



United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

Resource Bulletin
PNW-RB-233
January 2001



Summary Estimates of Forest Resources on Unreserved Lands of the Ketchikan Inventory Unit, Tongass National Forest, Southeast Alaska, 1998

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Abstract

van Hees, Willem W.S. 2001. Summary estimates of forest resources on unreserved lands of the Ketchikan inventory unit, Tongass National Forest, southeast Alaska, 1998. Resour. Bull. PNW-RB-233. Portland, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 8 p.

Summary estimates are presented of forest resource area, timber volume, and growth and mortality of timber on unreserved national forest land in the Ketchikan inventory unit of the Tongass National Forest. Pacific Northwest Research Station, Forest Inventory and Analysis, crews collected inventory data from 1995 to 1998. Productive forest land area (timberland) was estimated at 1,295 thousand acres, cubic-foot volume on timberland at 7,448 million cubic feet, and net annual growth and mortality at 11,003 and 50,426 thousand cubic feet, respectively.

Keywords: Forest surveys, timber resources, statistics (forest), Alaska (southeast), Ketchikan.

Summary

The total land and water area of the Ketchikan inventory unit of the Tongass National Forest is 5,164,000 acres. Unreserved lands within the unit encompass 2,705,676 acres, 52 percent of the total. Eighty-three percent (2,256,623 acres) of this unreserved area is forested and slightly more than half (57 percent) of the forest land is timberland (1,295,490 acres). Cubic-foot volume on timberland is estimated at about 7.4 billion cubic feet. Nearly 75 percent of this volume is in western hemlock and Sitka spruce trees. Net annual growth of growing stock on timberland is estimated at 11.0 million cubic feet and average annual mortality is about 50.4 million cubic feet.

Preface

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

Inventory Area

The forest resources on unreserved, national forest lands within the Ketchikan inventory unit (fig. 1) were sampled with a single phase, unstratified, systematic grid sample (grid spacing is 2.98 miles). No ground sampling occurred in wilderness areas. Ground plots (2.47 acres) were established at each grid intersection and were subsampled by a cluster of four, 24-foot, fixed-radius subplots. Three other subplots were sited, one each at 120 feet north, southeast, and southwest from the first, centrally located subplot. Each subplot was mapped for land cover.

Some plots were either entirely or partially physically inaccessible owing to dangerous terrain. For these locations, land cover was estimated; detailed measurements of trees and other vegetation were not made. These locations contribute to estimates of other forest land and nonforest area.

Sampling Error

Estimates presented in this report are based on sampling and are subject to two types of error. The first is sampling error. This type of error can be estimated mathematically. The second type of error comes from measurement mistakes or equipment limitations; it cannot be estimated mathematically but is minimized through proper training, supervision, and emphasis on careful work.

Bootstrap estimation was used to estimate sampling error. The bootstrap process is an iterative resampling, with replacement, of the sample list. For each resample, a new estimate of the total is constructed. The means and variances of the estimated totals provide the estimate of standard error. The estimated errors presented in table 1 resulted from 300 iterations. Sixty-eight percent confidence bands (one standard error) can be calculated from these figures.

