What Types of Vegetation Are Present?

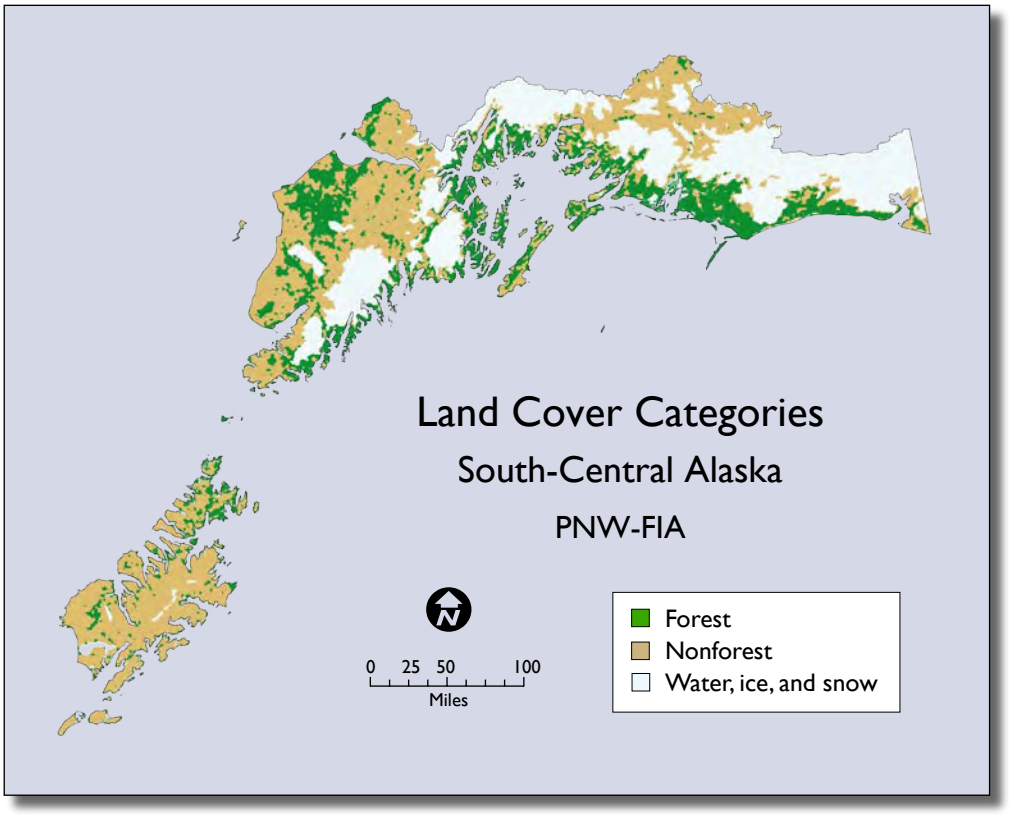


Figure 2—Land cover categories, south-central Alaska. Source: Statewide land cover/vegetation map of Alaska (Fleming 1998).

THE TOTAL LAND AND FRESHWATER area of the south-central Alaska inventory area is 18.5 million acres. Almost two-thirds of it has some kind of vegetation on it (fig. 2). Of this vegetated portion, 33 percent has forest as the major cover, 51 percent has shrubs and dwarf trees, and 16 percent has herbs and grass (fig. 3).

Walter Foss

Blueberry (*Vaccinium* spp.)

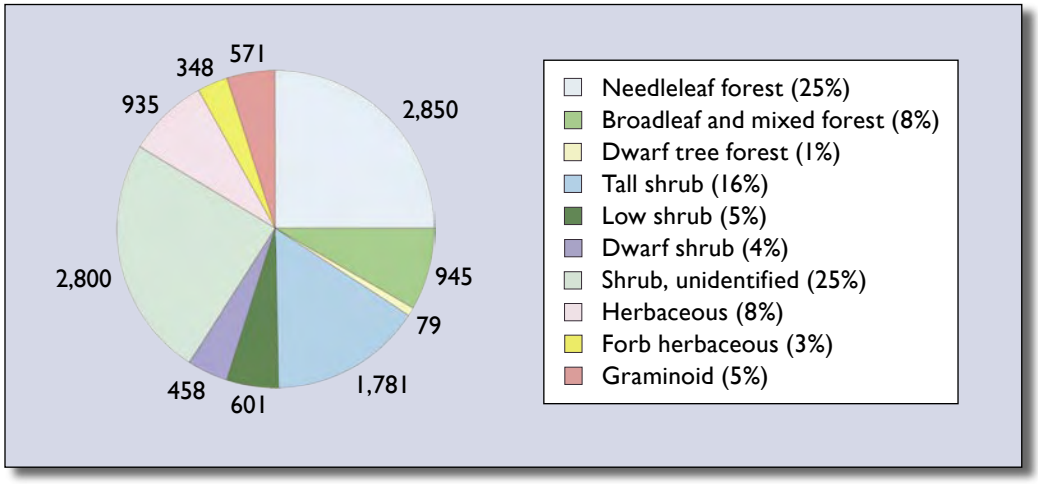
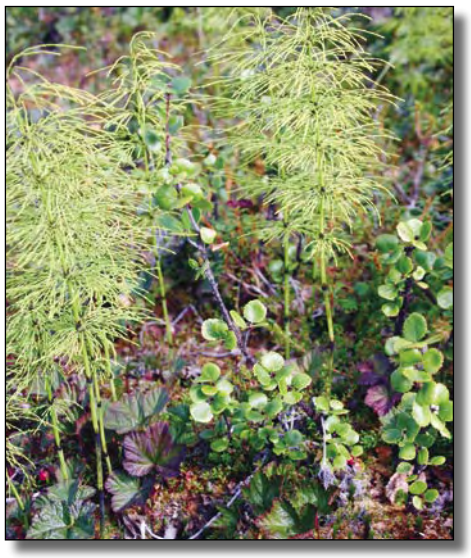


Figure 3—Area (thousand acres) of vegetated land by vegetation type, south-central Alaska, 2003.



Jerry Bednarczik

Woodland horsetail (*Equisetum sylvaticum*), dwarf birch (*Betula nana*),and nagoon berry (*Rubus articus*).

