Section: Appendix A
Estimation of Biomass Weights from Forestry Volume Data

Simple volume to weight conversion

An equation for estimation of merchantable biomass from merchantable volume assuming the specific gravity and moisture content are known and the specific gravity basis corresponds to the moisture content of the volume involved.

Weight = (volume) * (specific gravity) * (density of H_2O) * ($1+MC^{od}/100$)

where volume is expressed in cubic feet or cubic meters,

where the density of water is 62.4 lb/ft^3 or 1000 kg/m^{3,}

where MC^{od} equals oven dry moisture content.

for example the weight of fiber in an oven dry log of 44 ft^3 with a specific gravity of 0.40 =

40 ft^3*0.40 * 62.4 lb ft^3 * (1+0/100) equals 1,098 lb or 0.549 dry ton

Source: Briggs D. 1994. Forest Products Measurements and Conversion Factors, Chapter 1. College of Forest Resources University of Washington. http://www.ruraltech.org/projects/conversions/briggs_conversions/briggs_book.asp

Specific gravity (SG) is a critical element of the volume to biomass estimation equation. The SG content should correspond to the moisture content of the volume involved. SG varies considerably from species to species, differs for wood and bark, and is closely related to the moisture content as explained in graphs and tables in Briggs (1994). The wood specific gravity of species can be found in several references though the moisture content basis is not generally given. Briggs (1994) suggests that a moisture content of 12% is the standard upon which many wood properties measurements are based.

Biomass expansion factors for estimating total aboveground biomass Mg ha^{-1} from growing stock volume data (m^3 ha^{-1})

Methods for estimating total aboveground dry biomass per unit area from growing stock volume data in the USDA ForestService FIA database were described by Schroeder et. al (1997). The growing stock volume was by definition limited to trees > than or equal to 12.7 cm diameter. It is highly recommended that the paper be studied for details of how the biomass expansion factors (BEF) for oak-hickory and beech-birch were developed.

The BEFs for the two forest types were combined and reported as:

BEF = EXP (1.912 - 0.344*lnGSV) **GSV = growing stock volume m^3 ha^{-1}**

R2 = 0.85, n = 208 forest units , std. error of estimate = 0.109.

The result is curvilinear with BEF values ranging from 3.5 to 1.5 for stands with very low growing stock volume and approaching the value of 1 at high growing stock volumes. Minimum BEFs for the forest types evaluated are estimated to be about 0.61 to 0.75.

Source: Schroeder P, Brown S, Mo J, Birdsey R, Cieszewski C. 1997. Biomass estimation for temperate broadleaf forests of the US using forest inventlry data. Forest Science 43, 424-434.