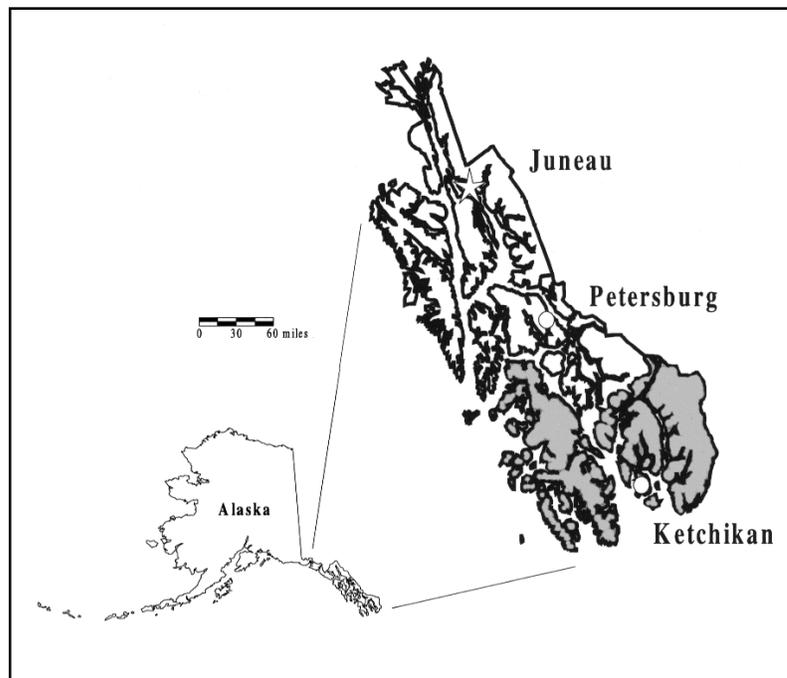


Figure 1—Ketchikan inventory unit, southeast Alaska, 1998.

Table 1—Bootstrap estimates of the mean and standard error for selected forest resource estimates, Ketchikan inventory unit, southeast Alaska, 1998

Resource estimate	Mean	Standard error
Productive acres	1,302,322	54,996
Nonproductive acres	953,587	54,225
Nonforest acres	449,767	44,988
Net volume (ft ³)	7,419,075,864	470,799,942
Gross growth (ft ³)	61,414,744	3,325,562

Key Findings

- Eighty-three percent of the Ketchikan inventory unit's unreserved land base of 2,706 thousand acres was classified as forest land (2,257 thousand acres), and an estimated 57 percent of this forest land was timberland (1,295 thousand acres)
- Sitka spruce was encountered rarely as a pure type and was found on 4 percent of the timberland acres.¹ The dominant forest types, by percentage of area, were western hemlock (40 percent), western redcedar/hemlock (22 percent), western hemlock/Sitka spruce (16 percent), and mixed conifer (12 percent). Although Sitka spruce seldom was found in pure stands, the species accounted for almost 23 percent of total net cubic volume on timberland. Also, the Sitka spruce forest type produced the highest cubic volumes per acre (9,210 cubic feet).
- Gross annual growth per acre was highest for the western hemlock/Sitka spruce forest type (60 cubic feet per acre) followed closely by that for the pure Sitka spruce type (56 cubic feet per acre). Average annual gross growth exceeded average annual mortality for all forest types except western hemlock, resulting in an average annual net growth of 11.0 million cubic feet.

Acknowledgments

Completion of this inventory, from design through data collection and compilation, resulted from the efforts of many people. Thanks go to Ray Koleser, data collection team leader, and the data collection staff: DeAnna Barbaria, Aaron Bergdahl, Whitney Burgess, Brian Charlton, Ian Doleman, Jason Downing, Jason Edney, Jahn Haddeland, Albert Helgenberg, Corey Henderson, Keith Kanoti, Dan Kenney, Tristan Kelley, Brad Kriekhaus, Teresa Lysak, Mary Miller, Frank Pendleton, David Pierce, Brandy Reed, Julie Roller, Sadie Rosenthal, John Saddler, Chris Teutsch, David Thompson, Fred Thorsteinson, and August Wright. Thanks also to Kevin Dobelbower, information management team leader, for database development and field data recorder and compilation programming, and to Edward Ezzell for database and systems maintenance.

