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Abstract

Scribner board-foot, merchantable cubic-foot, and total cubic-foot volume equations were derived from fall, buck, and scale data for 441 trees at 78 locations in the Susitna River basin, Alaska. Tree species included white and black spruce, paper birch, black cottonwood, and quaking aspen.

Keywords: Volume tables, volume equations, white spruce, black spruce, paper birch, black cottonwood, quaking aspen, Susitna River basin, Alaska.

Introduction

Scribner board-foot, merchantable cubic-foot, and total cubic-foot volume equations were derived from an analysis of fall, buck, and scale data obtained during a multi-resource inventory of the Susitna River basin, Alaska (USDA, Soil Conservation Service 1986). Board-foot volumes are presented for combinations of diameter at breast height (dbh) and total tree height and for dbh and height to a 6-inch top. Merchantable cubic-foot volumes are presented for combinations of dbh and total tree height, and for dbh and height to a 4-inch top. Total cubic-foot volumes are given for dbh and total tree height only.

A total of 441 trees were used in the analysis: 244 white spruce (*Picea glauca* (Moench) Voss), 43 black spruce (P. *mariana* (Mill.) B.S.P.), 97 paper birch (*Betula papyifera* Marsh.), 14 quaking aspen (*Populus tremuloides* Michx.), and 43 black cottonwood (P. *trichocarpa* Torr. & Gray). Data were collected from 78 locations in the Susitna River basin, which is roughly bounded by the Alaska Range to the north and west, the Talkeetna Mountains to the east, and Cook Inlet and Knik Arm to the south (fig-1).

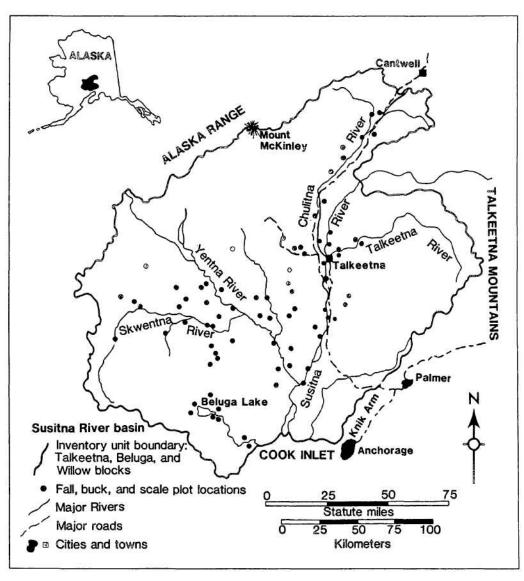


Figure 1—Part of the Susitna River basin, Alaska, where fall, buck, and scale data were collected.

Methodology

Fall, buck, and scale sample trees were selected by using a 40-basal-area factor prism rotated about points located 200 feet north of point 3; east of points 4, 5, and 6; south of point 7; and west of points 8, 9, and 10 of the forest survey 10-point inventory plots. Al! tally trees greater than 5 inches dbh were destructively sampled. Each sample tree was measured and marked at a 1-foot stump and at dbh. After felling and limbing, total height and height to a 6-inph and a 4-inch top were recorded. The tree was bucked into 16.3-fo6t logs and at 6-inch and 4-inch tops. All cross-sectional diameters inside bark were measured twice at right angles and averaged.

Data from trees suitable for volume-table construction were used to build a data file consisting of dbh, total height, height to 4-inch and 6-inch tops, total and merchantable cubic-foot volume, and Scribner board-foot volume. Trees with missing data, or data obviously in error, were eliminated from the data base as were obviously deformed and cull trees. All merchantable portions of forked trees were included. Tree data were then examined to assure that the bucking was consistent with USDA, Forest Service log scaling rules. ¹1f a log was too short or too long, a portion of the next log was "added" or the log was "cut" to a standard length and a new diameter was calculated; it was assumed that logs were circular in cross section with linear taper between the existing end measurements. Board-foot volumes were not computed for pieces shorter than 8 feet or if diameter inside bark at the small end was less than 6 inches. Cubic-foot volumes were computed using Smalian's formula. Board-foot volumes, Scribner rule, were computed by using the Girard and Bruce rule of thumb (Dilworth 1968):

volume = $(0.79 \text{ x diameter}^2 - 2.0 \text{ x diameter} - 4.0) \text{ x (length/16.0)}$.

Plottings of volume over dbh² x height indicated that cubic-foot volume was linearly related to dbh² x height and board-foot volume was curvilinearly related to dbh² x height. The independent variables tested therefore included dbh, dbh², height (ht), dbh².x.ht, 1/dbh, 1/dbh², and (dbh²ht)°.

Regression portions of the SPSS^X statistical program package (SPSS 1983)² were used to run forward-stepwise analysis for linear expressions of the data. The term $(dbh^2ht)^c$ was fitted after transformation with logarithms; for example, $ln(BFV) = b_0 + 1$ x $ln(dbh^2ht)$. Both weighted and unweighted linear regressions were tested as described by Furnival (1961) with various results. The logarithm transformation to obtain an equation with $(dbh^2ht)^c$ avoids the need of weights because it assumes that the residuals are distributed normally about a log normal distribution function.

Analysis of covariance was used to test for significant differences in the data between white and black spruce and between paper birch and quaking aspen. In both cases, the data were not significantly different and therefore were pooled.

The regression equation for each table is presented at the bottom of the table; it is followed by the increased efficiency of the equation used over the unweighted linear model, where volume = a + b(dbh ht). The standard error of the estimate is also presented. The shading in the tables indicates the limits of the data. The number of trees in each diameter class by species is also presented.

Discussion

¹ Unpublished manual, 1981, "Forest Service Manual, title 2400, Timber Management, Alaska Region Supplement 228," by U.S. Department of Agriculture, Forest Service, Alaska Region, Juneau, Alaska 99802.

² The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture of any product or service to the exclusion of others that may be suitable.

Board-foot volumes for most species were lower than shown in all published tables (Dippold and Farr 1971, Farr 1967, Gregory and Haack 1964, Haack 1963, Kerr and Eleazer 1980) and unpublished tables³ for small-diameter classes. Greater board-foot volumes are reported for spruce trees larger than 24 inches dbh in all published tables except the Tyonek tables (Kerr and Eleazer 1980). The Tyonek tables show that spruce volume is less than the volumes published in this report after the spruce reach 10 inches dbh. Board-foot volumes for birch and aspen exceed published values when trees exceed 16-18 inches dbh except in the Tyonek tables where, like the spruce, more volume is reported at 10 inches dbh and above. Volumes for black cottonwood were higher in lower classes, below 17 inches dbh, than are reported for balsam poplar (Haack 1963) but slightly higher than Ryan's data for very large classes (see footnote 3).

In our tables, board-foot volumes for trees whose height was measured to a merchantable 6-inch top diameter were lower than Ryan's (see footnote 3) for white and black spruce, lower than Ryan's for paper birch and quaking aspen less than 12 inches dbh, and lower than Ryan's for black cottonwood less than 19 inches dbh.

Our spruce merchantable cubic-foot volumes (that is, volumes to a 4-inch top diameter inside bark [dib]) were nearly identical to those reported by Gregory and Haack (1964) and Ryan (see footnote 3), and only slightly lower in large-diameter classes than those reported by Haack (1963) and Dippold and Farr (1971). Merchantable cubic-foot volumes were greater than those reported by Kerr and Eleazer (1980) for white and black spruce, birch, and aspen greater than 11 inches dbh. Birch and aspen merchantable cubic-foot volumes were greater than those reported for Tyonek (Kerr and Eleazer 1980) but, otherwise, not much different than those reported by others cited. Black cottonwood merchantable cubic-foot volumes were nearly identical to other reported data for this species except as reported by Gregory and Haack (1964) for black cottonwood and balsam poplar {Populus balsamifera L.}) where reported volumes are greater in diameter classes above 16-17 inches dbh. Poplar and cottonwood were combined by Gregory and Haack.

Merchantable cubic-foot volumes in tables for tree heights measured to a merchantable 4-inch top diameter inside bark were nearly identical to Ryan's (see footnote 3) for spruce, birch, and aspen and only slightly lower than those for black cottonwood in large-diameter classes.

Total cubic-foot volumes of the entire stem for spruce, paper birch and quaking aspen were nearly equal to those reported by Gregory and Haack (1964) for small-size classes but were slightly lower for larger classes. The total cubic-foot volume of black cottonwood was slightly higher in our tables than in those of Gregory and Haack (1964).

³ Unpublished office report, 1984, "Volume tables for the Susitna River valley, Alaska," by Phyllis Ryan, State of Alaska, Department of Natural Resources, 3601 C. Street, Anchorage, Alaska 99503.

