

## BOOK REVIEW

### ***PINUS RADIATA*—BIOMASS, FORM AND GROWTH**

by H. A. I. Madgwick

Published by H.A.I.Madgwick, 36 Selwyn Road, Rotorua, New Zealand. 1994. 428 pages.  
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Students of the worldwide literature dealing with forest biomass research over the past several decades will know that H.A.I.Madgwick has published some of the most significant manuscripts on the subject. The book "*Pinus radiata*—Biomass, Form and Growth" is no exception, and has been written with the thorough approach and style typical of Madgwick. Beyond its high value as a comprehensive compilation, the greatest significance of this work is in the quantitative synthesis and critique of the worldwide literature on biomass, form, and growth of *Pinus radiata* that has been provided for each subject area addressed.

In the foreword, Madgwick has highlighted that one of the biggest problems associated with a synthesis of the literature arises from the inconsistencies in methodology used in forestry research. This problem was addressed by the International Union of Forestry Research Organizations (IUFRO) working party on forest biomass studies in several proceedings published in the early 1970s by Dr. Harold E. Young, University of Maine at Orono, and colleagues. However, it appears that their call for standardisation in units of measure has been ignored. The problem is greatest, of course, when one attempts to ask common questions of all published research in any subject area. Many researchers have not reached the point in their careers where they have attempted something the magnitude of this book, so will not have realised the pitfalls of taking a novel approach to their measurements. Perhaps this is a reflection on the urgency of the times, or on the failure of many scientists to synthesise the literature before undertaking an area of investigation. Perhaps repeating the plea for increased consistency in forestry research methodology will have an impact in the future. Madgwick has tried to overcome the inconsistencies by standardising the units in the book, and using oven-dry weights, unless otherwise noted, and converting all logarithms to base e.

The original aim of the book was to include all literature on the ecology of *Pinus radiata*. As this proved impossible for this effort, the literature dealing with concentration and content of nutrients in *Pinus radiata*, and cycling of nutrients, organic matter, and water may be compiled in a second volume. We hope so, given the contribution of this book. "*Pinus radiata* - Biomass, Form and Growth" is based on some 1100 publications drawn from books, journals, proceedings, and technical bulletins and reports. The 14 chapters and three appendices include:

- I Estimation of Individual Tree Weight;
- II Estimation of Stand Weight;

- III Biomass of Stands;
- IV Tree Form—Stems;
- V Tree Form—Foliage;
- VI Tree Form—Branches and Cones;
- VII Tree Form—Roots;
- VIII Stand Form;
- IX Growth;
- X Site Studies;
- XI Physical Factors Affecting Growth;
- XII Soil Nutrients Affecting Growth;
- XIII Biological Factors Affecting Growth;
- XIV Forestry Operations Affecting Growth;
- Appendix I Field and Laboratory Methods;
- Appendix II Stand Biomass;
- Appendix III Mychorrhizae of *Pinus radiata*.

Most chapters follow a similar format, where Madgwick has aggregated the literature according to significant factors affecting the response of *Pinus radiata*. In each subsection, Madgwick has sought unifying theories to explain tree or stand responses, has provided a critique of individual papers and the state of knowledge in each area, and has provided summary recommendations and statements which could serve to stimulate further research. The most significant, and the most personally disappointing, departure from this approach is in Chapter X on "Site Studies" where the text diverged into a list format for nine published papers. It is not clear if this was an oversight or intentional. In any case, the outline format used in Chapter X detracted from an otherwise consistent and useful style found in other chapters. I also found Chapter XI on "Physical Factors Affecting Growth" to be one of the weaker chapters in the book, containing a rather abrupt ending without the customary summary section found in other chapters.

Madgwick published this book in a paperback format on A4 size paper using a word processor. Figures and tables are neat, and easy to comprehend. Most figures have reasonable clarity; however, the symbols on many two dimensional graphs were printed with fine line width and a light tone, which makes them a bit hard to distinguish. Similarity of font in figure and table titles and footnotes and text can detract from the flow of reading afforded by different fonts. Overall, the book contains few technical or typographic errors, and the quality of presentation is very adequate. While commercial publishing and editorial review would have improved the appearance and reduced the number of errors, this should not detract from the significant contribution of the book.

The book will be highly useful to quantitative ecologists, silviculturists, and mensurationists. While *Pinus radiata* is the sole focus, the principles applied and the approach taken to the analysis of the literature are instructive for application to other species. The highly intensive research programme on *Pinus radiata* conducted by New Zealand and Australia must be unequalled by research programmes associated with any other species worldwide. The intensive focus on one species has provided information concerning relationships affecting the growth and development of *Pinus radiata* that may provide useful insight for scientists working with other species. The text is not a fast read, given the highly quantitative treatment of the subject matter. For each subject area, Madgwick has asked questions concerning the

assumptions behind the various studies, the state of knowledge, and the bias associated with various estimates. This systematic evaluation of the factors affecting various relationships contributes to the usefulness of this publication. For example, Chapter 1 on "Estimation of Individual Tree Weight" contains a systematic evaluation of how the foliage weight:sapwood ratio ( $w_f/s_o$ ) varies with variation in age, stocking, pruning, nutrition, and clone.

While the real strengths of the book are to be found in the area of sampling theory and in the statistical evaluation of the quality of various estimates, the wider perspective of an ecologist collaborator might have provided a more sensitive analysis of the ecology of *Pinus radiata*. The potential for improvement can be seen in the treatment of the relationship of foliage mass to various site-related variables in Chapter III on "Biomass of Stands". One might argue that the quantitative style of presentation and synthesis of the literature is not appropriate, or overdone, for some subject areas. For example, in Chapter V on "Tree Form—Foliage", quantitative treatment of the literature on the number of chlorophyll and stomates in tree foliage may not be adequate without consideration of the factors relating to the ecology of the species and the physiological significance of variation in the relevant parameters, as can be found in the physiological ecology literature. Having said that, I should point out that Madgwick frequently comments on the biological relevance of various published equations and models.

For students of forest biomass research, this book will provide valuable insight to the developmental benchmarks of one of the leading scientists in forestry science. We hope the rewards from this effort will stimulate Madgwick to complete the second volume on the ecology of *Pinus radiata*. We hope that the current trend towards confidential reports and private ownership of research results will not preclude the forestry scientific community from insisting that the measure of scientist productivity be based on manuscripts published in internationally available journals. This book would not have been possible without such standards.

C. Tattersall Smith