

ESTIMATING OUTSIDE-BARK STEM VOLUME TO ANY TOP DIAMETER FOR ASH IN WISCONSIN

Paul F. Doruska and Timothy D. Hart

Professor of Forestry (PFD), College of Natural Resources (TDH),
University of Wisconsin-Stevens Point,
800 Reserve St., Stevens Point, WI 54481.

PFD is corresponding author;
to contact, call (715) 346-3988
or email at pdoruska@uwsp.edu.

The future of Wisconsin's estimated 742 million ash trees (5 million of which are in urban settings composing 20 percent of Wisconsin's urban forests) is being considered based on the presence of the emerald ash borer. Part of this discussion includes the stem volumes of these ash trees. An outside-bark volume ratio equation was developed for individual trees, allowing one to estimate outside-bark stem volume (cubic feet) to any top diameter limit for green and white ash trees in Wisconsin. Outside-bark stem diameters were estimated at predetermined heights aboveground on 84 standing trees in central Wisconsin, using two Laser Technology Inc. Criterion RD 1000 optical dendrometers with lines of sight perpendicular to one another. A subset of trees was felled to validate the diameter estimates obtained with the optical dendrometers, and a paired t-test confirmed that no differences exist (p -value = 0.36) between the standing

tree diameter estimates and the corresponding felled tree measurements. An outside-bark, total stem volume equation was then developed. The equation explained about 98 percent of the variation present and possessed a mean absolute error of 1.4 cubic feet per tree. A ratio equation was subsequently developed to estimate the proportion of outside-bark stem volume present in a given tree up to a given top diameter. The ratio equation explained about 86 percent of the variation present in the data and possessed a mean absolute error of 0.015 (or 1.5 percent). Applying the ratio equation to volumes derived from the total stem volume equation on validation data resulted in a mean absolute error of 4.5 cubic feet per tree. Use of the outside-bark total stem volume and ratio equations should allow resource managers to make more informed management and utilization decisions about ash trees in Wisconsin.