Karen Waddell

Devil's club (*Oplopanax horridum*).

Location and Abundance of Nonforest Vegetation Types

Nonforest areas of south-central Alaska differ from the southeast archipelago; these areas are even more heavily influenced by recent glaciation on both lowland and high alpine sites. The largest North American subpolar ice field, the Bagley Ice Field, dominates the Chugach Mountains and feeds many tidewater glaciers there. The Harding Ice Field on the Kenai Peninsula feeds 35 glaciers. Vegetation near these areas occurs on soils that are typically thin and rocky. Nonforest communities may dominate these glacier-influenced areas for long periods. Alpine tundra and snowbed tundra types are common. On lower elevation sites, pioneer nitrogen-fixing plants such as alder[1] are common and serve to prepare soils for colonization and further succession into forest community types. Marshes and wetland bogs are also common throughout the region.

[1] See "Common and Scientific Names" on page 25.

Andy Tasler

Lily pond.

Karen Waddell

Alder leaves and catkins (*Alnus* spp.).

Karen Waddell

White spruce branch.

Walter Foss

Arrowleaf groundsel (*Senecio triangularis*), Wingham Island.

- **Dwarf-tree shrub types** cover an estimated 79,000 acres, occurring either on alpine sites near treeline as krummholz or as stunted trees on wet or bog soil conditions at lower elevations. Woodland mountain hemlock dwarf-tree type is the most common (25,000 acres).
- **Tall shrub types** are the most common nonforest condition sampled found on 1,781,000 acres, representing 15.7 percent of the vegetated area of south-central Alaska.
- **Low shrub types** predominate on 601,000 acres with willow types on 132,000 acres, and three sweetgale types on 85,000 acres.
- **Dwarf shrub types** are found on 458,000 acres. Alaska moss heather occurred on 157,000 acres and mountain heather on another 82,000 acres. Crowberry ericaceous dwarf shrub tundra occurs on 109,000 acres.
- **Herbaceous and grass types** cover 1,854,500 acres, with bluejoint, bluejoint-herb and bluejoint-shrub types predominating on 232,000 acres. Fresh sedge-marsh was found on 44,000 acres, and the mesic mixed herb type covered 201,000 acres.
- Numerous **other community types** were documented on only a small number of plots, so detailed community descriptions and complete species lists cannot be written from the inventory data.

Of the 556 unique vascular plant species or groups tallied by inventory crews, only 5 species were identified as nonnative species; these included rough bluegrass, field clover, wild chives, common dandelion, and Asian forget-me-not.

Diversity of Vegetation

Among closed forest plots, Sitka spruce forest had the highest diversity (a measure of heterogeneity within a community) across all locations, followed by the mountain hemlock type. In open forests, the highest diversity was also found in open Sitka spruce stands, followed by black spruce and white spruce, respectively. Lowest diversity values were found in mixed-spruce-birch-poplar type and mixed-conifer types, although smaller numbers of plots in these types may have highly influenced the lower diversity values. Woodland forests, the most open category, showed similar trends, with Sitka spruce, black spruce, and white spruce stands having highest diversity and mixed spruce-birch forests having the lowest diversity values.

Among tall shrub types, highest diversity was found in closed tall alder type, and lowest in the open scrub birch-willow type. Among low shrub types, the willow type had the highest diversity, and among dwarf shrub types, crowberry tundra type was highest. On herbaceous plots, mixed-herb types had highest diversity and wet sedge-herb meadow tundra had the lowest diversity.

How Much of South-Central Alaska Is Forest and Who Owns It?

LESS THAN ONE-QUARTER of south-central Alaska—4.0 million acres or 22 percent—is defined as forest land (figs. 2 and 4).

Forest land ownership in south-central Alaska is fairly evenly divided among the Chugach National Forest (27 percent), other federal agencies (28 percent), private owners (26 percent), and state and local governments (20 percent) (table 1, fig. 5).

Table 1—Estimated area by forest land class and owner group, south-central Alaska, 2003

Owner group	Timber-land	Other forest land	Total forest land
	Thousand acres		
National forest	324	755	1,079
Other federal:			
Bureau of Land Management	43	37	80
Kenai National Wildlife Refuge	90	850	940
National parks	—	60	60
Department of Defense	31	7	38
Other	6	—	6
Total other federal	170	954	1,124
State and local	646	156	801
Private	736	305	1,040

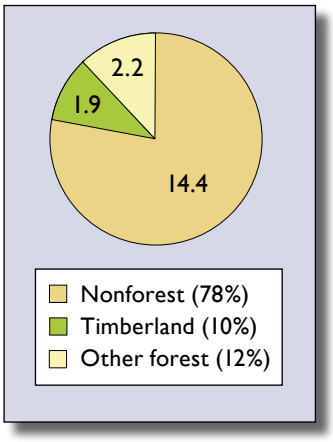


Figure 4—Area (million acres) of forest and nonforest, south-central Alaska, 2003.

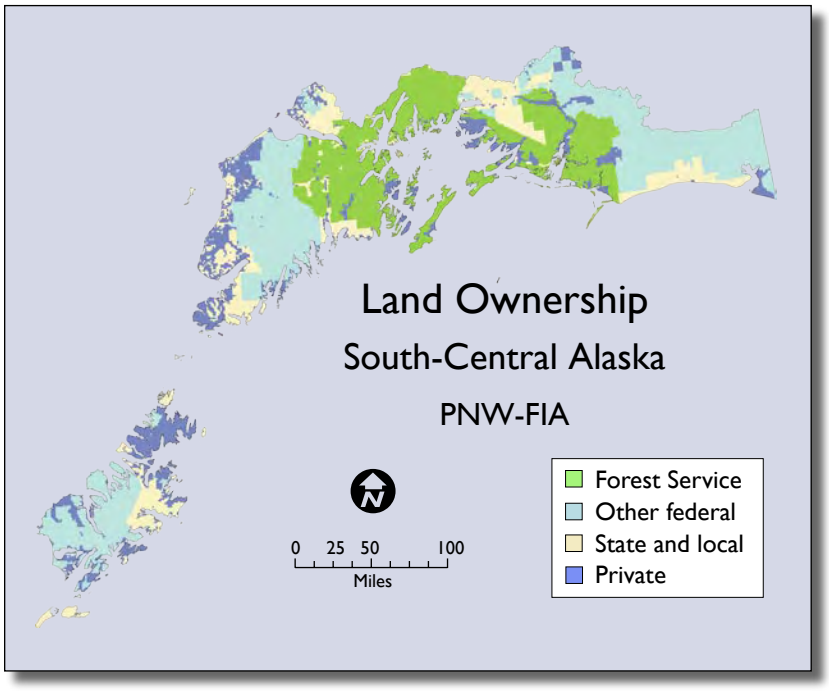


Figure 5—Land ownership, south-central Alaska, 2003. Source: Alaska Department of Natural Resources, 2005.

