

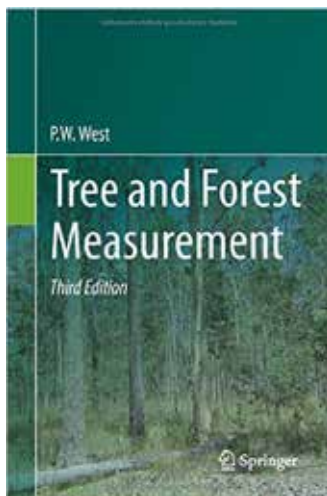
Tree and Forest Measurement

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Tree and Forest Measurement is a technical text with wide appeal. This revised edition includes the latest developments in the measuring of biomass and remote sensing. The author, with many years of experience as a forestry lecturer, covers the standard mensuration topics such as the age-old task of evaluating how much wood or biomass is in a forest. In a logical framework, three scales of measurement are examined: the individual tree, the forest stand and large forest areas. The book begins with a useful discussion on the essential ideas of accuracy, bias and precision when taking measurements.

The author moves on to arguably the most useful measurement taken in a forest, that of the stem diameter or DBH which is known to correlate with several variables. Height measurement is discussed next, and as for DBH, the concepts and theory behind the different methods and the instruments used are described, with an additional discussion on the challenges involved in direct measurement. Adopting this formula throughout, volume comes next, which begins with direct measurement and moves on to the widely used formulae which estimate sectional stem volumes using diameter and length of the section (the formulae of Huber, Smalian and Newton) and finishes with centroid sampling. A further chapter is devoted to equations that estimate the stem volume from the DBH and height of the stem and to taper equations which can be used to produce volume estimates and to evaluate the potential product assortments obtainable from the stem.

In the biomass chapter, the reasons for measuring the biomass of a tree and each of its components are provided (estimating the amount of carbon sequestered, research into photosynthesis, bioenergy production). Direct measurements of biomass and the challenges involved are followed by the more practical estimation methods such as the use of allometric equations and expansion factors.

The stand level chapter includes a fine exposition of the exceptionally useful point sampling system for measuring basal area, as devised by Bitterlich. The straightforward calculations of stocking and quadratic mean diameter are followed by a discussion of site productivity and dominant height and finally the important concepts of current annual increment and mean annual increment are described. The topic of yield class and related concepts are not covered, presumably since the author is based in New Zealand, where these concepts are not in common practice.

The last few chapters of the book are devoted to sampling which is required to estimate the area of a forest or conduct an inventory. The concepts of population, sample, mean, variance and uncertainty link the previously mentioned tree and stand measurements to the large forest area chapters. A selection of different sampling methods are discussed including the factors determining when they can be used and the level of accuracy associated with each method (simple random sampling, sampling proportional to size, sampling proportional to prediction, stratified sampling and model-based sampling).

The penultimate chapter outlines how to map and calculate forest area using a survey. An account is given of the principles behind the global positioning system (GPS) which is becoming relevant to more than just foresters as more mainstream devices (e.g. phones and apps) are utilising GPS. Remote sensing tools used from the air and also satellites are next described as are tools such as LIDAR and spectral photography. Regrettably though, there is only scant reference to drones; aside from their use outside the world of forestry (delivery of consumer purchases and surveillance), these low cost devices have great potential for surveying forest areas.

The book has a multitude of equations and functions in use worldwide and is loaded with references while, at the same time, the text is very readable. Abstracts have been added to each chapter in this edition making the topics more accessible to students or to those interested in particular topics. The appendices are complete with metric-imperial conversions, a glossary of technical terms (which have also been highlighted throughout in bold), the Greek alphabet (used to label parameters in the equations throughout) and basic trigonometry. With all of the above in mind, the book seems to be aimed at students and designed as a supporting textbook to a mensuration course however, it would certainly be useful to anybody working with forests and this reviewer recommends it as such.

Andrew McCullagh