361.0	24,923.9	573.0
All counties	66,895.1	907.6	1,327.5	171.8	68,222.6	904.7	22,151.1	775.5	1,883.7	293.4	24,034.8	742.9	92,257.4	1,130.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all live trees ≥ 5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-13—Net volume of live trees[a] on forest land, by forest type group and stand size class, Washington 2002–2011

	Stand size class							
	Large-diameter stands		Medium-diameter stands		Small-diameter stands		All classes	
Forest type group	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet							
Softwoods:								
Douglas-fir	35,245.5	1,022.3	1,422.2	115.3	369.2	38.9	37,037.0	1,016.4
Fir/spruce/mountain hemlock	18,082.0	787.2	541.4	81.9	235.5	29.1	18,858.9	783.3
Hemlock/Sitka spruce	22,227.6	951.1	498.6	83.1	112.9	23.0	22,839.1	951.7
Lodgepole pine	1,063.4	163.7	531.4	81.0	43.0	9.9	1,637.8	181.0
Ponderosa pine	3,322.7	208.1	60.4	20.8	109.8	27.0	3,493.0	209.7
Western larch	970.6	136.3	127.1	38.1	14.4	4.3	1,112.1	141.1
Other western softwoods	148.8	32.6	25.6	10.3	17.1	5.9	191.5	34.0
Total	81,060.6	1,181.0	3,206.7	184.5	901.9	60.3	85,169.3	1,145.3
Hardwoods:								
Alder/maple	4,683.2	404.6	966.6	111.2	112.1	25.0	5,761.9	414.4
Aspen/birch	144.2	52.5	77.0	25.8	11.5	5.5	232.7	58.7
Elm/ash/cottonwood	672.8	169.4	17.4	10.4	2.6	1.5	692.8	169.7
Western oak	61.6	34.4	67.6	22.7	15.9	6.2	145.1	41.6
Woodland hardwoods	28.1	14.3	4.7	2.9	17.1	8.1	50.0	16.6
Other hardwoods	76.6	56.0	24.3	14.1	24.2	8.0	125.0	58.3
Total	5,666.5	440.3	1,157.6	117.3	183.4	28.6	7,007.5	449.4
Nonstocked	—	—	—	—	—	—	80.6	12.0
All forest types	86,727.1	1,181.8	4,364.3	215.2	1,085.4	66.2	92,257.4	1,130.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.
[a] Includes all live trees ≥ 5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-14—Net volume of live trees[a] on forest land, by forest type group and ownership group, Washington, 2002-2011

	Ownership group													
							Private							
	Forest Service		Other federal government		State and local government		Corporate		Noncorporate		All private		All owners	
Forest type group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Million cubic feet							
Softwoods:														
Douglas-fir	14,179.8	505.6	3,924.4	531.4	6,766.9	488.5	6,860.7	418.4	5,305.1	399.1	12,165.8	541.7	37,037.0	1,016.4
Fir/spruce/mountain hemlock	13,396.9	592.4	3,517.0	442.6	698.4	178.1	390.8	88.5	855.8	167.8	1,246.6	188.0	18,858.9	783.3
Hemlock/Sitka spruce	8,250.4	457.2	5,176.7	527.6	3,939.5	471.7	3,725.9	389.4	1,746.6	263.1	5,472.5	454.2	22,839.1	951.7
Lodgepole pine	1,047.5	138.2	0.9	1.1	113.8	41.7	57.5	51.2	418.1	96.7	475.5	109.1	1,637.8	181.0
Ponderosa pine	853.3	89.1	125.7	42.4	365.8	68.0	449.4	76.0	1,698.7	160.2	2,148.2	174.1	3,493.0	209.7
Western larch	729.6	103.3	63.3	53.0	113.9	56.2	60.6	30.0	144.7	49.2	205.4	57.3	1,112.1	141.1
Other western softwoods	178.0	33.2	—	—	3.5	3.4	3.1	3.4	6.8	5.4	9.9	6.4	191.5	34.0
Total	38,635.6	636.9	12,807.9	536.7	12,001.9	572.2	11,548.0	527.3	10,175.9	514.4	21,723.9	635.2	85,169.3	1,145.3
Hardwoods:														
Alder/maple	376.7	66.7	116.7	53.2	1,672.3	259.5	1,452.9	202.2	2,143.3	254.3	3,596.2	318.4	5,761.9	414.4
Aspen/birch	46.9	17.4	—	—	28.3	21.0	1.3	1.2	156.1	52.1	157.4	52.1	232.7	58.7
Elm/ash/cottonwood	153.2	86.4	31.1	29.2	311.7	127.6	53.2	27.4	143.7	59.1	196.8	65.1	692.8	169.7
Western oak	3.5	3.5	2.1	2.6	9.3	9.0	62.8	34.8	67.4	20.5	130.1	40.4	145.1	41.6
Woodland hardwoods	22.9	12.9	—	—	1.7	1.5	1.7	1.6	23.7	10.3	25.4	10.4	50.0	16.6
Other hardwoods	7.7	5.1	0.4	0.4	—	—	35.4	30.2	81.5	49.6	116.9	58.1	125.0	58.3
Total	611.0	112.3	150.3	60.6	2,023.4	285.1	1,607.2	208.4	2,615.6	268.8	4,222.9	332.1	7,007.5	449.4
Nonstocked	29.5	5.4	0.1	0.1	12.5	5.9	3.9	3.1	34.6	8.4	38.5	8.9	80.6	12.0
All forest types	39,276.1	629.0	12,958.3	536.7	14,037.8	592.2	13,159.0	547.2	12,826.2	551.3	25,985.2	639.7	92,257.4	1,130.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all live trees ≥5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-15—Net volume of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011

Species group	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	630.0	21.8	1,492.4	50.7	2,220.9	74.8	2,680.4	88.6	2,821.8	96.4	2,777.2	98.1	2,579.8	103.6	2,452.3	103.4
Engelmann and other spruces	38.8	4.6	75.1	9.4	111.5	11.8	148.2	18.3	157.8	19.0	160.7	20.1	148.8	21.0	182.4	28.8
Lodgepole pine	225.5	24.4	408.0	33.1	376.8	30.4	329.9	33.0	242.3	27.9	128.6	20.9	67.8	13.2	31.0	8.8
Ponderosa and Jeffrey pines	58.6	4.1	120.9	9.4	209.8	15.5	273.1	19.7	331.3	25.4	376.9	28.9	323.9	30.5	369.3	35.8
Sitka spruce	10.1	1.9	21.2	5.3	37.8	11.2	50.4	12.4	41.2	9.7	44.2	9.9	37.7	9.2	39.5	12.5
True fir	454.5	18.7	810.6	32.2	1,063.2	43.3	1,184.3	50.2	1,261.5	58.4	1,158.7	56.4	1,154.2	62.8	1,189.2	76.6
Western hemlock	468.3	21.2	911.4	41.6	1,312.2	57.2	1,611.8	75.9	1,707.6	85.6	1,645.3	86.6	1,448.3	77.7	1,262.0	81.5
Western larch	60.3	6.5	116.1	11.4	174.3	14.5	209.5	17.2	187.6	16.6	172.3	18.3	114.0	14.6	117.4	16.7
Western redcedar	132.9	7.9	224.3	13.9	245.4	15.9	288.2	19.0	290.0	22.3	294.8	24.8	270.7	24.9	279.7	29.4
Western white pine	5.9	0.9	11.4	1.8	12.2	2.1	14.3	3.4	21.2	4.7	23.0	5.8	10.8	3.1	15.0	8.4
Other western softwoods	63.6	5.5	119.1	9.8	160.3	14.3	189.9	18.3	203.1	20.1	192.3	19.9	204.9	23.5	253.5	32.6
Total	2,148.4	47.3	4,310.5	83.7	5,924.5	110.8	6,979.9	135.0	7,265.6	148.0	6,974.0	151.0	6,361.0	154.6	6,191.4	166.7
Hardwoods:																
Cottonwood and aspen	15.4	2.6	30.2	5.5	37.1	6.3	44.3	9.4	48.3	12.1	49.4	12.0	48.2	10.6	49.8	14.1
Oak	23.0	5.9	18.0	4.6	12.9	3.4	8.7	3.3	7.4	2.7	5.4	2.3	8.3	4.2	4.1	2.5
Red alder	196.5	13.8	379.7	24.3	477.6	34.1	566.7	43.9	514.9	42.8	466.7	44.5	436.9	49.9	246.5	35.0
Woodland hardwoods	8.9	1.1	8.2	1.2	6.8	1.1	8.9	1.7	4.6	1.2	3.9	1.6	1.6	0.9	1.8	1.6
Other western hardwoods	109.0	10.1	143.2	13.4	173.4	16.7	173.2	19.1	180.3	23.8	179.1	26.7	173.0	35.6	141.7	24.5
Total	352.8	19.3	579.4	30.0	707.7	39.4	801.8	50.1	755.6	51.8	704.5	55.1	668.0	64.9	443.8	45.8
All species groups	2,501.3	50.6	4,889.9	87.7	6,632.2	115.2	7,781.7	141.1	8,021.1	153.6	7,678.4	158.8	7,028.9	166.3	6,635.2	173.3

Table A1-15—Net volume of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	2,238.1	109.4	1,983.9	113.2	1,833.8	114.1	1,514.0	113.0	1,103.0	74.7	908.2	50.0	840.5	50.2	708.4	47.6
Engelmann and other spruces	142.5	29.8	134.6	28.1	95.1	15.9	93.0	18.2	63.9	12.6	58.0	12.7	41.5	10.2	32.9	8.2
Lodgepole pine	16.6	7.0	11.7	6.6	9.0	4.9	1.5	1.3	--	--	1.4	1.4	1.3	1.3	--	--
Ponderosa and Jeffrey pines	325.6	37.6	250.6	25.6	229.8	16.3	187.5	14.3	170.2	15.0	132.1	14.6	76.9	12.7	77.6	11.3
Sitka spruce	32.5	11.1	52.5	18.8	86.7	22.7	35.9	15.3	15.1	7.9	32.3	7.6	18.3	5.7	24.9	7.4
True fir	1,047.7	75.1	921.6	70.8	840.0	74.5	650.3	64.7	568.3	60.8	485.8	37.7	472.0	38.1	354.9	35.5
Western hemlock	1,098.0	80.8	1,018.0	83.6	754.2	73.3	762.3	78.2	624.3	62.6	525.2	39.9	446.1	35.7	427.5	37.7
Western larch	96.7	20.0	85.9	17.8	63.1	10.2	47.5	7.9	41.8	7.6	31.2	6.6	15.9	4.5	15.7	5.0
Western redcedar	218.9	27.5	226.5	30.1	240.0	32.5	164.3	25.8	172.9	28.5	130.8	14.5	126.4	13.8	107.4	13.3
Western white pine	15.4	7.6	5.3	2.5	7.9	3.2	15.7	9.3	4.7	2.4	10.9	6.0	3.6	2.7	1.2	0.9
Other western softwoods	248.7	32.4	239.8	36.6	194.7	32.2	169.2	32.3	172.9	32.3	166.3	21.0	167.7	30.5	165.8	25.9
Total	5,480.8	167.1	4,930.3	167.2	4,354.2	168.0	3,641.2	161.1	2,937.2	127.7	2,482.0	82.2	2,210.0	81.3	1,916.3	78.8
Hardwoods:																
Cottonwood and aspen	39.4	13.4	59.1	17.9	71.0	25.4	77.5	30.2	66.8	27.4	25.2	7.4	28.3	8.3	12.1	4.5
Oak	3.8	2.7	0.4	0.4	0.6	0.5	0.3	0.3	--	--	--	--	--	--	1.6	1.2
Red alder	142.5	27.5	107.6	25.7	39.1	14.0	34.2	14.5	24.1	10.9	10.0	4.8	2.6	1.8	2.7	1.5
Woodland hardwoods	--	--	0.8	0.7	--	--	0.1	0.1	0.2	0.2	--	--	--	--	--	--
Other western hardwoods	69.2	15.6	107.1	28.8	73.1	21.1	35.1	13.0	31.4	10.2	27.5	6.7	12.0	4.4	11.3	3.8
Total	255.0	34.1	275.0	42.1	183.7	37.0	147.2	35.9	122.5	31.1	62.7	11.6	42.9	9.5	27.7	6.2
All species groups	5,735.8	169.6	5,205.3	172.9	4,537.8	171.3	3,788.4	166.0	3,059.7	132.0	2,544.7	83.3	2,252.9	82.0	1,944.0	79.2

Table A1-15—Net volume of live trees[a] on forest land, by species group and diameter class, Washington, 2002–2011 (continued)

	Diameter class (inches)															
	37.0–38.9		39.0–40.9		41.0–42.9		43.0–44.9		45.0–46.9		47.0–48.9		49.0 +		All classes	
Species group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	656.3	45.8	531.9	41.6	524.0	48.7	392.9	43.9	323.8	38.8	286.7	37.7	1,715.6	171.5	33,215.8	763.2
Engelmann and other spruces	32.2	8.2	15.0	5.7	12.9	6.5	14.0	7.4	1.7	1.3	5.7	5.0	—	—	1,766.4	165.1
Lodgepole pine	—	—	0.3	0.3	—	—	—	—	—	—	—	—	1.7	1.8	1,853.3	132.9
Ponderosa and Jeffrey pines	55.4	10.8	30.9	6.8	54.5	12.9	28.3	8.0	10.3	4.3	15.5	6.4	17.5	7.2	3,726.4	167.4
Sitka spruce	8.0	4.6	14.1	5.7	13.5	6.3	10.1	6.0	14.3	7.6	21.5	9.1	136.4	42.5	798.2	103.3
True fir	372.2	38.7	345.9	46.3	213.6	29.9	224.9	33.6	198.8	29.0	107.6	26.7	453.2	72.2	15,532.9	528.8
Western hemlock	479.3	42.3	395.2	39.6	332.1	40.5	272.8	34.2	292.8	43.3	201.8	29.4	797.2	111.0	18,793.6	611.6
Western larch	12.5	4.6	6.5	3.3	6.9	3.8	0.9	0.9	1.4	1.2	2.2	2.2	16.1	6.5	1,595.9	93.1
Western redcedar	106.8	13.4	123.4	15.8	105.6	14.9	97.5	15.6	87.1	15.1	60.0	11.6	1,097.7	165.3	5,091.3	271.3
Western white pine	—	—	1.3	1.4	—	—	—	—	—	—	—	—	5.3	5.3	185.1	22.8
Other western softwoods	116.1	20.1	115.2	22.4	63.3	18.8	65.2	18.2	54.7	21.0	40.5	12.3	94.4	25.7	3,461.2	249.5
Total	1,838.8	82.2	1,579.8	89.3	1,326.4	76.7	1,106.6	71.7	984.8	77.1	741.6	60.1	4,335.2	278.8	86,020.2	1,102.7
Hardwoods:																
Cottonwood and aspen	6.2	3.2	11.8	4.7	10.9	4.5	6.5	3.8	7.7	4.0	0.7	0.7	8.7	4.6	754.5	117.3
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94.6	19.3
Red alder	2.1	2.0	1.8	1.7	—	—	—	—	—	—	—	—	—	—	3,652.1	215.9
Woodland hardwoods	0.3	0.2	—	—	—	—	—	—	—	—	—	—	—	—	46.1	5.2
Other western hardwoods	5.7	2.5	12.4	4.4	6.9	3.3	6.2	3.1	4.0	1.8	—	—	15.1	6.3	1,690.0	162.3
Total	14.2	4.5	26.0	6.6	17.8	5.6	12.8	4.9	11.8	4.9	0.7	0.7	23.8	8.7	6,237.2	314.4
All species groups	1,853.0	82.4	1,605.8	89.5	1,344.2	76.8	1,119.4	72.0	996.6	77.3	742.3	60.1	4,359.0	279.0	92,257.4	1,130.4

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all live trees ≥ 5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-16—Average net volume per acre of live trees[a] on forest land, by forest type group and stand size class, Washington, 2002–2011

	Stand size class							
	Large-diameter stands		Medium-diameter stands		Small-diameter stands		All classes	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Cubic feet per acre							
Softwoods:								
Douglas-fir	5,454.80	110.99	1,382.91	65.63	281.48	25.10	4,208.06	92.42
Fir/spruce/mountain hemlock	6,450.89	180.35	1,607.46	147.04	309.75	28.17	4,835.47	156.32
Hemlock/Sitka spruce	8,889.92	190.62	2,143.91	203.21	303.17	51.81	7,354.78	194.82
Lodgepole pine	3,516.18	284.09	2,299.08	160.75	243.83	39.86	2,306.45	169.33
Ponderosa pine	1,969.20	76.08	780.23	166.80	395.28	75.58	1,709.85	69.30
Western larch	3,799.57	309.68	2,195.56	248.48	335.95	75.72	3,121.22	252.12
Other western softwoods	1,386.81	123.27	623.02	114.48	238.09	40.88	869.98	97.46
Total	5,741.96	70.60	1,599.07	55.59	299.32	16.39	4,450.67	57.43
Hardwoods:								
Alder/maple	5,409.42	236.13	1,888.13	117.31	307.61	58.23	3,307.56	169.97
Aspen/birch	3,525.98	383.14	1,774.39	285.38	230.26	89.62	1,731.57	303.79
Elm/ash/cottonwood	5,359.58	799.03	1,700.18	421.81	86.03	36.62	4,171.34	715.31
Western oak	1,558.88	684.79	961.61	163.21	377.15	76.52	954.68	209.56
Woodland hardwoods	854.09	175.77	306.17	100.98	507.51	123.80	608.51	108.30
Other hardwoods	6,303.55	1,416.41	1,351.87	377.97	238.94	57.13	952.88	396.69
Total	5,074.07	218.07	1,729.71	99.11	294.98	37.91	2,910.30	141.72
Nonstocked	—	—	—	—	—	—	99.16	13.01
All forest types	5,693.00	66.62	1,631.76	48.60	298.58	15.06	4,126.65	50.82

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 cubic feet per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all live trees ≥5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-17—Average net cubic volume per acre of dead trees[a] on forest land, by forest type group and stand size class, Washington, 2002–2011

	Stand size class							
	Large-diameter stands		Medium-diameter stands		Small-diameter stands		All classes	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Cubic feet per acre							
Softwoods:								
Douglas-fir	436.04	18.06	139.00	19.62	215.14	54.54	368.42	15.75
Fir/spruce/mountain hemlock	1,037.55	44.30	296.32	105.37	352.32	74.15	839.96	38.03
Hemlock/Sitka spruce	1,060.47	52.27	257.90	67.93	156.23	40.08	891.91	44.26
Lodgepole pine	667.28	80.37	354.08	78.50	900.12	250.02	623.22	78.01
Ponderosa pine	138.16	14.14	45.63	23.22	95.72	62.21	128.85	14.41
Western larch	498.40	65.61	376.32	127.85	147.98	79.90	436.30	53.14
Other western softwoods	451.57	101.46	331.91	180.99	36.22	17.08	293.91	63.37
Total	636.66	15.60	211.20	24.59	266.38	34.88	533.76	12.87
Hardwoods:								
Alder/maple	373.44	34.87	158.17	26.99	98.37	26.64	252.65	21.00
Aspen/birch	210.16	78.29	259.13	63.03	588.39	213.48	366.99	87.55
Elm/ash/cottonwood	179.62	42.33	52.16	52.16	25.00	17.94	143.54	34.48
Western oak	34.07	21.69	31.94	16.10	90.46	29.00	48.74	13.21
Woodland hardwoods	353.37	165.90	136.45	116.26	419.48	217.05	339.73	114.68
Other hardwoods	374.76	206.82	22.34	15.92	60.23	23.94	84.18	32.63
Total	333.09	28.75	145.70	21.74	144.98	27.32	232.42	16.96
Nonstocked	—	—	—	—	—	—	678.09	112.29
All forest types	614.41	14.56	194.81	19.27	245.61	29.34	506.55	11.71

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 cubic feet per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all dead trees ≥ 5 inches in diameter at breast height; smaller dead trees were not measured in this inventory.