What Forest Land Is Protected From Harvest?

THIRTY-TWO PERCENT OF the forest land in south-central Alaska (1.3 million acres) is reserved (withdrawn from timber use through statute or administrative regulation) and includes national parks, national forest wilderness study areas, and national wildlife refuges (fig. 6). State, local, and private lands do not currently have any forest land that is designated as reserved. In addition to lands officially designated as reserved, most of the forest land on the Chugach National Forest (75 percent) is not considered suitable for timber harvest under the revised Chugach Land Management Plan (USDA Forest Service 1999) because it is currently managed for other uses such as research natural areas, recreation areas, beach fringe, riparian areas, scenic viewsheds, and wild and scenic recreational rivers. Revisions of the plan in the future could result in changes in timber production locations and acres.

Glenn Christensen

Kenai Fjords National Park.

Joe Donnegan

Exit Glacier, Kenai Fjords National Park.

Joe Donnegan

Portage Bay, south-central Alaska.

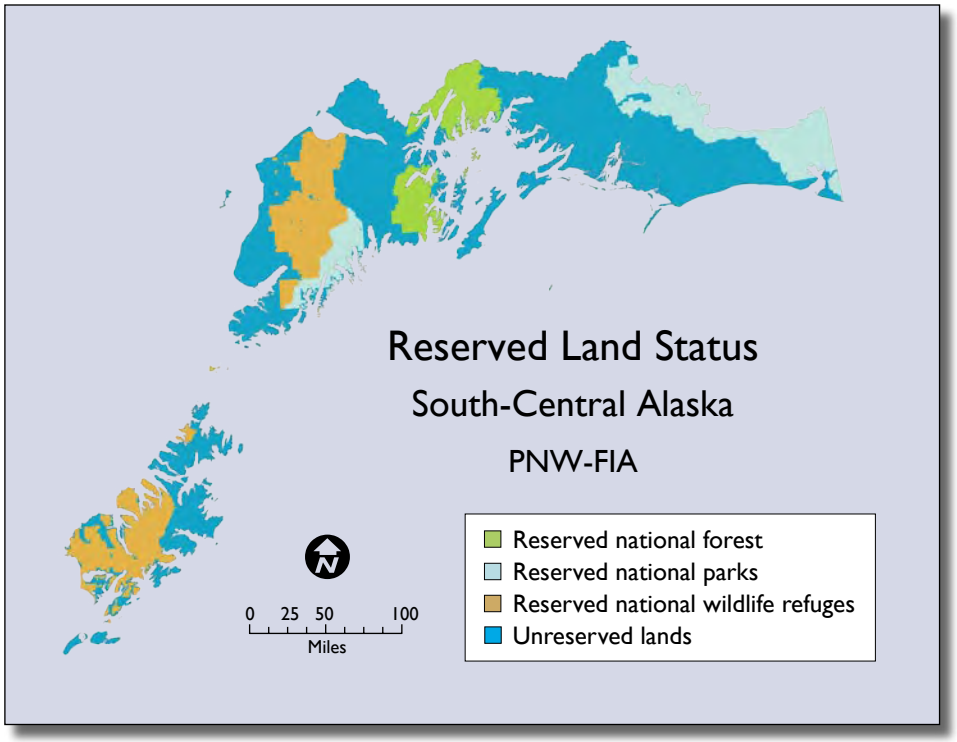


Figure 6—Protected areas in south-central Alaska. Source: Alaska Department of Natural Resources, 2005.

How Much Timber Is Available for Harvest?

Shawn Osborn

Duke Island.

Timberland Area and Owners

A total of 1.9 million acres is classified as timberland, the productive component of forest land not withdrawn from timber harvest by law or statute (fig. 7). Over two-thirds of this is privately owned (736,000 acres) or managed by state and local governments (646,000 acres). The Chugach National Forest and other federal agencies manage the remaining third (324,000 and 170,000 acres, respectively).

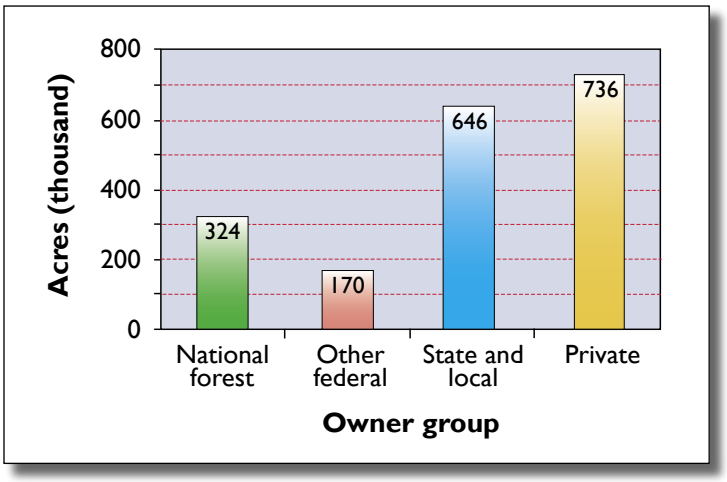


Figure 7—Area of timberland by owner group, south-central Alaska, 2003.

Timberland Volume and Owners

Timber availability also can be measured by the amount of wood volume available for harvest (fig. 8). The total volume of growing stock on timberland in south-central Alaska is 5.1 billion cubic feet. The state of Alaska and local governments manage the largest proportion of this volume—44 percent. Private companies, Native corporations, and individual landowners own and manage another 28 percent. The Chugach National Forest and other federal agencies manage the remaining 27 percent.