Literature Cited

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

Appendix

Names of trees²

Common name	Scientific name
Softwoods:	
Alaska-cedar	<i>Chamaecyparis nootkatensis</i> (D. Don) Spach
Lodgepole pine	<i>Pinus contorta</i> (Dougl.)
Mountain hemlock	<i>Tsuga mertensiana</i> (Bong.) Carr.
Pacific silver fir	<i>Abies amabilis</i> (Dougl.) Forbes
Sitka spruce	<i>Picea sitchensis</i> (Bong.) Carr.
Western hemlock	<i>Tsuga heterophylla</i> (Raf.) Sarg.
Western redcedar	<i>Thuja plicata</i> (Donn)
Hardwoods:	
Oregon crab apple	<i>Malus diversifolia</i> (Bong.) Roem.
Red alder	<i>Alnus rubra</i> Bong.

²Scientific names according to Viereck and Little (1972).

¹Scientific names for all trees are given in the appendix.

Table 2—Area by land class, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Land class				
Timberland	Other forest land	Total forest land	Nonforest land	All land
<i>Thousand acres</i>				
1,295	961	2,257	449	2,706
(47.9%)	(35.5%)	(83.4%)	(16.6%)	(100%)

^a Totals may be off due to rounding. Estimates are subject to sampling error.

Table 3—Area of timberland by forest type, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Forest type	----- Area -----	
	<i>Thousand acres</i>	<i>Percent</i>
Softwoods:		
Alaska-cedar/hemlock	53	4.1
Lodgepole pine	4	.3
Mixed conifer	149	11.5
Mountain hemlock	31	2.4
Sitka spruce	49	3.8
Western hemlock/Sitka spruce	204	15.8
Western redcedar/hemlock	288	22.2
Western hemlock	516	39.8
Total, softwoods	1,295	100.0
Hardwoods:		
Red alder	—	
Total, hardwoods	—	
All types	1,295	100.0

— = no data were collected.

^a Totals may be off due to rounding. Estimates are subject to sampling error.

Table 4—Net volume of growing stock on timberland by species, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Species	----- Volume -----	
	Thousand ft ³	Percent
Softwoods:		
Alaska-cedar	715,371	9.6
Lodgepole pine	21,358	0.3
Mountain hemlock	322,178	4.3
Pacific silver fir	596	<i>t</i>
Sitka spruce	1,698,721	22.8
Western redcedar	911,028	12.2
Western hemlock	3,761,423	50.5
Total, softwoods	7,430,676	99.8
Hardwoods:		
Oregon crab apple	31	<i>t</i>
Red alder	17,611	.2
Total, hardwoods	17,642	.2
All types	7,448,317	100.0

t = trace.

^aTotals may be off due to rounding. Estimates are subject to sampling error.

Table 5—Net volume of growing stock on timberland by forest type, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Forest type	----- Volume -----		
	Thousand ft ³	Percent	Ft ³ / acre
Softwoods:			
Alaska-cedar/hemlock	227,011	3.0	4,263
Lodgepole pine	8,379	.1	2,055
Mixed conifer	613,960	8.2	4,110
Mountain hemlock	140,479	1.9	4,508
Sitka spruce	455,082	6.1	9,210
Western hemlock/Sitka spruce	1,530,086	20.5	7,488
Western redcedar/hemlock	1,473,083	19.8	5,110
Western hemlock	3,000,236	40.3	5,819
Total, softwoods	7,448,317	100.0	5,749
Hardwoods:			
Red alder	—	—	—
Total, hardwoods	—	—	—
All types	7,448,317	100.0	5,749

— = no data were collected.

^aTotals may be off due to rounding. Estimates are subject to sampling error.

Table 6—Gross annual growth of growing stock on timberland by forest type, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Forest type	-----Growth-----	
	<i>Cubic feet</i>	<i>F³/ acre</i>
Softwoods:		
Alaska-cedar/hemlock	2,186,464	41
Lodgepole pine	221,436	54
Mixed conifer	6,680,125	45
Mountain hemlock	1,102,894	35
Sitka spruce	2,763,503	56
Western hemlock/Sitka spruce	12,178,884	60
Western redcedar/hemlock	14,658,939	51
Western hemlock	21,637,481	42
Total, softwoods	61,429,725	47
Hardwoods:		
Red alder	—	—
Total, hardwoods	—	—
All types	61,429,725	47

— = no data were collected.

