



# Timber Resource Statistics of South-Central Alaska, 2003

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## **Abstract**

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Estimates of timber resources for south-central Alaska are presented. Data collection began in 2000 and was completed in 2003. All forest lands over all ownerships were considered for sampling. The inventory unit was, roughly, the region between Icy Bay to the east and Kodiak Island to the west. Forest lands within national forest wilderness study areas and recommended wilderness areas were not sampled on the ground. Tables present supply estimates of area, timber volume, growth, mortality, and harvest.

Keywords: Forest surveys, timber resources, statistics (forest), Alaska (south-central).

## **Summary**

The south-central Alaska inventory unit covers approximately 18.5 million acres. Slightly over one-fifth of this area is forested, about 4.0 million acres. Nearly 1.3 million acres (32 percent) of the forested total is reserved from timber management. Timberland, that portion of the total forest land base that is potentially available for timber management and is capable of producing at least 20 ft<sup>3</sup> of wood per acre per year at culmination of mean annual increment, composes 46 percent (1.9 million acres) of the forest and 10 percent of the total land base. Most tabulated estimates presented in this report are for timberland forests.

Most timberland (74 percent) is owned by the state of Alaska and various private owners; the remainder is federally managed. The dominant forest type on timberland is Sitka spruce (37 percent) followed by paper birch (17 percent), white spruce (14 percent) and mixed conifer (10 percent). Net volume on timberland is estimated at 5.1 billion ft<sup>3</sup>. Gross average annual growth was estimated at 63.7 million ft<sup>3</sup> and average annual mortality at 72.4 million ft<sup>3</sup>. Average net annual growth was negative, with a loss of 8.8 million cubic feet per year. Other data showed harvest volumes from 1997 to 2001 ranged from a high of 248 million board feet in 1997 to a low of 58.4 million board feet in 2000.

## **Preface**

Forest Inventory and Analysis (FIA) is a nationwide program of the USDA Forest Service authorized by the Forest and Rangeland Renewable Resources Act of 1978. Work units, located at Forest Service research stations, conduct forest resource inventories throughout the 50 states. The FIA Program of the Pacific Northwest Research Station in Portland, Oregon, is responsible for forest inventories in Alaska, California, Oregon, Washington, Hawaii, and the Pacific Trust Islands.

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## Highlights

### Land cover

	<i>Thousand acres</i>	<i>Thousand ha</i>
South-central inventory area:		
Forest land—		
Timberland	1,875	759
Other forest	2,169	878
Total forest	4,044	1637
Nonforest land	14,435	5842
Total	18,480	7479
Timberland composition:		
Softwoods—		
Black spruce	24	10
Mixed conifer	196	79
Mountain hemlock	105	43
Sitka spruce	695	281
Western hemlock	121	49
White spruce	260	105
Total softwoods	1,402	567
Hardwoods—		
Aspen	13	5
Paper birch	319	129
Poplar	141	57
Total hardwoods	474	192

### Volumes on timberland

	Growing stock		Sawtimber	
	<i>Thousand ft<sup>3</sup><sup>a</sup></i>	<i>Thousand m<sup>3</sup><sup>a</sup></i>	<i>Thousand board feet<sup>b</sup></i>	<i>Thousand m<sup>3</sup><sup>c</sup></i>
Net volume	5,086,954	144 046	20,120,713	130 914
Average gross annual growth	63,673	1803	204,546	1204
Annual mortality	72,441	2051	218,026	1832

<sup>a</sup> Net volume of roundwood for growing-stock trees 5.0 in d.b.h. and larger.

<sup>b</sup> Net volume, Scribner rule, for softwood trees 9.0 in and larger and for hardwood trees 11.0 in d.b.h. and larger.

<sup>c</sup> Net volume of roundwood for softwood trees 9.0 in and larger and for hardwood trees 11.0 in d.b.h. and larger.

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## Introduction

The inventory of south-central Alaska was conducted between 2000 and 2003 by the Forest Inventory and Analysis (FIA) Program of the Pacific Northwest Research Station. This effort was the first inventory of the region using a consistent sample design. The inventory unit is depicted in figure 1.

Ecologically, the inventory unit is diverse; it contains all or part of four ecoregions (fig. 2). These ecoregions are Kodiak Island, the Cook Inlet Basin, the Chugach–St. Elias Mountains, and the Gulf of Alaska coast regions.

The Kodiak Island ecoregion is a geologic extension of the Chugach Mountains with a cool, wet maritime climate. This island group includes high peaks, low rounded ridges, and glacially scoured valleys with till or lacustrine soils entirely free of permafrost. Floral communities are relatively new because the last Pleistocene glaciation scoured the islands. Sitka spruce and black cottonwood (see “Names of Trees” for scientific names of trees mentioned in this publication) forests are present, particularly in northern areas of the region, but forb/grass meadows and willow (*Salix* spp.) and alder (*Alnus* spp.) thickets are otherwise dominant. Some alpine tundra exists at higher elevations.

The Cook Inlet Basin is characterized by a mixed continental and maritime climate, level to rolling topography, and soil generally free from permafrost. Vegetation includes black spruce forests, ericaceous shrubs in open bogs, mixed forests of white and Sitka spruce, aspen and birch on better drained sites, and tall shrub communities of willow and alder on slopes along the periphery of the basin.

Steep, rugged topography and a transitional climate typify the Chugach–St. Elias Mountain region. This region is largely barren of vegetation. Mountain summits and slopes without permanent ice and snow have thin and rocky soils supporting alpine communities of sedges, grasses, and low shrubs. Where glaciers and ice fields have receded, broad U-shaped valleys have deeper soils with isolated pockets of permafrost. Along valley bottoms and lower valley slopes, alder shrublands and mixed forests are present.