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Table 1- Board-foot volumes, Scribner line (1-foot stump to 6-inch top dib) given dbh and total height for white spruce and black spruce, Susitna River basin, Alaska^a

The column The	DBH						Tot	al heig	ht in f	Total height in feet (h) ^C	v						Tre	Trees d measured
2.5 3.1 3.7 4.3 5.0 5.8 6.5 7.3 8.1 13.7 15.0 4 3.8 4.7 5.7 7.8 8.9 10.0 11.2 12.4 13.7 15.0 4 5.5 6.8 6.3 7 7.8 8.9 10.0 11.2 12.4 13.7 15.0 4 13.5 16.7 20.2 23.8 27.6 31.5 32.7 25.2 27.8 30.4 4 13.5 16.7 20.2 23.8 27.6 31.5 35.6 39.9 44.2 48.7 53.4 58.1 74.2 80.4 86.7 31 17.2 21.4 25.8 30.4 35.2 40.3 40.5 50.9 56.5 62.2 68.1 74.2 80.4 86.7 31 22.5 32.9 39.7 46.8 54.3 52.1 70.1 70.1 70.1 70.1 70.1 70.1 70.1 70	۰_ ا	30	35	40	45	50	55	9	65	70	75	80	85	90	95	100	White	Black
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26.5 32.9 39.7 46.8 54.3 62.1 70.1 78.5 87.1 95.9 105.0 114.3 123.9 133.6 14 32.2 39.9 40.2 56.8 65.9 75.3 85.1 95.2 105.7 116.4 127.4 138.8 150.3 162.2 8 38.6 47.9 57.7 68.1 79.0 90.3 102.0 114.1 126.6 139.5 152.7 166.3 180.2 194.4 208.9 8 45.7 56.8 68.5 80.8 93.6 107.0 120.9 135.3 150.1 165.4 181.1 197.2 213.6 230.5 247.7 4 80.4 94.8 109.9 125.7 142.0 158.9 176.3 194.2 212.6 231.5 250.8 270.6 290.8 4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 395.2 444.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 470.5 552.0 395.2 488.3 538.5 582.2 630.6 680.3 731.1 1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	13	21.5	26.7	32.2	38.0	2.8.1	50.4	57.0	63.7	7:07	6.77	85.3	92.9	100.6	108.5		14	2
38.6 47.9 57.7 68.1 79.0 90.3 102.0 114.1 126.6 139.5 152.7 166.3 180.2 194.4 208.9 45.7 56.8 68.5 80.8 107.0 120.9 135.3 150.1 165.4 181.1 197.2 213.6 230.5 247.7 127.9 126.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 269.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 399.6 341.1 377.4 406.5 409.0 538.4 578.6 395.7 386.4 475.2 510.7 350.8 385.6 417.1 448.2 279.0 399.6 341.1 377.4 260.6 699.0 538.4 578.6 395.7 386.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 576.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	14	26.5	32.9	39.7	46.8	54.3	62.1	70.1	78.5	87.1	95.9	105.0	1.14.3	123.9	133.6		14	1
38.6 47.9 57.7 68.1 79.0 90.3 102.0 1141 126.6 139.5 152.7 166.3 180.2 194.4 208.9 45.7 56.8 68.5 80.8 93.6 107.0 120.9 135.3 150.1 165.4 181.1 197.2 213.6 230.5 247.7 80.4 94.8 109.9 125.7 142.0 158.9 176.3 194.2 212.6 231.5 250.8 270.6 290.8 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 168.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.7 360.8 475.2 510.7 350.7 386.4 423.0 460.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	1.5	32.2	39.9	48.2	56.8	62.9	75.3	85.1	95.2	105.7	116.4	127.4	138.8	150.3	162.2		œ	
45.7 56.8 68.5 80.8 93.6 107.0 120.9 135.3 150.1 165.4 181.1 197.2 213.6 230.5 247.7 80.4 94.8 109.9 125.7 142.0 158.9 176.3 194.2 212.6 231.5 250.8 270.6 290.8 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 168.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.7 313.1 433.7 313.1 443.2 488.3 534.5 582.2 630.6 680.3 731.1 443.2 488.3 534.5 582.2 630.6 680.3 731.1 550.1 606.0 663.4 722.3 782.7 844.4 907.4	91	38.6		57.7	- 4	79.0	90.3	102.0	114.1	126.6	139.5	152.7	166.3		194.4	208.9	00	
80.4 94.8 109.9 125.7 142.0 158.9 176.3 194.2 212.6 231.5 250.8 270.6 290.8 127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 168.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 356.8 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	17	45.7		68.5	m	93.6	107.0	120.9	135.3	150.1		181.1			230.5	247.7	4	
127.9 146.2 165.2 184.9 205.1 226.0 247.4 269.4 291.9 314.9 338.4 168.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 356.7 386.4 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	8			80.4	m	109.9	125.7	142.0		176.3		212.6			270.6	290.8	4	
168.9 190.8 213.5 236.9 261.0 285.7 311.1 337.1 363.7 390.8 218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	6					127.9	146.2	165.2		205.1		247.4		291.9	314.9	338.4		
218.8 244.8 271.7 299.3 327.7 356.8 386.6 417.1 448.2 279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	0						168.9	190.8	213.5	236.9	261.0	285.7	311.1	337.1	363.7	390.8		
279.0 309.6 341.1 373.4 406.5 440.5 475.2 510.7 350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	11							218.8	244.8	271.7	299.3	327.7	356.8	386.6	417.1	448.2		
350.7 386.4 423.0 460.6 499.0 538.4 578.6 395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	2								279.0	309.6	341.1	373.4	406.5	440.5	475.2	510.7		
395.2 435.4 476.7 519.0 562.4 606.7 652.0 443.2 488.3 534.5 582.2 630.6 680.3 731.1 494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	53									350.7	386.4	423.0	9.094	499.0	538.4	578.6		
494.8 545.1 596.7 649.7 704.0 759.5 816.2 550.1 606.0 663.4 722.3 782.7 844.4 907.4	74									395.2	435.4	476.7	519.0	562.4	606.7	652.0		
494.8 545.1 596.7 649.7 704.0 759.5 550.1 606.0 663.4 722.3 782.7 844.4	25									443.2	488.3	534.5	582.2	630.6	680.3	731.1	н	
550.1 606.0 663.4 722.3 782.7 844.4	98									494.8	545.1	2.965	7.649	704.0	759.5	816.2		
	7.5									550.1	0.909	663.4	722.3	782.7	844.4	4.706		

^a Regression: BFV = $0.000136 \, (d^2h)^{1.40338}$; increased efficiency = 184 percent; standard error of estimate = 8.5 board feet or 21 percent of the mean volume.

For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter

^c For example, 60-foot class includes trees 57.6 to 62.5 feet tall.

^d Number of trees; range of data is shaded. Includes 208 white spruce and 27 black spruce

Table 2—Board-foot volumes, Scribner rule (1-foot stump to 6-inch top dib) given dbh and total height for paper birch and quaking aspen, Susitna River basin, Alaska^a

	130				Total	Total height in feet (h)	in fee	r E					meas	measured
(a)	25	30	35	04	45	50	55	09	65	20	75	80	Paper	Quaking aspen
Inches	į		! ! ! !		Board-foot volume	rd-foo	t volum	-					Nu	Number
	2.0	5.6	3.5	4.0	4.7	5.5	6.3	7.2	8.1	9.1	10.1		-	
28	3.1	4.1	5.1	6.3	7.4	8.7	10.0	11.4	12.9	14.4	15.9		4	1
80	4.6	6.1	9.4	9.3	11.1	12.9	14.9	17.0	19.1	21.3	23.6		14	4
6	9.9	8.6	10.8	13.2	15.7	18.4	21.2	24.1	27.1	30.3	33.5		2	2
10	9.0	11.8	14.8	18.0	21.5	25.1	28.9	32.9	37.1		45.9	50.5	16	
	11.9	15.6	19.6	23.9	28.5	33.3	38.4	43.7	49.2	54.9	6.09	67.0	12	8
12	15.4	20.5	25.4	31.0	36.9	43.2	49.7	9.95	63.7	71.1	78.8	86.7	14	3
		25.6	32.2	39.3	8.94	54.7	63.1	71.7	80.8	90.2	6.66	110.0	7	1
			40.2	49.0	58.3	68.2	78.6	4.68	100.7	112.4	124.5	137.0	3	
15				60.1	71.6	83.7	96.4	109.7	123.6	138.0	152.8	168.2	4	
16				72.8	86.7	101.4	116.8	132.9	149.7	167.1	185.1	203.7		
17					103.8	121.4	139.8	159.1	179.2	200.0	221.6	243.9	2	
18					123.0	143.8	165.7	188.6	212.3	237.0	262.6	289.0	н	
19					144.4	168.9	194.6	221.4	249.3	278.3	308.3	339.3		
					168.2	196.7	226.6	257.8	290.3	324.1	359.1	395.2	-	
21								298.0	335.6	374.6	415.0	456.8		
								342.1	385.3	430.1	476.5	524.4		
											•		10	

^a Regression: BFV = 0.000081 * (d²h)^{1.48459}; increased efficiency = 108 percent; standard error of estimate = 11.0 board feet or 24 percent of the mean volume.

