



CO-OP REDWOOD YIELD RESEARCH PROJECT

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Generalized Height Diameter Curves for Red Alder and Tanoak

by

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I. Introduction

Research Note No. 8 (Krumland and Wensel, 1978) described generalized height diameter models for coastal conifers. This report presents coefficients for the same models when applied to tanoak or alder. Readers should refer to Research Note No. 8 for a complete description and details of the application of these models.

II. Model Descriptions

Two different model forms are used for each species with coefficients being estimated separately for each model. The models employ the following variables :

H = total tree height to be estimated

D = DBH of tree

D_m = Average DBH of a sample of trees selected from the largest 20% in the stand (plot)

H_m = Average total height of trees corresponding to the ' D_m ' sample

A. Exponential Model

This model has the form:

$$H = (H_m) \exp [b(D^{c_0+c_1H_m} - D_m^{c_0+c_1H_m})]$$

where

b, c_0, c_1 = parameters to be estimated

$\exp('X')$ = 2.71828 raised to the power of 'X'.

B. Logistic Model

$$H = a_0 H_m / (1 + \exp[a_1 + a_2 (D/D_m) + a_3 (DH_m/D_m)])$$

where

a_0, a_1, a_2, a_3 = parameters to be estimated

III. Data

A. Alder

Sufficient alder measurements on sample plots were unavailable so tabled values from empirical alder yield tables (Chambers, 1974) in Washington were used as observations. Stock tables in this report included numbers of stems per acre and average height by diameter class for stems 8 inches DBH and larger by a variety of stocking, site and age classes. Each of these stock tables were utilized as a 'plot' and Weibull density functions (see Research Note No. 11) were fitted to the one inch DBH classes to arrive at an estimate of stems per acre in trees less than 8 inches. This was done to arrive at estimates of average height and diameter (H_m and D_m) of the largest 20% of the trees. Average tabled heights^m by each diameter class on each "plot" were then utilized as observations.

B. Tanoak

The heights and diameters of four trees from single measurements on each of forty three temporary growth plots located in Mendocino and Humboldt counties were used as observations. Values for H_m and D_m were computed from plot measurements.

IV. Coefficient Estimates

Table 1 gives coefficient estimates for each model by species.

Table 1

Coefficient estimates and statistical summaries for total height-DBH models by model form and species ^{1/}

Model I. Exponential Form

	Estimated Coefficients			Statistics		
	b	c ₀	c ₁	R ²	S _{y.x}	Sample Size
Tanoak	-3.628	-2.218	.00186	.82	6.9	174
Alder	-9.02	-1.234	-.00268	.99	.42	219

Model II. Logistic Form

	Estimated Coefficients				Statistics		
	a ₀	a ₁	a ₂	a ₃	R ²	S _{y.x} (feet)	Sample Size
Tanoak	1.002	1.453	-2.806	-.0317	.78	7.5	174
Alder	1.115	.920	-2.552	-.0063	.99	.88	219

^{1/} Alder summary statistics reflect differences between model predictions and tabled values which have already been smoothed. Hence, as measures of "true" variability, they are misleading.

LITERATURE CITED

Chambers, Charles J. 1974. Empirical yield tables for predominantly alder stands in western Washington. Washington State Dept. of Nat. Res., DNR Report No. 31.

Krumland, Bruce E. and Lee C. Wensel. 1978. Generalized height diameter equations for coastal conifers. Co-op Redwood Yield Res. Project, Res. Note No. 8.

Krumland, Bruce E. and Lee C. Wensel. 1979. Diameter distribution models for coastal stands in California. Co-op Redwood Yield Res. Project, Res. Note No. 11.