^a Totals may be off due to rounding. Estimates are subject to sampling error.

Table 7—Net annual growth of growing stock on timberland by forest type, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Forest type	-----Growth-----	
	<i>Cubic feet</i>	<i>F³/ acre</i>
Softwoods:		
Alaska-cedar/hemlock	278,518	5
Lodgepole pine	208,808	51
Mixed conifer	2,330,390	16
Mountain hemlock	855,539	27
Sitka spruce	1,270,514	26
Western hemlock/Sitka spruce	7,361,961	36
Western redcedar/hemlock	2,974,980	10
Western hemlock	-4,277,575	-8
Total, softwoods	11,003,135	8
Hardwoods:		
Red alder	—	—
Total, hardwoods	—	—
All types	11,003,135	8

— = no data were collected.

^a Totals may be off due to rounding. Estimates are subject to sampling error.

Table 8—Average annual mortality of growing stock on timberland by forest type, unreserved national forest land, Ketchikan inventory unit, southeast Alaska, 1998^a

Forest type	----- Mortality -----	
	<i>Cubic feet</i>	<i>Ft³/ acre</i>
Softwoods:		
Alaska-cedar/hemlock	1,907,946	35
Lodgepole pine	12,628	3
Mixed conifer	4,349,735	29
Mountain hemlock	247,355	8
Sitka spruce	1,492,989	30
Western hemlock/Sitka spruce	4,816,923	24
Western redcedar/hemlock	11,683,959	41
Western hemlock	25,915,056	50
Total, softwoods	50,426,590	39
Hardwoods:		
Red alder	—	—
Total, hardwoods	—	—
All types	50,426,590	39

— = no data were collected.

^aTotals may be off due to rounding. Estimates are subject to sampling error.

Glossary

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 feet wide to be classified as forest land. Unimproved roads and trails, streams, and clearings in forest areas must be less than 120 feet wide to be classified as forest land. (See also timberland, other forest land, reserved forest land, and nonforest land.)

Forest type—A classification of forest land based on the species forming a plurality of stocking on the area currently occupied by tree cover.

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 bole 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.

Mean annual increment (m.a.i.)—A measure of the productivity of forest land in terms of the average increase in cubic-foot volume per acre per year. The minimum standard for timberland is the ability to produce 20 cubic feet per acre per year at culmination of m.a.i.

Mortality, average annual, of growing stock—The volume of sound wood in live sawtimber and poletimber trees dying annually from natural causes during the 5 years prior to measurement.

Net annual growth—The increase in net volume of wood for growing stock trees during a specified year. Components of net annual growth are (a) the increment in net volume of trees alive at the beginning of the specified year, plus (b) the net volume of trees reaching sawtimber or poletimber size during the year, minus (c) the net volume of trees that died during the 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. Includes land that has never supported forests and lands formerly forested where forest use is precluded by development for nonforest uses. Included are lands 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 feet 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 cubic feet per acre per year or more of wood at culmination of mean annual increment (m.a.i.) and not withdrawn from timber use by administrative statute.

Productive forest land—Forest land producing or capable of producing 20 cubic feet per acre per year or more of wood at culmination of mean annual increment (m.a.i.).

Poletimber trees—Growing stock trees greater than 5.0 inches in diameter at breast height and less than sawtimber sized.

Reserved forest land—Forest land withdrawn from timber utilization through statute or administrative regulation.

Sawtimber trees—Growing stock trees at least 11.0 inches in diameter at breast height for hardwoods and 9.0 inches for softwoods.

Timberland—Forest land producing or capable of producing 20 cubic feet per acre per year or more of wood at culmination of mean annual increment (m.a.i.) and not withdrawn from timber use by administrative statute.

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