The Gulf of Alaska Coast region contains deep narrow bays, steep valley walls, and irregular coastlines with glacial moraine deposits on lower slopes in central and western areas of the region. Eastern areas of the region contain coastal forelands with unconsolidated glacial, alluvial, and marine deposits. The maritime climate has abundant precipitation, and permafrost is absent. Temperate rain forests of Sitka spruce, western hemlock, and mountain hemlock are found sporadically near sea level where soil drainage is sufficient (Nowacki and others 2001).

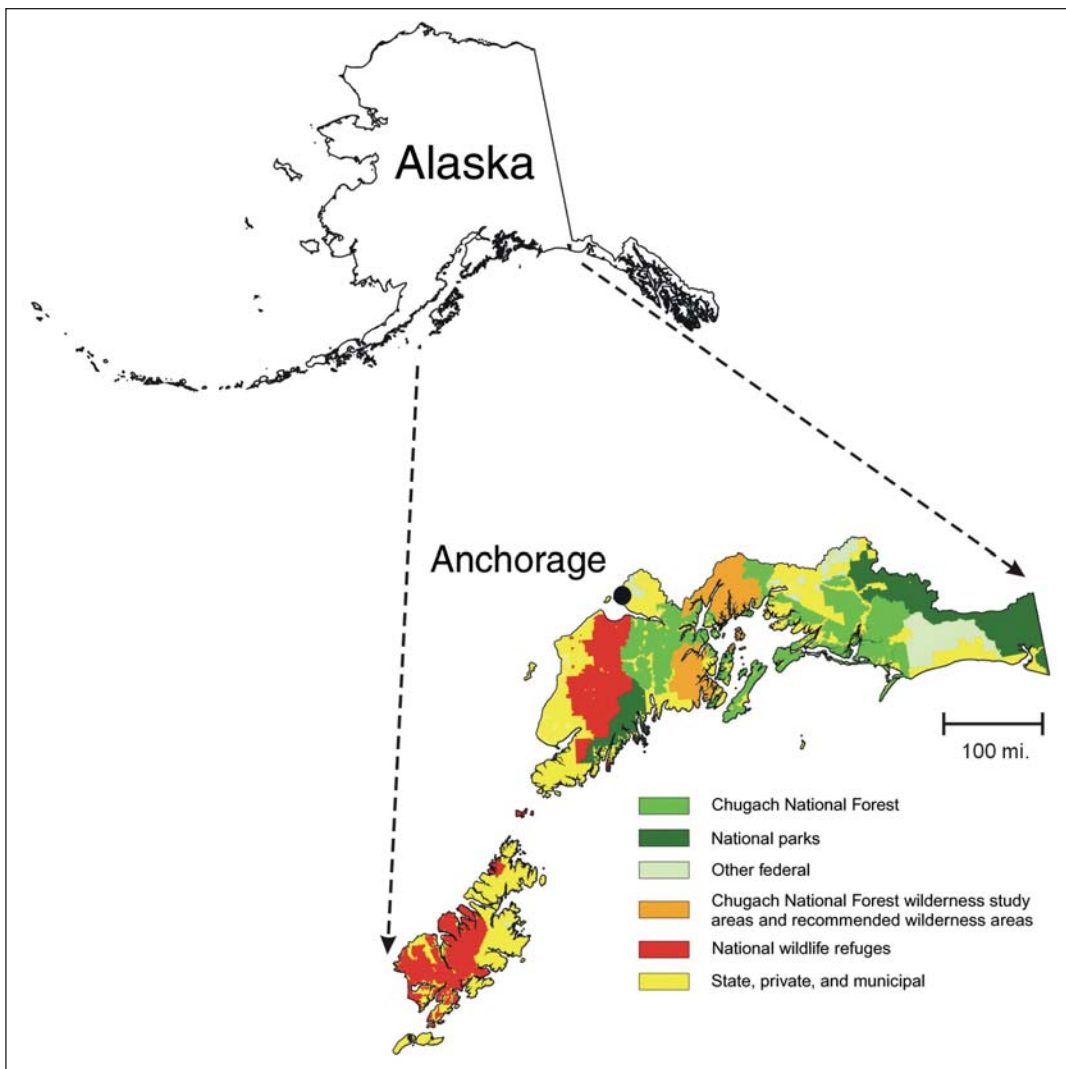


Figure 1—South-central Alaska inventory unit, 2003.

## Inventory Procedures

The inventory of forest resources in south-central coastal Alaska used a single-phase, unstratified systematic-grid sample with grid spacing of 3 mi. Ground plots were established at each grid intersection. Sampling intensity was chosen to meet sampling error guidelines of  $\pm 3$  percent per million acres for productive forest area and  $\pm 10$  percent per billion cubic feet for net volume.

Land cover was visually interpreted for each plot by using high-resolution orthophotoquads and high-resolution satellite imagery. Plots that were barren or covered with ice and snow were not visited on the ground. On national forest lands, all vegetated plots were ground visited; on other lands, only forested plots were

