

# Diameter Growth Equations for CONUS Using L3 EcoRegion

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## Data

We took the FIA diameter growth data subset for loblolly pine, filtered out stray (likely keypunch errors) states (IL and MI), FIA plot locations with missing EPA L3 Codes, and where the diameter at the end of the 5-year or greater measurement interval was less than the starting diameter. This left 336857 growth observations.

The observations are distributed among L3 Codes as follows:

NA_L3NAME	NA_L3CODE	n
Southeastern Plains	8.3.5	114201
Piedmont	8.3.4	73136
South Central Plains	8.3.7	71417
Middle Atlantic Coastal Plain	8.5.1	32468
Mississippi Valley Loess Plains	8.3.6	10101
Southern Coastal Plain	8.5.3	9812
Ridge and Valley	8.4.1	6583
Ouachita Mountains	8.4.8	6448
Southwestern Appalachians	8.4.9	4895
Interior Plateau	8.3.3	1769
Arkansas Valley	8.4.7	1491
Blue Ridge	8.4.4	1232
Western Gulf Coastal Plain	9.5.1	835
Mississippi Alluvial Plain	8.5.2	690
East Central Texas Plains	8.3.8	614
Boston Mountains	8.4.6	309
Western Allegheny Plateau	8.4.3	270
Interior River Valleys and Hills	8.3.2	219
Texas Blackland Prairies	9.4.7	121

NA_L3NAME	NA_L3CODE	n
Ozark Highlands	8.4.5	111
Northern Piedmont	8.3.1	84
Central Appalachians	8.4.2	29
Atlantic Coastal Pine Barrens	8.5.4	15
Cross Timbers	9.4.5	7

## Diameter Growth Prediction

We fit the equation:

$$\Delta dbh = e^{(\beta_0 + \beta_1 \log(\frac{(dbh+1)^2}{(cr*ht+1)^{\beta_4}}) + \beta_2 \frac{bal^{\beta_5}}{dbh+2.7})} \quad (1)$$

to the all 336857 growth observations, estimating  $\beta_0$  through  $\beta_5$ .

We then subsetted the data by each EPA L3 Ecoregion and re-estimated the  $\beta_0$  parameter. The final parameter estimates are:

B0	B1	B2	B4	B5
-1.00532	-0.6217308	-0.0376308	1.637096	0.9013956

L3 Region	B0	n
Southeastern Plains	-1.0055762	114201
Piedmont	-1.0163614	73136
Southwestern Appalachians	-1.0139538	4895
Ridge and Valley	-1.0203463	6583
Interior Plateau	-0.9978802	1769
Mississippi Alluvial Plain	-0.9850924	690
South Central Plains	-0.9932296	71417
Ouachita Mountains	-0.9750805	6448
Southern Coastal Plain	-1.0174516	9812
Mississippi Valley Loess Plains	-0.9778620	10101
Middle Atlantic Coastal Plain	-0.9956689	32468
Blue Ridge	-1.0062695	1232
Western Gulf Coastal Plain	-0.9944943	835
Central Appalachians	-0.9679050	29
Arkansas Valley	-0.9557621	1491
Interior River Valleys and Hills	-1.0024575	219

L3 Region	B0	n
Boston Mountains	-0.9799012	309
East Central Texas Plains	-0.9865456	614
Northern Piedmont	-0.9973803	84
Texas Blackland Prairies	-1.0106973	121
Ozark Highlands	-1.0042574	111
Western Allegheny Plateau	-0.9863604	270
Cross Timbers	-0.8947571	7
Atlantic Coastal Pine Barrens	-1.0366728	15

### Residual Analysis for Equation 1

The residual analysis below shows that state and L3 Ecoregion bias has been mitigated but not eliminated – particularly in GA and SC. It also shows that the trends with the traditional site index estimates are largely gone.