^b For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter

^c For example, 60-foot class includes trees 57.6 to 62.5 feet tall.

^d Number of trees; range of data is shaded. Includes 84 paper birch and 13 quaking aspen.

Table 3—Board-foot volume, Scribner rule (1-foot stump to 6-inch top dib) given dbh and total height for black cottonwood, Susitna River basin, Alaska⁸

Time	H						Tot	al heig	tht in f	Total height in feet $(h)^c$	U						Trees
1.9 4.9 7.9 10.9 13.1 16.9 16.9 17.0 13.3 15.5 17.8 20.1 14.1 18.8 23.5 28.2 32.8 37.5 42.2 46.9 51.6 56.3 60.9 65.6 70.3 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 34.9 31.9 31.9 34.9 34.9 34.9 34.9 34.9 34.9 34.9 34	۵ .	45	50	55	09	65	70	75	80	85	06	95	100	105	110	115	Black Cottonwood
1.9 4.9 7.9 10.9 13.9 16.9 19.9 22.9 25.9 28.9 31.9 34.9 34.9 14.1 18.8 23.5 28.2 32.8 37.5 14.2 46.9 13.9 16.9 19.9 22.9 25.9 25.9 28.9 31.9 34.9 34.9 34.1 18.8 23.5 28.2 32.8 37.5 46.9 51.6 56.3 46.0 47.8 51.6 47.8 51.6 23.2 28.2 32.8 37.5 42.2 46.9 51.6 56.3 74.0 79.6 85.3 91.0 23.7 39.4 46.2 52.9 52.9 66.4 73.1 79.9 66.5 114.5 122.4 130.3 138.2 146.1 59.0 66.9 77.3 87.9 82.1 91.3 100.5 109.7 118.9 128.0 137.2 146.4 155.6 164.8 173.9 66.8 77.3 87.9 98.4 109.0 119.5 130.1 140.6 157.1 161.7 172.2 182.8 193.3 293.8 66.8 77.3 87.9 98.4 109.0 119.5 130.1 140.6 157.1 161.7 172.2 182.8 193.3 293.8 93.8 107.3 120.9 134.4 147.9 161.5 161.8 155.0 146.4 293.3 310.2 24.5 260.3 275.5 290.7 194.0 1	ches							-Board-	foot vo	1							Number
1.9 4.9 7.9 10.9 13.9 16.9 16.9 25.9 25.9 28.9 31.9 34.9 14.1 9.9 13.7 17.5 21.3 25.1 28.9 32.7 36.4 40.2 44.9 67.6 56.5 56.9 65.6 70.3 14.1 9.9 13.7 17.5 21.3 25.1 28.6 34.9 46.6 68.3 74.0 65.6 70.3 10.0 13.6 11.3 6.6 47.8 10.0 11.0 9.1 10.0 11.0 9.1 10.0 11.0 9.1 10.0 11.0	7					1.8	4.1	4.9	8.7		13.3	15.5	17.8	20.1			1
6.1 9.9 13.7 17.5 21.3 25.1 28.9 32.7 36.4 40.2 44.0 65.6 70.3 23.0 28.6 34.3 40.0 45.6 51.3 57.0 62.6 68.3 74.0 79.6 85.3 91.0 23.0 28.6 34.3 40.0 45.6 51.3 57.0 62.6 68.3 74.0 79.6 85.3 91.0 24.6 63.8 72.9 82.1 91.3 100.5 19.7 18.6 15.1 16.7 172.2 122.4 130.3 138.2 146.1 25.0 28.6 115.9 127.8 130.9 119.5 130.1 140.6 151.1 161.7 172.2 182.8 193.3 203.8 25.1 103.9 115.9 127.8 139.8 151.8 163.8 175.8 187.8 187.8 187.8 199.8 211.8 223.8 235.8 25.1 103.9 115.9 127.8 139.8 151.8 163.8 175.8 187.8 187.8 187.8 199.8 211.8 223.8 235.8 197.8 107.3 120.9 134.4 147.9 161.5 175.0 188.6 202.1 215.6 229.2 240.7 256.3 269.8 199.8 107.9 161.5 175.0 188.6 202.1 215.6 229.2 240.7 256.3 269.8 199.8 107.3 120.9 134.4 147.9 161.5 175.0 188.6 202.1 215.6 229.2 240.7 256.3 240.0	80		1.9	4.9	7.9	10.9	13.9	16.9	19.9			28.9		34.9			4
23.0 28.6 34.3 40.0 45.6 51.3 57.0 62.6 68.3 74.0 79.6 85.3 91.0 32.7 39.4 46.1 52.9 59.6 66.4 73.1 79.9 86.6 93.4 100.1 106.9 113.6 43.2 51.1 59.0 66.9 74.9 86.6 93.4 100.1 106.9 113.6 54.6 63.8 72.9 80.7 98.6 106.5 114.5 122.4 130.3 138.2 146.1 56.8 77.3 98.2 109.7 118.9 128.6 130.4 140.0 140.0 140.1 140.0 140.1 140.1 140.0 151.8 173.9 146.1 170.2 140.4 140.1 140.0 151.8 161.5 151.8 151.8 151.8 151.8 152.4 152.4 152.6 154.7 150.9 250.2 250.2 250.2 250.2 250.2 250.2 250.2 250.2 </td <td>6</td> <td>6.1</td> <td>6.6</td> <td>13.7</td> <td>17.5</td> <td>21.3</td> <td>25.1</td> <td>28.9</td> <td>32.7</td> <td></td> <td></td> <td></td> <td></td> <td>51.6</td> <td></td> <td></td> <td>H</td>	6	6.1	6.6	13.7	17.5	21.3	25.1	28.9	32.7					51.6			H
23.0 28.6 34.3 40.0 45.6 51.3 57.0 62.6 68.3 74.0 79.6 85.3 91.0 32.7 39.4 46.1 52.9 59.6 66.4 73.1 79.9 86.6 93.4 100.1 106.9 113.6 43.2 51.1 59.0 66.9 74.9 82.8 90.7 98.6 106.5 114.5 122.4 130.3 138.2 146.1 66.8 77.3 87.9 98.4 109.0 119.5 190.7 118.9 128.6 146.4 155.6 164.8 193.3 203.8 66.8 77.3 87.9 115.9 127.8 139.8 151.8 163.8 175.8 187.8 199.8 211.8 223.8 235.8 77.9 91.9 103.9 115.9 127.8 139.8 151.8 163.8 175.8 187.8 199.8 211.8 256.3 209.7 305.9 93.8 107.3 120.9 134.4 14.4 199.6 214.8 290.5 260.3 245.2 260.3 340.0 215.6 234.3 253.0 271.8 290.5 309.3 310.2 327.1 364.5 215.6 224.3 253.0 271.8 200.5 309.3 3418.0 442.8 467.6 492.4 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 586.8 616.1 415.3 447.0 478.7 570.7 573.7 573.7 573.7 573.7 573.7 574.7 575.7 573.8 577.7	10	14.1	18.8	23.5	28.5	32.8	37.5	42.2	6.94	51.6	56.3			70.3			1
32.7 39.4 \$65.9 52.9 59.6 \$66.4 73.1 79.9 \$66.6 93.4 \$100.1 \$106.9 \$113.6 \$43.2 51.1 59.0 \$66.9 74.9 82.8 90.7 98.6 \$106.5 \$114.5 \$122.4 \$130.3 \$138.2 \$146.1 54.6 \$65.9 74.9 82.8 90.7 98.6 \$106.5 \$114.5 \$122.4 \$130.3 \$138.2 \$146.1 56.8 \$77.3 \$87.9 98.4 \$100.5 \$109.7 \$118.9 \$126.9 \$136.9 \$130.3 \$138.2 \$146.1 \$15.0 \$146.4 \$155.6 \$164.8 \$173.9 \$1	11	23.0	28.6	34.3		45.6	51.3	57.0		68.3		9.62	85.3	91.0			7
43.2 51.1 59.0 66.9 74.9 82.8 90.7 98.6 106.5 114.5 122.4 130.3 138.2 146.1 54.6 65.8 72.9 82.1 91.3 100.5 109.7 118.9 128.0 137.2 146.4 155.6 164.8 173.9 66.8 77.3 97.9 98.4 109.0 119.5 130.1 140.6 151.1 161.7 172.2 182.8 193.3 203.8 173.9 103.9 115.9 127.8 139.8 151.8 163.8 175.8 188.6 202.1 215.6 229.2 242.7 256.3 275.9 249.8 115.9 161.5 175.0 188.6 202.1 215.6 229.2 242.7 256.3 269.8 154.0 169.0 1447.9 161.5 175.0 188.6 202.1 215.6 229.2 242.7 256.3 269.8 154.0 154.1 169.3 184.4 199.6 214.8 290.0 245.2 260.3 275.5 290.7 305.9 191.8 208.7 225.6 242.5 259.5 276.4 293.3 310.2 327.1 344.0 103.9 125.6 234.3 253.0 277.1 320.0 245.2 260.3 376.7 365.5 384.2 215.6 234.3 253.0 277.1 334.0 142.8 467.6 492.4 177.8 290.5 309.3 328.0 346.7 365.5 384.2 289.4 312.1 334.7 357.4 380.1 402.8 425.6 242.8 289.4 312.1 334.7 357.4 440.4 469.7 499.0 528.3 577.6 586.8 616.1 410.3 440.0 478.7 510.6 538.6 555.6 242.8 262.	12	32.7	39.4	1.94		59.6	66.4	73.1		9.98		100.1	106.9	113.6			N