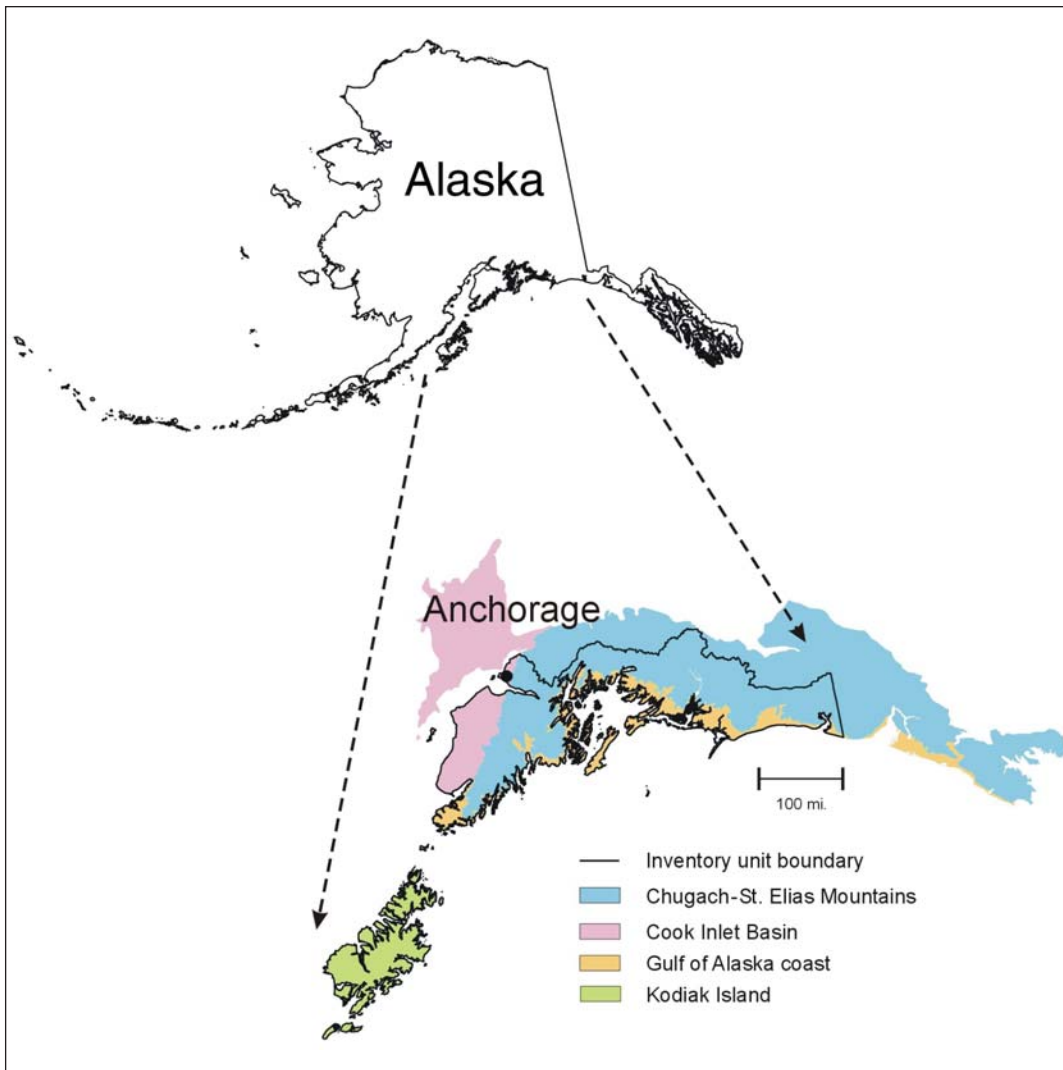


Figure 2— Ecoregions of south-central Alaska (Nowacki and others 2001).

visited. Ground plots consisted of a cluster of four, 24-ft fixed-radius subplots. From the first centrally located subplot, three other subplots were located 120 ft north, southeast, and southwest, respectively. Each subplot was mapped for land cover. Field plot design is detailed in Scott and Bechtold (1995).

Trees, if present, were sampled at each of the four subplots. Seedlings and saplings also were sampled, but with a 6.8-ft fixed-radius microplot at each subplot. Data collection procedures are described in USDA Forest Service (2000-2003).

Estimation of components of tree volume change, such as growth and mortality, is relatively straightforward in remeasurement inventories. However, in an initial inventory such as the one for which results are presented in this report, these observations are unavailable. For this inventory, field crews measured 10-year

radial increment, at breast height, on the first live, growing-stock, tally tree ( $\geq 5$  in diameter at breast height [d.b.h.]) of each species in each 2-in d.b.h. class. These measurements were used to develop models expressing radial growth rate as a function of d.b.h., crown length, and crown radius. Similarly, changes in tree height were estimated from models relating tree diameter to tree height (USDA 1998). Estimation of tree mortality relied on estimation of the time since death for dead trees on the plot. Using guides to estimate time since death, field crews determined if the tree had died more than 5 years or less than or equal to 5 years, prior to date of inventory. Trees that had died within the previous 5 years were used to estimate average annual mortality volumes. Volumes lost to harvest are not included in estimates of mortality presented here.

In all, 2,891 plots were located within south-central Alaska. Of these plots, 439 had some productive forest on them. About one-fourth (782) of the locations had some forested land cover whether productive, nonproductive, or inaccessible forest.

## Reliability of Inventory Data

Estimates presented in this report are based on sampling and are subject to three types of error. The first is sampling error. This type of error can be estimated mathematically. The second type of error arises from measurement mistakes or equipment limitations. The second error cannot be estimated mathematically but is minimized through proper training, supervision, emphasis on careful work, and a program of quality assurance and control. The third type of error arises from modeling error. This type of error arises from calculating attributes that are not directly measured, such as growth, mortality, and harvest. The reliability of the inventory is expressed as relative sampling error at the 68 percent confidence level. Estimates of sampling error and approximate confidence intervals are provided in tables 23 and 24. Figures presented in table 24 were developed by using the following relation:

Target estimated error percent = (percent sampling error of inventory estimate)\*  
 $[(\text{inventory estimate})^{0.5}/(\text{target estimate})^{0.5}]$  (Alerich and others 2004).

## Terminology

**average annual mortality**—The number of or the sound wood volume from live trees dying from natural causes during a specified period. For this inventory, the period was 5 years prior to field measurement.

**average gross annual growth**—The average annual increase in volume of wood for growing-stock trees during a specified period. Components of average gross annual

growth are the increment in net volume of trees alive at the beginning of the specified period plus the net volume of trees reaching sawtimber or poletimber size during the period. Average annual growth was modeled by using 10-year radial increment cores. Average net annual growth is average gross annual growth minus the average net volume of trees that died and minus the average volume lost to tree decay. Volume losses were averaged over the 5 years prior to date of field measurement.

**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.

**diameter class**—A classification of trees based on diameter at breast height (d.b.h.), 4.5 ft above the ground, outside bark. Each 2-in diameter class is assigned to the appropriate even inch at midpoint. For example, the 6-in class includes trees 5.0 through 6.9 in d.b.h.

