

RESOURCE AND MARKET PROJECTIONS  
FOR FOREST POLICY DEVELOPMENT

# Managing Forest Ecosystems

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Volume 14

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## **Aims & Scope:**

Well-managed forests and woodlands are a renewable resource, producing essential raw material with minimum waste and energy use. Rich in habitat and species diversity, forests may contribute to increased ecosystem stability. They can absorb the effects of unwanted deposition and other disturbances and protect neighbouring ecosystems by maintaining stable nutrient and energy cycles and by preventing soil degradation and erosion. They provide much-needed recreation and their continued existence contributes to stabilizing rural communities.

Forests are managed for timber production and species, habitat and process conservation. A subtle shift from *multiple-use management* to *ecosystems management* is being observed and the new ecological perspective of *multi-functional forest management* is based on the principles of ecosystem diversity, stability and elasticity, and the dynamic equilibrium of primary and secondary production.

Making full use of new technology is one of the challenges facing forest management today. Resource information must be obtained with a limited budget. This requires better timing of resource assessment activities and improved use of multiple data sources. Sound ecosystems management, like any other management activity, relies on effective forecasting and operational control.

The aim of the book series *Managing Forest Ecosystems* is to present state-of-the-art research results relating to the practice of forest management. Contributions are solicited from prominent authors. Each reference book, monograph or proceedings volume will be focused to deal with a specific context. Typical issues of the series are: resource assessment techniques, evaluating sustainability for even-aged and uneven-aged forests, multi-objective management, predicting forest development, optimizing forest management, biodiversity management and monitoring, risk assessment and economic analysis.

*The titles published in this series are listed at the end of this volume.*

# Resource and Market Projections for Forest Policy Development

Twenty-five Years of Experience  
with the US RPA Timber Assessment

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## PREFACE AND ACKNOWLEDGMENTS

Making projections is an integral part of managing forests and making forest policy. Although some issues and management objectives relate to immediate outcomes, many others evolve over decades. Projections are required to understand the effects of prospective policy actions on growth, inventories, and future forest conditions. In the USA, the work commissioned by Congress and prepared by Franklin Hough beginning in 1878 is commonly considered the progenitor of national-level forest sector projection studies. The nature of policy issues and US forest resource conditions have changed dramatically since Hough's work, but the basic need for sector projections remains. Over the last 25 years, the Timber Assessment Projection System (hereafter the Assessment System) has been the primary projection tool used by the Forest Service, US Department of Agriculture, to meet its obligations under the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 to assess future timber use and forest conditions. We conceived this book as a vehicle to describe the Assessment System, highlight its most recent projections, and attempt to distill the lessons learned about sector modeling and policy simulation during its development and application. We believe these lessons will be useful to those charged with constructing models to support forestry program development in other contexts.

The modeling origins of the current Assessment System lie in the editors' doctoral dissertations and in the crude sector models built for the Forest Service's Timber Harvest Scheduling Issues Study conducted in 1975 and 1976. The encouragement and challenge to convert these earliest efforts into a system that could support the Forest Service's Timber Assessment studies came from the late Dwight Hair of the Forest Service's Washington Office. Quite reasonably, Dwight

was fairly critical of the two young Ph.Ds. urging him to adopt a new and largely untested approach and was skeptical of the value of our first projections. Because of this, the 1980 RPA Timber Assessment included both our market-model projections and a set derived from the traditional “gap” models in a side-by-side comparison. The 1980 Assessment was well received, however, and convinced Dwight to employ the market-model approach exclusively for the 1985 RPA Timber Assessment. Twenty years later, we have just completed the 2005 RPA Timber Assessment using a vastly extended, elaborated, and refined version of that earlier model. We gratefully acknowledge Dwight’s early criticism, his mentoring, and his willingness to give a new approach a try.

Development of the Assessment System and compilation of the RPA Timber Assessment reports has always been a collaborative effort. The directors of the RPA efforts, notably Fred Kaiser, served as champions for using the best available science. The group of cooperators has been large and has changed over time, but the projections get done and the analyses prepared because all have been committed to, and seen the importance of, the assessment process.

The development of the NAPAP model in the 1980s and 1990s involved many individuals. At the University of Wisconsin, J. Keith Gillies, Patrice Calmels, Dali Zhang, and Yibing Zhang worked closely with Joseph Buongiorno in developing several versions of PELPS and its application to the paper industry. At the Forest Products Laboratory (FPL), James Howard and Ken Skog worked closely with Peter Ince in estimating recovered paper supply functions, while Irene Durbak worked on trade projections, and C. Denise Ingram developed an historical database on pulpwood receipts at US wood pulp mills. Researchers with Forestry Canada in the early 1990s worked on modeling the Canadian pulp and paper sector within the NAPAP model, including Don Roberts, Romain Jaques, Susan Phelps, Robert Prins, Barbara Baker, and Harry Jaaskelainen. Darius Adams estimated US pulpwood supply functions and provided projections of pulpwood supply using the TAMM/ATLAS model. Patti Lebow of the statistics group at FPL made a number of helpful revisions to PELPS in recent years and generally served as a consultant to FPL researchers on PELPS source code revisions since the mid-1990s. We also acknowledge Andrew Kramp at FPL, who ran the experiment introducing exchange rates to GFPM, discussed in Chapter 13.