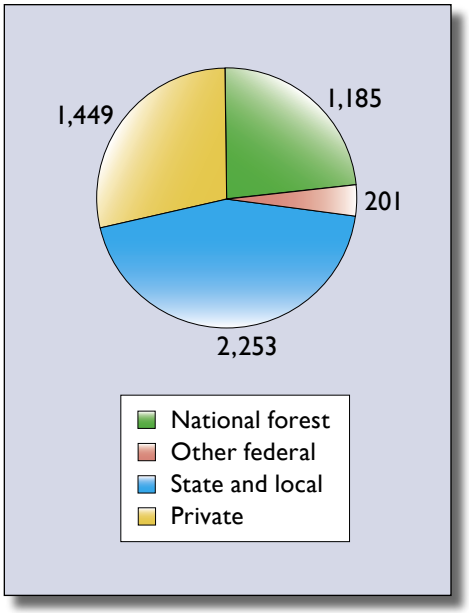


Figure 8—Growing-stock volume (million cubic feet) of timberland by owner group, south-central Alaska, 2003.

Karen Waddell

Black cottonwood, Portage area.

How Much of the Forest Is Sawtimber and Where Is It ?

Area in Sawtimber

About 57 percent of timberland stands in south-central Alaska are sawtimber sized (fig. 9). There is a fairly even distribution of age classes across the sawtimber-sized stands but a slight majority of these stands—61 percent—are 150 years old or younger (fig. 10). Eighty-one percent of timberland on the Chugach National Forest has sawtimber stands, and 59 percent of them are more than 150 years old; in comparison, 53 percent of state and private timberland has sawtimber stands of which 35 percent are more than 150 years old. Sitka spruce is the primary species in most of the sawtimber-sized stands (fig. 11). Other common forest types include white spruce, mixed conifer, paper birch, and poplar.

Stacy Allen

FIA crew member, Misha Yatskov, measuring a tree diameter.

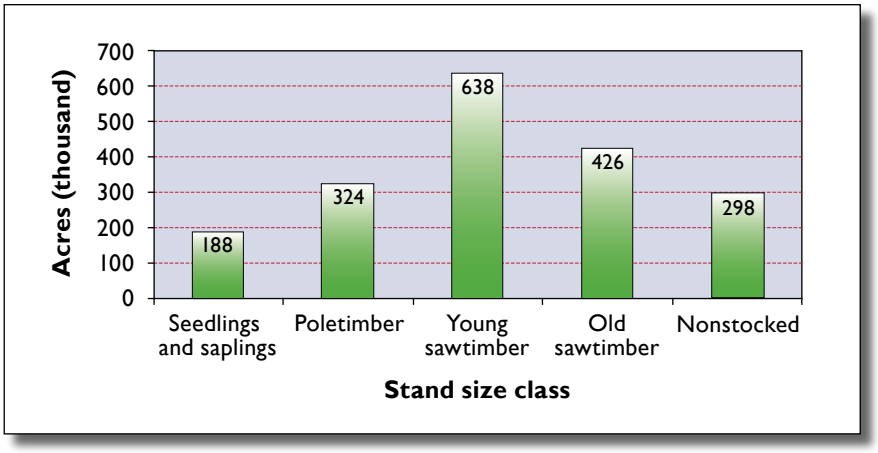


Figure 9—Distribution of timberland area by stand size classes, all owners, south-central Alaska, 2003.

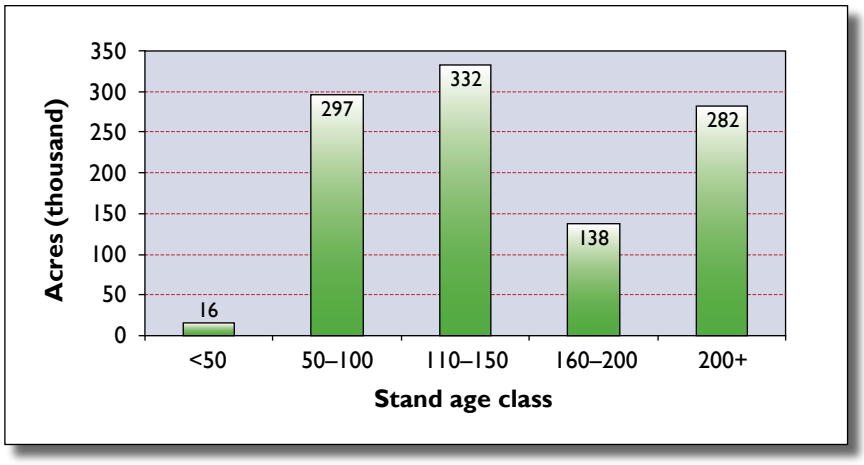


Figure 10—Distribution of sawtimber on timberland by stand age classes, south-central Alaska, 2003.

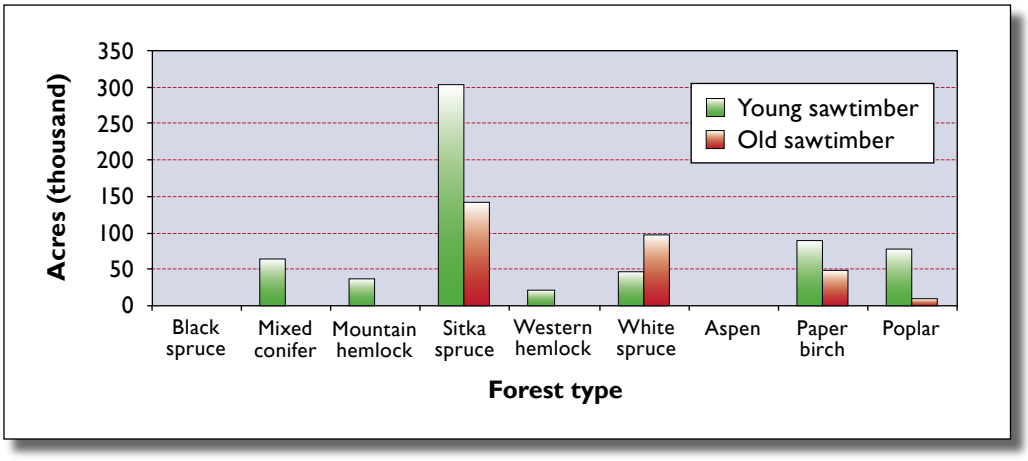


Figure 11—Sawtimber area on timberland by forest type, south-central Alaska, 2003.