**forest land**—Land at least 16.7-percent stocked by live trees of any size, or land formerly having such tree cover and not currently developed for nonforest use. The minimum area for classification as forest land or subclasses of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must be at least 120 ft wide to be classified as forest land. Unimproved roads and trails, streams, and clearings in forest areas must be less than 120 ft wide to be classified as forest land. (Also see timberland, other forest land, reserved forest land, and nonforest land.)

**forest types**—A classification of forest land based on the tree species stocking on the area currently occupied by tree cover.

**softwoods:**

**black spruce**—Forests in which black spruce stocking is greater than 65 percent of the softwood tree stocking.

**mixed conifer**—Forests in which the sum of all softwood stocking is greater than 50 percent of the tree stocking but no individual softwood species meets any of the minimum stocking levels to define a single-species forest type.

**mountain hemlock**—Forests in which mountain hemlock stocking is greater than 65 percent of the softwood tree stocking.

**Sitka spruce**—Forests in which Sitka spruce stocking is greater than 75 percent of the softwood tree stocking.

**western hemlock**—Forests in which western hemlock stocking is greater than 60 percent of the softwood tree stocking.

**white spruce**—Forests in which white spruce stocking is greater than 50 percent of the softwood tree stocking.

**hardwoods:**

**aspen**—Forests in which aspen stocking is greater than 30 percent of the hardwood tree stocking.

**paper birch**—Forests in which paper birch stocking is greater than 30 percent of the hardwood tree stocking.

**poplar**—Forests in which poplar stocking is greater than 30 percent of the hardwood tree stocking.

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

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

**land class**—A classification of land by forest cover, such as timberland, other forest, or nonforest. The minimum area for classification is 1 acre.

**mean annual increment (m.a.i.)**—A measure of the productivity of forest land in terms of the average increase in volume in cubic feet per acre per year.

**net volume**—The gross volume of a tree less deductions for rot, sweep, or other defect affecting product use.

**nonforest land**—Land that does not qualify as forest land. Nonforest land includes land that has never supported forest and land formerly forested where forest use is precluded by development for nonforest uses. Included is land used for agricultural crops, improved pasture, residential areas, city parks, improved roads, operating railroads and their right-of-way clearings, and pipeline clearings. If intermingled in forest areas, unimproved roads, streams, canals, and nonforest strips must be more than 120 ft wide, and clearings or other areas must be 1 acre or larger to qualify as nonforest land.

**other forest land**—Forest land not capable of producing 20 ft<sup>3</sup> per acre per year or more of wood at culmination of m.a.i. or withdrawn from timber use owing to administrative statute.

**poletimber stands**—Stands at least 16.7-percent stocked with growing-stock trees, with one-half or more of this stocking in poletimber and sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

**poletimber trees**—Growing-stock trees greater than 5.0 in d.b.h. and less than sawtimber size.

**productive forest land**—Forest land producing or capable of producing 20 ft<sup>3</sup> per acre per year or more of wood at culmination of m.a.i.

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

**sawtimber stands**—Stands at least 16.7-percent stocked with growing-stock trees, with half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to that of poletimber.

**sawtimber trees**—Growing-stock trees at least 11.0 in d.b.h. for hardwoods and 9.0 in for softwoods.

**seedling and sapling stands**—Stands at least 16.7-percent stocked with growing-stock trees and with saplings or seedlings composing more than half this stocking.

**seedling and sapling trees**—Growing-stock trees less than 1.0 in d.b.h. for seedlings and 1.0 to 4.9 in d.b.h. for saplings.

**site class**—A classification of forest land based on its capacity to grow wood.

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

**stocking**—A measure of the area occupied by trees of specified classes. The FIA forest inventories consider three categories of stocking: all live trees, growing-stock trees, and desirable trees. Stocking of all live trees is used to delineate forest land and forest types. Stocking of growing-stock trees is used in classifications of stand size and stand age.

**timberland**—Productive forest land not withdrawn from timber use by administrative statute.

## Names of Trees<sup>4</sup>

Common name	Scientific name
Softwoods:	
Black spruce	<i>Picea mariana</i> (Mill.) B.S.P.
Mountain hemlock	<i>Tsuga mertensiana</i> (Bong.) Carr.
Sitka spruce	<i>Picea sitchensis</i> (Bong.) Carr.
Western hemlock	<i>Tsuga heterophylla</i> (Raf.) Sarg.
White spruce	<i>Picea glauca</i> (Moench) Voss
Hardwoods:	
Black cottonwood (poplar)	<i>Populus trichocarpa</i> Torr. & Gray
Paper birch	<i>Betula papyrifera</i> Marsh.
Quaking aspen	<i>Populus tremuloides</i> Michx.

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<sup>4</sup> Scientific names are according to Viereck and Little (1972).



## Metric Equivalents

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1 inch (in) = 2.54 centimeters

1 foot (ft) = 0.3048 meter

1 mile (mi) = 1.609 kilometers

1 acre = 0.4047 hectare

1 cubic foot (ft<sup>3</sup>) = 0.0283 cubic meter

1 cubic foot per acre (ft<sup>3</sup> per acre) = 0.06997 cubic meter per hectare

Degrees Fahrenheit (°F) = 1.8 Celsius + 32

## Literature Cited

**Alerich, C.L.; Klevgard, L.; Liff, C.; Miles, P. 2004.** The forest inventory and analysis database: database description and users guide version 1.7. [http://fhm-server.lv-hrc.nevada.edu/fia/imb/d-team/FIADB\\_v17\\_122104.pdf](http://fhm-server.lv-hrc.nevada.edu/fia/imb/d-team/FIADB_v17_122104.pdf). (12 January 2005).

**Nowacki, G.J.; Spencer, P.; Brock, T.; Fleming, M.; Jorgenson, T. 2001.** Unified ecoregions of Alaska and neighboring territories. [1:4,000,000] Miscellaneous Investigations series I map. Open-file Report 02-297. Reston, VA: U.S. Department of the Interior, Geological Survey.