Many individuals have assisted in the development of the AREACHANGE models, associated databases, and projections. The assistance of SoEun Ahn, Brett Butler, Jeff Kline, Karen Lee Abt, Dave Lewis, Tim Marty, Brian Murray, Peter Parks, Ted Howard, and Jamie Wyant is appreciated. We also appreciate the early reviews and encouragement during initial modeling research provided by Darius Adams, David Brooks, Joseph Buongiorno, Robert Healy, and Fred White.

The development of ATLAS was an outgrowth of an earlier timber inventory projection system developed for *The South's Fourth Forest Study* by Phil Tedder, Rick LaMont, and Jonna Kincaid. Much of the direction for the development came from extensive reviews held in the South that involved industry analysts, university researchers, and agency officials all advocating more detailed treatment of the impacts of forest management actions on forest growth and conditions.

Building an eclectic projection system has required linking and coordinating an array of model components written in different programming languages, using different time steps, and adapting them to run in an ever-changing sequence of operating systems. Early versions were run on mainframe computers with, by today's standards, limited memory necessitating severe compromises. Since 1992 the system has run on personal computers. This flexibility has been made possible by a line of extremely talented and persistent programmers: Jonna Kincaid at Oregon State and University of Washington, Eric Jensen at University of Montana, and Adrienne Van Nalts at Oregon State.

The Assessment System relies on a large database of annual product and stumpage market data used to support econometric estimation of behavioral relations. Data collection and checking has been an important part of model development and expansion. Over the years many past students have contributed to this process: David Brooks, William Lange, David Shearer, Lisa Haven, Andres Katz, Robert Wilson, Janet Baker, James Schmidt, Richard Barber, Brian Sharer, Nianfu Song, and Greg Latta at Oregon State; James Stevens, John Chmelik, Thomas Manness, and David Evison at the University of Washington; and Ted Helvoigt at University of Montana. Kristine Jackson, formerly with the Forest Service, contributed to database development and a summary publication. Adam Daigneault orchestrated the publication of the historical harvest estimation database. Several of the databases were developed and maintained by researchers at FPL. There, David McKeever provided the end-use data for solid

wood products and James Howard provided various national summaries of consumption and production.

Other researchers in related or independent projects have contributed important components to the Assessment System. Peter Cardellichio and Clark Binkley developed a model and modeling approach for hardwood lumber markets that has been incorporated into the Assessment System; Henry Spelter's diffusion models of solid wood products demand provided a major breakthrough in our treatment of softwood lumber and plywood and OSB, and he has provided updates of coefficients and equations over the years; Claire Montgomery contributed a process for incorporating Spelter's approach in the system and a model of housing investment that projects housing starts by type and expenditures on residential upkeep and alteration. Ken Skog and others developed the fuelwood consumption and production models. David Brooks and Don Flora provided various assessments of the international situation that have influenced the trade assumptions used in the Assessment System. Xiaoping Zhou has made extensive contributions in developing the inventory representations for public lands.

We have also benefited from the insightful critique of many industry, agency, and nongovernmental organization (NGO) representatives who have reviewed drafts of the RPA Timber Assessments and reports on methodology or participated in workshops to discuss proposed modeling approaches, data collection, or reporting efforts. At an early stage Bruce Lippke, John Austin, Dick Pierson, and Dale Kalbfleisch, all formerly of Weyerhaeuser, helped us understand the critical role of investment models in long-term sector projections and the value of a detailed inventory representation. During the late 1980s and early 1990s, the staff of the American Paper Institute in New York (predecessor to the American Forest & Paper Association [AF&PA]), including Ronald Slinn, Jim Hutchison, Bill Driscoll, Virgil Horton, Stan Lancey, Dick Storat, and Red Caveney, provided review and consultation on the structure of early prototypes of the NAPAP model. Darcie Booth and Susan Phelps, of the Canadian Forest Service, have kindly reviewed and critiqued our projections for Canada in several past RPA Timber Assessments. David Darr of the Forest Service has also been a discerning reviewer, encouraging us to be clearer in explaining the economic implications of our projections. Fred Cabbage, David Wear and a consortium of Southern industry and university researchers have



hosted reviews of the projections and underlying assumptions leading to improvements in how the Southern forestry sector is treated.

Although not acknowledged in most science discussions, sustaining the production of six RPA Timber Assessments requires great diligence. We have been fortunate to have Judy Mikowski of the Pacific Northwest Research Station, who has been tireless in helping us prepare the assessment reports. We thank her for help in the assembly and review of this book. She has kept us on task and mindful of critical details that we might otherwise ignore. We also thank Rhonda Mazza for her assistance in editing this book and improving its clarity.

The use of trade or firm names in this publication is for reader information and does not imply endorsement by the authors or their affiliated organizations of any product or service.

Unit Conversion Table

When you know	Multiply by	To find
Meters (m)	3.28	Feet (ft)
Cubic meters (m <sup>3</sup> )	35.3	Cubic feet (ft <sup>3</sup> )
Square meters (m <sup>2</sup> )	10.8	Square feet (ft <sup>2</sup> )
Centimeters (cm)	2.54	Inches (in)
Hectares (ha)	2.47	Acres (ac)
Kilometers (km)	0.62	Miles (mi)
Kilogram (kg)	2.205	Pounds (lbs)
Tonne (metric ton)	1.1	Short tons
Product conversions		
Logs: cubic meters	5.66	Thousand board feet (log scale, assumes 5 board feet, log scale per cubic foot, log scale)
Lumber: cubic meters	2.36	Thousand board feet (lumber tally, assumes full sawn lumber)
Panel products: cubic meters	1.13	Thousand square feet (3/8" basis)

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