Table A1-18—Net volume of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011

Species group	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	599.8	21.0	1,428.3	50.0	2,117.2	73.6	2,525.7	85.9	2,627.6	93.7	2,522.0	93.6	2,317.4	98.2	2,163.9	97.0
Engelmann and other spruces	26.9	2.8	52.2	5.6	76.3	8.6	93.6	11.1	97.8	13.6	103.5	13.6	91.5	14.9	88.7	16.3
Lodgepole pine	156.1	16.1	297.8	23.6	282.7	21.7	237.3	22.4	159.2	17.1	87.0	12.9	47.3	9.5	17.9	6.1
Ponderosa and Jeffrey pines	55.5	4.0	117.2	9.3	199.7	15.1	260.9	19.1	312.4	24.2	354.5	27.2	303.7	29.0	332.3	34.6
Sitka spruce	9.6	1.9	18.7	5.2	32.7	11.0	47.4	12.3	39.6	9.6	35.9	9.0	29.5	8.0	31.9	11.3
True fir	284.3	14.4	478.9	21.2	619.1	27.6	648.2	28.9	637.4	32.3	599.6	32.8	583.0	35.9	559.2	37.6
Western hemlock	402.5	19.8	793.1	39.9	1,137.3	54.4	1,373.4	72.2	1,421.0	78.3	1,343.9	79.0	1,161.7	70.4	929.4	68.5
Western larch	59.0	6.4	112.8	11.2	164.6	13.6	189.8	14.6	175.9	15.3	147.2	15.4	106.2	14.1	105.3	15.2
Western redcedar	116.4	7.2	190.6	12.0	211.3	14.5	251.5	17.0	245.1	19.4	238.0	21.4	241.1	23.7	221.2	24.8
Western white pine	5.3	0.8	10.3	1.7	10.9	2.0	14.1	3.4	18.6	4.4	22.3	5.7	10.4	3.0	15.0	8.4
Other western softwoods	19.1	2.7	36.0	5.1	48.0	6.8	47.1	8.0	50.4	8.0	50.9	7.9	49.7	9.3	59.6	11.6
Total	1,734.5	40.1	3,536.0	73.8	4,899.9	99.7	5,688.9	119.0	5,785.1	130.0	5,504.8	133.4	4,941.4	135.1	4,524.4	137.9
Hardwoods:																
Cottonwood and aspen	14.0	2.5	25.7	5.0	32.2	5.9	41.1	9.2	42.8	11.8	40.1	10.7	41.2	9.7	42.5	13.4
Oak	11.5	3.3	10.2	2.9	8.0	2.7	5.7	3.0	5.3	2.5	2.2	1.4	4.8	3.6	1.9	1.9
Red alder	183.4	13.4	359.8	23.9	443.4	33.0	524.0	42.8	475.7	41.6	431.8	43.7	416.6	49.1	231.1	34.3
Other western hardwoods	102.2	9.9	130.8	12.9	157.4	15.5	154.7	18.4	150.7	20.6	166.1	26.1	157.2	34.9	126.4	22.3
Total	311.1	18.2	526.5	29.1	640.9	37.9	725.4	48.6	674.4	49.3	640.2	53.7	619.8	63.7	401.8	43.8
All species groups	2,045.7	43.9	4,062.5	78.3	5,540.8	104.6	6,414.3	125.9	6,459.5	136.2	6,145.0	142.3	5,561.3	148.3	4,926.2	145.2

Table A1-18—Net volume of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	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	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	1,916.6	99.6	1,713.3	105.0	1,499.3	102.8	1,257.1	102.0	916.2	67.4	716.3	41.9	643.9	43.0	515.4	35.8
Engelmann and other spruces	54.8	12.7	65.4	14.3	41.9	6.6	31.0	5.7	29.6	6.6	17.0	5.2	16.6	4.1	7.9	2.8
Lodgepole pine	16.6	7.0	4.2	1.8	2.5	1.3	1.5	1.3	—	—	1.4	1.4	1.3	1.3	—	—
Ponderosa and Jeffrey pines	298.0	35.8	241.8	25.4	212.9	15.4	175.1	13.8	160.1	14.7	122.4	13.8	61.8	9.7	72.7	10.7
Sitka spruce	24.1	9.5	34.6	15.9	53.7	17.7	35.9	15.3	11.7	7.6	20.2	5.8	6.7	3.1	15.7	5.5
True fir	485.3	38.6	408.3	37.6	403.5	37.7	302.0	30.7	248.3	29.7	198.5	18.1	214.9	21.6	166.8	19.2
Western hemlock	834.4	66.7	678.2	64.9	543.6	62.5	430.2	47.8	395.7	47.8	263.0	23.2	243.5	23.8	207.7	21.2
Western larch	93.6	19.7	71.1	14.8	53.1	7.5	41.0	7.1	36.3	7.1	26.7	5.5	12.8	3.8	15.7	5.0
Western redcedar	193.7	25.9	169.1	25.0	184.6	27.3	131.4	22.7	140.9	26.1	91.7	10.1	105.7	12.2	84.6	11.5
Western white pine	6.7	3.9	1.2	0.6	7.0	3.0	9.7	6.5	1.8	1.1	1.5	0.9	1.4	1.4	1.2	0.9
Other western softwoods	58.7	11.8	50.0	11.4	43.8	14.3	31.6	13.8	60.5	13.3	32.1	5.9	31.3	6.2	41.2	8.7
Total	3,982.6	136.2	3,437.2	135.8	3,046.0	136.2	2,446.5	122.1	2,001.1	96.5	1,490.8	57.1	1,339.8	58.2	1,128.9	51.5
Hardwoods:																
Cottonwood and aspen	22.9	10.5	46.9	16.0	46.9	19.7	43.0	21.8	55.2	25.6	19.3	6.1	17.9	6.6	10.0	4.0
Oak	2.1	2.1	—	—	0.6	0.5	—	—	—	—	—	—	—	—	1.1	1.1
Red alder	139.0	27.3	99.7	25.2	39.1	14.0	32.2	14.4	23.8	10.9	10.0	4.8	2.6	1.8	2.4	1.4
Other western hardwoods	59.3	14.4	91.1	26.7	65.5	18.9	24.7	10.7	29.3	10.1	26.5	6.6	11.9	4.4	10.3	3.5
Total	223.3	32.5	237.7	39.7	152.1	32.1	100.0	28.2	108.3	29.5	55.8	10.7	32.4	8.1	23.9	5.6
All species groups	4,205.9	139.2	3,674.9	142.2	3,198.0	139.5	2,546.5	126.1	2,109.4	101.6	1,546.5	58.4	1,372.2	59.0	1,152.8	52.0

Table A1-18—Net volume of growing stock trees[a] on timberland, by species group and diameter class, Washington, 2002–2011 (continued)

Species group	Diameter class (inches)															
	37.0–38.9		39.0–40.9		41.0–42.9		43.0–44.9		45.0–46.9		47.0–48.9		49.0 +		All classes	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet															
Softwoods:																
Douglas-fir	440.3	33.4	355.1	29.7	301.9	29.2	225.5	23.6	188.6	22.7	158.5	19.9	906.6	96.0	28,056.4	652.4
Engelmann and other spruces	11.4	3.9	8.3	3.7	4.9	3.2	—	—	0.6	0.7	1.1	1.2	—	—	921.1	87.3
Lodgepole pine	—	—	0.3	0.3	—	—	—	—	—	—	—	—	1.7	1.8	1,314.8	86.5
Ponderosa and Jeffrey pines	47.8	9.9	26.8	6.3	37.7	9.2	22.0	6.2	10.3	4.3	15.5	6.4	17.5	7.2	3,458.9	159.0
Sitka spruce	8.0	4.6	6.1	3.5	9.6	5.0	3.2	2.6	3.1	3.1	21.5	9.1	82.1	36.1	581.6	89.2
True fir	157.5	19.3	114.9	15.2	79.2	12.8	84.2	13.3	86.5	15.2	34.5	10.9	130.0	30.6	7,524.1	277.4
Western hemlock	213.5	20.1	170.6	17.3	139.1	17.3	116.6	15.3	97.5	13.1	93.4	14.9	303.2	43.6	13,292.5	496.1
Western larch	10.5	4.0	3.8	1.6	3.8	1.9	0.9	0.9	1.4	1.2	2.2	2.2	16.1	6.5	1,449.3	80.4
Western redcedar	69.5	10.4	84.8	12.5	77.4	11.3	66.1	12.4	52.4	9.2	39.5	8.6	460.5	60.8	3,667.2	188.1
Western white pine	—	—	1.3	1.4	—	—	—	—	—	—	—	—	5.3	5.3	144.1	18.1
Other western softwoods	28.1	6.7	37.2	9.5	11.5	4.3	15.0	4.8	12.4	5.0	12.7	4.6	40.3	13.4	867.2	92.0
Total	986.6	49.4	809.3	43.0	665.0	40.9	533.5	35.7	452.8	33.3	378.8	32.8	1,963.4	138.2	61,277.3	869.3
Hardwoods:																
Cottonwood and aspen	4.0	2.4	5.2	2.6	7.0	3.3	3.7	2.6	4.9	3.2	0.7	0.7	6.6	4.1	573.8	98.0
Oak	—	—	—	—	—	—	—	—	—	—	—	—	—	—	53.3	14.2
Red alder	2.1	2.0	—	—	—	—	—	—	—	—	—	—	—	—	3,416.5	211.6
Other western hardwoods	5.6	2.5	10.3	4.1	5.6	3.1	5.8	3.0	2.9	1.3	—	—	11.4	5.1	1,505.9	152.5
Total	11.7	4.0	15.5	4.8	12.6	4.5	9.6	4.0	7.8	3.5	0.7	0.7	18.0	6.6	5,549.4	296.9
All species groups	998.2	49.7	824.8	43.3	677.7	41.1	543.1	36.2	460.6	33.5	379.5	32.8	1,981.4	138.3	66,826.7	907.3

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes live growing stock trees of commercial species that are ≥ 5 inches in diameter at breast height; excludes trees that are classified as rough or rotten cull.

Table A1-19—Net volume of growing stock trees[a] on timberland, by species group and ownership group, Washington, 2002–2011

Species group	Ownership group													
							Private							
	Forest Service		Other federal government		State and local government		Corporate		Noncorporate		All private		All owners	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Softwoods:														
Douglas-fir	10,595.5	297.4	469.8	150.0	5,786.0	395.1	6,347.8	340.9	4,857.2	327.7	11,205.0	433.1	28,056.4	652.4
Engelmann and other spruces	599.9	46.6	7.8	6.5	155.1	63.4	14.0	7.9	144.2	36.6	158.3	37.4	921.1	87.3
Lodgepole pine	772.2	50.8	13.9	8.3	103.1	29.0	38.2	11.7	387.5	62.3	425.7	63.2	1,314.8	86.5
Ponderosa and Jeffrey pines	862.2	49.4	17.4	7.9	376.7	54.2	444.6	64.4	1,757.9	130.4	2,202.6	141.8	3,458.9	159.0
Sitka spruce	67.7	33.8	—	—	145.8	47.2	235.8	56.9	132.3	37.9	368.1	68.0	581.6	89.2
True fir	5,499.4	216.0	40.6	27.0	658.3	114.9	561.6	77.6	764.2	105.8	1,325.8	128.8	7,524.1	277.4
Western hemlock	5,510.7	194.9	71.2	59.7	3,284.4	342.2	3,283.9	279.1	1,142.3	168.6	4,426.3	310.4	13,292.5	496.1
Western larch	806.5	45.2	16.8	12.5	156.9	33.4	107.6	22.6	361.5	52.2	469.0	56.2	1,449.3	80.4
Western redcedar	1,541.0	90.8	30.0	26.6	624.8	86.6	550.7	87.9	920.7	111.2	1,471.4	139.5	3,667.2	188.1
Western white pine	90.8	13.2	1.2	0.6	18.3	8.5	8.3	3.5	25.4	8.5	33.8	9.2	144.1	18.1
Other western softwoods	739.9	82.2	—	—	20.9	22.5	30.6	19.1	75.9	28.9	106.5	34.5	867.2	92.0
Total	27,085.9	426.8	668.9	176.3	11,330.3	543.9	11,623.2	505.6	10,569.2	488.9	22,192.3	592.3	61,277.3	869.3
Hardwoods:														
Cottonwood and aspen	103.3	16.7	1.4	1.2	180.2	80.1	61.2	16.5	227.6	51.8	288.9	54.2	573.8	98.0
Oak	0.9	0.6	0.6	0.6	7.4	3.3	25.9	12.1	18.6	6.5	44.4	13.8	53.3	14.2
Red alder	306.7	35.5	18.4	14.7	969.5	127.6	1,044.9	121.9	1,076.8	121.0	2,121.8	167.4	3,416.5	211.6
Other western hardwoods	126.3	19.3	23.9	16.4	423.0	111.5	258.4	50.7	674.2	90.1	932.7	102.5	1,505.9	152.5
Total	537.3	47.0	44.3	22.1	1,580.0	195.9	1,390.5	139.8	1,997.2	184.8	3,387.7	224.4	5,549.4	296.9
All species groups	27,623.2	428.2	713.2	182.9	12,910.3	583.3	13,013.7	544.7	12,566.4	547.9	25,580.1	638.3	66,826.7	907.3

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes live growing stock trees of commercial species that are ≥5 inches in diameter at breast height; excludes trees that are classified as rough or rotten cull.

