



CLIMATE
ACTION
RESERVE

Forest Project Protocol

Version 3.0
September 1, 2009

The derived estimate of biomass must be multiplied by 0.5 to calculate the mass (kg) in carbon. This product must be multiplied by 0.001 tonnes/kg to convert the mass to metric tonnes of carbon.

Because of the difficulties associated with measuring the below-ground carbon component of trees, the Reserve allows for the estimation of this component of tree carbon through the use of a regression equation (Cairns, Brown, Helmer, & Baumgardner, 1997). This equation provides a practical and cost-effective approach that estimates below-ground biomass of standing live trees using the sampling-based calculation of above-ground biomass of standing live trees only:

$$\text{BBD} = \exp(-0.7747 + 0.8836 * \ln(\text{ABD}))$$

Where:

BBD = below-ground biomass density of standing live trees in tonnes per hectare

ABD = above-ground biomass density of standing live trees in tonnes per hectare

This equation must be applied at the plot level, after estimates of above-ground biomass have been calculated as described above.

Example A.1. Quantification Example (Part III – Tree Biomass)

The chart below displays summary data for tree biomass for the first plot in Strata 1.

Tree Biomass								
1	2	3	4	5	6	7	8	9
Plot	Tree Number	Species	DBH (cm)	Total Height (m)	Status	Biomass (kg)	Weight (Expansion per Hectare)	Biomass (kg per Hectare)
1	1	Redwood	65	32	L	2,560	21	53,768
1	2	Douglas-fir	65	29	L	2,007	21	42,152
1	3	Tanoak	28	14	L	280	112	31,402
1	4	Redwood	68	30	L	2,677	19	50,858
1	5	Redwood	76	27	L	3,086	15	46,287
1	6	Douglas-fir	65	34	L	2,310	21	48,501
1	7	Tanoak	42	17	L	729	50	36,442
1	8	Tanoak	46	18	L	914	41	37,464
Total								346,874

The plot in this example was measured using a 30 square foot basal area factor prism. The plot number is entered in column 1. All 'in' trees (trees on the plot) are measured and input consecutively starting at North and proceeding clockwise (this facilitates check cruising, quality control). Each tree is numbered (column 2), the species documented (column 3), the DBH measurements entered as centimeters in column 4, and the total height entered as meters in column 5.

The status of the tree goes in column 6. The status codes are shown below.