Sawtimber Volume

Growing-stock volume on timberland is evenly divided between young and old sawtimber-sized stands (2.4 and 2.3 billion cubic feet, respectively) with only minor volume in poletimber stands (0.3 billion cubic feet). Almost half of the timberland volume is in sawtimber-sized stands of Sitka spruce (fig. 12). Stands of western hemlock, mixed conifer, and mountain hemlock also contribute significant volume. Seventy percent of old sawtimber-sized stands are either Sitka spruce or western hemlock. Hardwoods are a minor contributor to volume on timberland.

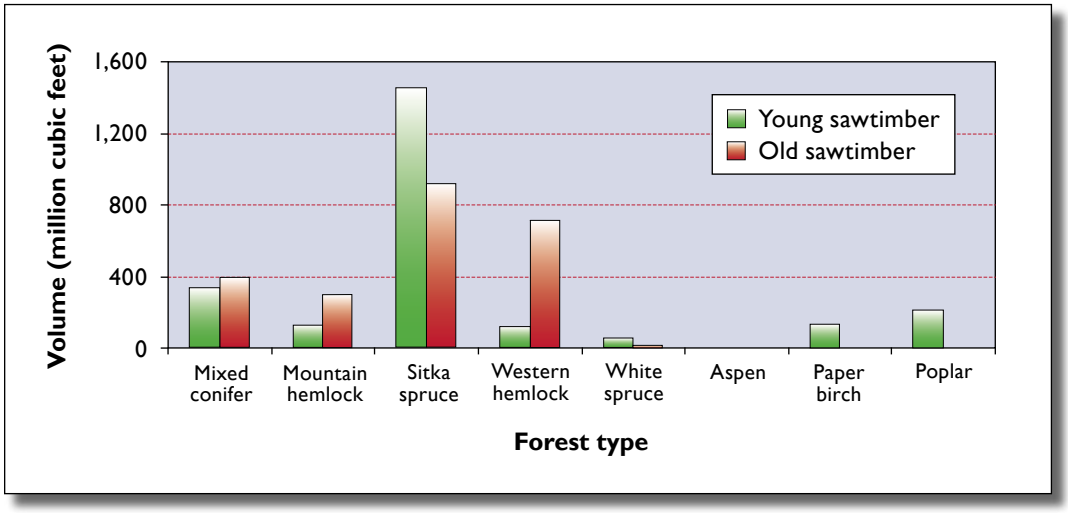


Figure 12—Volume of sawtimber growing stock on timberland by forest type, south-central Alaska, 2003.

Jerry Bednarczyk

FIA crew member, Walter Grabowiecki, counting tree rings.

What Is the Productivity of South-Central Alaska Timberland?

Bert Mead

White spruce, Kenai Peninsula.

PRODUCTIVITY IN THIS SECTION refers to timber productivity rather than other measures of forest productivity. Most timberland in south-central Alaska is only slightly more productive than the minimum needed to qualify as timberland. Only about 10 percent of all south-central Alaska timberland produces 85 cubic feet or more per acre per year. In comparison, 23 percent of the timberland in southeast Alaska and 86 percent of timberland in western Washington produces more than 85 cubic feet per acre per year (MacLean et al. 1992, van Hees 2003). Timber productivity in Alaska tends to be low, a characteristic of more northern latitudes. It is likely that, as in southeast Alaska, stands with the greatest tree volume are generally near tidewater, with stand heights and wood quality diminishing with increasing elevation (Harris and Farr 1974).

Karen Waddell

Black cottonwood.

Timber Productivity by Owner

Highly productive timberland (≥120 cubic feet per acre per year) is a minor component of south-central Alaska's forests; only 51,000 acres of timberland are in this category, and most of this is owned by the state of Alaska and local municipalities. Sixty-three percent of timberland area across all owners is in the lowest productivity class (20 to 49 cubic feet per year) with an additional 27 percent in the next class (50 to 84 cubic feet per year) (fig. 13).

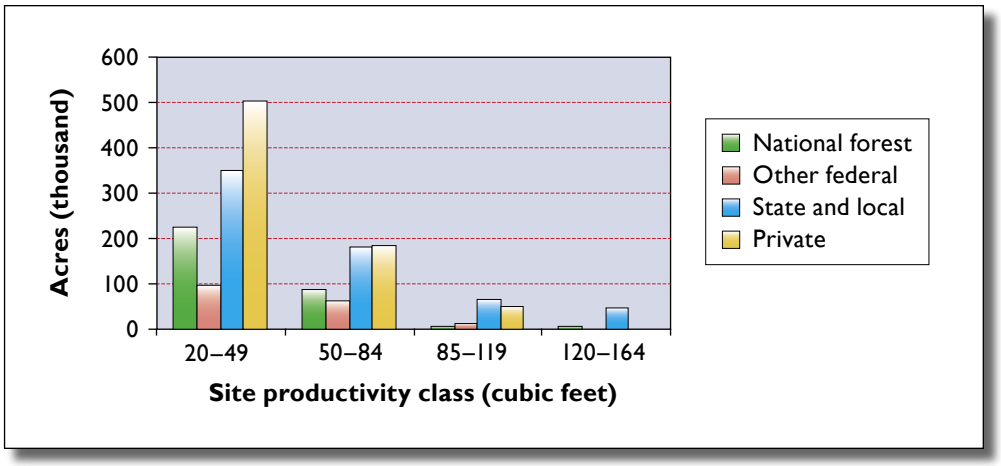


Figure 13—Percentage distribution of timberland acres by selected owner groups and cubic-foot site productivity classes, south-central Alaska, 2003.

What Is the Rate of Forest Growth, Mortality, and Harvest?

AVERAGE NET ANNUAL GROWTH of growing stock on timberland is estimated at -8.8 million cubic feet. Mortality exceeded growth for growing stock on timberland for state, local, and private owners (fig. 14), resulting in overall negative net growth. Only on national forests and other federal lands did growth exceed mortality, resulting in positive net growth on those lands.