Table A1-20—Aboveground biomass of live trees[a] on forest land, by ownership and land status, Washington, 2002–2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand tons													
Forest Service:														
National forest	556,072.6	8,139.7	15,664.0	2,288.2	571,736.6	8,000.4	184,100.2	9,894.4	28,778.5	4,867.9	212,878.7	9,421.1	784,615.3	11,770.2
Total	556,072.6	8,139.7	15,664.0	2,288.2	571,736.6	8,000.4	184,100.2	9,894.4	28,778.5	4,867.9	212,878.7	9,421.1	784,615.3	11,770.2
Other federal government:														
Bureau of Land Management	2,410.2	997.0	233.0	216.7	2,643.2	1,018.4	—	—	—	—	—	—	2,643.2	1,018.4
Departments of Defense or Energy	5,618.5	2,375.7	—	—	5,618.5	2,375.7	—	—	—	—	—	—	5,618.5	2,375.7
National Park Service	—	—	—	—	—	—	222,393.8	10,207.9	10,850.8	3,125.5	233,244.5	9,671.7	233,244.5	9,671.7
Fish and Wildlife Service	—	—	—	—	—	—	6,701.2	2,066.1	37.2	46.3	6,738.4	2,065.3	6,738.4	2,065.3
Other federal government	5,710.1	2,275.2	1,392.9	1,368.1	7,103.0	2,653.1	1,002.4	828.7	—	—	1,002.4	828.7	8,105.4	2,779.5
Total	13,738.9	3,431.1	1,625.9	1,385.2	15,364.7	3,694.2	230,097.4	10,280.3	10,888.0	3,125.8	240,985.3	9,734.8	256,350.1	10,325.2
State and local government:														
Local	33,903.5	5,460.9	1,303.8	737.0	35,207.3	5,530.1	6,008.0	2,188.5	237.8	235.5	6,245.8	2,201.2	41,453.1	5,931.9
State	220,562.3	9,621.6	1,082.4	497.2	221,644.8	9,601.5	12,965.9	3,588.7	187.7	181.7	13,153.5	3,593.3	234,798.3	9,594.5
Other public	923.9	915.0	—	—	923.9	915.0	—	—	—	—	—	—	923.9	915.0
Total	255,389.7	11,051.5	2,386.2	889.0	257,775.9	11,067.4	18,973.9	4,196.5	425.4	297.4	19,399.3	4,207.0	277,175.2	11,191.5
Corporate private	269,744.5	10,526.2	2,745.0	1,090.5	272,489.5	10,561.6	—	—	—	—	—	—	272,489.5	10,561.6
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	15,738.7	3,212.0	231.8	221.3	15,970.5	3,219.6	—	—	—	—	—	—	15,970.5	3,219.6
Unicorporated partnerships, associations, clubs	1,943.8	1,556.9	—	—	1,943.8	1,556.9	—	—	—	—	—	—	1,943.8	1,556.9
American Indian	89,714.9	6,515.3	1,604.8	988.5	91,319.7	6,577.4	—	—	—	—	—	—	91,319.7	6,577.4
Individual	147,734.0	8,637.4	4,070.1	1,240.5	151,804.0	8,708.7	—	—	—	—	—	—	151,804.0	8,708.7
Total	255,131.4	10,507.3	5,906.6	1,599.0	261,038.0	10,580.1	—	—	—	—	—	—	261,038.0	10,580.1
All private	524,875.9	11,983.9	8,651.6	1,929.3	533,527.5	12,002.6	—	—	—	—	—	—	533,527.5	12,002.6
All owners	1,350,077.1	16,984.7	28,327.7	3,413.8	1,378,404.7	16,908.8	433,171.5	14,856.5	40,091.9	5,792.7	473,263.4	14,167.4	1,851,668.1	21,207.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-21—Aboveground biomass of dead trees[a] on forest land, by ownership and land status, Washington, 2002–2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand tons													
Forest Service:														
National forest	76,471.8	1,985.3	3,254.6	577.3	79,726.4	2,021.1	36,084.1	2,873.5	5,978.0	1,379.6	42,062.1	2,968.8	121,788.6	3,552.6
Total	76,471.8	1,985.3	3,254.6	577.3	79,726.4	2,021.1	36,084.1	2,873.5	5,978.0	1,379.6	42,062.1	2,968.8	121,788.6	3,552.6
Other federal government:														
Bureau of Land Management	232.7	165.9	29.9	37.2	262.6	170.0	—	—	—	—	—	—	262.6	170.0
Departments of Defense or Energy	321.3	156.7	—	—	321.3	156.7	—	—	—	—	—	—	321.3	156.7
National Park Service	—	—	—	—	—	—	29,784.8	2,209.1	2,578.2	774.1	32,363.0	2,172.2	32,363.0	2,172.2
Fish and Wildlife Service	—	—	—	—	—	—	606.9	258.0	—	—	606.9	258.0	606.9	258.0
Other federal government	571.6	264.9	15.4	15.1	587.0	265.3	81.8	83.2	—	—	81.8	83.2	668.7	278.0
Total	1,125.6	349.3	45.2	40.1	1,170.9	351.5	30,473.4	2,215.1	2,578.2	774.1	33,051.7	2,177.8	34,222.6	2,200.0
State and local government:														
Local	2,603.1	642.6	99.1	60.8	2,702.3	645.5	443.6	207.3	113.9	112.8	557.4	236.0	3,259.7	685.8
State	20,157.0	1,678.8	122.4	79.7	20,279.4	1,679.3	1,211.2	422.1	—	—	1,211.2	422.1	21,490.6	1,696.2
Other public	18.1	17.9	—	—	18.1	17.9	—	—	—	—	—	—	18.1	17.9
Total	22,778.2	1,795.3	221.5	100.2	22,999.7	1,796.8	1,654.7	468.7	113.9	112.8	1,768.6	482.0	24,768.3	1,820.6
Corporate private	17,016.5	1,150.4	180.7	85.9	17,197.2	1,152.3	—	—	—	—	—	—	17,197.2	1,152.3
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	857.2	216.0	—	—	857.2	216.0	—	—	—	—	—	—	857.2	216.0
Unicorporated partnerships, associations, clubs	70.9	56.1	—	—	70.9	56.1	—	—	—	—	—	—	70.9	56.1
American Indian	11,077.4	1,220.9	256.6	175.4	11,334.0	1,232.0	—	—	—	—	—	—	11,334.0	1,232.0
Individual	8,549.8	806.2	119.5	49.2	8,669.3	807.3	—	—	—	—	—	—	8,669.3	807.3
Total	20,555.4	1,440.8	376.1	182.1	20,931.5	1,449.3	—	—	—	—	—	—	20,931.5	1,449.3
All private	37,571.9	1,737.0	556.8	201.0	38,128.7	1,741.8	—	—	—	—	—	—	38,128.7	1,741.8
All owners	137,947.6	3,163.2	4,078.1	620.6	142,025.7	3,188.0	68,212.3	3,658.1	8,670.1	1,586.0	76,882.4	3,713.2	218,908.2	4,842.9

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated.

[a] Includes all dead trees ≥ 5 inches in diameter at breast height; smaller dead trees were not measured in this inventory. Aboveground biomass is estimated from ground to actual height, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-22—Aboveground biomass of live trees[a] on forest land, by county and land status, Washington, 2002–2011

	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousands tons							
Western Washington:														
Clallam	76,081.1	6,946.1	617.2	367.1	76,698.2	6,948.5	66,897.1	9,461.3	1,302.2	676.0	68,199.4	9,463.2	144,897.6	11,731.5
Clark	17,752.3	3,907.2	140.6	140.3	17,892.9	3,910.8	551.8	686.2	—	—	551.8	686.2	18,444.7	3,970.6
Cowlitz	40,611.2	5,000.1	93.8	75.4	40,705.0	5,000.7	2,260.3	984.9	—	—	2,260.3	984.9	42,965.3	5,096.4
Grays Harbor	91,033.3	7,904.4	1,852.8	1,022.1	92,886.1	7,965.9	—	—	—	—	—	—	92,886.1	7,965.9
Island	3,644.8	1,440.9	—	—	3,644.8	1,440.9	323.0	299.3	—	—	323.0	299.3	3,967.8	1,471.7
Jefferson	57,928.5	6,865.9	561.8	420.1	58,490.4	6,876.0	91,995.2	11,203.6	6,260.7	2,809.0	98,255.9	11,381.6	156,746.3	13,352.6
King	67,844.0	6,639.4	2,599.1	969.0	70,443.0	6,727.6	17,834.3	4,884.4	3,366.8	2,412.5	21,201.1	5,336.3	91,644.1	8,543.6
Kitsap	15,538.6	3,805.3	—	—	15,538.6	3,805.3	—	—	—	—	—	—	15,538.6	3,805.3
Lewis	106,756.3	7,660.1	857.3	608.5	107,613.6	7,686.8	23,079.6	4,608.8	654.8	478.2	23,734.4	4,668.5	131,348.0	8,947.8
Mason	29,109.9	4,006.0	465.1	328.7	29,575.1	4,022.9	8,482.5	3,926.5	—	—	8,482.5	3,926.5	38,057.6	5,599.1
Pacific	45,169.5	5,892.7	228.3	146.2	45,397.9	5,899.0	2,098.3	1,330.5	37.2	46.3	2,135.5	1,330.6	47,533.4	6,037.5
Pierce	48,725.1	6,032.8	1,590.6	1,375.2	50,315.8	6,182.8	34,275.6	6,707.9	2,510.5	1,432.6	36,786.1	6,765.6	87,101.9	9,165.2
San Juan	5,493.8	1,847.7	—	—	5,493.8	1,847.7	2,614.2	1,895.0	—	—	2,614.2	1,895.0	8,108.0	2,646.7
Skagit	63,318.8	6,053.5	223.6	164.3	63,542.4	6,055.7	25,052.0	5,822.2	283.7	162.2	25,335.7	5,825.1	88,878.1	8,396.8
Skamania	115,416.8	6,850.9	674.7	524.1	116,091.5	6,854.8	9,328.2	2,738.2	1,300.0	1,404.3	10,628.3	2,927.0	126,719.8	7,419.2
Snohomish	78,906.3	7,657.4	2,705.8	1,718.0	81,612.2	7,639.1	28,128.6	6,192.1	4,402.8	2,064.3	32,531.4	6,359.0	114,143.6	9,804.4
Thurston	20,142.8	4,085.6	794.5	795.7	20,937.3	4,160.9	—	—	—	—	—	—	20,937.3	4,160.9
Wahkiakum	14,143.5	4,037.7	197.3	195.5	14,340.8	4,042.3	—	—	—	—	—	—	14,340.8	4,042.3
Whatcom	51,871.3	5,527.3	1,860.4	685.1	53,731.7	5,563.1	38,453.2	6,039.9	1,949.8	827.1	40,403.0	6,068.9	94,134.7	8,225.9
Total	949,488.2	17,024.6	15,462.9	3,003.4	964,951.1	16,992.1	351,373.8	14,191.3	22,068.7	4,668.2	373,442.5	13,512.1	1,338,393.7	21,116.2

Table A1-22—Aboveground biomass of live trees[a] on forest land, by county and land status, Washington, 2002–2011 (continued)

	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousands tons							
Eastern Washington:														
Asotin	2,540.1	618.6	5.3	6.1	2,545.4	618.5	—	—	—	—	—	—	2,545.4	618.5
Chelan	41,149.5	3,133.0	2,867.9	665.2	44,017.4	3,194.0	19,518.0	4,539.4	4,370.1	1,438.2	23,888.1	4,700.1	67,905.6	5,675.1
Columbia	4,547.2	733.0	—	—	4,547.2	733.0	6,037.5	1,824.0	—	—	6,037.5	1,824.0	10,584.7	1,965.8
Douglas	58.9	58.7	—	—	58.9	58.7	—	—	—	—	—	—	58.9	58.7
Ferry	58,518.8	3,911.3	542.8	188.1	59,061.5	3,912.9	240.2	229.4	—	—	240.2	229.4	59,301.8	3,917.7
Garfield	3,433.0	605.3	9.5	7.2	3,442.4	605.7	2,889.7	1,422.5	—	—	2,889.7	1,422.5	6,332.2	1,546.1
Kittitas	42,844.1	3,538.9	1,266.6	447.5	44,110.7	3,561.0	2,731.5	1,362.7	12.2	11.6	2,743.6	1,368.2	46,854.3	3,814.7
Klickitat	26,921.4	3,982.0	2,109.3	664.1	29,030.7	4,040.8	259.9	293.2	—	—	259.9	293.2	29,290.6	4,051.4
Lincoln	1,481.1	510.0	—	—	1,481.1	510.0	—	—	—	—	—	—	1,481.1	510.0
Okanogan	61,577.9	3,497.2	3,197.4	697.0	64,775.3	3,540.2	21,115.0	3,383.4	6,462.2	1,655.9	27,577.3	3,631.8	92,352.6	5,056.4
Pend Oreille	43,599.8	2,621.8	475.9	181.0	44,075.8	2,617.7	2,570.5	1,461.9	420.7	444.1	2,991.2	1,524.0	47,067.0	3,029.0
Spokane	11,971.3	2,061.2	43.1	43.0	12,014.3	2,061.6	2,293.3	1,158.6	—	—	2,293.3	1,158.6	14,307.7	2,360.6
Stevens	48,409.0	3,564.7	360.1	208.9	48,769.2	3,568.9	4,319.4	1,587.7	—	—	4,319.4	1,587.7	53,088.6	3,838.4
Walla Walla	743.6	476.6	—	—	743.6	476.6	—	—	—	—	—	—	743.6	476.6
Whitman	840.1	592.8	—	—	840.1	592.8	—	—	—	—	—	—	840.1	592.8
Yakima	51,953.1	4,839.4	1,986.8	1,003.5	53,939.9	4,934.9	19,822.6	4,298.1	6,758.0	2,831.0	26,580.6	4,928.5	80,520.6	6,974.5
Total	400,588.9	8,969.9	12,864.8	1,630.3	413,453.6	9,009.2	81,797.7	6,559.6	18,023.2	3,431.0	99,820.8	6,544.8	513,274.5	11,009.6
All counties	1,350,077.1	16,984.7	28,327.7	3,413.8	1,378,404.7	16,908.8	433,171.5	14,856.5	40,091.9	5,792.7	473,263.4	14,167.4	1,851,668.1	21,207.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-23—Aboveground biomass of dead trees[a] on forest land, by county and land status, Washington, 2002–2011

	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousands tons							
Western Washington:														
Clallam	5,926.3	747.3	29.5	16.5	5,955.8	747.3	7,486.6	1,275.4	248.9	178.6	7,735.5	1,279.3	13,691.3	1,481.0
Clark	1,289.7	375.1	—	—	1,289.7	375.1	1.1	1.3	—	—	1.1	1.3	1,290.8	375.1
Cowlitz	2,385.9	498.5	—	—	2,385.9	498.5	331.7	172.1	—	—	331.7	172.1	2,717.6	527.3
Grays Harbor	10,133.4	1,077.3	229.1	167.3	10,362.4	1,089.5	—	—	—	—	—	—	10,362.4	1,089.5
Island	147.2	55.9	—	—	147.2	55.9	—	—	—	—	—	—	147.2	55.9
Jefferson	7,434.4	1,352.7	21.0	15.6	7,455.4	1,352.7	14,355.7	2,103.7	1,475.4	606.0	15,831.1	2,149.5	23,286.5	2,546.2
King	5,325.7	784.9	195.0	91.5	5,520.8	789.7	3,025.1	1,004.2	695.2	499.2	3,720.3	1,104.2	9,241.0	1,347.5
Kitsap	694.2	174.8	—	—	694.2	174.8	—	—	—	—	—	—	694.2	174.8
Lewis	7,303.3	709.8	29.7	16.0	7,333.0	710.3	3,009.0	791.8	134.4	97.0	3,143.4	798.1	10,476.4	1,063.4
Mason	2,497.2	377.3	12.8	10.7	2,510.0	377.4	1,461.7	678.5	—	—	1,461.7	678.5	3,971.7	776.0
Pacific	2,509.7	410.0	19.3	19.3	2,529.0	410.4	168.6	122.4	—	—	168.6	122.4	2,697.6	427.9
Pierce	4,114.8	672.0	46.1	31.3	4,160.9	673.2	4,281.3	956.7	673.8	498.9	4,955.1	1,061.6	9,116.0	1,257.0
San Juan	300.2	153.1	—	—	300.2	153.1	190.7	169.1	—	—	190.7	169.1	490.9	228.1
Skagit	6,794.8	820.2	16.9	16.8	6,811.7	820.4	2,320.0	728.1	97.1	76.0	2,417.0	732.1	9,228.8	1,099.1
Skamania	12,547.2	1,054.1	118.9	92.0	12,666.1	1,056.5	1,931.6	553.5	211.6	193.6	2,143.2	566.0	14,809.3	1,193.8
Snohomish	8,648.4	1,034.1	490.0	354.7	9,138.4	1,062.4	2,994.5	896.4	581.5	334.3	3,576.0	942.9	12,714.5	1,411.4
Thurston	809.7	261.8	—	—	809.7	261.8	—	—	—	—	—	—	809.7	261.8
Wahkiakum	1,171.4	465.4	8.3	8.2	1,179.7	465.5	—	—	—	—	—	—	1,179.7	465.5
Whatcom	5,534.2	786.3	267.8	101.9	5,801.9	792.1	3,903.3	795.8	96.4	44.6	3,999.7	795.7	9,801.6	1,122.2
Total	85,567.7	2,706.9	1,484.4	427.5	87,052.1	2,719.2	45,460.8	2,718.9	4,214.3	995.7	49,675.1	2,690.8	136,727.2	3,781.7

Table A1-23—Aboveground biomass of dead trees[a] on forest land, by county and land status, Washington, 2002–2011 (continued)

	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousands tons							
Eastern Washington:														
Asotin	336.6	105.9	1.3	1.5	337.9	105.8	—	—	—	—	—	—	337.9	105.8
Chelan	8,204.5	783.0	719.0	263.6	8,923.5	819.2	5,340.8	1,575.0	359.6	184.3	5,700.4	1,584.8	14,623.9	1,783.6
Columbia	1,179.4	302.2	—	—	1,179.4	302.2	1,386.6	501.7	—	—	1,386.6	501.7	2,566.0	585.7
Ferry	5,913.3	629.9	154.3	83.4	6,067.6	633.8	—	—	—	—	—	—	6,067.6	633.8
Garfield	915.1	241.8	0.7	0.8	915.8	241.8	1,309.3	790.2	—	—	1,309.3	790.2	2,225.1	826.4
Kittitas	4,237.2	474.7	193.0	66.8	4,430.3	479.1	361.3	186.2	—	—	361.3	186.2	4,791.6	514.0
Klickitat	1,787.6	377.4	82.3	43.6	1,869.9	379.8	61.7	69.5	—	—	61.7	69.5	1,931.6	386.1
Lincoln	72.8	45.3	—	—	72.8	45.3	—	—	—	—	—	—	72.8	45.3
Okanogan	11,210.7	964.0	992.0	313.7	12,202.6	1,004.1	9,116.9	1,810.9	2,966.0	1,180.7	12,082.8	2,096.7	24,285.5	2,323.4
Pend Oreille	6,018.5	436.7	78.4	35.1	6,096.9	435.2	551.1	370.1	154.2	162.8	705.3	404.2	6,802.1	593.9
Spokane	549.9	192.1	—	—	549.9	192.1	100.7	74.6	—	—	100.7	74.6	650.7	206.1
Stevens	4,281.9	496.3	42.1	30.1	4,324.0	498.3	440.5	247.1	—	—	440.5	247.1	4,764.5	549.4
Walla Walla	45.2	42.8	—	—	45.2	42.8	—	—	—	—	—	—	45.2	42.8
Whitman	24.6	16.2	—	—	24.6	16.2	—	—	—	—	—	—	24.6	16.2
Yakima	7,602.6	962.7	330.7	144.7	7,933.4	972.6	4,082.7	1,123.4	976.0	373.2	5,058.7	1,155.5	12,992.0	1,510.3
Total	52,379.9	1,815.6	2,593.7	450.1	54,973.6	1,845.2	22,751.5	2,565.2	4,455.8	1,234.5	27,207.3	2,678.7	82,181.0	3,242.7
All counties	137,947.6	3,163.2	4,078.1	620.6	142,025.7	3,188.0	68,212.3	3,658.1	8,670.1	1,586.0	76,882.4	3,713.2	218,908.2	4,842.9

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated.