54.6 63.8 72.9 82.1 91.3 100.5 109.7 118.9 128.0 137.2 146.4 155.6 164.8 173.3 203.8 66.8 77.3 87.9 98.4 109.0 119.5 130.1 140.6 151.1 161.7 172.2 182.8 193.3 203.8 79.9 91.9 103.9 115.9 127.8 139.8 151.8 163.8 175.0 188.6 202.1 215.6 242.7 259.2 242.7 259.8 289.8 235.9 242.5 260.3 275.5 290.7 305.9 347.2 365.9 346.7 259.7 260.3 275.5 290.7 305.9 346.7 355.9 384.2 259.5 276.4 293.3 310.2 230.7 346.7 365.5 384.2 286.9 366.5 386.7 366.5 384.2 286.9 366.7 369.3 327.0 346.7 366.5 384.2 286.7 369.3 346.7 366.5 384.2 386.1 460.5 366.5 366.5 366.6 366.6 366.6	13	43.2	51.1	9.69		4.9	82.8	4.06		106.5	114.5		130.3	138.2	146.1	154.0	
66.8 77.3 87.9 98.4 109.0 119.5 130.1 140.6 151.1 161.7 172.2 182.8 193.3 203.8 179.9 91.9 103.9 115.9 127.8 139.8 151.8 163.8 175.8 187.8 199.8 211.8 223.8 223.8 235.8 93.8 107.3 120.9 134.4 147.9 161.5 175.0 188.6 2021. 215.6 229.2 242.7 256.3 242.7 256.3 154.2 169.3 134.4 147.9 161.5 175.0 242.5 259.3 246.7 256.3 346.7 256.3 375.5 290.7 365.5 384.2 215.6 234.3 253.0 242.5 259.5 376.4 293.3 310.2 377.1 344.0 215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 260.3 328.0 346.7 365.5 384.2 260.3 328.0 346.7 365.5 344.2 260.3 328.0 346.7 365.5 344.2 260.3 328.0 346.7 365.5 344.2 260.3 328.0 346.7 365.5 344.2 260.3 328.0 346.7 365.5 344.2 260.3 328.0 346.7 365.5 349.7 376.7 403.7 403.7 409.7 409.7 409.7 409.7 409.7 409.7 409.7 409.7 511.6 538.6 565.6 381.9 411.2 440.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3 17.5 17.5 17.5 17.5 17.5 17.5 17.5 17.5	4	54.6	63.8	72.9		91.3	100.5	109.7	118.9	128.0		146.4		164.8	173.9	183.1	e
79.9 91.9 103.9 115.9 127.8 139.8 151.8 163.8 175.8 189.8 199.8 211.8 223.8 235.8 93.8 107.3 120.9 134.4 147.9 161.5 175.0 188.6 202.1 215.6 229.2 242.7 256.3 269.8 154.1 169.3 184.4 199.6 214.8 230.0 245.2 260.3 275.5 290.7 305.9 215.6 234.3 225.6 242.5 259.5 276.4 293.3 310.2 327.1 344.0 215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 226.1 228.1 8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 380.1 402.8 467.6 492.4 517.2 349.7 376.7 484.7 511.6 538.6 565.6 349.7 469.7 499.0 528.3 557.6 586.8 616.1 4815.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	2	8.99	77.3	87.9		109.0	119.5	130.1	140.6	151.1		172.2		193.3	203.8	214.4	9
93.8 107.3 120.9 134.4 147.9 161.5 175.0 188.6 202.1 215.6 229.2 242.7 256.3 269.8 154.1 169.3 184.4 199.6 214.8 230.0 245.2 260.3 275.5 290.7 305.9 191.8 208.7 225.6 242.5 259.5 276.4 293.3 310.2 327.1 344.0 215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 261.2 281.8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 380.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 369.7 499.0 528.3 557.6 586.8 616.1 481.2 445.0 478.7 510.6 580.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3 77	91	79.9	91.9	103.9	115.9	127.8	139.8	151.8	163.8	175.8	187.8		211.8	223.8	235.8	247.8	6
154.1 169.3 184.4 199.6 214.8 230.0 245.2 260.3 275.5 290.7 305.9 191.8 208.7 225.6 242.5 259.5 370.3 310.2 327.1 344.0 215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 261.2 281.8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 380.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	7	93.8	107.3	120.9	134.4	147.9	161.5	175.0	188.6		215.6	. 34.	242.7	256.3	269.8	283.3	4
191.8 208.7 225.6 242.5 259.5 276.4 293.3 310.2 327.1 344.0 215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 261.2 281.8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 380.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 457.7 484.7 511.6 538.6 565.6 381.9 411.2 440.4 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	8				154.1	169.3	184.4	199.6	214.8	230.0		260.3	275.5	100	305.9	321.1	8
215.6 234.3 253.0 271.8 290.5 309.3 328.0 346.7 365.5 384.2 261.2 281.8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 380.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 369.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	6					191.8	208.7	225.6	242.5	259.5			310.2		344.0	360.9	2
261.2 281.8 302.5 323.2 343.8 364.5 385.1 405.8 426.5 289.4 312.1 334.7 357.4 360.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 376.7 480.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	0					215.6	234.3	253.0	271.8	290.5	309.3		346.7		384.2	403.0	N
289.4 312.1 334.7 357.4 380.1 402.8 425.4 448.1 470.8 318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 376.7 403.7 430.7 457.7 484.7 511.6 538.6 565.6 381.9 411.2 440.4 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	11						261.2	281.8	302.5	323.2	343.8			405.8		447.1	1
318.9 343.7 368.5 393.3 418.0 442.8 467.6 492.4 517.2 349.7 376.7 403.7 430.7 457.7 484.7 511.6 538.6 565.6 381.9 411.2 4460.4 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	2						289.4	312.1	334.7	357.4	380.1			448.1	470.8	493.5	e
349.7 376.7 403.7 430.7 457.7 484.7 511.6 538.6 565.6 381.9 411.2 440.4 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	3						318.9	343.7	368.5	393.3	418.0		3350	495.4	517.2	542.0	
381.9 411.2 440.4 469.7 499.0 528.3 557.6 586.8 616.1 415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	54						349.7		403.7		457.7	484.7	511.6	538.6	565.6	592.6	
415.3 447.0 478.7 510.3 542.0 573.7 605.3 637.0 668.7 450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	52						381.9		440.4		499.0	528.3	557.6	586.8	616.1	645.4	æ
450.1 484.2 518.4 552.5 586.7 620.9 655.0 689.2 723.3	92						415.3	447.0	478.7	510.3	542.0	573.7	605.3	637.0	668.7	700.4	
Tota	27						450.1	484.2	518.4	552.5	586.7	650.9	655.0	689.2	723.3	757.5	
Tota																	
															F	otal	42