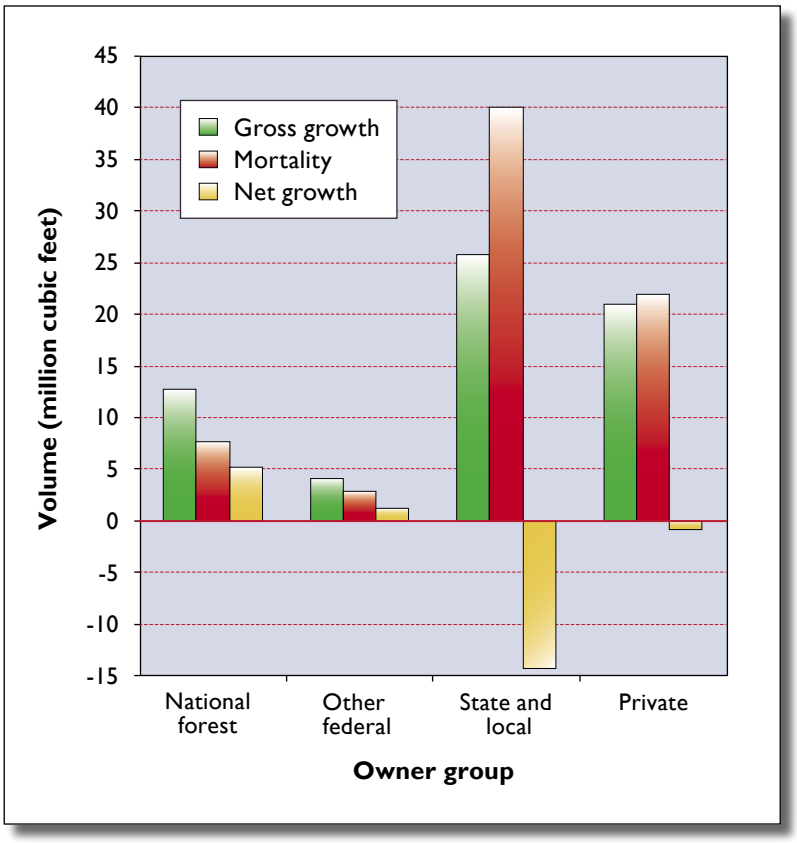


Figure 14—Average gross annual growth, average annual mortality, and average net annual growth (gross growth minus mortality) of growing stock on timberland by owner group, south-central Alaska, 2003.

Karen Waddell

White birch snag with spruce-beetle-killed white spruce.

Positive net growth (gross growth minus mortality) occurred in only about two-thirds of the forest types. Mountain hemlock, white spruce, and paper birch types all experienced negative net growth owing to large amounts of mortality (fig. 15). Mortality was also high in the Sitka spruce type but was exceeded by gross growth resulting in positive net growth. The primary causes of mortality were insects (84 percent), unknown factors (16 percent), physical defect (<1 percent), and rot and decay (<1 percent).

Walter Foss

Clearcut in Seldovia area, Kenai Peninsula.

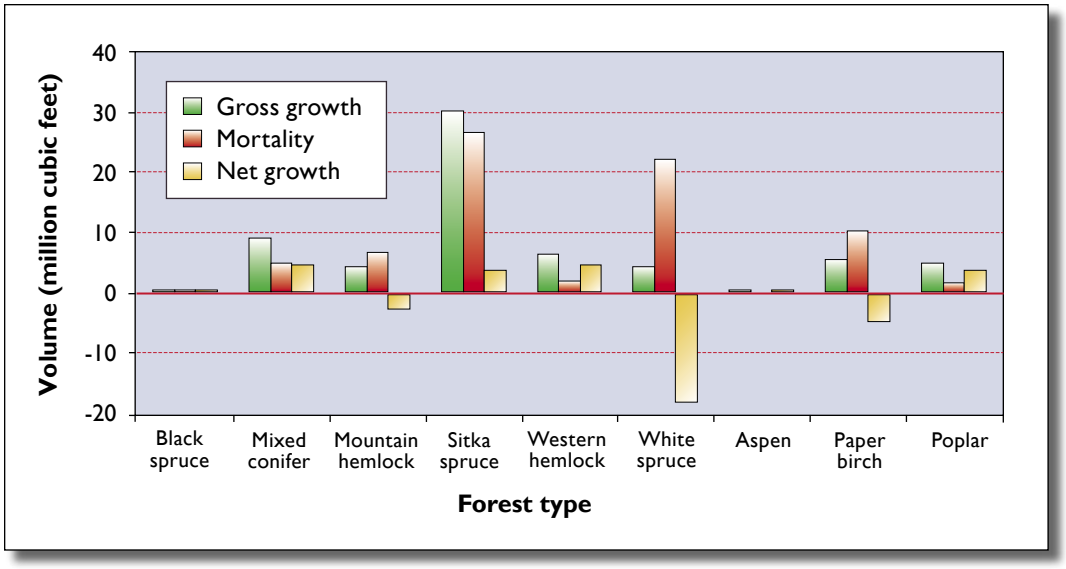


Figure 15—Average gross annual growth, average annual mortality, and average net annual growth of growing stock on timberland by softwood forest type, south-central Alaska, 2003.

Harvest levels in south-central Alaska have decreased in recent years, from over 60 million cubic feet in 1997 to about 18 million in 2001. The majority (97 percent) of harvesting between 1988 and 2001 took place on private lands so that private land harvesting drove overall trends. Although the Chugach National Forest shows net annual growth (gross growth minus mortality) exceeding annual harvest amounts, net annual growth on both state and private lands was negative and thus lower than any level of annual harvest (fig. 16).