[a] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory. Aboveground biomass is estimated from ground to actual height, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-24—Average aboveground biomass per acre of live trees[a] on forest land, by forest type group and ownership group, Washington, 2002–2011

	Ownership group													
							Private							
	Forest Service		Other federal government		State and local government		Corporate		Noncorporate		All private		All owners	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Tons per acre							
Softwoods:														
Douglas-fir	99.64	2.38	185.07	14.36	100.59	5.05	56.41	2.40	68.58	3.37	61.13	1.95	85.55	1.71
Fir/spruce/mountain hemlock	95.14	3.06	137.86	11.61	79.95	13.76	35.35	4.95	59.32	7.64	47.75	4.77	93.30	2.84
Hemlock/Sitka spruce	175.67	4.90	228.44	10.58	160.83	10.54	92.21	5.94	86.65	8.14	90.36	4.79	148.25	3.81
Lodgepole pine	48.32	3.53	8.54	0.03	53.29	9.09	64.79	31.43	50.29	6.08	51.60	6.31	49.28	2.94
Ponderosa pine	41.98	2.56	50.94	7.95	29.33	3.23	27.06	2.63	31.32	1.88	30.30	1.56	32.86	1.25
Western larch	74.40	4.87	138.85	8.18	53.63	16.34	47.26	12.42	50.87	7.89	49.71	6.68	67.12	4.47
Other western softwoods	23.31	2.18	—	—	27.33	0.60	24.68	16.48	16.88	0.88	18.46	3.93	23.18	2.02
Total	98.85	1.47	177.57	6.65	102.04	3.95	59.75	2.02	57.73	2.03	58.80	1.36	89.27	1.07
Hardwoods:														
Alder/maple	65.55	6.81	62.15	15.41	83.36	7.93	57.38	5.00	63.07	4.65	60.62	3.42	66.06	3.05
Aspen/birch	26.28	7.14	—	—	45.15	18.89	5.87	2.01	44.81	7.96	36.99	7.39	34.76	5.41
Elm/ash/ ottonwood	131.20	40.75	110.34	43.36	121.88	22.08	32.36	13.77	47.54	12.27	42.51	9.76	77.98	12.33
Western oak	55.17	—	21.18	0.00	43.25	0.00	29.14	11.08	34.61	4.74	32.15	5.63	32.55	5.27
Woodland hardwoods	11.70	3.15	—	—	7.92	0.00	6.90	3.04	14.14	2.01	13.32	1.87	12.26	1.69
Other hardwoods	13.61	6.57	7.80	—	—	—	17.77	12.47	30.74	14.44	24.65	9.69	23.01	8.45
Total	53.23	7.04	61.53	15.15	84.86	7.30	48.92	4.26	54.83	3.63	52.41	2.76	58.84	2.55
Nonstocked	1.72	0.27	1.05	0.60	3.24	1.10	0.85	0.54	3.04	0.55	2.31	0.43	2.09	0.24
All forest types	93.33	1.37	171.38	6.46	96.97	3.42	56.76	1.79	54.44	1.69	55.60	1.16	82.82	0.95

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-25—Average aboveground biomass per acre of dead trees[a] on forest land by forest type group and ownership group, Washington, 2002–2011

	Ownership group													
							Private							
	Forest Service		Other federal government		State and local government		Corporate		Noncorporate		All private		All owners	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Tons per acre							
Softwoods:														
Douglas-fir	11.32	0.66	17.94	2.52	7.41	0.77	3.50	0.29	4.45	0.48	3.87	0.26	7.51	0.31
Fir/spruce/mountain hemlock	15.80	0.80	18.73	1.90	11.46	3.23	2.47	0.54	12.45	2.12	7.63	1.25	14.85	0.65
Hemlock/Sitka spruce	26.30	1.43	34.36	3.19	17.92	2.36	5.26	0.73	7.11	1.34	5.87	0.66	18.30	0.88
Lodgepole pine	13.28	1.78	—	—	7.44	2.35	5.37	2.99	6.29	1.45	6.20	1.34	10.96	1.29
Ponderosa pine	5.56	0.97	2.68	1.58	1.85	0.56	1.33	0.32	1.75	0.30	1.65	0.24	2.43	0.27
Western larch	9.94	1.29	12.40	5.66	4.83	1.56	6.00	2.08	7.15	2.62	6.78	1.91	8.56	0.98
Western white pine	23.44	4.87	—	—	—	—	—	—	—	—	—	—	23.44	4.87
Other western softwoods	3.43	0.92	—	—	—	—	—	—	3.93	1.70	3.13	1.63	3.30	0.84
Total	14.35	0.42	22.91	1.46	9.25	0.73	3.63	0.25	4.71	0.35	4.14	0.21	10.33	0.24
Hardwoods:														
Alder/maple	6.00	1.37	22.17	4.23	6.61	1.07	4.14	0.72	4.07	0.52	4.10	0.43	5.16	0.42
Aspen/birch	12.56	3.63	—	—	4.12	2.96	1.88	1.46	4.85	1.72	4.26	1.43	6.50	1.50
Elm/ash/cottonwood	2.99	1.26	0.17	0.12	4.88	1.69	2.99	1.78	1.23	0.53	1.81	0.72	2.74	0.68
Western oak	3.17	0.00	9.02	0.00	—	—	1.42	0.39	1.01	0.37	1.19	0.28	1.33	0.34
Woodland hardwoods	9.82	3.07	—	—	0.52	0.00	29.90	10.94	1.24	0.90	4.46	3.16	6.58	2.23
Other hardwoods	4.48	3.31	1.12	0.00	—	—	0.95	0.49	2.69	1.46	1.87	0.83	2.12	0.81
Total	7.30	1.12	16.93	3.93	6.22	0.94	3.70	0.59	3.52	0.41	3.59	0.34	4.71	0.34
Nonstocked	21.64	3.00	35.42	29.56	5.00	2.10	1.27	0.83	2.69	0.96	2.22	0.70	12.16	1.88
All forest types	14.49	0.42	22.88	1.47	8.66	0.62	3.58	0.22	4.37	0.28	3.97	0.18	9.79	0.22

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory. Aboveground biomass is estimated from ground to actual height, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-26—Average aboveground biomass per acre of live trees[a] on forest land, by forest type group and stand size class, Washington, 2002–2011

	Stand size class							
	Large-diameter stands		Medium-diameter stands		Small-diameter stands		All classes	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre							
Softwoods:								
Douglas-fir	108.64	2.05	36.61	1.52	10.14	0.67	85.55	1.71
Fir/spruce/mountain hemlock	121.33	3.33	42.32	3.65	12.56	0.90	93.30	2.84
Hemlock/Sitka spruce	177.43	3.78	52.56	4.42	12.06	1.47	148.25	3.81
Lodgepole pine	65.31	4.63	55.12	3.70	14.17	2.40	49.28	2.94
Ponderosa pine	37.39	1.37	18.51	3.56	9.37	1.44	32.86	1.25
Western larch	77.55	5.42	56.51	6.06	19.38	4.52	67.12	4.47
Other western softwoods	30.60	3.02	18.46	2.93	14.80	2.13	23.18	2.02
Total	112.74	1.33	41.06	1.29	11.40	0.47	89.27	1.07
Hardwoods:								
Alder/maple	102.97	4.27	42.60	2.19	11.33	1.52	66.06	3.05
Aspen/birch	66.66	7.41	36.22	5.33	7.48	1.93	34.76	5.41
Elm/ash/cottonwood	99.43	13.45	35.20	8.42	3.60	1.43	77.98	12.33
Western oak	46.57	15.39	33.77	5.10	17.38	6.11	32.55	5.27
Woodland hardwoods	16.79	2.29	7.19	2.54	10.17	1.90	12.26	1.69
Other hardwoods	137.64	21.30	36.65	9.54	6.81	1.24	23.01	8.45
Total	97.08	3.91	40.17	1.89	10.25	1.06	58.84	2.55
Nonstocked	—	—	—	—	—	—	2.09	0.24
All forest types	111.60	1.25	40.83	1.08	11.20	0.43	82.82	0.95

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-27—Average aboveground biomass per acre of dead trees[a] on forest land, by forest type group and stand size class, Washington, 2002–2011

	Stand size class							
	Large-diameter stands		Medium-diameter stands		Small-diameter stands		All classes	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre							
Softwoods:								
Douglas-fir	8.85	0.35	3.06	0.41	4.41	1.10	7.51	0.31
Fir/spruce/mountain hemlock	18.45	0.77	5.42	1.81	5.78	1.12	14.85	0.65
Hemlock/Sitka spruce	21.76	1.03	5.42	1.42	3.10	0.78	18.30	0.88
Lodgepole pine	11.33	1.35	6.47	1.32	16.19	4.07	10.96	1.29
Ponderosa pine	2.60	0.26	0.87	0.40	1.84	1.18	2.43	0.27
Western larch	9.64	1.19	8.03	2.39	2.87	1.53	8.56	0.98
Western white pine	26.16	4.85	—	—	5.60	—	23.44	4.87
Other western softwoods	4.35	0.94	5.57	3.06	0.53	0.27	3.30	0.84
Total	12.35	0.29	4.23	0.45	4.94	0.63	10.33	0.24
Hardwoods:								
Alder/maple	7.55	0.69	3.44	0.58	1.92	0.52	5.16	0.42
Aspen/birch	3.60	1.32	4.76	1.17	10.37	3.61	6.50	1.50
Elm/ash/cottonwood	3.42	0.84	0.82	0.62	0.56	0.42	2.74	0.68
Western oak	1.03	0.64	1.05	0.52	2.07	0.51	1.33	0.34
Woodland hardwoods	6.66	3.17	2.75	2.29	8.26	4.28	6.58	2.23
Other hardwoods	8.74	4.90	3.13	2.91	1.15	0.43	2.12	0.81
Total	6.70	0.57	3.21	0.47	2.76	0.50	4.71	0.34
Nonstocked	—	—	—	—	—	—	12.16	1.88
All forest types	11.93	0.27	3.98	0.36	4.56	0.53	9.79	0.22

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory. Aboveground biomass is estimated from ground to actual height, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-28—Aboveground carbon mass[a] of live trees[b] on forest land, by ownership and land status, Washington, 2002–2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand megagrams													
U.S. Forest Service:														
National forest	252,234.5	3,692.2	7,105.2	1,037.9	259,339.7	3,629.0	83,507.9	4,488.1	13,053.9	2,208.1	96,561.8	4,273.4	355,901.5	5,339.0
Total	252,234.5	3,692.2	7,105.2	1,037.9	259,339.7	3,629.0	83,507.9	4,488.1	13,053.9	2,208.1	96,561.8	4,273.4	355,901.5	5,339.0
Other federal government:														
Bureau of Land Management	1,093.3	452.2	105.7	98.3	1,199.0	461.9	—	—	—	—	—	—	1,199.0	461.9
Departments of Defense or Energy	2,548.6	1,077.6	—	—	2,548.6	1,077.6	—	—	—	—	—	—	2,548.6	1,077.6
National Park Service	—	—	—	—	—	—	100,877.8	4,630.3	4,921.9	1,417.7	105,799.7	4,387.1	105,799.7	4,387.1
Fish and Wildlife Service	—	—	—	—	—	—	3,039.7	937.2	16.9	21.0	3,056.6	936.8	3,056.6	936.8
Other federal government	2,590.1	1,032.0	631.8	620.6	3,221.9	1,203.5	454.7	375.9	—	—	454.7	375.9	3,676.6	1,260.8
Total	6,231.9	1,556.4	737.5	628.3	6,969.4	1,675.7	104,372.2	4,663.1	4,938.8	1,417.9	109,311.0	4,415.7	116,280.4	4,683.5
State and local government:														
Local	15,378.6	2,477.1	591.4	334.3	15,970.0	2,508.4	2,725.2	992.7	107.9	106.8	2,833.1	998.5	18,803.1	2,690.7
State	100,047.1	4,364.4	491.0	225.5	100,538.1	4,355.2	5,881.3	1,627.8	85.1	82.4	5,966.4	1,629.9	106,504.5	4,352.1
Other public	419.1	415.1	—	—	419.1	415.1	—	—	—	—	—	—	419.1	415.1
Total	115,844.8	5,013.0	1,082.4	403.3	116,927.2	5,020.2	8,606.6	1,903.5	193.0	134.9	8,799.5	1,908.3	125,726.7	5,076.5
Corporate private	122,356.1	4,774.7	1,245.1	494.7	123,601.2	4,790.7	—	—	—	—	—	—	123,601.2	4,790.7
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	7,139.1	1,457.0	105.1	100.4	7,244.2	1,460.4	—	—	—	—	—	—	7,244.2	1,460.4
Unicorporated partnerships, associations, clubs	881.7	706.2	—	—	881.7	706.2	—	—	—	—	—	—	881.7	706.2
American Indian	40,694.7	2,955.4	727.9	448.4	41,422.6	2,983.5	—	—	—	—	—	—	41,422.6	2,983.5
Individual	67,012.1	3,917.9	1,846.2	562.7	68,858.3	3,950.3	—	—	—	—	—	—	68,858.3	3,950.3
Total	115,727.6	4,766.1	2,679.2	725.3	118,406.8	4,799.1	—	—	—	—	—	—	118,406.8	4,799.1
All private	238,083.7	5,435.9	3,924.4	875.1	242,008.1	5,444.4	—	—	—	—	—	—	242,008.1	5,444.4
All owners	612,395.0	7,704.3	12,849.4	1,548.5	625,244.4	7,669.9	196,486.6	6,738.9	18,185.7	2,627.6	214,672.3	6,426.3	839,916.7	9,619.5

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 megagrams was estimated.

[a] Includes all live trees ≥1 inch in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

[b] Total aboveground carbon mass of the tree from ground to tip, includes stem wood, bark, and branches; calculated by applying a factor of 0.5 to aboveground biomass estimated from regional biomass equations, and converting to metric units. Convert megagrams of carbon to tons of biomass by multiplying by 2.204586. The result will be approximate owing to rounding.

Table A1-29—Aboveground carbon mass[a] of dead trees[b] on forest land, by ownership and land status, Washington, 2002-2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand megagrams													
U.S. Forest Service:														
National forest	34,687.6	900.5	1,476.3	261.8	36,163.9	916.8	16,367.8	1,303.4	2,711.6	625.8	19,079.4	1,346.6	55,243.3	1,611.5
Total	34,687.6	900.5	1,476.3	261.8	36,163.9	916.8	16,367.8	1,303.4	2,711.6	625.8	19,079.4	1,346.6	55,243.3	1,611.5
Other federal government:														
Bureau of Land Management	105.6	75.3	13.6	16.9	119.1	77.1	—	—	—	—	—	—	119.1	77.1
Departments of Defense or Energy	145.7	71.1	—	—	145.7	71.1	—	—	—	—	—	—	145.7	71.1
National Park Service	—	—	—	—	—	—	13,510.4	1,002.1	1,169.5	351.1	14,679.9	985.3	14,679.9	985.3
U.S. Fish and Wildlife Service	—	—	—	—	—	—	275.3	117.0	—	—	275.3	117.0	275.3	117.0
Other federal	259.3	120.2	7.0	6.8	266.2	120.3	37.1	37.8	—	—	37.1	37.8	303.3	126.1
Total	510.6	158.4	20.5	18.2	531.1	159.4	13,822.8	1,004.8	1,169.5	351.1	14,992.2	987.8	15,523.4	997.9
State and local government:														
Local	1,180.8	291.5	45.0	27.6	1,225.7	292.8	201.2	94.0	51.6	51.2	252.8	107.0	1,478.6	311.1
State	9,143.2	761.5	55.5	36.2	9,198.7	761.7	549.4	191.5	—	—	549.4	191.5	9,748.1	769.4
Other public	8.2	8.1	—	—	8.2	8.1	—	—	—	—	—	—	8.2	8.1
Total	10,332.2	814.4	100.5	45.5	10,432.7	815.0	750.6	212.6	51.6	51.2	802.2	218.7	11,234.9	825.8
Corporate private	7,718.7	521.8	82.0	39.0	7,800.7	522.7	—	—	—	—	—	—	7,800.7	522.7
Noncorporate private:														
Nongovernmental conservation or natural resource organizations	388.8	98.0	—	—	388.8	98.0	—	—	—	—	—	—	388.8	98.0
Unincorporated partnerships, associations, clubs	32.2	25.5	—	—	32.2	25.5	—	—	—	—	—	—	32.2	25.5
American Indian	5,024.7	553.8	116.4	79.5	5,141.1	558.8	—	—	—	—	—	—	5,141.1	558.8
Individual	3,878.2	365.7	54.2	22.3	3,932.4	366.2	—	—	—	—	—	—	3,932.4	366.2
Total	9,323.9	653.5	170.6	82.6	9,494.5	657.4	—	—	—	—	—	—	9,494.5	657.4
All private	17,042.6	787.9	252.6	91.2	17,295.2	790.1	—	—	—	—	—	—	17,295.2	790.1
All owners	62,573.0	1,434.8	1,849.8	281.5	64,422.9	1,446.1	30,941.1	1,659.3	3,932.8	719.4	34,873.9	1,684.3	99,296.7	2,196.7

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 megagrams was estimated.