**Scott, C.T.; Bechtold, W.A. 1995.** Techniques and computations for mapping plot clusters that straddle stand boundaries. *Forest Science Monograph*. 31: 46-61.

**U.S. Department of Agriculture, Forest Service. 1998.** Unpublished algorithms for estimation of tree height and radial growth rates. On file with: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 3301 C St., Suite 200, Anchorage, AK 99503.

**U.S. Department of Agriculture, Forest Service. 2000-2003.** Field procedures for the south-central Alaska inventory. Anchorage, AK: Pacific Northwest Research Station; Region 10 [Alaska Region]. Annual.

**Viereck, L.A.; Little, E.E., Jr. 1972.** Alaska trees and shrubs. *Agric. Handb.* 410. Washington, DC: U.S. Department of Agriculture. 265 p.

**Table 1—Estimated area by land class, owner group, and reserved component, south-central Alaska, 2003<sup>a</sup>**

Owner group	Timberland	Other forest land	Total forest land	Nonforest land	All land
<i>Thousand acres</i>					
National forest:	324	755	1,079	4,354	5,433
Reserved	—	(435)	(435)	(1,544)	(1,978)
Other federal:	170	954	1,124	6,283	7,407
Reserved	—	(864)	(864)	(4,934)	(5,798)
State and local	646	156	801	2,217	3,018
Private	736	305	1,040	1,582	2,622
All owners	1,875	2,169	4,044	14,435	18,480

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 2—Estimated area of forest land by owner group, reserved status, and forest type, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All land
<i>Thousand acres</i>					
Softwoods:					
Black spruce—					
Reserved	—	312	—	—	312
Unreserved	5	52	28	58	142
Total	5	364	28	58	455
Hemlock-spruce—					
Reserved	126	6	—	—	132
Unreserved	—	—	3	17	20
Total	126	6	3	17	152
Mixed conifer—					
Reserved	—	31	—	—	31
Unreserved	146	1	69	70	287
Total	146	33	69	70	318
Mountain hemlock—					
Reserved	303	49	—	—	352
Unreserved	273	1	70	68	412
Total	576	50	70	68	764
Sitka spruce—					
Reserved	6	15	—	—	21
Unreserved	69	23	349	338	779
Total	74	39	349	338	800

Table 2—Estimated area of forest land by owner group, reserved status, and forest type, south-central Alaska, 2003<sup>a</sup> (continued)

Forest type	National forest	Other federal	State and local	Private	All land
<i>Thousand acres</i>					
White spruce—					
Reserved	—	190	—	—	190
Unreserved	28	42	107	126	303
Total	28	233	107	126	494
Western hemlock—					
Reserved	—	—	—	—	—
Unreserved	88	6	36	21	150
Total	88	6	36	21	150
Total softwoods:					
Reserved	435	604	—	—	1,039
Unreserved	608	126	661	698	2,094
Total	1,043	730	661	698	3,132
Hardwoods:					
Aspen—					
Reserved	—	24	—	—	24
Unreserved	—	8	6	—	13
Total	—	32	6	—	38
Paper birch—					
Reserved	—	172	—	—	172
Unreserved	25	118	64	272	479
Total	25	290	64	272	651
Poplar—					
Reserved	—	64	—	—	64
Unreserved	11	9	69	70	158
Total	11	72	69	70	222
Total hardwoods:					
Reserved	—	260	—	—	260
Unreserved	36	134	139	342	651
Total	36	394	139	342	911
Mixed:					
Spruce-birch—					
Reserved	—	—	—	—	—
Unreserved	—	—	1	—	1
Total	—	—	1	—	1
All types:					
Reserved	435	864	—	—	1,299
Unreserved	644	260	801	1,040	2,746
Total	1,079	1,124	801	1,040	4,044

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 3—Estimated area of timberland by owner group and forest type, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Thousand acres</i>					
Softwoods:					
Black spruce	—	10	9	5	24
Mixed conifer	97	1	65	33	196
Mountain hemlock	49	—	35	21	105
Sitka spruce	56	18	307	314	695
Western hemlock	70	6	24	21	121
White spruce	28	37	88	107	260
Total softwoods	300	72	529	502	1,402
Hardwoods:					
Aspen	—	8	6	—	13
Paper birch	13	82	49	175	319
Poplar	11	9	63	58	141
Total hardwoods	24	98	117	234	474
All types	324	170	646	736	1,875

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 4—Estimated area of timberland by owner group and stand size class, south-central Alaska, 2003<sup>a</sup>**

Stand size class	National forest	Other federal	State and local	Private	All owners
<i>Thousand acres</i>					
Seedling and sapling	6	47	42	93	188
Poletimber	45	52	96	132	324
Young sawtimber	107	56	250	227	638
Old sawtimber	157	15	135	119	426
Nonstocked	10	—	123	165	298
All classes	324	170	646	736	1,875

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 5—Estimated area of timberland by owner group and cubic-foot site class, south-central Alaska, 2003<sup>a</sup>**

Site class	National forest	Other federal	State and local	Private	All owners
<i>Cubic feet</i>	----- <i>Thousand acres</i> -----				
20-49	225	96	351	502	1,174
50-84	86	63	182	184	515
85-119	7	11	67	50	135
120-164	6	—	46	—	51
All classes	324	170	646	736	1,875

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 6—Estimated area of timberland by forest type and stand-size class, south-central Alaska, 2003<sup>a</sup>**

Forest type	Seedling and sapling	Poletimber	Young sawtimber	Old sawtimber	Nonstocked	All stand size classes
	<i>Thousand acres</i>					
Softwoods:						
Black spruce	13	11	—	—	—	24
Mixed conifer	2	33	65	97	—	196
Mountain hemlock	—	4	36	65	—	105
Sitka spruce	46	48	304	156	141	695
Western hemlock	—	—	21	100	—	121
White spruce	31	78	47	6	98	260
All softwoods	92	175	472	424	240	1,402
Hardwoods:						
Aspen	1	10	—	2	—	13
Paper birch	71	111	89	—	49	319
Poplar	24	29	78	—	10	141
All hardwoods	97	150	166	2	59	474
All types	188	324	638	426	298	1,875