Weighted regression: BFV = -28.0674 * 0.00937 * d²h; increased efficiency = 147 percent; standard error of estimate = 27.3 board feet or 16 percent of the mean volume.
 For example, 9-inch class includes trees 8.6 to 9-5 inches in diameter.
 For example, 60-foot class includes trees 57.6 to 62.5 feet tall.
 Aumber of trees; range of data is shaded. Includes 42 black cottonwood.

Table 4—Board-foot volumes, Scribner rule (1-foot stump to 6-inch top dib) given dbh and height to a usable top for white spruce and black spruce, Susitna River basin, Alaska[‡]

рвн					Не	Height to	a 6-ir	a 6-inch top dib in feet (h)	dib in	feet (P	, C					Trees	Trees d measured
(a) (a)	5	10	15	20	25	30	35	Óħ	45	50	55	09	65	20	75	White	Black
Inches							Board-1	-Board-foot volume	ume							Number	per
9	1.3	2.8	4.3	5.8	7.4	9.0	10.5									1	1
7	1.9	3.9	6.0	8.1	10.2	12.4	14.6	16.8	19.0							4	N
œ	5.2	5.5	7.9	10.7	13.6	16.4	19.4	22.3	25.2							23	00
6	3.5	9.9	10.1	13.7	17.4	21.1	24.8	28.6	32.4	36.2	40.0					40	2
10	4.0	8.3	12.7	17.2	21.7	26.3	31.0	35.7	40.4	45.2	50.0					34	3
11	4.9	10.1	15.5	21.0	26.6	32.2	37.9	43.7	49.5	55.3	61.1	67.0				22	4
12	5.8	12.1	18.6	25.2	31.9	38.7	45.6	52.5	59.4		73.5	80.5	9.78	94.8	101.9	31	1
13	6.9	14.4	22.1	29.9	37.8	45.9	54.0	62.1	70.4	78.7	87.0		103.8	112.2	120.7	14	N
14		16.8	25.8	35.0	44.2	53.6	63.1	72.7	82.3	92.0	101.7	111.5	121.4	131.2	141.2	1.4	1
15			29.8		51.2	62.0	73.0	84.1	95.2	150.00	117.7	129.0	140.4	151.8	163.3	8	
16			34.2	46.3	58.7	71.1	83.7	96.4	109.1	122.0	134.9	147.9	160.9	174.0	187.2	89	
17			38.9	52.7	2.99		95.1	109.5		138.6	2.5790	168.1	182.9	197.8	212.7	4	
18			43.9	59.4	75.2	91.2	107.3	123.6	140.0	156.4	173.0	189.6	206.4	223.2	240.0	4	
19						102.2	120.3	138.5	156.9	175.4	193.9	212.6	231.3	250.2	269.1		
50							134.1	154.4	174.8	195.4	216.1	236.9	257.8	278.8	6.662		
21									193.8	216.6	239.6	262.6	285.8	309.1	332.4		
22										239.0	264.3	289.8	315.3	341.0	366.8		
23										262.5	290.3	318.3	346.4	374.6	402.9		
24										287.2	317.6	348.2	378.9	8.604	440.8		
25										313.1	346.3	379.6	413.1	446.7	480.5	н	
56										340.1	376.2	412.4	448.8	485.3	522.0		
27										368.4	407.4	446.6	486.0	525.6	565.3		
					*									ŕ		800	22
														1	ora.	200	Ĭ

^a Regression: BFV = 0.005601 * (d²h)^{1.05619}; increased efficiency = 171 percent; standard error of estimate = 6.4 board feet or 16 percent of the mean volume.

^b For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter

^c For example, 60-foot class includes trees 57.6 to 62.5 feet tall.

^d Number of trees; range of data is shaded. Includes 208 white spruce and 27 black spruce.

Table. 5—Board-foot volumes, Scribner rule (1-foot stump to 6-inch top dib) given dbh and height to a usable top for paper birch and quacking aspen, Susitna River basin, Alaska^a

measured	Quaking aspen	Number		-1	7	5		8	3	н											
9	Paper	N	н	4	14	7	16	12	14	7	3	7		2	н		н			ĺ	
	65	1					71.6	87.1	104.1	122.7	142.9	164.6	187.9	212.8	239.3	267.4	297.1	328.4	361.4		
	09			31.7	41.7	53.1	0.99	80.2	6.56	113.0	131.6	151.6	173.1	196.0	220.4	246.3	273.6	302.5	332.8		
	55	1		29.0	38.2	48.6	60.3	73.4	87.7	103.4	1.20.4	138.7	158.3	179.3	201.6	225.3	250.3	276.6	304.3		
	50	! ! ! !		26.3	34.6	44.1	54.7	66.5	9.62	93.8	109.2	125.8	143.6	162.6	182.8	204.3	227.0	250.9	276.0		
	45	1		23.6	31.1	39.6	49.1	59.7	71.4	84.2	98.0	112.9	128.9	145.9	164.1	183.3	203.7	225.2	247.7		
	40	volume-	15.3	20.9	27.5	35.1	43.5	52.9	63.3	74.6	86.8	100.0	114.2	129.3	145.4	162.5	180.5	199.5	219.5		
	35	Board-foot volume	13.3	18.3	24.0	30.6	38.0	46.2	55.2	65.0	75.7	87.2	9.66	112.8	126.8	141.7	157.4				
5	30	Boar	11.4	15.6	20.5	26.1	32.4	39.4	47.1	55.5	9.49	74.5	85.0	96.3	108.2	120.9	134.4				
	25		4.6	12.9	17.0	21.6	56.9	32.7	39.1	0.94	53.6	61.8	70.5	8.64	89.8	100.3	111.4				
	50		7.5	10.3	13.5	17.2	21.4	26.0	31.1	36.6	42.6	49.1									
	15	! !	5.6	7.7	10.1	12.8	15.9	19.3	23.1	27.3	31.7										
	10	i ! ! !	3.7	2.0	9.9	8.5	10.5	12.8	15.3	18.0	20.9										
	2		1.8	2.5	3.3	4.2	5.5	6.3	7.5	8.8	10.3										
рви	(a)	Inches	9	7	80	6	10	11	12	13	14	15	16	17	18	19	20	21	22		

[;] increased efficiency = 119 percent; standard error of estimate = 8.3 board feet or 18 percent of the mean volume,

For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter, дυд

Number of trees; range of data is shaded. Includes 84 paper birch and 13 quaking aspen. For example, 60-foot class includes trees 57.6 to 62.5 feet tall,

Table 6—Board-foot volume (1-foot stump to 6-inch top dib) given dbh and height to a usable top for black cottonwood, Susitna River basin, Alaska³

25															
	30	35	40	45	50	55	09	65	70	75	8.	85	96	95	Black
1 1					Boar	Board-foot volume-	volume-								Number
6.9	8.9	10.9	12.8	14.8	16.8										
10.5	13.2	15.8	18.5	21.2	23.9	56.6	29.5								1
14.6	18.1	21.6	25.1	28.6	32.1	35.6	39.1								4
19.2	23.7	28.1	32.5	37.0	41.4	45.8	50.3	54.7	59.1						-
24.4	29.9	35.4	40.8	46.3	51.8	57.3	62.7	68.2	73.7						
30.2	36.8	43.4	50.0	56.7	63.3	6.69	76.5	83.1	7.68						7
36.5	44.3	52.2	60.1	68.0	75.9	83.7		99.5	107.4	115.2	123.1	131.0			2
43.3		61.8	71.0	80.3	89.5	98.8	108.0	117.3	126.5	135.8	145.0	154.2	163.5	172.7	
50.7	61.4	72.1	82.9	93.6	104.3	115.0	125.7	136.5	147.2	157.9	168.6	179.3	190.1	200.8	e
58.6	70.9	83.2	95.5	107.9	120.2	132.5	144.8	157.1	169.4	181.7	194.0	206.3	218.6	230.9	9
67.1	81.1	95.1	109.1	123.1	137.1	151.1	165.1	179.1	193.1	207.1	221.1	235.1	249.1	263.1	2
76.1	91.9	107.7	123.6	139.4	155.2	171.0	186.8	202.6	218.4	234.2	250.0	265.8	281.6	297.4	4
			138.9	156.6	174.3	192.0	209.8	227.5	245.2	262.	280.7	298.4	316.1	333.8	2
			155.1	174.8	194.6	214.3	234.0	253.8	273.5	293.3	313.0	332.8	352.5	372.3	2
				194.0	215.9	237.8	259.6	281.5	303.4		347.2	369.0	390.9	412.8	8
					238.3	262.4	286.6	310.7	334.8	358.9	383.0	407.2	431.3	455.4	
					261.8	288.3	314.8	341.3	367.7	394.2	420.7	447.2	473.6	500.1	3
					286.4	315.4	344.3	373.3	402.2	431.1	460.1	489.0	517.9	546.9	
					312.2	343.7	375.2	406.7	438.2	469.7	501.2	532.7	564.2	595.7	
					339.0	373.1	407.3	441.5	475.7	509.9	544.1	578.3	612.5	9.919	п
					366.9	403.8	440.8	477.8	514.8	551.7	588.7	625.7	662.7	7.669	
					395.8	435.7	475.6	515.5	555.4	595.2	635.1	675.0	714.9	754.7	1
															-

Weighted regression: BFV = -2.91379 + 0.01094 • d^2h ; increased efficiency = 170 percent; standard error of estimate = 22.2 board feet or 13 percent of the mean volume, For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter, Д ט ש

Number of trees; range of data is shaded. Includes 42 black cottonwood. For example, 60-foot class includes trees 57.6 to 62.5 feet tall,

Table 7—Merchantable cubic-foot volume (1-foot stump to 4-inch top dib) given dbh and total height, Smalian's formula, for white spruce and black spruce, Susitna River basin, Alaskaª

