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Research Note



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SITE CURVES FOR RED ALDER

by

Daniel M. Bishop and Floyd A. Johnson
Pacific Northwest Forest and Range Experiment Station

and

George R. Staebler
Forestry Research Center, Weyerhaeuser Timber Co.

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The increasing commercial importance of red alder (*Alnus rubra*) in the Pacific Northwest has created a demand for research on this species. Noting the lack of information on growth of alder, the Puget Sound Research Center Advisory Committee established a subcommittee^{1/} in January 1956 to undertake construction of alder yield tables. Through the cooperative efforts of private and public forest agencies,^{2/} 437 sample plots of varied sizes were measured in northwestern Oregon, western Washington, and British Columbia.

This preliminary report presents site curves developed in the process of yield table construction. The curves are based on stem analysis data from 43 felled and sectioned trees, geographically distributed throughout western Washington (table 1).

An attempt was made to distribute the sampling of alder stands over varied ecological conditions, at the same time allowing coverage of the entire band of site values.

^{1/} William J. Lloyd, chairman; Laurence O. Barrett; Royce Cornelius; Gilbert E. Liming; and L. T. Webster.

^{2/} Cooperating agencies are listed on the last page.

Table 1.--Distribution and site indices
of red alder sample trees

County	Sample trees	Stands represented	Site indices represented
	<u>Number</u>	<u>Number</u>	
Clallam	10	4	78, 67, 80, 78
Grays Harbor	3	1	98
Island	3	2	62, 94
Kitsap	3	1	100
Lewis	3	1	88
Mason	4	1	88
Pacific	8	3	104, 111
Skagit	6	2	68, 92
Whatcom	3	1	104

The index stand age for these curves is 50 years. Stand age was arbitrarily defined for all sites as breast-high age plus 2 years.

The stem analysis data led to the following equation:

$$S.I. = \text{Height} (0.60924 + 19.538/\text{Age})$$

Solution of the equation is shown graphically in figures 1 and 2, and numerically in table 2.

For most uses, interpolated site indices from figures 1 and 2 should be adequate. However, the formula can be used almost as quickly if a desk calculator is available.

The general approach to the development of site indexing systems through stem analysis has been described by Bull^{3/} and Spurr.^{4/} A detailed description of the procedure used for this

^{3/} Bull, Henry. The use of polymorphic curves in determining site quality in young red pine plantations. Jour. Agr. Res. 43: 1-28, illus. 1931.

^{4/} Spurr, Stephen H. Soils in relation to site index curves. Soc. Amer. Foresters Proc. 1955: 80-85, illus. 1956.