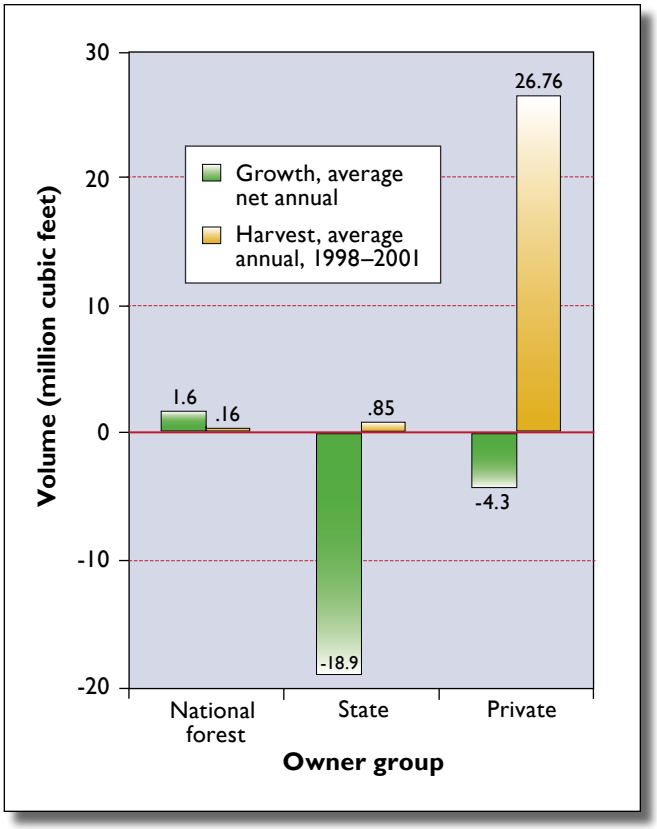


Figure 16—Net growth and harvest for sawtimber trees on timberland by owner group, south-central Alaska. Source: USDA Forest Service, Alaska Region, 2003.

What Is the Impact of the Spruce Bark Beetle on the Kenai Peninsula?

DURING THE PAST 30 YEARS, spruce forests of Alaska's Kenai Peninsula have undergone dramatic changes resulting from widespread spruce bark beetle infestation. In 1987 and again in 2000, the Pacific Northwest Forest Inventory and Analysis Program conducted initial and remeasurement inventories to assess broad-scale impacts of this infestation. Ground data were collected on 130 plots. Detailed results are provided in Schulz (2003), van Hees (2004), and van Hees (2005a).

Tina Boucher

Mortality from spruce beetle, Tustumena Lake, Kenai Peninsula.

Spruce Volume Change, Growth, and Mortality

The total volume of Sitka and white spruce growing stock on timberland on the Kenai Peninsula decreased from 872 million cubic feet in 1987 to 400 million in 2000, a 54 percent decrease (fig. 17). Volume on lands considered nonstocked (land not meeting the minimum occupancy by trees to be considered stocked) showed about a fiftyfold increase. In the same period, mortality exceeded growth for all stand sizes resulting in negative net annual growth overall (fig. 18).

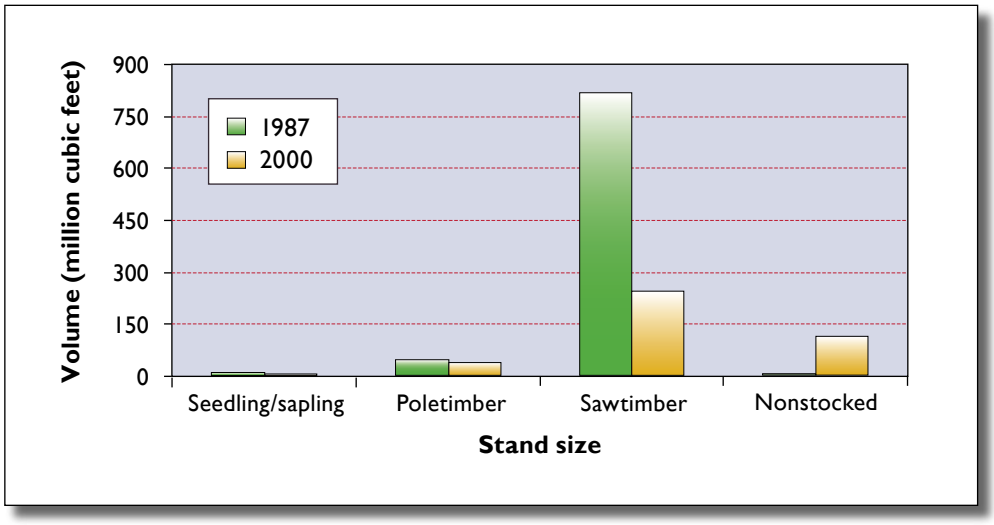


Figure 17—Net volume change for Sitka spruce and white spruce growing stock on timberland, Kenai Peninsula, 1987 to 2000.

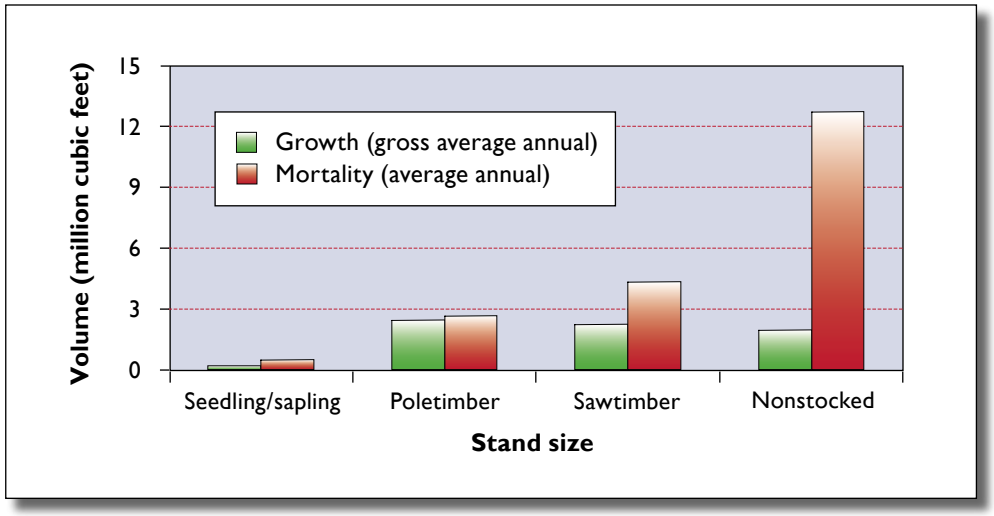


Figure 18—Growth (gross average annual) and mortality (average annual) of Sitka spruce and white spruce growing stock on timberland, Kenai Peninsula, 1987 to 2000.

Spruce Regeneration

Bertr Mead

White spruce regeneration, Kenai Peninsula.