0						Tot	at neigi	lotal neignt in leet (n)	(11)							mea	d measured
	20	25	30	35	40	45	50	55	09	65	70	75	80	85	06	White	Black
Ì							-Cubic-	-Cubic-foot volume	Lume				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		-	Nur	Number-
. 0		1.0	1.2		1.7	1.9	2.1	2.4	5.6	2.9						7	1000
1		1.5	1.8		2.5	2.8		3.5	3.9	4.2	4.5					19	1150
н		2.1	2.6		3.5	3.9	11.00	6.4		5.8	6.3	6.7	7.2			12	
8	2.2	2.8	3.4		4.6	5.5	5.8	6.4	19	9.2	8.2	8.9	9.5			56	
2		3.6			5.9	6.7	7.4	8.2	9.0	9.7	10.5		12.0			40	5
က		4.5	5.5	6.4	7.3	6	9.2	10.2	T. 1	12.1	13.0	14.0	14.9			34	100
		5.5		.8	7.8 8.9	10.1	11.2	12.4	13.5	14.6	2000/01/20	16.9	18.1	19.5		22	4
		9.9		9.3	10.7	12.0	13.4	14.8	16.1	17.5	18.8		21.6	22.9	24.3	31	1
		7.8		11.0	12.6	14.2	15.8	17.3	18.9	20.5	22.1	125	25.3	26.9	28.5	14	8
			10.9	12.7	14.6	16.5	18.3	20.2	22.0	23.9	25.7	A Second		31.3		14	-
				14.7	16.8	18.9	21.0	23.2	25.3	27.4	29.5	31.7	33.8	35.9	38.1	∞	
			14.3	16.7	19.1	21.6	24.0	26.4		31.2	33.7	36.1	38.5	40.9	43.3	∞	
			16.2	18.9	21.6	24.4	27.1	29.8	Stone L	35.3		40.7	43.5	46.2	48.9	4	
				21.2	24.3	27.3	30.4	33.5	36.5	39.6	42.6	45.7	48.8	51.8	443	4	
							33.9	37.3	40.7	44.1	47.5	51.0	54.4	57.8	61.2		
									45.1	48.9	52.7	56.5	60.3	64.0	8.79		
										54.0	58.1	62.3	66.5	9.02	74.8		
										59.2	63.8	68.4	73.0	77.5	82.1		
											8.69	74.8	79.8	8.48	8.68		
											0.92	81.4	86.9	92.3	8.76		
											82.5	88.4	94.3	100.2	106.1	-	
											89.2	95.6	102.0	108.4	114.8		
											96.2	103.1	110.0	116.9	123.8		
														Ę.	Total	244	143

Weighted regression: CFV = -0.21849 * 0.00189 ° d^2h ; increased efficiency = 136 percent; Number of trees; range of data is shaded. Includes 244 white spruce and 43 black spruce. standard error of estimate = 1.4 cubic feet or 13 percent of the mean volume, For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter, For example, 60-foot class includes trees 57.6 to 62.5 feet tall,

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Table 8—Merchantable cubic-foot volume (1-foot stump to 4-inch top dib) given dbh and total height, Smalian's formula, for paper birch and quaking aspen, Susitna River basin, Alaska^a

(4)	-				147				Ď					
	52	30	35	40	45	50	55	09	65	70	75	80	Paper	Quaking aspen
Inches			-		no	oic-foot	Cubic-foot volume-	1					InN	Number
2	9.	6.	1.1	1.4	1.7	1.9	2.2	2.5	2.7	3.0	3.5		ĸ	
9	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.8	4.2	4.6	2.0		2	+
7	1.9	2.4	2.9	3.4	3.9	4.5	5.0	5.5	6.0	6.5	7.0		80	1
80	2.7	3.3	4.0	4.7	5.4	6.0	6.7	7.4	8.1		9.4		16	4
6	3.6	4.4	5.3	6.1	7.0	7.8	8.7	9.5	10.4	11.3	12.1		2	7
10	4.6	9.6	6.7	7.7	8.8	9.8	10.9	11.9	13.0	14.1	15.1	16.2	16	
11	5.7	6.9	8.5	9.5	10.8	12.1	13.3	14.6	15.9	17.2	18.4	19.7	12	2
12	6.9	8.4		11.4	13.0	11.12.2	16.0	17.5	19.0	9.02	22.1	23.6	14	3
13		10.0	11.8	13.6	15.3	17.1	18.9	20.7	22.5	24.2	26.0	27.8	7	1
14			13.8	15.8	17.9	20.0	22.0	24.1	26.2	28.2	30.3	32.4	က	
15) ė	18.3	20.7	23.0	25.4	27.8	30.1	32.5	34.9	37.3	7	
16				20.9	23.6	26.3	29.0	31.7	34.4	37.1	39.8	42.5		
17					26.7	8.62	32.8		38.9	42.0	45.0.	48.1	2	
18			6)		30.1		36.9	40.3	43.7	47.1	9.09	54.0	1	
19					33.6		41.2	45.0	48.8	52.6	56.4	60.2		
20					37.3	41.5	45.7	6.64	54.1	58.4	62.6	8.99	-	
21				1 64				55.1	59.8	64.4	69.1	73.7		
22							¥	9.09	65.7	70.8	75.9	81.0	l	Î
												Total	07	14

Weighted regression: CFV = -0.71200 + 0.00211 * d h; increased efficiency = 109 percent; standard error of estimate = 2.0 cubic feet or 16 percent of the mean volume, For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter, ט ש ď Д

Number of trees; range of data is shaded. Includes 97 paper birch and 14 quaking aspen. For example, 60-foot class includes trees 57.6 to 62.5 feet tall,

Table 9—(Merchantable cubic-foot volume (1-foot stump to 4-inch top dib) given dbh and total height, Smalian's formula, for black cottonwood, Susitna River basin, Alaska³

75 80 85	7.5						
oot volume		75	70 75		0.2	65 70	5 60 65 70
	2		Cubic-fo				
2.4 2.6		2.1	1.9 2.1	N	4 1.7 1.9 2	1.4 1.7 1.9 2	1.4 1.7 1.9 2
ij.			3.3	3.3	7 3.0 3.3	7 3.0 3.3	2.0 2.3 2.7 3.0 3.3
sal			5.1	5.1	1 4.6 5.1	4.1 4.6 5.1	3.2 3.7 4.1 4.6 5.1
8.2 8.8		9.7	7.0	7.0	8 6.4 7.0	5.8 6.4 7.0	4.6 5.2 5.8 6.4 7.0
10.8 11.5		10.0	9.3		9.3	9.5 9.3	9.3
Ē			14 5	14 5	3 W 4 10 E	12.3 13. 1 14 E	10.0 11.1 12.3 #3.10 E
			17.6		17.6	14.8 16.2 17.6	13.5 14.8 16.2 17.6
24.0 25.6		22.4	20.8	20.8	.7 19.3 20.8	17.7 19.3 20.8	16.1 17.7 19.3 20.8
28.1 29.9			24.4	24.4	.7 22.6 24.4	20.7 22.6 24.4	18.9 20.7 22.6 24.4
32.4 34.6		30.3	28.5		26.1 28.2	24.0 26.1 28.2	24.0 26.1 28.2
37.1 39.5		34.7	32.3 34.7		.5 29.9 32.3	27.5 29.9 32.3	25.1 27.5 29.9 32.3
42.1 44.8		39.4	36.6		.2 33.9 36.6	31.2 33.9 36.6	31.2 33.9 36.6
47.3 50.4			41.2	41.2	38.2 41.2	35.1 38.2 41.2	35.1 38.2 41.2
6		49.5	46.1 49.5		.3 42.7 46.1	.3 42.7 46.1	.3 42.7 46.1
58.8 62.5		55.0	51.2		51.2	51.2	51.2
64.9 69.1		8.09	56.6 60.8				
78.2 83.1			68.2 73.2				
85.2		8.62		8.62	8.62	8.62	8.62
92.6 98.5		86.7	7	86.7	86.7	86.7	86.7
100.3 106.6		93.9		93.9	93.9	93.9	93.9
108.2 115.1		-	94.5 101.4	-	-	-	-

Weighted regression: CFV = -1-39764 + 0.00188 ° d h; increased efficiency = 138 percent; standard error of estimate = 4.1 cubic feet or 11 percent of the mean volume.

For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter.

For example, 60-foot class includes trees 57.6 to 62.5 feet tall, d Number of trees; range of data is shaded. Includes 43 black cottonwood.