— = no data were collected or less than 500 acres.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 7—Estimated number of growing-stock trees on timberland by species and diameter class, south-central Alaska, 2003<sup>a</sup>**

Species	Diameter class (inches at breast height)												All classes		
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+					
<i>Thousand trees</i>															
Softwoods:															
Black spruce	2,410	413	34	—	—	—	—	—	—	—	—	—	34	—	2,893
Mountain hemlock	8,230	6,990	4,545	3,581	2,651	2,410	1,653	861	—	—	—	—	1,205	344	32,472
Sitka spruce	28,861	23,611	14,920	12,505	8,682	8,037	5,032	3,871	—	—	—	—	8,813	2,932	117,264
Western hemlock	9,814	7,197	4,408	3,271	2,032	1,515	895	585	—	—	—	—	2,238	1,067	33,023
White spruce	14,187	7,059	3,409	2,135	1,033	413	172	34	—	—	—	—	—	—	28,443
Total	63,503	45,271	27,316	21,492	14,398	12,376	7,753	5,351	—	—	—	—	12,292	4,343	214,095
Hardwoods:															
Black cottonwood	3,409	3,753	2,342	1,756	1,067	861	792	310	—	—	—	—	723	103	15,117
Paper birch	4,614	3,306	3,065	1,997	792	551	310	69	—	—	—	—	34	—	14,738
Quaking aspen	1,136	413	551	310	103	34	69	—	—	—	—	—	34	—	2,651
Total	9,160	7,472	5,957	4,063	1,963	1,446	1,171	379	—	—	—	—	792	103	32,507
All species	72,662	52,743	33,273	25,555	16,361	13,822	8,923	5,730	—	—	—	—	13,084	4,447	246,602

— = no data were collected or less than 500 trees.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

**Table 8—Estimated net volume of growing stock and sawtimber on timberland by class of timber, owner group, and species group, south-central Alaska, 2003<sup>a</sup>**

Class of timber and owner group	Average volume	Species group		All species
		Softwoods	Hardwoods	
	<i>Cubic feet per acre</i>	<i>-----Million cubic feet-----</i>		
Growing stock: <sup>b</sup>				
National forest	3,657	1,142	43	1,185
Other federal	1,184	115	86	201
State and local	3,488	2,116	137	2,253
Private	1,969	1,309	140	1,449
Total growing stock	2,713	4,682	405	5,087
	<i>Board feet per acre</i>	<i>-----Million board feet-----</i>		
Sawtimber (Scribner rule): <sup>c</sup>				
National forest	14,362	4,517	137	4,653
Other federal	3,436	391	192	583
State and local	14,341	8,846	416	9,262
Private	7,643	5,323	299	5,623
Total sawtimber	10,730	19,077	1,044	20,121

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

<sup>b</sup> Includes growing-stock trees 5.0 in d.b.h. and larger.

<sup>c</sup> Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 9—Estimated net volume of growing stock on timberland by species and diameter class, south-central Alaska, 2003<sup>a</sup>**

Species	Diameter class (inches at breast height)												All classes		
	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+					
<i>Million cubic feet</i>															
Softwoods:															
Black spruce	5	2	—	—	—	—	—	—	—	—	—	—	6	—	13
Mountain hemlock	19	35	43	57	64	78	74	45	45	99	863	717	51	564	3,121
Sitka spruce	75	141	158	210	213	279	230	235	37	231	224	809	—	175	—
Western hemlock	25	41	52	59	49	51	40	7	2	—	—	—	—	—	—
White spruce	32	34	31	33	24	11	—	—	—	—	—	—	—	—	—
Total	156	253	284	359	350	419	351	319	1,199	992	4,682	246	137	22	—
Hardwoods:															
Black cottonwood	4	15	19	25	22	28	35	15	62	19	—	—	—	—	—
Paper birch	11	20	28	31	17	15	10	3	2	—	—	—	—	—	—
Quaking aspen	2	2	6	5	2	1	2	—	2	—	—	—	—	—	—
Total	18	37	54	61	42	43	47	18	67	19	405	1,012	5,087	—	—
All species	174	290	337	420	392	462	398	337	1,266	1,012	5,087	—	—	—	—

— = no data were collected or less than 500,000 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing-stock trees 5.0 in d.b.h. and larger.



**Table 10—Estimated net volume of sawtimber on timberland by species and diameter class, south-central Alaska, 2003<sup>a</sup>**

Species	Diameter class (inches at breast height)							All classes	
	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9		29.0+
<i>Million board feet, Scribner rule</i>									
Softwoods:									
Black spruce	—	—	—	—	—	—	35	—	35
Mountain hemlock	117	181	238	297	302	191	453	204	1,982
Sitka spruce	452	717	810	1,159	1,013	1,094	4,282	3,838	13,365
Western hemlock	159	207	186	206	175	170	1,144	1,148	3,395
White spruce	68	89	75	35	26	8	—	—	299
Total	797	1,193	1,309	1,697	1,516	1,462	5,914	5,190	19,077
Hardwoods:									
Black cottonwood	—	78	80	105	136	59	250	71	780
Paper birch	—	77	49	41	32	11	10	—	221
Quaking aspen	—	14	7	2	9	—	12	—	43
Total	—	169	136	149	176	70	272	71	1,044
All species	797	1,362	1,445	1,846	1,692	1,532	6,185	5,261	20,121

— = no data were collected or less than 500,000 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 11—Estimated net volume of growing stock on timberland by species and owner group, south-central Alaska, 2003<sup>a</sup>**

Species	National forest	Other federal	State and local	Private	All owners
<i>Million cubic feet</i>					
Softwoods:					
Black spruce	—	1	7	5	13
Mountain hemlock	282	2	195	84	564
Sitka spruce	427	32	1,665	998	3,121
Western hemlock	408	35	221	145	809
White spruce	25	45	27	77	175
Total	1,142	115	2,116	1,309	4,682
Hardwoods:					
Black cottonwood	36	34	122	54	246
Paper birch	7	42	12	77	137
Quaking aspen	—	10	3	9	22
Total	43	86	137	140	405
All species	1,185	201	2,253	1,449	5,087

— = no data were collected or less than 500,000 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing-stock trees 5.0 in d.b.h. and larger.