[a] Total aboveground carbon mass of the tree from ground to tip, includes stem wood, bark, and branches; calculated by applying a factor of 0.5 to aboveground biomass estimated from regional biomass equations, and converting to metric units. Convert megagrams of carbon to tons of biomass by multiplying by 2.204586. The result will be approximate due to rounding.

[b] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory.

Table A1-30—Average aboveground carbon mass[a] per hectare of live trees[b] on forest land, by forest type group and ownership group, Washington, 2002-2011, sampled plots

	Ownership group													
							Private							
	U.S. Forest Service		Other federal		State and local government		Corporate		Noncorporate		All private		All owners	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Kilograms per hectare													
Softwoods:														
Douglas-fir	111,681.94	2,673.00	207,437.10	16,093.68	112,745.05	5,660.98	63,230.97	2,694.63	76,868.94	3,779.60	68,514.05	2,184.45	95,884.68	1,920.85
Fir/spruce/mountain hemlock	106,640.23	3,432.98	154,524.01	13,014.00	89,616.49	15,423.68	39,625.73	5,551.26	66,487.82	8,565.94	53,522.42	5,350.27	104,581.96	3,188.33
Hemlock/Sitka spruce	196,901.37	5,495.77	256,051.06	11,863.16	180,271.10	11,808.37	103,354.29	6,655.13	97,117.67	9,119.07	101,286.21	5,369.41	166,163.34	4,265.35
Lodgepole pine	54,164.18	3,951.85	9,566.92	31.91	59,728.27	10,193.33	72,616.79	35,229.78	56,365.37	6,809.32	57,835.04	7,067.73	55,234.33	3,295.45
Ponderosa pine	47,055.75	2,871.25	57,100.81	8,905.31	32,876.48	3,616.68	30,330.21	2,943.53	35,110.97	2,105.21	33,957.65	1,750.94	36,827.26	1,395.96
Western larch	83,395.25	5,456.92	155,630.56	9,172.32	60,112.85	18,314.63	52,977.26	13,921.09	57,013.18	8,841.12	55,719.86	7,491.94	75,231.23	5,010.42
Other western softwoods	26,127.53	2,444.87	—	—	30,635.67	676.64	27,660.93	18,473.52	18,917.85	988.93	20,694.68	4,403.45	25,985.61	2,264.52
Total	110,794.35	1,650.92	199,030.53	7,454.40	114,374.29	4,423.77	66,971.89	2,268.80	64,707.48	2,278.92	65,903.65	1,527.55	100,060.12	1,203.53
Hardwoods:														
Alder/maple	73,469.06	7,634.34	69,657.31	17,272.39	93,432.02	8,890.29	64,317.98	5,606.43	70,690.72	5,214.00	67,947.87	3,828.19	74,044.84	3,416.28
Aspen/birch	29,455.76	8,007.84	—	—	50,604.79	21,170.13	6,582.08	2,249.65	50,223.96	8,924.91	41,465.21	8,281.38	38,966.71	6,064.22
Elm/ash/cottonwood	147,058.66	45,678.83	123,677.46	48,605.28	136,607.57	24,749.85	36,271.78	15,437.33	53,287.81	13,757.57	47,649.69	10,935.87	87,402.33	13,815.91
Western oak	61,832.73	0.00	23,743.51	0.00	48,474.35	—	32,658.79	12,417.26	38,797.97	5,308.56	36,038.86	6,307.26	36,482.43	5,902.09
Woodland hardwoods	13,118.66	3,528.04	—	—	8,878.31		7,735.52	3,412.26	15,844.18	2,254.84	14,932.10	2,090.48	13,739.97	1,895.02
Other hardwoods	15,257.44	7,361.95	8,747.42	—	—	—	19,913.85	13,974.32	34,453.39	16,188.81	27,624.96	10,862.04	25,786.14	9,469.80
Total	59,659.13	7,891.41	68,968.38	16,975.99	95,112.72	8,186.44	54,837.49	4,776.78	61,456.82	4,069.17	58,745.55	3,088.57	65,950.67	2,854.12
Nonstocked	1,926.54	306.88	1,174.29	667.41	3,631.87	1,237.78	954.47	607.60	3,408.12	620.53	2,592.43	476.38	2,338.75	274.23
All forest types	104,609.10	1,534.70	192,092.34	7,246.20	108,687.87	3,831.44	63,622.42	2,007.04	61,024.50	1,897.45	62,324.27	1,302.84	92,835.60	1,062.99

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 kilograms per hectare was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Total aboveground carbon mass of the tree from ground to tip, includes stem wood, bark, and branches; calculated by applying a factor of 0.5 to aboveground biomass estimated from regional biomass equations, and converting to metric units. Convert kilograms per hectare of carbon to tons per acre of biomass by multiplying by 0.00089. The result will be approximate due to rounding.

[b] Includes all live trees ≥1 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-31—Average aboveground carbon mass[a] per hectare of dead trees[b] on forest land, by forest type group and ownership group, Washington, 2002-2011

	Ownership group													
							Private							
	U.S. Forest Service		Other federal		State and local government		Corporate		Noncorporate		All private		All owners	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Kilograms per hectare													
Softwoods:														
Douglas-fir	12,692.84	739.53	20,109.67	2,819.67	8,310.40	861.82	3,922.84	320.69	4,987.83	538.18	4,335.39	286.35	8,415.57	348.14
Fir/spruce/mountain hemlock	17,714.82	891.62	20,990.70	2,124.67	12,850.53	3,623.69	2,764.80	602.18	13,955.49	2,377.47	8,554.13	1,400.92	16,649.80	728.40
Hemlock/Sitka spruce	29,474.64	1,606.25	38,514.49	3,578.04	20,082.84	2,646.42	5,896.12	820.06	7,964.24	1,497.82	6,581.91	744.88	20,510.09	982.88
Lodgepole pine	14,880.59	1,996.02	—	—	8,341.19	2,639.16	6,016.51	3,346.66	7,048.22	1,620.63	6,954.92	1,502.07	12,279.98	1,441.88
Ponderosa pine	6,232.24	1,092.09	3,003.15	1,767.59	2,072.90	632.36	1,486.89	355.84	1,958.22	332.99	1,844.52	266.93	2,720.66	297.19
Western larch	11,144.36	1,440.87	13,902.45	6,345.52	5,409.28	1,746.00	6,721.83	2,334.85	8,016.94	2,939.44	7,601.92	2,145.52	9,596.27	1,094.09
Other western softwoods	5,663.57	1,225.66	—	—	—	—	—	—	4,407.10	1,907.11	3,511.46	1,831.65	5,374.99	1,131.87
Total	16,085.29	474.42	25,684.67	1,641.98	10,367.81	822.98	4,068.89	276.75	5,280.61	390.75	4,640.52	234.74	11,578.86	269.08
Hardwoods:														
Alder/maple	6,726.53	1,530.52	24,853.23	4,745.74	7,407.32	1,203.24	4,635.33	808.42	4,562.46	586.03	4,593.83	482.26	5,788.36	473.91
Aspen/birch	14,075.98	4,066.25	—	—	4,622.71	3,318.98	2,111.38	1,633.21	5,438.76	1,933.23	4,770.97	1,603.32	7,284.77	1,677.14
Elm/ash/cottonwood	3,349.98	1,410.74	186.21	138.00	5,465.87	1,890.29	3,352.17	1,999.73	1,379.08	599.13	2,032.85	805.25	3,066.98	763.08
Western oak	3,550.46	3,550.46	10,109.92	10,109.92	—	—	1,589.66	438.83	1,126.74	419.57	1,334.79	309.38	1,492.91	378.31
Woodland hardwoods	11,003.31	3,441.30	—	—	582.72	582.72	33,513.44	12,264.45	1,389.65	1,003.31	5,003.02	3,544.02	7,377.33	2,504.01
Other hardwoods	5,021.55	3,712.72	1,257.15	0.00	—	—	1,063.32	548.66	3,012.57	1,639.80	2,097.12	928.90	2,381.51	904.94
Total	8,183.05	1,258.36	18,971.64	4,402.99	6,970.90	1,051.33	4,145.70	658.00	3,943.43	454.65	4,026.28	380.44	5,281.63	378.07
Nonstocked	24,258.79	3,367.79	39,702.02	33,138.37	5,607.65	2,358.70	1,426.64	934.51	3,017.39	1,072.12	2,488.56	787.47	13,631.57	2,105.44
All forest types	16,237.50	469.83	25,644.19	1,646.29	9,712.32	693.55	4,015.31	250.55	4,893.29	311.20	4,454.03	198.73	10,975.22	242.90

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 kilograms per hectare was estimated; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] Total aboveground carbon mass of the tree from ground to tip, includes stem wood, bark, and branches; calculated by applying a factor of 0.5 to aboveground biomass estimated from regional biomass equations, and converting to metric units. Convert kilograms per hectare of carbon to tons per acre of biomass by multiplying by 0.00089. The result will be approximate due to rounding.

[b] Includes all dead trees ≥5 inches in diameter at breast height; smaller dead trees were not measured in this inventory.

Table A1-32—Volume of down wood on forest land, by forest type group and down wood diameter class, Washington, 2002-2011

	Down wood diameter class (inches)													
	Fine-wood size classes[a]						Coarse-wood size classes[b]							
	0.1–0.24		0.25–0.9		1.0–2.9		3.0–9.0		10.0–19.0		≥20.0		All down wood	
Forest type group	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Million cubic feet													
Softwoods:														
Douglas-fir	98.1	2.7	513.9	13.6	1,835.6	58.2	2,742.3	71.6	4,869.6	141.1	6,728.6	311.5	16,788.1	483.2
Fir/spruce/mountain hemlock	35.6	1.5	203.2	8.1	578.1	25.7	1,214.3	53.6	3,092.1	125.9	3,367.1	212.6	8,490.5	346.9
Hemlock/Sitka spruce	41.1	2.3	194.5	9.0	673.7	34.4	1,298.7	58.6	3,339.0	143.5	7,323.9	416.1	12,870.8	578.2
Lodgepole pine	4.4	0.5	34.1	3.1	148.6	16.3	427.7	40.8	451.1	53.9	195.0	63.3	1,260.9	132.1
Ponderosa pine	6.5	0.9	83.8	12.8	270.5	19.0	337.0	23.2	402.1	31.3	381.8	48.9	1,481.8	102.4
Western larch	3.1	0.4	25.5	3.2	85.5	10.5	203.9	27.2	248.3	33.6	123.3	25.4	689.8	83.2
Other western softwoods	0.7	0.1	6.5	1.1	18.0	3.8	29.7	5.7	64.8	13.5	21.2	7.2	140.9	24.7
Total	189.6	3.4	1,061.5	19.8	3,610.1	66.7	6,253.6	97.9	12,466.9	201.0	18,141.0	516.3	41,722.7	692.8
Hardwoods:														
Alder/maple	12.2	1.0	86.4	5.9	326.5	25.3	474.4	31.1	784.0	56.4	1,506.7	146.7	3,190.2	222.7
Aspen/birch	0.8	0.2	6.7	1.5	26.9	6.1	50.4	10.9	60.5	14.7	16.1	5.2	161.5	32.9
Elm/ash/cottonwood	1.3	0.4	7.7	1.6	27.2	5.5	46.1	9.7	70.6	24.4	57.4	23.2	210.4	57.2
Western oak	0.3	0.1	8.1	5.7	115.3	105.8	11.9	3.3	11.3	3.8	5.1	2.9	152.0	113.5
Woodland hardwoods	0.3	0.1	4.6	1.9	17.3	7.9	19.5	6.2	36.2	13.4	29.8	13.1	107.7	37.5
Other hardwoods	0.7	0.2	5.5	1.3	25.7	6.4	43.7	12.3	63.5	20.9	81.4	38.2	220.5	69.1
Total	15.7	1.1	118.9	8.6	538.8	109.4	646.1	36.6	1,026.2	67.0	1,696.5	153.4	4,042.2	267.4
Nonstocked	7.0	3.1	39.2	5.4	133.6	17.4	201.3	22.4	322.5	34.9	357.8	60.1	1,061.4	111.3
All forest types	212.3	4.5	1,219.6	20.9	4,282.5	126.1	7,101.0	97.3	13,815.7	202.0	20,195.2	532.1	46,826.4	704.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error.

[a] The diameter of each piece was visually estimated before being counted within each size class. Counts were used as input to volume equations for fine-wood.

[b] Diameter classes are based on the diameter at the large end of the piece for decay classes less than 5, and based on the transect diameter for decay class 5 pieces. The diameter of each piece was measured and recorded to the nearest inch. Because of this, class breakpoints for 9, 10, 19, and 20 actually represent 0.4 inch above and below the value. For example, 9 represents 8.6 to 9.4 inches.

Table A1-33—Biomass of down wood[a] on forest land, by forest type group, ownership group, and land status, Washington, 2002-2011

Forest type group	Ownership group and land status																	
	U.S. Forest Service				Other federal				State and local government				Private					
	Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand tons																	
Softwoods:																		
Douglas-fir	37,777.9	1,210.4	5,815.9	1,052.4	717.0	276.6	5,889.8	911.7	19,469.5	1,515.2	1,003.5	333.4	53,677.6	2,557.5	15.0	12.1	124,366.3	3,468.8
Fir/spruce/mountain hemlock	23,746.7	1,218.2	18,918.8	1,447.8	309.3	173.6	7,159.2	945.4	3,932.4	897.1	63.1	48.5	9,808.2	1,262.6	248.6	144.0	64,186.3	2,600.9
Hemlock/Sitka spruce	27,151.9	1,456.5	4,414.0	1,182.6	331.2	239.0	18,172.8	2,252.4	15,529.8	2,048.9	823.2	348.1	27,681.0	2,267.3	141.3	80.8	94,245.3	4,234.2
Lodgepole pine	4,557.3	431.5	2,352.5	553.3	—	—	0.6	0.7	862.9	404.2	108.6	86.3	2,370.2	621.2	285.7	249.0	10,537.8	1,052.4
Ponderosa pine	2,711.7	261.1	741.6	432.7	22.9	17.9	225.0	122.3	1,156.8	253.6	183.1	120.5	7,608.6	673.9	39.2	33.3	12,688.8	889.1
Western larch	3,247.5	348.1	210.9	174.5	—	—	168.5	153.3	1,145.7	519.0	44.7	49.0	1,301.8	356.4	—	—	6,119.0	757.1
Other western softwoods	468.6	143.0	650.1	148.1	—	—	—	—	5.4	5.7	9.0	8.7	60.0	30.1	24.3	24.2	1,217.4	209.5
Total	99,661.5	1,825.8	33,103.8	1,820.9	1,380.4	404.3	31,615.9	2,037.8	42,102.3	2,410.7	2,235.3	505.2	102,507.5	3,304.4	754.2	301.9	313,360.9	5,074.2
Hardwoods:																		
Alder/maple	1,760.7	359.8	377.4	156.0	293.2	223.3	659.5	320.1	4,641.2	761.9	605.1	211.3	14,043.3	1,199.7	313.9	131.8	22,694.3	1,526.2
Aspen/birch	270.2	80.4	17.0	8.8	—	—	—	—	81.8	60.6	10.2	10.4	828.1	239.2	9.5	9.7	1,216.8	260.0
Elm/ash/cottonwood	156.6	61.4	79.1	71.4	—	—	50.4	45.3	651.9	367.5	68.2	46.0	393.0	122.5	163.1	79.5	1,562.3	411.2
Western oak	16.6	16.6	—	—	—	—	16.5	20.5	18.3	17.7	—	—	1,307.2	1,129.4	184.4	76.4	1,543.1	1,132.3
Woodland hardwoods	340.7	199.4	101.9	59.1	—	—	—	—	0.8	0.7	—	—	441.6	223.6	—	—	885.1	304.9
Other hardwoods	56.0	33.4	76.2	50.4	14.4	14.9	—	—	—	—	—	—	1,572.4	506.8	—	—	1,718.9	510.6
Total	2,600.8	425.0	651.5	188.5	307.6	223.8	726.5	321.6	5,394.1	841.2	683.4	216.5	18,585.6	1,747.0	670.9	171.8	29,620.4	2,029.6
Nonstocked	2,318.5	282.0	2,139.5	478.9	7.4	5.9	85.1	63.0	610.2	258.9	32.7	23.1	3,912.2	700.0	—	—	9,105.4	932.0
All forest types	104,580.8	1,834.5	35,894.8	1,839.4	1,695.4	461.4	32,427.4	2,085.5	48,106.6	2,442.9	2,951.4	546.2	125,005.2	3,530.1	1,425.0	346.6	352,086.7	5,187.2

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated; for details on down woody material biomass calculation see "FIA Methods and Design" Supplement.