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Table 10—Merchantable cubic-foot volume (1-foot stump to 4-inch top dib) given dbh and height to a usable top, Smalian's formula, for white spruce and black spruce, Susitna River basin, Alaska^a

9																	
	10	15	20	25	30	35	40	45	50	55	09	65	70	75	80	White	Black
Inches							-Cubic-foot volume-	oot vol	ume				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			ınN	Number
2	1.1	1.4		0	2.3	2.6	2.9							e		7	-
	7	1.8	19.00	2.7	3		4.0	4.5	4.9							19	6
	1.7	2.3		.5	4.1		5.3	5.9	6.5	7.1	7.7					12	6
	2.1	2.9	3.6	۷.	5.2	59"4	6.7	7.5	8.3	9.1	6.6					56	80
	2.5		4.5	4	6.4	7.4	8.4	9.4	10.4	11.3	12.3					40	5
	2.9		5.4	Sept 1	7.8	6.0	10.2	11.5	12.7	13.9	15.1	16.3				34	3
11	3.5	4.9		7.9	9.3		12.3	13.8	15.2	16.7	18.2	19.6	21.1			22	4
	4.0	5.8	7.5	9.3	Solver.	12.8	14.5	16.3	18.0	19.8	21.5	23.3	25.0	26.8	28.5	31	н
		6.7		10.8	12.8	14.9	16.9	19.0	21.1	23.1	25.2	27.2	29.3	31.3	33.4	14	7
			10.0	12.4	14.8	17.2	19.6	22.0	24.3	26.7	29.1	31.5	33.9	36.2	38.6	14	н
			11.5	14.2	16.9	19.7	22.4	25.1	27.9	30.6	33.3	36.1	38.8		44.3	80	
			13.0	16.1	19.2	22.3	25.4	28.5	31.6		37.8	41.0	44.1	47.2	50.3	80	
			14.6	18.1	21.6	25.1		32.1		39.1		46.2	KE	53.2	26.7	4	
			16.3	20.5	24.1	28.1		35.9		43.8	47.8		55.6	9.69	63.5	4	
19						31.2	35.6	40.0		48.8	53.2	57.5	61.9	66.3	70.7		
								44.3	49.1	54.0	58.8	63.7	9.89	73.4	78.3		
									54.1	59.5	64.8	70.2	75.5	80.9	86.2		
									59.3	65.2	71.1	77.0	82.8	88.7	94.6		
										71.2	9.77	84.1	90.5	6.96	103.4		
										77.5	84.5	91.5	98.5	105.5	112.5		
											91.6	99.5	106.8	114.4	122.0	1	
											99.1	107.3	115.5	123.7	131.9		
											106.8	115.7	124.5	133.4	142.2		Ì

Weighted regression: CFV = 0.519^3 + 0.00243 * d h; increased efficiency = 117 percent; standard error of estimate = 1.3 cubic feet or 12 percent of the mean volume.

For example, 9-inch class includes trees 8.6 to 9-5 inches in diameter.

For example, 60-foot class includes trees 57.6 to 62.5 feet tall.

Includes 244 white spruce and 43 black spruce. Number of trees; range of data is shaded.

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Table 11—Merchantable cubic-foot volume (1-foot stump to 4-inch top dib) given dbh and height to a usable top, Smalian's formula, for paper birch and quaking aspen, Susitna River basin, Alaska

рвн					Hei	ght to	Height to a 4-inch top dib in feet	h top d	ib in f	eet					meas	Trees d measured
(g)	5	10	15	20	25	30	35	40	45	50	55	09	65	70	Paper	Quaking aspen
Inches						3	Cubic-foot volume	ot volum	ne						In N-	Number
5	® .	2.5	1.5	1.9	2.5	2.6	2.9	3.3	3.6						3	
9	1.0	1.5	5.0	ing of	3.0	3.5	4.0	4.5	5.0	5.5					2	1
7	1.2	1.8	500		3.9	4.6	5.2	5.9	9.9	7.3					80	1
80	1.4	2.3	3.1	4.0	6.4	5.8	6.7	9.4	8.5	9.4	10.3	11.2			16	4
6	1.6	2.7	3.9		6.1	7.2	8.4	9.5	10.6	11.7	12.9	14.0	15.1		2	2
10	1.9	3.3	4.6		7.4	8.8	10.2	11.6	13.0	14.4	15.8	17.2	18.5	19.9	16	
11			5.5	7.2	8.9	10.6	12.3	13.9	15.6	17.3	19.0	20.7	22.3	24.0	12	8
12			6.5	8.5	10.5	12.5		16.5	18.5	20.5	22.5	24.5	26.5	28.5	14	9
13			7.5	6.6	12.2	14.6	16.9	19.3	21.6	24.0	26.3	28.7	31.0	33.4	7	-
14			8.7	11.4	14.1	16.8	R	22.3	25.0	27.7	30.4	33.2	35.9	38.6	3	
15					16.1	19.2	22.4	25.5	28.6	31.8	34.9	38.0	41.1	44.3	4	
16					18.3	21.8	25.4	28.9	32.5	36.1	39.6	43.2	46.7	50.3		
17					20.6	24.6	28.6	32.6		40.6	44.7	48.7	52.7	26.7	2	
18					23.0	27.5	32.0	36.5	41.0	45.5	50.0	54.5	59.0	63.5	1	
19					25.6	30.6	35.6	9.04	45.6	50.7	55.7	60.7	65.7	7.07		
20					28.3	33.8	39.4	45.0	50.5	56.1	9'19	67.2	72.8	78.3	н	
21									9.55	61.8	6.79	74.0	80.2	86.3		
22									61.0	8.79	74.5	81.2	87.9	4.7	1	1
													Ţ	Total	44	14

Weighted regression: CFV = 0.A7860 + 0.00278 $^{\rm 0}$ d² h; increased efficiency = 106 percent; standard error of estimate =1.9 cubic feet or 15 percent of the mean volume.

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Number of trees; range of data is shaded. Includes 97 paper birch and 14 quaking aspen.

For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter.

For example. 60-foot class includes trees 57-6 to 62.5 feet tall.

Table 12—Merchantable cubic-foot volunge (1-foot stump to 4-inch top dib) given dbh and height to a usable top, Smalian's formula, for black cottonwood, Susitna River basin, Alaska

														09	measured
30	35	40	45	20	55	09	65	70	75	80	85	06	95	100	Black Cottonwood
	1					-Cubic-	Cubic-foot volume-	lume			-				Number
2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.6								
3.5	3.9	4.3	4.6	5.0	5.4	5.8	6.2	6.5							
4.3	4.8	5.3	5	6.4	6.9	7.4	4.9	8.5	0.6	9.5					2
5.3	5.9	9.9		8.0		9.3	10.0	10.7	11.3	12.0					4
6.3		8.1	8.9	8.6	10.6		12.3	13.2	14.0	14.9	15.7	16.6			1
7.5	8.6	4.6	10.7	11.8	12.8	13.9	Salano.	16.0	17.0	18.1	19.1	20.5			T
8.9	10.1	11.4	12.7	14.0	15.3	16.5	17.8	19.1	20.4	21.6	22.9	24.2			7
10.3	11.8	13.4	14.9	16.4	17.9		21.0	22.5	UC.	25.5	27.0	28.6	30.1		8
11.9	13.7	15.5	17.3	19.0	20.8	22.6	24.4	26.2	28.0	29.7	31.5	33.3	35.1	36.9	
13.6	15.7	17.8		21.9	24.0	26.0	28.1	30.2	32.2	34.3	36.4		40.5	42.6	m
15.5	17.8	20.5	22.6	25.0	27.3	29.7	32.1	34.4	36.8	39.5	41.6	43.9	46.3	48.7	9
17.4	20.1	22.8		28.5	30.9	33.6	36.3	39.0	41.7	44.4	47.1	8.64	52.5	55.2	8
19.5	22.6	25.6	28.7	31.7	34.8	37.8	40.9		46.9	50.0	53.0	56.1	59.1	62.2	4
			32.0	35.4	38.8	42.2	45.7			55.9	59.3	62.7	66.2	9.69	8
				39.3	43.1	46.9	50.7	54.5	58.3	62.2	0.99	8.69	73.6	4.77	2
				43.4	47.6	51.9	56.1	60.3	64.5	68.7	73.0	77.2	81.4	85.6	CI
					52.4	57.0	61.7	66.3	71.0	75.7	80.3	85.0	9.68	94.3	1
					57.4	62.5	9.19	72.7	77.8	82.9	88.0	93.1	98.2	103.3	e
					62.6	68.2	73.8	79.3	84.9	90.5	96.1	101.7	107.3	112.8	
					68.1	74.1	80.2	86.3	92.4	98.4	104.5	110.6	116.7	122.7	
					73.7	80.3	86.9	93.5	100.1	106.7	113.3	119.9	126.5	133.1	#
					7.62	86.8	93.9	101.1	108.2	115.3	122.5	129.6	136.7	143.8	
					85.8	93.5	101.2	108.9	116.6	124.3	132.0	139.7	147.3	155.0	Ì
								Ø			ä		E	10+01	43

Weighted regression: $CFV = 1.9987 + 0.00204 * d^2 h$; increased efficiency = 131 percent; percent of the mean volume. standard error of estimate = 4.1 cubic feet or 11

For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter.

For example, 60-foot class includes trees 57.6 to 62.5 feet tall.

Number of trees; range of data is shaded. Includes 43 black cottonwood.