**Table 12—Estimated net volume of sawtimber on timberland by species and owner group, south-central Alaska, 2003<sup>a</sup>**

Species	National forest	Other federal	State and local	Private	All owners
<i>Million board feet, Scribner rule</i>					
Softwoods:					
Black spruce	—	—	35	—	35
Mountain hemlock	981	8	674	319	1,982
Sitka spruce	1,837	147	7,113	4,269	13,365
Western hemlock	1,656	169	980	591	3,395
White spruce	43	67	45	144	299
Total	4,517	391	8,846	5,323	19,077
Hardwoods:					
Black cottonwood	133	100	396	151	780
Paper birch	3	65	18	134	221
Quaking aspen	—	27	1	15	43
Total	137	192	416	299	1,044
All species	4,653	583	9,262	5,623	20,121

— = no data were collected or less than 500,000 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 13—Estimated net volume of growing stock on timberland by forest type and stand-size class, south-central Alaska, 2003<sup>a</sup>**

Forest type	Seedling - sapling	Poletimber	Young sawtimber	Old sawtimber	Nonstocked	All classes
<i>Million cubic feet</i>						
Softwoods:						
Black spruce	1	6	—	—	—	7
Mixed conifer	1	48	334	397	—	780
Mountain hemlock	—	7	120	303	—	431
Sitka spruce	9	85	1,449	918	10	2,471
Western hemlock	—	—	111	716	—	827
White spruce	9	48	49	6	2	114
Total	19	194	2,063	2,340	12	4,629
Hardwoods:						
Aspen	—	6	—	1	—	7
Paper birch	6	80	123	—	2	212
Poplar	1	26	209	—	4	239
Total	7	111	332	1	6	458
All types	26	306	2,396	2,342	18	5,087

— = no data were collected or less than 500,000 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing-stock trees 5.0 in d.b.h. and larger.

**Table 14—Estimated net volume of sawtimber on timberland by forest type and stand-size class, south-central Alaska, 2003<sup>a</sup>**

Forest type	Seedling - sapling	Poletimber	Young sawtimber	Old sawtimber	Nonstocked	All classes
<i>Million board feet, Scribner rule</i>						
Softwoods:						
Black spruce	—	5	—	—	—	5
Mixed conifer	1	81	1,434	1,539	—	3,054
Mountain hemlock	—	6	367	1,182	—	1,555
Sitka spruce	7	111	5,971	4,410	21	10,519
Western hemlock	—	—	383	3,249	—	3,632
White spruce	3	49	102	13	—	168
Total	11	252	8,257	10,392	21	18,933
Hardwoods:						
Aspen	—	4	—	4	—	7
Paper birch	6	81	307	—	1	395
Poplar	—	51	720	—	15	785
Total	6	135	1,027	4	16	1,188
All types	17	387	9,284	10,396	37	20,121

— = no data were collected or less than 500,000 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 15—Estimated net volume of growing stock on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Million cubic feet</i>					
Softwoods:					
Black spruce	—	—	2	4	7
Mixed conifer	369	5	305	101	780
Mountain hemlock	178	—	172	80	431
Sitka spruce	179	21	1,365	906	2,471
Western hemlock	408	42	229	148	827
White spruce	20	24	23	47	114
Total	1,154	92	2,096	1,287	4,629
Hardwoods:					
Aspen	—	3	4	—	7
Paper birch	7	72	20	112	212
Poplar	24	34	131	50	239
Total	31	108	156	162	458
All types	1,185	201	2,253	1,449	5,087

— = no data were collected or less than 500,000 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing-stock trees 5.0 in d.b.h. and larger.

**Table 16—Estimated net volume of sawtimber on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Million board feet, Scribner rule</i>					
Softwoods:					
Black spruce	—	—	2	3	5
Mixed conifer	1,410	20	1,292	333	3,054
Mountain hemlock	619	—	611	325	1,555
Sitka spruce	775	86	5,785	3,874	10,519
Western hemlock	1,724	218	1,032	658	3,632
White spruce	29	18	35	86	168
Total	4,557	342	8,756	5,279	18,933
Hardwoods:					
Aspen	—	4	4	—	7
Paper birch	3	137	49	206	395
Poplar	94	101	453	138	785
Total	97	241	506	344	1,188
All types	4,653	583	9,262	5,623	20,121

— = no data were collected or less than 500,000 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 17—Estimated current average gross annual growth of growing stock on timberland by owner group and species group, south-central Alaska, 2003<sup>a</sup>**

Owner group	Average volume	Species group		All species
		Softwoods	Hardwoods	
<i>Cubic feet per acre</i> ----- <i>Thousand cubic feet</i> -----				
Growing stock: <sup>b</sup>				
National forest	39	12,044	744	12,788
Other federal	24	2,344	1,750	4,094
State and local	40	23,221	2,565	25,785
Private	29	17,782	3,223	21,006
Total growing stock	34	55,392	8,282	63,673

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error.

<sup>b</sup> Includes growing-stock trees 5.0 in d.b.h. and larger.