[a] Includes down wood with diameters ≥0.1 inch.

Table A1-34—Biomass of down wood[a] on forest land, by county and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousand tons							
Western Washington:														
Clallam	15,748.1	1,591.9	118.4	62.3	15,866.5	1,592.3	7,360.0	1,165.4	82.4	55.3	7,442.4	1,165.3	23,309.0	1,972.0
Clark	2,576.4	647.4	18.3	15.7	2,594.6	648.2	7.5	9.3	—	—	7.5	9.3	2,602.1	648.2
Cowlitz	11,885.2	1,592.1	60.6	48.7	11,945.8	1,592.8	412.3	151.5	—	—	412.3	151.5	12,358.1	1,600.0
Grays Harbor	25,769.8	2,372.6	328.7	251.9	26,098.5	2,384.4	—	—	—	—	—	—	26,098.5	2,384.4
Island	353.4	133.1	—	—	353.4	133.1	85.7	79.4	—	—	85.7	79.4	439.1	155.0
Jefferson	13,286.6	1,667.0	112.7	91.4	13,399.3	1,668.9	14,934.1	2,167.9	519.3	192.8	15,453.3	2,162.3	28,852.6	2,755.8
King	13,054.9	1,404.6	343.4	163.1	13,398.3	1,423.9	1,781.1	562.6	482.4	308.9	2,263.5	629.8	15,661.8	1,548.6
Kitsap	1,744.4	395.1	—	—	1,744.4	395.1	—	—	—	—	—	—	1,744.4	395.1
Lewis	19,400.9	1,482.2	105.7	70.4	19,506.6	1,484.2	2,165.0	490.1	128.0	74.5	2,293.0	502.4	21,799.6	1,564.7
Mason	6,082.0	741.8	37.7	24.3	6,119.7	742.6	634.9	335.7	—	—	634.9	335.7	6,754.5	814.9
Pacific	10,550.4	1,346.7	128.6	73.0	10,679.1	1,355.2	582.1	414.4	0.6	0.7	582.6	414.4	11,261.7	1,416.4
Pierce	9,245.8	1,231.9	133.2	80.6	9,379.0	1,234.4	3,456.0	739.5	780.8	580.1	4,236.8	915.3	13,615.8	1,536.7
San Juan	515.4	190.1	—	—	515.4	190.1	213.4	175.3	—	—	213.4	175.3	728.8	258.6
Skagit	12,847.0	1,305.0	65.6	60.6	12,912.6	1,306.4	3,097.2	831.6	39.4	24.4	3,136.6	832.8	16,049.2	1,548.8
Skamania	15,705.9	1,067.6	156.7	93.5	15,862.5	1,074.1	1,884.1	471.4	271.3	167.7	2,155.4	487.3	18,017.9	1,166.8
Snohomish	13,417.8	1,349.8	301.7	191.1	13,719.5	1,345.0	3,846.4	1,166.9	336.8	169.5	4,183.2	1,171.0	17,902.7	1,771.9
Thurston	2,766.6	562.9	56.6	56.7	2,823.2	565.6	—	—	—	—	—	—	2,823.2	565.6
Wahkiakum	2,492.0	608.6	48.8	48.3	2,540.8	610.4	—	—	—	—	—	—	2,540.8	610.4
Whatcom	10,431.7	1,160.0	554.4	263.1	10,986.2	1,186.7	4,341.0	808.9	288.9	180.2	4,629.9	821.0	15,616.1	1,442.7
Total	187,874.3	4,199.2	2,571.1	493.8	190,445.5	4,202.0	44,800.6	2,581.6	2,929.8	737.8	47,730.4	2,569.8	238,175.8	4,873.7

Table A1-34—Biomass of down wood[a] on forest land, by county and land status, Washington, 2002-2011 (continued)

County	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand tons													
Eastern Washington:														
Asotin	653.4	179.1	0.1	0.1	653.5	179.1	—	—	—	—	—	—	653.5	179.1
Chelan	9,724.6	626.0	597.8	123.0	10,322.4	632.6	3,658.9	846.9	503.1	154.6	4,162.0	860.8	14,484.4	1,066.2
Columbia	1,175.0	226.0	46.3	47.0	1,221.4	232.0	1,065.4	416.4	—	—	1,065.4	416.4	2,286.8	476.7
Douglas	22.5	22.4	—	—	22.5	22.4	—	—	—	—	—	—	22.5	22.4
Ferry	12,286.4	830.9	214.7	93.4	12,501.1	834.4	8.6	8.2	—	—	8.6	8.2	12,509.7	834.4
Garfield	986.9	172.8	1.4	1.4	988.3	172.7	320.0	162.2	—	—	320.0	162.2	1,308.4	236.9
Kittitas	9,295.3	844.9	273.6	89.2	9,568.8	848.9	391.5	216.2	27.9	26.5	419.4	236.9	9,988.2	881.3
Klickitat	4,711.4	659.7	260.7	91.8	4,972.1	671.8	9.9	11.2	—	—	9.9	11.2	4,982.0	673.0
Lincoln	372.9	129.5	—	—	372.9	129.5	—	—	—	—	—	—	372.9	129.5
Okanogan	17,102.3	1,011.5	854.3	225.9	17,956.6	1,029.8	6,440.3	974.2	1,800.2	543.0	8,240.5	1,061.0	26,197.1	1,475.5
Pend Oreille	9,219.1	654.9	123.6	52.9	9,342.7	654.6	423.0	249.9	100.8	106.4	523.8	270.9	9,866.5	708.4
Spokane	1,880.6	361.9	0.0	0.0	1,880.6	361.9	203.2	89.8	—	—	203.2	89.8	2,083.7	372.5
Stevens	9,956.4	849.8	181.1	107.9	10,137.5	856.5	645.2	270.1	—	—	645.2	270.1	10,782.6	891.0
Walla Walla	163.8	114.8	—	—	163.8	114.8	—	—	—	—	—	—	163.8	114.8
Whitman	97.9	48.7	—	—	97.9	48.7	—	—	—	—	—	—	97.9	48.7
Yakima	13,865.4	1,684.9	427.8	173.7	14,293.3	1,692.5	3,192.4	735.9	625.3	241.2	3,817.8	752.9	18,111.1	1,852.4
Total	91,513.7	2,416.7	2,981.5	369.2	94,495.3	2,421.5	16,358.3	1,310.4	3,057.3	601.1	19,415.6	1,287.9	113,910.9	2,720.6
All counties	279,388.1	4,475.5	5,552.6	616.0	284,940.7	4,470.1	61,158.9	2,814.7	5,987.1	950.9	67,146.0	2,787.3	352,086.7	5,187.2

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated; for details on down wood biomass biomass calculation see "FIA Methods and Design" Supplement.

[a] Includes down wood with diameters ≥0.1 inch.

Table A1-35—Average volume per acre of down wood on forest land by, forest type group and and down wood diameter class, Washington, 2002-2011

	Down wood diameter class (inches)													
	Fine-wood size classes[a]						Coarse-wood size classes[b]							
	0.1–.24		0.25–0.9		1.0–2.9		3.0–9.0		10.0–19.0		≥20.0		All down wood	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Cubic feet per acre							
Softwoods:														
Douglas-fir	11.15	0.24	58.39	1.17	208.56	5.32	311.57	5.93	553.27	12.86	764.49	32.88	1,907.43	43.61
Fir/spruce/mountain hemlock	9.12	0.30	52.11	1.55	148.23	4.99	311.36	10.67	792.82	24.35	863.34	48.22	2,176.98	64.47
Hemlock/Sitka spruce	13.25	0.58	62.62	1.91	216.94	7.92	418.21	11.31	1,075.24	28.21	2,358.48	110.04	4,144.74	124.24
Lodgepole pine	6.22	0.48	47.99	2.75	209.32	17.06	602.33	40.36	635.21	54.13	274.66	85.33	1,775.73	122.33
Ponderosa pine	3.20	0.42	41.00	5.97	132.40	7.23	164.99	8.81	196.84	12.86	186.91	22.28	725.33	38.37
Western larch	8.83	0.65	71.67	5.66	240.09	16.91	572.36	50.35	696.90	63.36	346.10	59.34	1,935.97	122.25
Other western softwoods	3.25	0.45	29.45	3.53	81.94	17.10	134.71	23.23	294.21	56.79	96.35	30.83	639.91	97.81
Total	9.91	0.17	55.47	0.96	188.65	3.18	326.79	4.58	651.48	9.80	947.99	26.51	2,180.30	33.76
Hardwoods:														
Alder/maple	7.00	0.42	49.59	2.26	187.40	10.93	272.34	11.60	450.04	23.81	864.94	71.64	1,831.31	88.53
Aspen/birch	6.06	0.87	49.79	6.60	200.04	24.62	375.20	43.22	450.27	68.52	120.06	32.33	1,201.41	101.50
Elm/ash/cottonwood	7.90	2.02	46.07	6.31	163.92	19.21	277.70	33.28	425.26	124.76	345.62	123.15	1,266.47	258.09
Western oak	1.90	0.48	53.41	35.86	758.57	677.97	78.52	15.78	74.52	23.16	33.24	18.44	1,000.16	719.94
Woodland hardwoods	3.99	0.71	55.81	17.46	210.73	77.63	237.16	56.56	441.27	127.17	362.67	129.82	1,311.63	327.24
Other hardwoods	5.71	0.83	41.91	5.89	195.48	24.67	333.36	62.03	484.07	124.58	619.96	261.50	1,680.48	395.30
Total	6.52	0.35	49.39	2.93	223.77	44.28	268.34	10.28	426.20	21.72	704.57	56.11	1,678.79	85.05
Nonstocked	8.60	3.71	48.26	5.44	164.45	17.66	247.77	21.11	397.04	33.93	440.43	69.84	1,306.55	106.92
All forest types	9.50	0.20	54.55	0.90	191.55	5.53	317.63	4.15	617.97	8.81	903.33	23.65	2,094.53	30.57

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; the average was calculated using a ratio of means formula across plots within forest type groups.

[a] The diameter of each piece was visually estimated before being counted within each size class. Counts were used as input to volume equations for fine-wood.

[b] Diameter classes are based on the diameter at the large end of the piece for decay classes less than 5, and based on the transect diameter for decay class 5 pieces. The diameter of each piece was measured and recorded to the nearest inch. Because of this, class breakpoints for 9, 10, 19, and 20 actually represent 0.4 inches above and below the value. For example, 9 represents 8.6 to 9.4 inches.

Table A1-36—Average biomass per acre of down wood[a] on forest land, by forest type group, ownership group, and land status, Washington, 2002-2011

	Ownership group and land status																	
	U.S. Forest Service				Other federal				State and local government				Private					
	Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		Timberland		Other forest land		All forest land	
Forest type group	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre																	
Softwoods:																		
Douglas-fir	15.325	0.350	14.023	1.812	10.357	2.754	17.020	1.783	15.438	0.927	14.268	2.120	12.879	0.487	2.143	0.277	14.130	0.306
Fir/spruce/mountain hemlock	19.383	0.666	12.811	0.790	14.736	2.926	15.306	1.438	23.189	3.191	16.348	3.140	19.202	1.470	9.822	2.883	16.458	0.480
Hemlock/Sitka spruce	33.404	1.169	29.925	5.586	24.249	7.723	40.622	3.485	34.743	2.778	21.764	3.893	23.451	1.176	7.519	2.282	30.349	0.914
Lodgepole pine	14.991	0.839	14.003	1.732	—	—	0.128	0.000	21.232	5.965	10.509	0.864	13.930	2.547	22.689	11.564	14.840	0.933
Ponderosa pine	8.071	0.523	15.892	5.977	3.812	1.205	5.352	2.381	5.177	0.786	9.897	2.970	5.604	0.369	3.149	1.302	6.211	0.334
Western larch	16.147	0.862	18.725	2.937	—	—	19.143	5.112	29.184	6.209	8.797	0.000	14.339	1.924	—	—	17.173	1.159
Other western softwoods	13.573	2.754	3.887	0.695	—	—	—	—	50.851	50.851	1.336	0.000	11.724	2.560	3.836	3.836	5.531	0.817
Total	18.529	0.304	13.611	0.702	12.563	2.375	24.018	1.530	19.303	0.944	14.639	1.727	13.699	0.379	9.144	2.669	16.375	0.246
Hardwoods:																		
Alder/maple	20.107	2.870	13.948	4.292	18.763	8.345	31.506	8.337	13.587	1.460	12.635	2.427	11.981	0.671	10.736	2.410	13.027	0.585
Aspen/birch	8.625	1.542	3.295	0.419	—	—	—	—	10.876	0.421	2.760	2.760	9.888	1.233	3.213	0.000	9.054	0.902
Elm/ash/cottonwood	12.181	2.839	9.869	3.158	—	—	7.913	5.025	20.722	7.204	4.873	1.461	5.966	0.801	5.923	1.087	9.406	1.818
Western oak	12.630	12.630	—	—	—	—	4.983	0.000	3.075	3.075	—	—	18.372	14.878	2.627	0.790	10.155	7.166
Woodland hardwoods	15.775	4.278	6.889	3.116	—	—	—	—	0.157	0.157	—	—	10.910	3.789	—	—	10.774	2.617
Other hardwoods	7.273	2.210	12.416	8.146	3.876	3.876	—	—	—	—	—	—	13.833	3.161	—	—	13.099	2.796
Total	16.019	1.730	10.654	2.424	15.899	7.311	23.726	7.029	13.767	1.440	10.424	1.944	12.014	0.903	5.163	0.929	12.302	0.660
Nonstocked	11.033	0.910	13.165	2.213	0.782	0.782	8.352	0.024	9.653	3.111	8.133	5.058	11.087	1.510	—	—	11.209	0.864
All forest types	18.184	0.289	13.515	0.656	12.228	2.269	23.894	1.509	18.249	0.816	13.278	1.364	13.323	0.342	6.709	1.235	15.749	0.224

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.0005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots within forest type groups; for details on down woody debris biomass calculation see Forest Inventory and Analysis Methods and Design Supplement.

[a] Includes down wood with diameters ≥0.1 inch.

Table A1-37—Average biomass per acre of down wood[a] on forest land, by ownership and land status, Washington, 2002-2011

Ownership	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre													
U.S. Forest Service:														
National forest	18.184	0.289	9.537	0.944	17.701	0.278	16.307	0.937	7.414	0.962	14.101	0.740	16.709	0.286
Total	18.184	0.289	9.537	0.944	17.701	0.278	16.307	0.937	7.414	0.962	14.101	0.740	16.709	0.286
Other federal government:														
Bureau of Land Management	8.880	2.762	4.562	0.328	8.225	2.404	—	—	—	—	—	—	8.225	2.404
Department of Defense	18.698	5.427	—	—	18.698	5.427	—	—	—	—	—	—	18.698	5.427
National Park Service	—	—	—	—	—	—	26.629	1.725	10.844	3.631	24.760	1.594	24.760	1.594
U.S. Fish and Wildlife Service	—	—	—	—	—	—	16.524	5.428	0.129	0.129	15.556	5.214	15.556	5.214
Other federal	10.563	3.083	4.995	4.995	10.003	2.814	3.143	0.553	—	—	3.143	0.553	9.103	2.521
Total	12.228	2.269	4.761	0.236	11.533	2.099	25.846	1.639	10.541	3.548	24.096	1.522	22.812	1.386
State and local government:														
Local	19.095	2.941	10.047	3.256	18.657	2.813	9.510	1.961	15.735	15.735	10.170	1.862	17.414	2.446
State	18.155	0.832	18.901	2.938	18.166	0.821	14.594	2.145	1.336	1.336	13.781	2.148	17.967	0.789
Other public	7.280	7.280	—	—	7.280	0.000	—	—	—	—	—	—	7.280	7.280
Total	18.249	0.816	15.911	2.578	18.204	0.803	12.840	1.624	8.378	4.984	12.495	1.562	17.862	0.761
Corporate private	16.172	0.528	6.565	1.238	16.018	0.522	—	—	—	—	—	—	16.018	0.522
Noncorporate private:														
NGOs and conservation or natural resource organizations	14.054	2.184	7.851	7.851	14.002	2.167	—	—	—	—	—	—	14.002	2.167
Unincorporated partnerships, associations, or clubs	4.036	1.292	—	—	4.036	1.292	—	—	—	—	—	—	4.036	1.292
American Indian	12.555	0.774	10.310	5.699	12.511	0.767	—	—	—	—	—	—	12.511	0.767
Individual	8.545	0.489	5.445	1.089	8.430	0.474	—	—	—	—	—	—	8.430	0.474
Total	10.434	0.430	6.790	1.801	10.331	0.421	—	—	—	—	—	—	10.331	0.421
All private	13.323	0.342	6.709	1.235	13.176	0.336	—	—	—	—	—	—	13.176	0.336
All owners	15.601	0.236	8.981	0.741	15.380	0.229	19.803	0.832	8.079	1.055	17.534	0.699	15.749	0.224

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.0005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots; for details on down woody debris biomass calculation see "FIA Methods and Design" Supplement. NGO = nongovernmental organization.

[a] Includes down wood with diameters ≥0.1 inch.