Spruce reproduction on timberland on the Kenai Peninsula in 2000 was not dramatically different from that found in 1987. Seedling stocking remained at 1987 levels, or improved, on 51 percent of the inventoried plots. Seventy-two percent of the area was less than fully stocked (≥5 seedlings per plot) on both occasions. Regeneration differed by forest type and ecological region. In the northwest where mixed types dominate and spruce mortality decreased, spruce reproduction was relatively unchanged. In the southwest where there is more spruce and spruce types dominate, spruce mortality was high and spruce regeneration was more dynamic. Stocking declined to zero on 33 percent of plots, but 26 percent of plots became stocked. Overall, this inventory showed that spruce regeneration is taking place, sometimes at relatively high levels, such as along the southern edge of the lowlands region.

Fuels

Bert Mead

Down wood.

Fuel heights, fine fuels, and sound large fuels increased between 1987 and 2000 on the Kenai Peninsula (Schulz 2003). Moss depths and rotten large fuels decreased. Areas where white spruce was salvage logged (as a result of bark beetle mortality) showed the greatest increase of fine fuel classes—10- and 100-hour fuels (<0.25-inch and 0.25- to 1-inch diameter fuels, respectively). Sound 1,000-hour fuels (>3-inch diameter) increased on both harvested and nonharvested stands, but this increase was only significant in the nonharvested stands.

All forest types showed a decrease in moss depth and rotten 1,000-hour fuels (rotten fuels, >3-inch diameter) indicating greater rates of site dehydration as stands become more open after spruce mortality. The white spruce forest type showed the largest number of significantly changed measures, including all fuel classes, but no significant difference in rotten 1,000-hour fuels.

Common and Scientific Names

Common name	Scientific name
Softwoods:	
Black spruce	*Picea mariana* (Mill.) B.S.P.
Mountain hemlock	*Tsuga mertensiana* (Bong.) Carr.
Sitka spruce	*Picea sitchensis* (Bong.) Carr.
Western hemlock	*Tsuga heterophylla* (Raf.) Sarg.
White spruce	*Picea glauca* (Moench) Voss
Hardwoods:	
Poplar	*Populus* spp.
Paper birch	*Betula papyrifera* Marsh.
Red alder	*Alnus rubra* (Bong.)
Quaking aspen	*Populus tremuloides* Michx.
Willow	*Salix* spp.
Other vegetation:	
Alaska moss heather	*Cassiope mertensiana* (Bong.) D. Don.
Asian forget-me-not	*Myosotis asiatica* (Vesterg.) Schischkin & Sergievskaja
Common dandelion	*Taraxacum officinale* G.H. Weber ex Wiggers
Crowberry	*Empetrum nigrum* L.
Field clover	*Trifolium campestre* Schreb.
Mountain heather	*Phyllodoce* spp. Salisb.
Rough bluegrass	*Poa trivialis* L.
Sweetgale	*Myrica gale* L.
Wild chives	*Allium schoenoprasum* L.

Metric Equivalents

1 inch = 2.54 centimeters

1 foot = 0.3048 meter

1 mile = 1.609 kilometers

1 acre = 0.4047 hectare

1 cubic foot = 0.0283 cubic meter

20 cubic feet per acre = 1.3994 cubic meters per hectare

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Glossary

average gross annual growth—The increase in net volume of wood (the gross volume less deductions for defect) for growing-stock trees during the year.

average net annual growth—Average gross annual growth minus the volume of trees that died during the year (average annual mortality).

cull trees—Live trees of sawtimber or poletimber size that are not merchantable for saw logs and are unlikely to become merchantable because of defect, rot, or species.

d.b.h.—Diameter at breast height.

forest land—Land that is at least 16.7 percent stocked by live trees of any size or that formerly had such tree cover and is at least an acre in size and 120 feet wide.

forest type—A classification of forest land based on the species forming a plurality of stocking on the area currently occupied by tree cover. Identification of the appropriate forest type for this inventory required a decision process described in van Hees 2003.

growing-stock trees—All live trees except cull trees.

growing-stock volume—Net volume in cubic feet of live sawtimber and poletimber growing-stock trees from stump to a minimum 4.0-inch top (of central stem) outside the bark. Net volume equals gross volume less deductions for rot and missing stem sections.

land class—A classification of land by major use, such as timberland, other forest, or nonforest. The minimum size (area) for classification is 1 acre.

mortality—The volume of wood from trees that died from natural causes during a specified period.

nonforest land—Land that does not qualify as forest land. Includes land that has never supported forests and lands formerly forested where forest use is precluded by development for nonforest uses.

other forest land—Forest land not capable of producing 20 cubic feet per acre per year or more of wood and not withdrawn from timber use by statute or administrative regulation.

poletimber stands—Stands at least 16.7-percent stocked with live growing-stock trees, with half or more of this stocking in poletimber (growing stock trees greater than 5.0 inches and less than 11.0 in d.b.h.) and sawtimber trees and with poletimber stocking exceeding that of sawtimber.

reserved forest land—Forest land withdrawn from timber use through statute or administrative regulation.

sawtimber stands—Stands at least 16.7-percent stocked with live growing-stock trees, with half or more of this stocking in sawtimber trees (growing-stock trees at least 11.0 inches in d.b.h. for hardwoods and 9.0 inches for softwoods) and with sawtimber stocking at least equal to that of poletimber.

sawtimber volume—Net volume of sawtimber trees measured in board feet. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber. Board feet are often converted to cubic feet.

seedling and sapling stands—Stands at least 16.7 percent stocked with live growing-stock trees and with live saplings (1.0 to 4.9 in d.b.h.) or seedlings (<1.0 in d.b.h.) composing more than half this stocking.

stand size class—A classification of forest land based on the predominant size of trees present: sawtimber, poletimber, or seedlings and saplings.

stand age class—The 10-year age class that best characterizes the stand.

stocking—The degree of occupancy of land by trees, measured by basal area or number of trees by size and spacing, or both, compared to a stocking standard: that is, the basal area or number of trees, or both, required to fully utilize the growth potential of the land.

timberland—Forest land that is capable of producing 20 cubic feet of wood per acre per year, and is not reserved from timber harvest.

The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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