**Table 18—Estimated current average net annual growth of growing stock on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Thousand cubic feet</i>					
Softwoods:					
Black spruce	—	9	110	96	215
Mixed conifer	1,817	62	1,130	1,314	4,324
Mountain hemlock	-2,136	—	-1,032	748	-2,420
Sitka spruce	1,723	318	-4,966	6,537	3,611
Western hemlock	3,070	258	541	418	4,287
White spruce	35	-808	-6,681	-10,349	-17,803
Total	4,508	-160	-10,897	-1,237	-7,786
Hardwoods:					
Aspen	—	141	141	—	281
Paper birch	228	734	-4,400	-1,198	-4,636
Poplar	415	541	886	1,530	3,373
Total	643	1,416	-3,373	332	-982
All types	5,152	1,256	-14,270	-904	-8,767

— = no data were collected or less than 500 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing stock trees 5.0 in d.b.h. and larger.

**Table 19—Estimated current average net annual growth of sawtimber on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Thousand board feet, Scribner rule</i>					
Softwoods:					
Black spruce	—	—	66	110	176
Mixed conifer	4,631	221	3,703	3,677	12,232
Mountain hemlock	-11,248	—	-3,774	2,852	-12,171
Sitka spruce	7,217	1,575	-15,155	31,449	25,085
Western hemlock	10,486	985	2,607	2,295	16,373
White spruce	-1,082	-2,893	-16,117	-30,881	-50,974
Total	10,003	-112	-28,671	9,501	-9,279
Hardwoods:					
Aspen	—	143	152	—	295
Paper birch	53	282	-13,198	-5,797	-18,659
Poplar	2,630	2,316	3,252	5,963	14,162
Total	2,684	2,741	-9,793	167	-4,202
All types	12,686	2,629	-38,464	9,668	-13,481

— = no data were collected or less than 500 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes soft wood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 20—Estimated average annual mortality of growing stock on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Thousand cubic feet</i>					
Softwoods:					
Black spruce	—	—	75	33	108
Mixed conifer	2,453	—	1,814	283	4,551
Mountain hemlock	3,856	—	2,699	—	6,555
Sitka spruce	406	—	20,839	5,056	26,301
Western hemlock	243	—	848	618	1,709
White spruce	666	1,679	7,602	11,967	21,914
Total	7,623	1,679	33,877	17,957	61,136
Hardwoods:					
Aspen	—	—	13	—	13
Paper birch	13	1,159	4,821	3,952	9,946
Poplar	—	—	1,344	1	1,345
Total	13	1,159	6,178	3,953	11,304
All types	7,636	2,838	40,055	21,910	72,441

— = no data were collected or less than 500 ft<sup>3</sup>.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes growing-stock trees 5.0 in d.b.h. and larger.

**Table 21—Estimated average annual mortality of sawtimber on timberland by forest type and owner group, south-central Alaska, 2003<sup>a</sup>**

Forest type	National forest	Other federal	State and local	Private	All owners
<i>Thousand board feet, Scribner rule</i>					
Softwoods:					
Black spruce	—	—	—	—	—
Mixed conifer	9,561	—	6,139	658	16,357
Mountain hemlock	16,529	—	8,731	—	25,260
Sitka spruce	1,019	—	69,907	16,290	87,217
Western hemlock	91	—	2,569	1,170	3,830
White spruce	1,873	3,383	16,928	32,459	54,643
Total	29,073	3,383	104,274	50,577	187,308
Hardwoods:					
Aspen	—	—	—	—	—
Paper birch	—	2,159	13,802	9,696	25,657
Poplar	—	—	5,062	—	5,062
Total	—	2,159	18,863	9,696	30,719
All types	29,073	5,543	123,137	60,274	218,026

— = no data were collected or less than 500 board feet.

<sup>a</sup> Totals may be off owing to rounding. Estimates are subject to sampling error. Includes softwood sawtimber trees 9.0 in d.b.h. and larger and hardwood sawtimber trees 11.0 in d.b.h. and larger.

**Table 22—Estimated timber harvest volume (scaled postharvest) by year and owner group, south-central Alaska, 1988 to 2001<sup>a</sup>**

Year	National forest	State	Private	All owners
<i>Million board feet, Scribner rule</i>				
1988	1.0	2.1	85.6	88.7
1989	1.5	2.1	120.0	123.6
1990	1.5	1.0	105.1	107.6
1991	1.5	2.5	134.5	138.5
1992	.5	1.0	123.5	125.0
1993	1.7	.0	127.2	128.9
1994	6.5	.0	186.0	192.5
1995	1.9	2.6	230.1	234.6
1996	3.3	8.1	207.6	219.0
1997	2.2	8.6	237.1	247.9
1998	1.5	5.0	172.2	178.7
1999	.4	5.4	139.9	145.7
2000	.3	1.8	56.3	58.4
2001	.4	2.1	71.3	73.8

<sup>a</sup> Source: USDA Forest Service, Alaska Region. Data on file with: Ecosystems Planning, USDA Forest Service, P.O. Box 21628, Juneau, AK 99802-1628.

**Table 23—Standard errors of selected inventory estimates, south-central Alaska, 2003**

Attribute	Estimate	Standard error
		<i>Percent</i>
All forest land	4,044 thousand acres	3.4
Other forest land	2,169 thousand acres	5.1
Timberland	1,875 thousand acres	5.0
Nonforest land	14,435 thousand acres	.9
Net volume	5,087 million cubic feet	8.4
Gross growth	63,671 thousand cubic feet	6.4
Mortality	72,438 thousand cubic feet	16.1

**Table 24—Approximate confidence intervals for timberland area and growing-stock volume estimates of varying magnitudes, south-central Alaska, 2003**

Timberland area			Growing-stock volume		
Estimate	Confidence interval		Estimate	Confidence interval	
<i>-----Thousand acres-----</i>	<i>Percent</i>		<i>-----Million cubic feet-----</i>	<i>Percent</i>	
2,000	±98	5	6,000	±467	8
1,500	±84	6	4,000	±381	10
1,000	±69	7	2,000	±270	13
800	±62	8	1,000	±191	19
600	±53	9	800	±170	21
400	±44	11	600	±148	25
200	±31	15	400	±121	30
100	±22	22	200	±85	43
50	±15	31	100	±60	60
25	±11	44	50	±43	85
15	±8	56			
10	±7	69			
5	±5	98			



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