Table A1-38—Average biomass per acre of down wood[a] on forest land, by county and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre													
Western Washington:														
Clallam	21.873	1.431	11.129	1.187	21.717	1.413	24.790	2.232	3.155	1.977	23.041	2.212	22.123	1.193
Clark	13.639	2.401	4.640	0.571	13.455	2.351	2.168	2.168	—	—	2.168	2.017	13.257	2.323
Cowlitz	20.133	1.813	7.772	7.772	19.972	1.794	13.673	3.630	—	—	13.673	3.630	19.670	1.719
Grays Harbor	22.616	1.500	13.873	7.626	22.438	1.479	—	—	—	—	—	—	22.438	1.479
Island	8.049	0.943	—	—	8.049	0.943	19.919	19.919	—	—	19.919	19.919	9.109	1.248
Jefferson	26.325	2.159	17.440	11.445	26.213	2.141	38.285	3.989	8.977	1.570	34.500	3.658	30.083	2.081
King	19.475	1.318	11.139	3.933	19.108	1.280	13.516	2.680	18.814	5.511	14.379	2.446	18.241	1.142
Kitsap	10.796	1.278	—	—	10.796	1.278	—	—	—	—	—	—	10.796	1.278
Lewis	16.448	0.839	8.571	5.305	16.367	0.834	18.155	2.657	4.644	1.505	15.618	2.405	16.285	0.788
Mason	13.300	1.181	8.280	3.820	13.251	1.169	19.584	5.992	—	—	19.584	5.992	13.666	1.181
Pacific	19.362	1.509	9.158	2.982	19.106	1.483	30.547	15.238	0.129	0.129	24.889	13.585	19.338	1.525
Pierce	17.636	1.639	9.038	2.676	17.401	1.602	17.764	2.172	24.381	14.919	18.699	2.805	17.785	1.401
San Juan	8.873	1.819	—	—	8.873	1.819	16.003	6.931	—	—	16.003	6.931	10.205	2.127
Skagit	21.050	1.428	8.132	1.338	20.881	1.413	22.893	3.758	2.884	1.329	21.058	3.577	20.916	1.334
Skamania	18.611	0.904	13.697	5.937	18.545	0.896	21.107	3.522	14.345	4.889	19.925	3.025	18.700	0.867
Snohomish	23.298	1.614	9.148	3.825	22.531	1.552	21.003	5.288	5.370	1.963	17.015	4.084	20.945	1.620
Thurston	11.122	1.481	8.993	8.993	11.070	1.445	—	—	—	—	—	—	11.070	1.445
Wahkiakum	17.919	2.264	7.534	7.534	17.457	2.210	—	—	—	—	—	—	17.457	2.210
Whatcom	22.314	1.559	18.029	6.512	22.049	1.514	14.544	1.763	3.648	2.043	12.260	1.590	17.828	1.151
Total	19.431	0.375	11.425	1.606	19.249	0.369	23.076	1.197	8.418	1.821	20.848	1.061	19.550	0.360

Table A1-38—Average biomass per acre of down wood[a] on forest land, by county and land status, Washington, 2002-2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre													
Eastern Washington:														
Asotin	9.618	2.090	0.053	0.053	9.386	2.040	—	—	—	—	—	—	9.386	2.040
Chelan	12.447	0.561	7.555	1.001	11.997	0.521	12.485	2.282	4.552	0.889	10.312	1.713	11.459	0.652
Columbia	9.028	1.285	101.989	101.989	9.351	1.328	14.077	4.248	—	—	14.077	4.248	11.085	1.829
Douglas	4.635	4.635	—	—	4.635	4.635	—	—	—	—	—	—	4.635	4.635
Ferry	10.083	0.497	8.729	2.747	10.056	0.490	1.242	1.242	—	—	1.242	1.242	10.007	0.489
Garfield	12.758	2.061	0.486	0.215	12.311	1.986	8.665	2.648	—	—	8.665	2.648	11.162	1.598
Kittitas	13.464	0.792	8.619	1.990	13.251	0.763	13.568	5.089	6.098	6.098	12.547	3.839	13.220	0.748
Klickitat	9.225	0.822	3.494	0.880	8.494	0.763	4.911	4.911	—	—	4.911	4.911	8.482	0.759
Lincoln	5.874	1.063	—	—	5.874	1.063	—	—	—	—	—	—	5.874	1.063
Okanogan	10.913	0.462	8.404	1.513	10.760	0.443	15.366	1.478	9.114	2.067	13.363	1.217	11.462	0.466
Pend Oreille	12.765	0.611	8.026	2.093	12.666	0.600	16.804	3.218	13.871	13.871	16.147	2.560	12.813	0.590
Spokane	5.493	0.782	0.006	0.006	5.452	0.778	5.083	0.941	—	—	5.083	0.941	5.414	0.704
Stevens	8.672	0.532	14.973	3.494	8.738	0.530	12.796	3.140	—	—	12.796	3.140	8.907	0.526
Walla Walla	8.082	3.288	—	—	8.082	3.288	—	—	—	—	—	—	8.082	3.288
Whitman	3.493	0.928	—	—	3.493	0.928	—	—	—	—	—	—	3.493	0.928
Yakima	15.988	1.508	9.229	2.249	15.645	1.441	18.911	2.064	8.548	1.949	15.778	1.796	15.673	1.199
Total	11.106	0.247	7.582	0.681	10.945	0.238	14.262	0.921	7.778	1.170	12.607	0.742	11.197	0.231
All counties	15.601	0.236	8.981	0.741	15.380	0.229	19.803	0.832	8.079	1.055	17.534	0.699	15.749	0.224

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.0005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots; for details on down woody material biomass calculation see "FIA Methods and Design" Supplement.

[a] Includes down wood with diameters ≥0.1 inch.

Table A1-39—Average biomass per acre of all dead wood (dead trees and down wood)[a] on forest land, by county and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre													
Western Washington:														
Clallam	30.105	1.847	13.901	0.969	29.869	1.823	50.007	4.269	12.684	8.507	46.989	4.272	35.117	1.909
Clark	20.467	3.372	4.640	0.571	20.144	3.299	2.475	2.475	—	—	2.475	2.475	19.833	3.265
Cowlitz	24.175	2.170	7.772	7.772	23.961	2.148	24.675	7.051	—	—	24.675	7.051	23.995	2.073
Grays Harbor	31.509	1.878	23.540	12.070	31.347	1.855	—	—	—	—	—	—	31.347	1.855
Island	11.402	1.178	—	—	11.402	1.178	19.919	19.919	—	—	19.919	19.919	12.162	1.259
Jefferson	41.056	3.992	20.690	12.611	40.798	3.952	75.088	6.585	34.483	7.688	69.844	6.027	54.363	3.645
King	27.419	1.801	17.465	5.114	26.982	1.741	36.472	6.909	45.928	16.009	38.013	6.407	29.004	1.890
Kitsap	15.092	1.463	—	—	15.092	1.463	—	—	—	—	—	—	15.092	1.463
Lewis	22.640	1.122	10.976	5.817	22.519	1.114	43.388	6.460	9.518	2.306	37.029	5.912	24.110	1.209
Mason	18.762	1.510	11.088	4.425	18.686	1.495	64.674	14.044	—	—	64.674	14.044	21.702	2.122
Pacific	23.968	1.656	10.535	2.581	23.631	1.626	39.394	17.445	0.129	0.129	32.091	15.948	23.971	1.691
Pierce	25.485	2.228	12.163	3.318	25.120	2.174	39.771	4.159	45.421	27.751	40.569	5.298	29.693	2.272
San Juan	14.042	2.647	—	—	14.042	2.647	30.305	14.754	—	—	30.305	14.754	17.078	3.958
Skagit	32.183	2.161	10.228	1.878	31.897	2.138	40.041	6.683	9.992	3.201	37.285	6.269	32.943	2.138
Skamania	33.479	1.779	24.095	12.173	33.354	1.761	42.746	5.020	25.536	10.073	39.738	4.526	34.070	1.654
Snohomish	38.314	2.659	24.004	10.788	37.539	2.582	37.354	8.849	14.642	5.034	31.561	6.902	35.819	2.711
Thurston	14.377	2.012	8.993	8.993	14.244	1.967	—	—	—	—	—	—	14.244	1.967
Wahkiakum	26.341	4.105	8.818	8.818	25.562	3.994	—	—	—	—	—	—	25.562	3.994
Whatcom	34.151	2.635	26.736	8.225	33.694	2.518	27.622	3.192	4.866	2.438	22.851	2.908	29.019	1.921
Total	28.281	0.530	18.022	2.782	28.048	0.522	46.493	2.132	20.528	3.919	42.546	1.924	30.772	0.554

Table A1-39—Average biomass per acre of all dead wood (dead trees and down wood)[a] on forest land, by county and land status, Washington, 2002-2011 (continued)

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
County	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Tons per acre													
Eastern Washington:														
Asotin	14.572	3.184	0.817	0.817	14.239	3.103	—	—	—	—	—	—	14.239	3.103
Chelan	22.948	1.219	16.643	3.198	22.368	1.145	30.709	5.740	7.805	2.217	24.436	4.393	23.029	1.608
Columbia	18.090	3.083	101.989	101.989	18.381	3.090	32.397	8.372	—	—	32.397	8.372	23.524	3.883
Douglas	4.635	4.635	—	—	4.635	4.635	—	—	—	—	—	—	4.635	4.635
Ferry	14.935	0.786	15.001	3.768	14.936	0.774	1.242	1.242	—	—	1.242	1.242	14.861	0.772
Garfield	24.588	3.862	0.722	0.366	23.719	3.734	44.116	18.457	—	—	44.116	18.457	30.146	6.658
Kittitas	19.602	1.121	14.701	3.286	19.387	1.081	26.091	8.336	6.098	6.098	23.357	6.227	19.562	1.075
Klickitat	12.725	1.157	4.596	1.150	11.689	1.073	35.490	35.490	—	—	35.490	35.490	11.771	1.076
Lincoln	7.020	1.186	—	—	7.020	1.186	—	—	—	—	—	—	7.020	1.186
Okanogan	18.066	0.859	18.163	3.399	18.072	0.831	37.117	4.121	24.130	6.261	32.957	3.467	22.088	1.170
Pend Oreille	21.101	0.958	13.114	3.129	20.934	0.938	38.699	9.788	35.086	35.086	37.890	7.615	21.649	1.025
Spokane	7.100	1.207	0.006	0.006	7.046	1.200	7.604	2.302	—	—	7.604	2.302	7.104	1.101
Stevens	12.402	0.754	18.453	5.309	12.465	0.751	21.534	6.276	—	—	21.534	6.276	12.843	0.772
Walla Walla	10.314	4.949	—	—	10.314	4.949	—	—	—	—	—	—	10.314	4.949
Whitman	4.370	0.926	—	—	4.370	0.926	—	—	—	—	—	—	4.370	0.926
Yakima	24.754	1.877	16.362	3.581	24.328	1.796	43.095	5.901	21.889	4.153	36.683	4.676	26.916	1.753
Total	17.463	0.364	14.177	1.387	17.313	0.352	34.099	2.481	19.115	3.453	30.274	2.038	19.275	0.433
All counties	23.304	0.333	15.577	1.359	23.046	0.324	41.890	1.630	19.778	2.588	37.611	1.405	25.541	0.359

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.0005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots; for details on down woody debris biomass calculation see "FIA Methods and Design" Supplement.

[a] Includes down wood with diameters ≥0.1 inch at the transect intersection.

Table A1-40—Area of forest land, by national forest and land status, Washington, 2002-2011

National forest	Land status													
	Unreserved forests						Reserved forests						All forest land	
	Timberland		Other forest		Total		Productive		Other forest		Total			
	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand acres													
National forests:														
Colville	988.2	12.4	35.4	7.7	1,023.7	10.0	25.2	14.1	7.3	7.7	32.4	16.0	1,056.1	18.9
Gifford Pinchot	1,009.0	14.7	17.2	5.3	1,026.2	14.2	212.0	16.6	31.2	13.8	243.2	17.3	1,269.4	15.1
Mount Baker-Snoqualmie	873.7	24.1	65.3	14.7	939.0	21.7	420.2	31.7	140.1	30.7	560.3	31.4	1,499.3	31.6
Okanogan	819.0	32.2	88.5	12.5	907.5	32.9	496.3	49.5	209.1	36.2	705.4	55.1	1,612.9	63.3
Olympic	521.4	8.8	12.9	4.8	534.2	7.4	59.9	20.0	—	—	59.9	20.0	594.1	21.3
Umatilla	151.9	7.0	5.1	2.9	157.0	6.8	112.6	18.3	—	—	112.6	18.3	269.6	19.5
Wenatchee	1,257.2	37.9	113.0	14.1	1,370.2	38.0	414.7	46.4	186.6	34.1	601.3	51.6	1,971.5	62.8
Other areas:														
Columbia River Gorge National Scenic Area	21.9	4.8	—	—	21.9	4.8	—	—	—	—	—	—	21.9	4.8
Idaho Panhandle	108.9	8.9	3.3	1.9	112.2	8.4	—	—	—	—	—	—	112.2	8.4
All national forests	5,751.1	43.5	340.7	26.1	6,091.9	37.3	1,740.8	60.4	574.3	56.4	2,315.2	48.5	8,407.0	48.6

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 acres was estimated.

Table A1-41—Net volume of live trees[a] on forest land, by national forest and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
National forest	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Million cubic feet							
National forests:														
Colville	3,005.4	87.1	47.3	12.8	3,052.7	85.7	135.1	78.7	21.9	23.1	157.0	81.9	3,209.7	118.5
Gifford Pinchot	7,374.8	217.4	39.5	21.9	7,414.3	216.6	1,564.6	197.2	87.0	76.5	1,651.6	188.9	9,065.9	267.2
Mount Baker-Snoqualmie	6,736.3	281.4	265.6	94.5	7,001.8	276.0	3,441.9	352.1	442.4	163.4	3,884.3	329.7	10,886.2	408.0
Okanogan	1,766.0	94.4	104.7	24.7	1,870.7	96.0	1,630.9	230.6	258.0	79.4	1,888.9	237.5	3,759.5	253.9
Olympic	3,938.4	171.0	50.6	23.1	3,989.1	169.4	330.8	136.3	—	—	330.8	136.3	4,319.9	217.4
Umatilla	458.6	33.3	0.5	0.3	459.1	33.3	497.0	113.0	—	—	497.0	113.0	956.1	117.8
Wenatchee	3,885.0	166.8	227.9	42.7	4,112.8	167.8	1,913.6	299.0	558.5	161.4	2,472.1	318.0	6,584.9	358.8
Other areas:														
Columbia River Gorge National Scenic Area	149.5	34.4	—	—	149.5	34.4	—	—	—	—	—	—	149.5	34.4
Idaho Panhandle	338.3	29.6	6.3	3.6	344.6	28.4	—	—	—	—	—	—	344.6	28.4
All national forests	27,652.2	428.4	742.3	111.9	28,394.6	422.5	9,513.9	522.3	1,367.7	252.3	10,881.6	502.1	39,276.1	629.0

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50,000 cubic feet was estimated.

[a] Includes all live trees ≥5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-42—Aboveground biomass of live trees[a] on forest land, by national forest and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
National forest	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
							Thousand tons							
National forests:														
Colville	63,979.7	1,570.4	965.4	259.8	64,945.1	1,534.0	2,570.5	1,461.9	420.7	444.1	2,991.2	1,524.0	67,936.3	2,162.3
Gifford Pinchot	144,412.3	4,081.4	910.7	536.0	145,323.1	4,066.6	29,093.0	3,478.6	1,710.1	1,474.5	30,803.0	3,318.8	176,126.1	4,842.5
Mount Baker-Snoqualmie	133,634.2	5,386.3	5,486.5	1,914.7	139,120.7	5,266.2	69,337.1	7,006.5	9,115.1	3,145.6	78,452.2	6,514.9	217,572.9	7,897.1
Okanogan	38,139.5	1,928.7	2,520.4	533.1	40,659.9	1,961.8	30,889.8	3,993.2	6,420.0	1,647.4	37,309.8	4,175.8	77,969.8	4,558.6
Olympic	79,106.7	3,263.2	1,120.7	504.6	80,227.4	3,222.6	6,600.1	2,673.5	—	—	6,600.1	2,673.5	86,827.6	4,187.2
Umatilla	8,400.0	555.7	14.8	9.1	8,414.8	555.4	8,927.2	1,906.5	—	—	8,927.2	1,906.5	17,341.9	1,985.7
Wenatchee	78,697.3	3,284.2	4,543.2	830.1	83,240.5	3,296.7	36,682.6	5,672.2	11,112.6	3,097.6	47,795.2	6,017.4	131,035.7	6,846.6
Other areas:														
Columbia River Gorge National Scenic Area	2,820.9	646.0	—	—	2,820.9	646.0	—	—	—	—	—	—	2,820.9	646.0
Idaho Panhandle	6,881.9	560.0	102.3	58.8	6,984.1	539.4	—	—	—	—	—	—	6,984.1	539.4
All national forests	556,072.6	8,139.7	15,664.0	2,288.2	571,736.6	8,000.4	184,100.2	9,894.4	28,778.5	4,867.9	212,878.7	9,421.1	784,615.3	11,770.2

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated.