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Table 13 –Total cubic-foot volume (1-foot stump to tree tip) given dbh and total tree height, Smalian's formula, for white spruce and black spruce, "Susitna" River basin, Alaska^a

(d) ^b 20 Inches					Tots	Total height in feet (h)	it in fe	set (h)							measur	measured
ches	25	30	35	40	45	50	55	09	65	02	7.5	80	85	06	White	Black spruce
						-Cubic-foot volume	oot vol	ume							Nue	Number
1.6	1.8	11979119		2.6	2 8,	3.0	3.3	3.5	3.8						7	H
6.2.0	त ()	2.7	3.1	0.00% TX 10	3.7	4.1	4.4		5.1	5.5					19	6
2.5		3.5	3.9	4.4	4.9	5.3	5.8		6.7	7.2	7.7	8.1			12	6
		4.3		Land I	6.2	8.9	7.4	2010/2010	8.6	9.5	8.6	10.4			56	80
		5.3	41.	1000	7.6	#. 8	9.2	9.9	10.7	11.5	12.3	13.0			40	5
		6.4	7.3		9.3	10.2	11.2	Buch	13.1	14.0	15.0	15.9			34	3
п	6.4		8.7	6.6	11.1	12.2	13.4	14.5		16.8	18.0	19.1	20.3		22	4
2	7.5		10.3	11.7	10% Y	14.4	15.8	17.2	18.5	19.9	21.3	22.7	24.0	25.4	31	+
13	8.7		12.0	13.6	15.2	16.8	18.4	20.0	21.6	23.3	24.9	26.5	28.1	29.7	1.4	N
14			13.8	15.6	W-26 -	19.4	21.2	23.1	25.0	26.9	28.7	30.6	32.5	34.3	1.4	1
15		13.5	15.7	Al Philips	1 1116 111	22.1	24.3	W.	28.6	30.7	32.9	35.0	37.2	39.3	œ	
16		15.3	17.8		22.7	25.1	27.5	30.0	32.4	34.9	37.3	39.8	42.2	44.7	80	
.7		17.2	20.0	22.7	25.5	28.3	31.0	33.8	36.5	39.3	42.1		9.44	50.3	7	
18			22.3	25.4	28.5	31.6	34.7	37.8	40.9	44.0	47.1	50.2	53.3	56.4	4	
61						35.1	38.6	42.0	45.5	48.9	52.4	55.8	59.3	62.7		
50								46.5	50.3	54.1	58.0	61.8	9.59	4.69		
21									55.4	9.69	63.8	68.0	72.3	76.5		
22									60.7	65.4	0.07	74.6	79.2	83.9		
23										71.4	76.4	81.5	86.5	91.6		
44										7.77	83.2	88.7	94.2	2.66		
25										84.2	90.2	96.2	102.1	108.1		
92										91.0	97.5	103.9	110.4	116.9		
27										98.1	105.1	112.0	119.0	126.0		1
													Tc	Total	244	43

Weighted regression: CFV = 0.65559 + 0.00191 ° d h; increased efficiency = 137 percent; standard error of estimate = 1.4 cubic feet or 11 percent of the mean volume.

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Number of trees; range of data is shaded. Includes 2kk white spruce and 43 black spruce.

For example, 9-inch class includes trees 8.6 to 9-5 inches in diameter.

For example, 60-foot class includes trees 57-6 to 62.5 feet tall.

Table 14—Total cubic-foot volume (1-foot stymp to tree tip) given dbh and total tree height, Smalian's formula, for paper birch and quaking aspen, Susitna River basin, Alaska

¥.					Total	height	Total height in feet (h)	t (h)					meas	measured
(a)	25	30	35	40	45	50	55	09	65	70	75	80	Paper birch	Quaking aspen
Inches		,			Cul	oic-foo	Cubic-foot volume-						Nu	Number
5	1.9	2.2	2.4	2.7	3.0	3.2	3.5	3.7	4.0	4.2	4.5		8	
9	2.5	5.9	3.2	3.6	4.0	4.4	4.7	5.1	5.5	5.8	6.2		5	н
7	3.5	3.7	4.2	4.7	5.5	5.7	6.2	6.7	7.2	7.7	8.2		∞	1
&	3.9	4.6	5.3	5.9	9.9	7.2	7.9	9.6	9.5	6.6	10.5		16	4
6	4.8	5.7	6.5	7.3	8.2	9.0	9.6	10.7	11.5	12.3	13.2		2	8
10	5.8	8.9	6.7	8.9	9.9	10.9	12.0	13.0	14.0	15.1	16.1	17.1	16	
11	6.9	8.1	9.4	10.6	11.9	13.1	14.4	15.6	16.8	18.1	19.3	20.6	12	8
12	8.1	9.5		12.5	14.0	15.5	17.0	18.4	19.9	21.4	22.9	24.4	14	n
13		11.1	12.8	14.6	16.3	18.1	19.8	21.5	23.3	25.0	26.8	28.5	7	н
14			14.8	16.8	18.8	20.8	22.9	24.9	26.9	28.9	30.9	32.9	3	
15				19.2	21.5	23.8	26.1	28.5	30.8	33.1	35.4	37.7	4	
16				21.7	24.4	27.0	29.6	32.3	34.9	37.6	40.2	42.8		
17					27.4	30.4	33.4	36.4	39.3	42.3	45.3	48.3	8	
18					30.7	34.0	37.4	40.7	44.0	47.4	50.7	54.0	1	
19					34.1	37.8	41.5	45.3	49.0	52.7	56.4	60.1		
20		w w			37.7	41.8	46.0	50.1	54.2	58.3	62.4	9.99	.	
21								55.2	59.7	64.2	68.8	73.3		
22								60.5	65.5	70.4	75.4	80.4	I	İ
												Total	40	14

Weighted regression: CFV = 0.6M56 + 0.00206 • d^2h ; increased efficiency = 113 percent; standard error of estimate = 1.8 cubic feet or 13 percent of the mean volume,

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For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter, c For example, 60-foot class includes trees 57.6 to 62.5 feet tall,

Number of trees; range of data is shaded. Includes 97 paper birch and 14 quaking aspen.

Table 15—Total cubic-foot volume (1-foot stump to tree tip) given dbh and total tree height, Smalian's formula, for black cottonwood, Susitna River basin Alask^a

#				To.		Tota	al heig	Total height in feet (h)	eet (h)	U		9		10		Trees d
(q) (a)	45	50	55	09	65	70	75	80	85	06	95	100	105	110	115	Black Cottonwood
Inches							-Cubic-	-Cubic-foot volume-	Lume							Number
	3.0		3.5	3.7	3.9	4.2	4.4	4.6	4.8	5.1						
9	3.9	4.2	4.6	4.9	5.5	5.5	5.9	6.2	6.5	6.9	7.2					
	2.0		5.9	6.3	8.9	7.2		8.1	8.5	0.6	4.6	6.6	10.3			2
	8.3		7.4	7.9	8.5	9.1	4.6	10.3	10.8	11.4	12.0	12.6	13.1			4
	9.2		0.6	8.6	10.5	11.2	12.0	12.7			14.9	15.6	16.4			
	9.1		10.9	11.8	12.8	13:7	14.6	15.5	16.4	17.3		19.1	20.0			1
11	10.8		13.0	14.	15.2	16.3	17.4	18.5	19.6	20.7	21.8	22.9	24.0			7
12	12.7	14.0	15.3	16.	17.9		20.5	21.8	23.1	24.4	25.7	27.1	28.4			8
13	14.8		17.8		20.9	22.4	23.9	25.5	27.0	28.5	30.0	31.6	33.1	34.6	36.2	
14	17.0		20.5	22.	24.0	25.8	27.6	29.4	31.1	32.9	34.7	36.5	38.2	40.0	41.8	3
15	19.3		23.4	25.	27.5	29.5	31.5	33.6	35.6	37.6	39.7	41.7	43.7	45.8	47.8	9
16	21.8	24.2	26.5	28.8	31.1	33.4	35.7	38.1	40.4	42.7	45.0	47.3	9.64	52.0	54.3	N
17	24.5	27.1	29.8	32.4	35.0	37.6	40.2	Serie	45.4	48.1	50.7	53.3	55.9		61.1	4
18				36.2	39.1	42.0	45.0	47.9	50.8	53.8	56.7	59.6	62.6	65.5	68.4	N
19					43.5	46.7	50.0	53.3	56.5	59.8	63.1	66.3	9.69	72.9	76.1	8
20					48.0	51.7	55.3	58.9	62.5	66.1	8.69	73.4	77.0	80.6	84.2	N
21						56.9	6.09	64.8	68.8	72.8	76.8	80.8	84.8	88.8	92.8	н
22						62.3	66.7	71.1	75.4	79.8	84.2	88.6	93.0	4.76	101.7	3
23						68.0	72.8	77.6	82.4	87.2	91.9	2.96	101.5	106.3	111.1	
24						74.0	79.2	84.4	9.68	8.46	100.0	105.2	110.5	115.7	120.9	
25						80.2	85.8	91.5	97.1	102.8	108.5	114.1	119.8	125.4	131.1	+
56						9.98	92.8	98.9	105.0	111.1	117.2	123.3	129.5	135.6	141.7	
27						93.4	6.66	106.5	113.1	119.7	126.3	132.9	139.5	146.1	152.7	
														E		4
														Total	ят	7.

Weighted regression: CFV = 0.98640 + 0.00181 ° d^2h ; increased efficiency = 138 percent; standard error of estimate = k.2 cubic feet or 11 percent of the mean volume.

Number of trees; range of data is shaded. Includes 43 black cottonwood.

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For example, 9-inch class includes trees 8.6 to 9.5 inches in diameter.

For example, 60-foot class includes trees 57.6 to 62.5 feet tall.