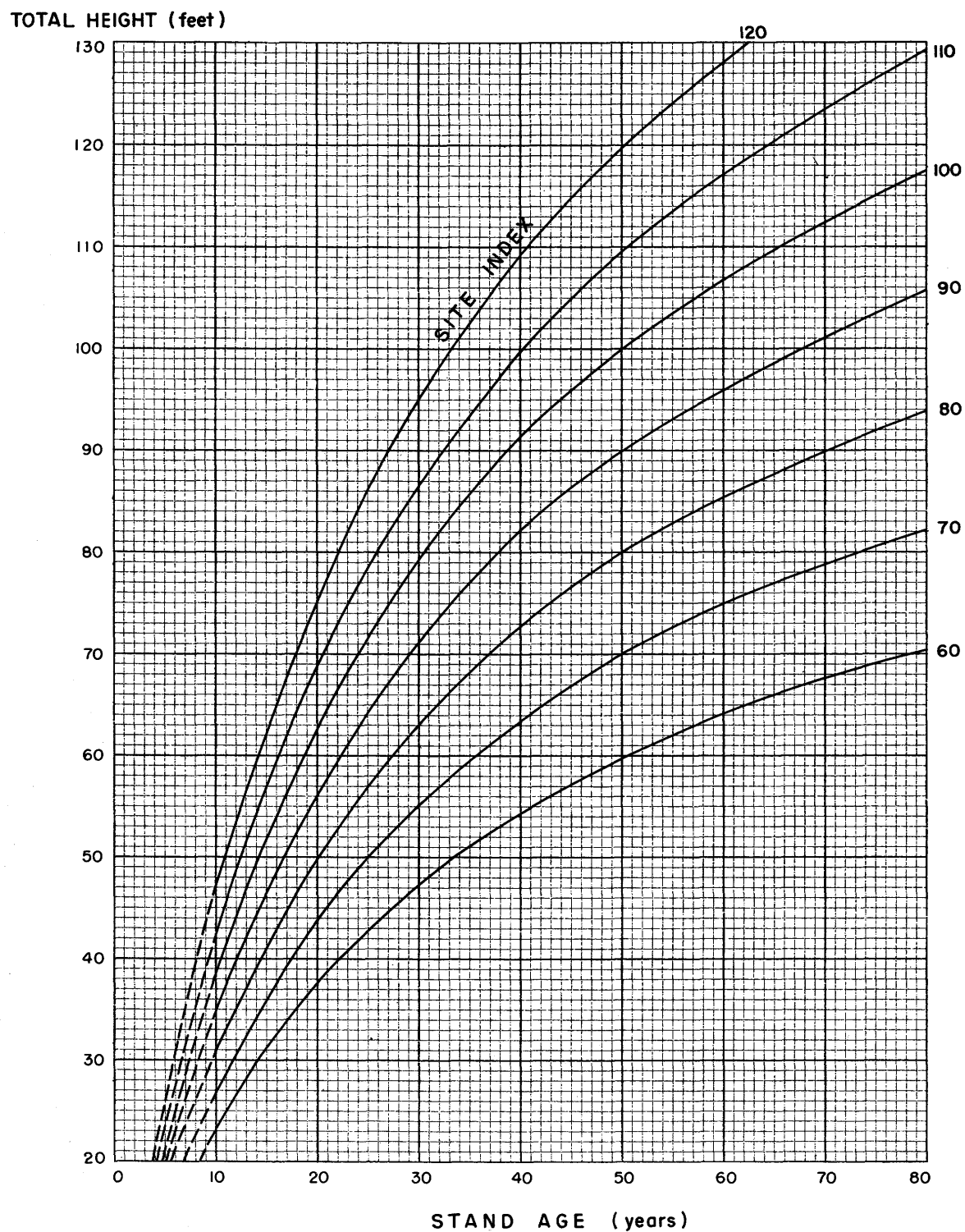


Figure 1. --Average total height of dominant and codominant red alder trees, by stand age and site index.