[a] Includes all live trees ≥1 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-43—Biomass of down wood on forest land, by national forest and down wood diameter class, Washington, 2002-2011

	Down wood diameter class (inches)													
	Fine-wood size classes[a]						Coarse-wood size classes[b]							
	0.1–0.24		0.25–0.9		1.0–2.9		3.0–9.0		10.0–19.0		≥20.0		All down wood	
National forest	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE
	Thousand tons													
National forests:														
Colville	108.41	4.23	722.04	28.66	2,057.10	98.68	4,127.18	193.94	5,792.00	297.33	2,025.05	188.06	14,831.79	557.39
Gifford Pinchot	160.56	6.49	767.19	26.28	1,984.79	84.30	2,375.22	91.28	7,247.92	310.19	11,398.07	632.20	23,933.76	845.32
Mount Baker-Snoqualmie	160.58	8.53	765.71	34.49	2,085.98	115.19	2,902.34	138.93	8,692.57	396.44	18,738.87	1,292.86	33,346.05	1,612.10
Okanogan	120.11	6.37	759.90	38.37	2,304.74	124.49	4,609.52	304.60	8,082.83	567.74	4,911.49	560.70	20,788.59	1,228.62
Olympic	98.83	6.69	360.31	17.04	975.41	56.11	1,499.62	84.38	4,365.94	293.53	8,541.28	633.21	15,841.39	815.50
Umatilla	18.56	2.09	166.93	18.62	398.73	40.02	557.07	60.80	1,405.08	185.37	1,094.54	288.28	3,640.92	446.62
Wenatchee	210.09	11.34	1,150.75	54.49	3,479.67	214.92	4,353.45	215.64	9,096.02	490.54	7,584.63	643.75	25,874.61	1,280.63
Other areas:														
Columbia River Gorge National Scenic Area	3.16	1.32	12.65	3.11	34.59	7.91	56.34	19.24	148.85	45.80	202.25	56.44	457.83	114.04
Idaho Panhandle	8.70	0.91	81.44	8.93	312.21	36.82	280.05	26.73	773.28	114.09	306.59	81.66	1,762.27	238.12
All national forests	889.00	16.95	4,786.92	76.80	13,633.24	284.34	20,760.80	412.52	45,604.49	877.76	54,802.77	1,790.92	140,477.22	2,467.46

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 50 bone-dry tons was estimated; for details on down woody material biomass calculation see "FIA Methods and Design" Supplement.

[a] The diameter of each piece was visually estimated before being counted within each size class. Counts were used as input to volume equations for fine-wood.

[b] Diameter classes are based on the diameter at the large end of the piece for decay classes less than 5, and based on the transect diameter for decay class 5 pieces. The diameter of each piece was measured and recorded to the nearest inch. Because of this, class breakpoints for 9, 10, 19, and 20 actually represent 0.4 inches above and below the value. For example, 9 represents 8.6 to 9.4 inches.

Table A1-44—Average net volume per acre of live trees[a] on forest land, by national forest and land status, Washington, 2002-2011

National forest	Land status													
	Unreserved forests						Reserved forests						All forest land	
	Timberland		Other forest		Total		Productive		Other forest		Total			
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Cubic feet per acre													
National forests:														
Colville	3,041.13	79.65	1,336.88	210.05	2,982.17	77.12	5,366.70	885.43	3,011.37	3,011.37	4,838.95	835.66	3,039.20	83.55
Gifford Pinchot	7,309.10	202.67	2,298.26	1,058.27	7,225.23	199.32	7,378.93	767.84	2,786.59	1,835.22	6,789.60	724.77	7,141.76	203.09
Mount Baker-Snoqualmie	7,710.19	282.93	4,064.72	1,005.01	7,456.53	269.75	8,191.65	650.19	3,156.63	974.93	6,932.33	553.32	7,260.63	268.27
Okanogan	2,156.25	78.61	1,182.65	215.34	2,061.28	74.29	3,285.99	363.13	1,233.89	297.66	2,677.76	274.25	2,330.89	126.78
Olympic	7,553.96	302.21	3,936.72	979.86	7,466.89	294.29	5,526.16	1,398.01	—	—	5,526.16	1,398.01	7,271.33	306.57
Umatilla	3,019.30	235.16	94.69	14.79	2,924.94	225.80	4,412.94	766.63	—	—	4,412.94	766.63	3,546.55	349.07
Wenatchee	3,090.26	104.68	2,015.84	272.38	3,001.62	97.11	4,614.96	527.81	2,992.30	641.28	4,111.31	400.99	3,340.06	140.83
Other areas:														
Columbia River Gorge National Scenic Area	6,815.17	481.30	—	—	6,815.17	481.30	—	—	—	—	—	—	6,815.17	481.30
Idaho Panhandle	3,107.56	277.14	1,907.18	1,907.18	3,072.36	268.89	—	—	—	—	—	—	3,072.36	268.89
All national forests	4,808.13	70.47	2,178.81	257.42	4,661.07	66.71	5,465.14	262.23	2,381.34	357.56	4,700.13	205.90	4,671.83	73.53

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 cubic feet per acre was estimated; the average was calculated using a ratio of means formula across plots.

[a] Includes all live trees ≥5 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes.

Table A1-45—Average aboveground biomass per acre of live trees[a] on forest land, by national forest and land status, Washington, 2002-2011

	Land status													
	Unreserved forests						Reserved forests							
	Timberland		Other forest		Total		Productive		Other forest		Total		All forest land	
National forest	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
							Tons per acre							
National forests:														
Colville	64.741	1.383	27.261	3.999	63.444	1.341	102.127	10.267	57.878	57.878	92.212	12.076	64.328	1.415
Gifford Pinchot	143.125	3.773	53.023	26.141	141.617	3.713	137.210	13.163	54.783	34.980	126.632	12.558	138.746	3.673
Mount Baker-Snoqualmie	152.955	5.316	83.971	20.211	148.155	5.071	165.019	12.507	65.041	18.151	140.013	10.706	145.112	5.124
Okanogan	46.569	1.495	28.469	4.280	44.803	1.415	62.238	5.933	30.707	5.411	52.892	4.497	48.341	2.111
Olympic	151.728	5.758	87.152	19.680	150.173	5.598	110.253	26.537	—	—	110.253	26.537	146.151	5.848
Umatilla	55.299	3.892	2.922	0.353	53.609	3.748	79.269	12.549	—	—	79.269	12.549	64.328	5.709
Wenatchee	62.599	2.011	40.190	5.163	60.750	1.865	88.466	9.975	59.544	11.978	79.489	7.513	66.465	2.646
Other areas:														
Columbia River Gorge National Scenic Area	128.625	8.690	—	—	128.625	8.690	—	—	—	—	—	—	128.625	8.690
All national forests	96.689	1.324	45.974	5.187	93.853	1.253	105.754	4.881	50.108	6.611	91.950	3.815	93.329	1.369

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; — = less than 0.005 bone-dry tons per acre was estimated; the average was calculated using a ratio of means formula across plots.

[a] Includes all live trees ≥1 inches in diameter at breast height, consisting of growing stock, rough cull, and rotten cull tree classes. Aboveground biomass of the tree from ground to tip, includes stem wood, bark, and branches; calculated with regional biomass equations.

Table A1-46—Total roundwood output by product, species group, and source of material, Washington, 2010

	Source of material			
	Growing-stock trees			
Products and species group	Sawtimber	Poletimber	Other sources	All sources
	Thousand cubic feet			
Sawlogs:				
Softwood	415,565	32,097	15,128	462,790
Hardwood	18,288	1,412	280	19,980
Total	433,852	33,510	15,408	482,770
Veneer logs:				
Softwood	31,812	498	459	32,769
Hardwood	1,281	20	18	1,320
Total	33,094	518	477	34,088
Pulpwood:				
Softwood	147,723	16,414	3,886	168,023
Hardwood	16,269	1,808	442	18,519
Total	163,992	18,221	4,328	186,542
Post, poles, and pilings:				
Softwood	2,304	5,809	126	8,239
Hardwood	0	0	0	0
Total	2,304	5,809	126	8,239
Miscellaneous prodcuts:				
Softwood	35	4	3	42
Hardwood	0	0	0	0
Total	35	4	3	42
Total industrial products:				
Softwood	597,440	54,822	19,602	671,864
Hardwood	35,838	3,240	740.050	39,818
Total	633,278	58,062	20,342	711,682
Fuelwood:[a]				
Softwood	0	0	42,493	42,493
Hardwood	0	0	1,987	1,987
Total	0	0	44,480	44,480
Total roundwood products	633,278	58,062	64,822	756,162

[a] Includes residential fuelwood consumption as reported by U.S. Energy Information Administration http://www.eia.gov/state/seds/seds-data-complete.cfm?sid=US#Consumption.

Table A1-47—Volume of timber removals by source of material, species group, and removal type, Washington, 2010

Removal type	Source of material						All sources		
	Growing stock			Other sources[a]					
	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods	Total
	Thousand cubic feet								
Industrial products:									
Sawlogs	447,662	19,700	467,362	15,128	280	15,408	462,790	19,980	482,770
Veneer logs	32,310	1,301	33,611	459	18	477	32,769	1,320	34,088
Pulpwood	164,137	18,077	182,214	3,886	442	4,328	168,023	18,519	186,542
Fuelwood[b]				42,493	1,987	44,480			44,480
Posts, poles, and pilings	8,114	0	8,114	126	0	126	8,239	0	8,239
Miscellaneous products	39	0	39	3	0	3	42	0	42
Total industrial products	652,262	39,078	691,340	62,095	2,727	64,822	671,864	39,818	756,162
Logging residue	24,476	1,466	25,943	152,065	4,419	156,484	176,541	5,885	182,426
Total removals	676,738	40,545	717,283	214,160	7,145	221,305	848,405	45,703	938,588

[a] Other removals come from plot data—change of land use, withdrawls for wilderness, etc.

[b] Includes residential fuelwood consumption reported by U.S. Energy Information Administration http://www.eia.gov/state/seds/seds-data-complete.cfm?sid=US#Consumption.

Table A1-48—Estimated area of forest land covered by the most abundant vascular plant nontimber forest products, by plant group and species, Washington, 2002-2011

Plant group and scientific name	Common name	Total	SE
		Acres	
Tree seedlings and saplings:			
Abies amabilis	Pacific silver fir	265,015	20,254
Abies grandis	Grand fir	129,024	12,182
Abies lasiocarpa	Subalpine fir	118,424	11,568
Alnus rubra	Red alder	145,153	15,614
Pinus ponderosa	Ponderosa pine	101,560	9,410
Pseudotsuga menziesii	Douglas-fir	642,740	37,954
Thuja plicata	Western redcedar	144,682	12,384
Tsuga heterophylla	Western hemlock	494,867	31,114
Shrubs:			
Acer circinatum	Vine maple	847,752	36,437
Amelanchier alnifolia	Saskatoon serviceberry	105,597	6,062
Arctostaphylos uva-ursi	Kinnikinnick	108,706	9,222
Ceanothus velutinus	Snowbrush ceanothus	103,610	11,811
Corylus cornuta	Beaked hazelnut	72,988	8,543
Frangula purshiana	Cascara buckthorn	179,682	13,523
Gaultheria shallon	Salal	938,267	42,998
Holodiscus discolor	Oceanspray	267,536	15,103
Mahonia nervosa	Cascade barberry	425,864	21,835
Paxistima myrsinites	Oregon boxleaf	166,352	11,642
Rhododendron albiflorum	Cascade azalea	125,399	14,425
Rubus parviflorus	Thimbleberry	117,173	8,976
Rubus spectabilis	Salmonberry	614,794	29,982
Rubus ursinus	California blackberry	318,581	20,185
Salix	Willow	81,165	8,188
Sambucus racemosa	Red elderberry	94,479	8,841
Symphoricarpos albus	Common snowberry	509,750	23,885
Vaccinium membranaceum	Thinleaf huckleberry	437,006	24,146
Vaccinium ovalifolium	Oval-leaf blueberry	331,648	23,223
Vaccinium ovatum	California huckleberry	140,998	18,817
Vaccinium parvifolium	Red huckleberry	195,092	9,596
Vaccinium scoparium	Grouse whortleberry	148,985	16,675

Table A1-48—Estimated area of forest land covered by the most abundant vascular plant nontimber forest products, by plant group and species, Washington, 2002-2011 (continued)

Plant group and scientific name	Common name	Total	SE
		Acres	
Herbs:			
Achillea millefolium	Common yarrow	66,270	3,719
Arnica cordifolia	Heartleaf arnica	79,462	6,541
Athyrium filix-femina	Common ladyfern	77,006	6,369
Balsamorhiza sagittata	Arrowleaf balsamroot	61,004	7,592
Blechnum spicant	Deer fern	140,894	9,624
Chamerion angustifolium	Fireweed	26,951	5,535
Claytonia sibirica	Siberian springbeauty	29,652	4,479
Fragaria vesca	Woodland strawberry	31,171	2,968
Fragaria virginiana	Virginia strawberry	37,240	4,077
Polystichum munitum	Western swordfern	1,278,333	42,355
Pteridium aquilinum	Western brackenfern	232,801	16,233
Urtica dioica	Stinging nettle	30,672	5,505
Valeriana sitchensis	Sitka valerian	35,883	5,387
Xerophyllum tenax	Common beargrass	112,775	13,583

Note: Data subject to sampling error; SE = standard error.

Table A1-49—Index of vascular plant species richness on forest land, by ecological section, Washington, 2011

Ecological section	Number of plots	Species richness/plot		Total richness	Species turnover	Native richness/ plot		Nonnative richness/plot		Native species cover (sum)		Nonnative cover (sum)	
		Mean	SE			Mean	SE	Mean	SE	Mean	SE	Mean	SE
Blue Mountains	4	57.3	7.8	153	2.7	47.0	6.0	4.0	1.4	122.2	17.6	0.9	0.4
Columbia Basin	1	67.0	—	67	—	51.0	—	12.0	—	142.2		2.3	
Eastern Cascades	10	53.7	5.9	258	4.8	46.0	5.7	4.3	1.3	109.0	7.6	1.7	0.7
Northern Cascades	39	35.5	2.0	416	11.7	32.3	1.9	0.9	0.4	135.2	9.3	1.8	1.2
Okanogan Highland	32	60.0	3.6	460	7.7	50.3	2.8	6.0	1.2	135.6	5.1	5.3	2.0
Oregon and Washington Coast Ranges	35	33.0	2.1	286	8.7	27.1	1.6	3.5	0.9	186.9	12.7	11.0	5.4
Puget Trough	13	33.7	4.1	190	5.6	27.8	3.1	3.4	0.8	209.8	13.7	6.0	3.9
Western Cascades	29	44.2	2.7	349	7.9	38.1	2.3	3.2	0.8	174.7	13.0	6.1	3.6

Note: Data subject to sampling error; SE = standard error; — = value can not be estimated. Native and nonnative species values only include vegetation records identified to the species level. Species' cover at the plot level were summed with no overlap assumptions (total cover could exceed 100 percent).

Table A1-50—Estimated area of forest land covered by selected nonnative vascular plant species and number of sample plots,[a] by life form and species, Washington, 2002-2011

Plant group and Scientific name	Common name	Area covered		Number of plots
		Total	SE	
		Acres		
Shrubs:				
Cytisus scoparius	Scotch broom	19,887	5,829	47
Hedera helix	English ivy	6,128	2,796	10
Ilex aquifolium	English holly	6,418	1,248	69
Rubus armeniacus	Himalayan blackberry	115,857	14,032	205
Rubus laciniatus	Cutleaf blackberry	19,753	4,404	82
Forbs:				
Centaurea diffusa	Diffuse knapweed	2,147	1,230	11
Cirsium arvense	Canada thistle	12,964	3,847	58
Cirsium	Thistle	11,831	3,490	76
Cirsium vulgare	Bull thistle	5,161	1,838	44
Digitalis purpurea	Purple foxglove	13,413	2,009	119
Hieracium aurantiacum	Orange hawkweed	2,356	1,385	9
Hypericum perforatum	Common St. Johnswort	21,286	2,819	144
Hypochaeris radicata	Hairy cat's ear	16,562	4,682	47
Leucanthemum vulgare	Oxeye daisy	5,211	2,130	22
Linaria dalmatica	Dalmatian toadflax	2,527	734	28
Mycelis muralis	Wall-lettuce	4,860	1,659	43
Potentilla recta	Sulphur cinquefoil	1,813	809	11
Verbascum thapsus	Common mullein	2,006	510	42
Grasses:				
Bromus tectorum	Cheatgrass	114,306	12,699	233
Dactylis glomerata	Orchardgrass	8,694	2,307	64
Holcus lanatus	Common velvetgrass	31,794	6,428	68
Poa bulbosa	Bulbous bluegrass	19,050	4,959	53

Note: Data subject to sampling error; SE = standard error. Estimates are likely low for all species because only plants present at >3 percent cover on a subplot were recorded, and because most grasses and some forbs can be difficult to identify to species outside of their short flowering seasons.

[a]Total number of sample plots with accessible forest land was 3,774.

Table A1-51—Forest land area on which evidence of fire was observed, by year, Washington, 1996-2009

	West of the Cascades		East of the Cascades		All Washington	
Year	Total	SE	Total	SE	Total	SE
			Acres			
1996	1,939	1,970	15,060	5,506	16,999	5,848
1997	—	—	17,365	7,515	17,365	7,515
1998	5,990	5,976	25,157	11,439	31,147	12,900
1999	—	—	33,986	12,133	33,986	12,133
2000	—	—	37,615	12,297	37,615	12,297
2001	6,461	6,347	95,968	23,214	102,429	24,066
2002	—	—	72,386	18,434	72,386	18,434
2003	—	—	198,969	37,923	198,969	37,923
2004	—	—	126,503	22,832	126,503	22,832
2005	—	—	93,376	26,765	93,376	26,765
2006	12,447	12,465	248,772	39,514	261,219	41,433
2007	—	—	124,052	41,498	124,052	41,498
2008	—	—	112,050	42,359	112,050	42,359
2009	—	—	72,361	48,129	72,361	48,129
Average	1,789	1,023	64,228	5,598	66,017	5,690

Note: Data subject to sampling error; SE = standard error; — = less than 500 acres estimated.

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