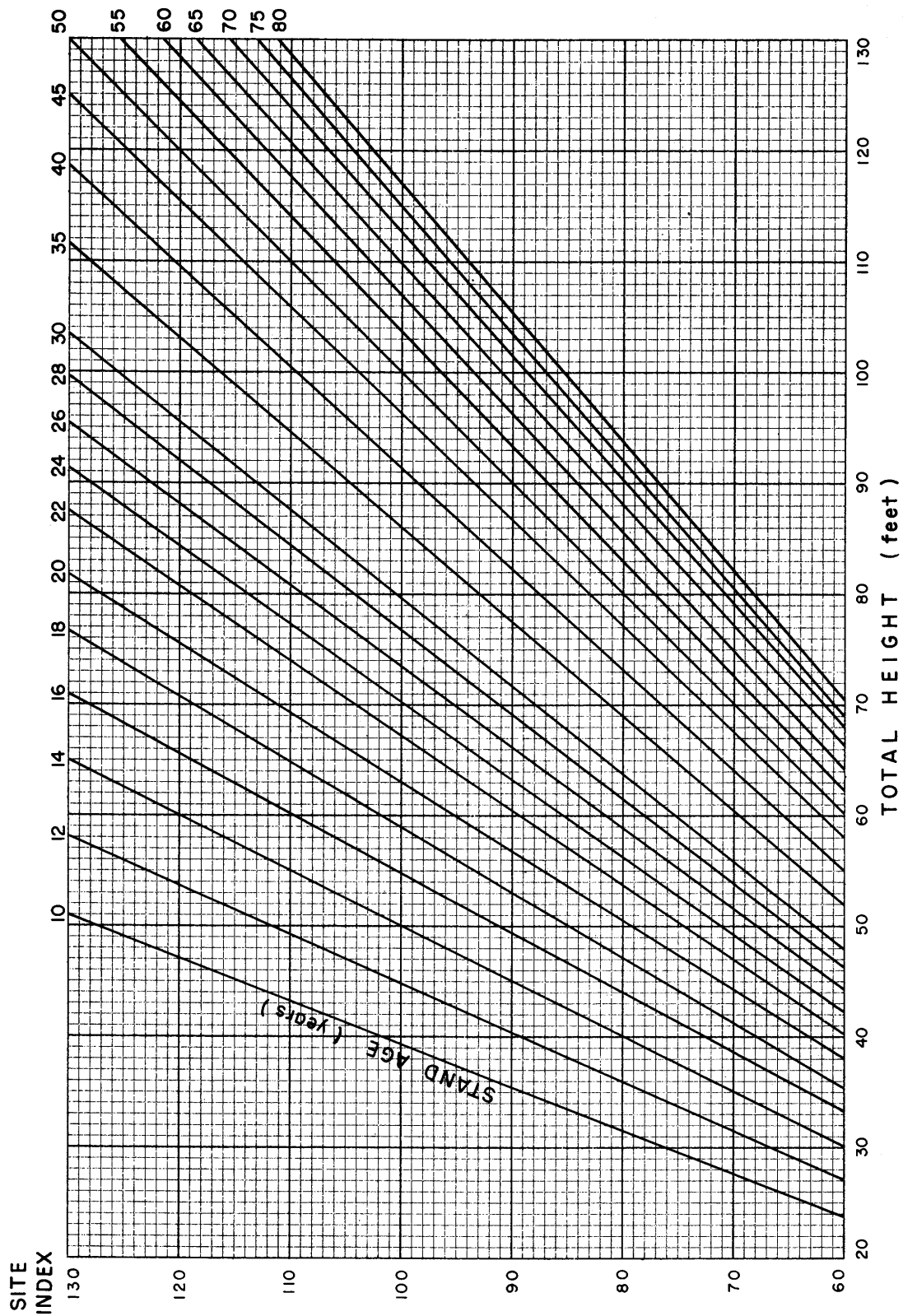


Figure 2. --Site index for red alder, by stand age and average total height of dominant and codominant trees.

Table 2.--Site index for red alder, by stand age and average total height of dominant and codominant trees

(In feet)

Stand age ¹ / (years)	Total height (feet)																				
	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
10	51	64	77	90	103	115	128	141	--	--	--	--	--	--	--	--	--	--	--	--	--
12	--	56	67	78	89	101	112	123	134	--	--	--	--	--	--	--	--	--	--	--	--
14	--	50	60	70	80	90	100	110	120	130	140	--	--	--	--	--	--	--	--	--	--
16	--	--	55	64	73	82	92	101	110	119	128	137	--	--	--	--	--	--	--	--	--
18	--	--	51	59	68	76	85	93	102	110	119	127	136	--	--	--	--	--	--	--	--
20	--	--	--	56	63	71	79	87	95	103	111	119	127	135	--	--	--	--	--	--	--
22	--	--	--	52	60	67	75	82	90	97	105	116	120	127	135	--	--	--	--	--	--
24	--	--	--	50	57	64	71	78	85	92	100	107	114	121	128	135	--	--	--	--	--
26	--	--	--	--	54	61	68	75	82	88	95	102	109	116	122	129	136	--	--	--	--
28	--	--	--	--	52	59	65	72	78	85	91	98	105	111	118	124	131	137	--	--	--
30	--	--	--	--	50	57	63	69	76	82	88	94	101	107	113	120	126	132	--	--	--
32	--	--	--	--	--	55	61	67	73	79	85	92	98	104	110	116	122	128	134	--	--
34	--	--	--	--	--	53	59	65	71	77	83	89	95	101	107	112	118	124	130	136	--
36	--	--	--	--	--	52	58	63	69	75	81	86	92	98	104	109	115	121	127	132	138
38	--	--	--	--	--	49	56	62	67	73	79	84	90	95	101	107	112	118	124	129	135
40	--	--	--	--	--	--	55	60	66	71	77	82	88	93	99	104	110	115	121	126	132
42	--	--	--	--	--	--	54	59	64	70	75	81	86	91	97	102	107	113	118	124	129
44	--	--	--	--	--	--	53	58	63	68	74	79	84	90	95	100	105	111	116	121	126
46	--	--	--	--	--	--	52	57	62	67	72	78	83	88	93	98	103	109	114	119	124
48	--	--	--	--	--	--	51	56	61	66	71	76	81	86	91	97	102	107	112	117	122
50	--	--	--	--	--	--	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
52	--	--	--	--	--	--	--	54	59	64	69	74	79	84	89	94	98	103	108	113	118
54	--	--	--	--	--	--	--	53	58	63	68	73	78	83	87	92	97	102	107	112	117
56	--	--	--	--	--	--	--	53	57	62	67	72	77	81	86	91	96	101	105	110	115
58	--	--	--	--	--	--	--	52	57	61	66	71	76	80	85	90	95	99	104	109	114
60	--	--	--	--	--	--	--	51	56	61	65	70	75	79	84	89	94	98	103	108	112
62	--	--	--	--	--	--	--	51	55	60	65	69	74	79	83	88	92	97	102	106	111
64	--	--	--	--	--	--	--	50	55	59	64	69	73	78	82	87	92	96	101	105	110
66	--	--	--	--	--	--	--	--	54	59	63	68	72	77	81	86	90	95	100	104	109
68	--	--	--	--	--	--	--	--	54	58	63	67	72	76	81	85	90	94	99	103	108
70	--	--	--	--	--	--	--	--	53	58	62	67	71	75	80	84	89	93	98	102	107
72	--	--	--	--	--	--	--	--	53	57	62	66	70	75	79	84	88	93	97	101	106
74	--	--	--	--	--	--	--	--	52	57	61	65	70	74	79	83	87	92	96	100	105
76	--	--	--	--	--	--	--	--	52	56	61	65	69	74	78	82	87	91	95	100	104
78	--	--	--	--	--	--	--	--	52	56	60	64	69	73	77	82	86	90	95	99	103
80	--	--	--	--	--	--	--	--	51	55	60	64	68	73	77	81	85	90	94	98	102

¹/ Breast-high age + 2 years.

particular application of the stem analysis technique is beyond the scope of this paper and will be covered in a later report. The primary purpose of this research note is to make the site curves available for use. For now, it may be enough to say that the analysis problem was essentially one involving multiple regression. The derived site system fitted the basic data well, with a tendency toward greater accuracy near age 50.

The data on accuracy of site determination plus experience gained in collecting the information suggest that site should be based on measurement of at least 3 trees. These should be from the dominant—codominant component of the stand and should show no evidence of serious top damage. Heights of the measured trees should not range more than 5 feet above or below the average of the sample; ages should not range more than 2 years from the average, though in uneven-aged stands it may be necessary to extend the limit to 5 years.

COOPERATING AGENCIES

1. Bloedel Timberlands
2. British Columbia Forest Service
3. Bureau of Land Management
4. Crown Zellerbach Corp.
5. Fibreboard Products, Inc.
6. Gifford Pinchot National Forest
7. Kaiser Gypsum Co.
8. Longview Fibre Co.
9. Milwaukee Land Co.
10. Mt. Baker National Forest
11. Northern Pacific Railway Co.
12. Olympic National Forest
13. Pope & Talbot, Inc.
14. Puget Sound Pulp & Timber Co.
15. Rayonier, Inc.
16. St. Paul & Tacoma Lumber Co.
17. St. Regis Paper Co.
18. Seattle Water Dept.
19. Scott Paper Co.
20. Simpson Logging Co.
21. Snoqualmie National Forest
22. Soil Conservation Service
23. Washington State Dept. of Natural Resources
24. Western Washington Indian Agency
25. West Tacoma Newsprint Co.
26. Weyerhaeuser Timber Co.
27. Willapa Valley Water District
28. Willamette Research Center