



# The Fifth Resources Planning Act Timber Assessment

## A Critical Tool for Sound Stewardship

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### ABSTRACT

For the past century, national assessments of supply-and-demand trends for timber have helped shape perceptions of future commodity consumption and have guided forest policy. Trends and projections since 1952 consistently have shown rising forest products consumption and changing sources of timber supplies. The current assessment envisions forest products consumption rising 42 percent by 2050 and marked shifts in the extent and location of domestic and imported supplies. Prospective shifts include a temporary near-term decline in US roundwood harvest and an increase in share of consumption from imports.

**Keywords:** economics; industry; sustainable forestry

The United States has a long history of developing national assessments of supply-and-demand trends for timber. These assessments have shaped perceptions of emerging trends in the forest sector and helped guide forest policies for a century. The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) as amended by the National Forest Management Act of 1976 (NFMA) formalized these analyses by directing the secretary of agriculture to prepare a renewable resource assessment. The purposes of these assessments are to

- Analyze and project trends in demands and supplies of timber and the determinants of these trends.
- Estimate prospective changes in the land and timber resource base.
- Examine the implications of these trends in use and the resource base.
- Survey the opportunities to manage and use the forest resource base to meet private- and public-sector goals.

We present results of the fifth RPA

Timber Assessment. The assessment shows the evolution of the US forest sector from 1952 to 2050. In this portrayal, output from the forest products sector increases, as does the share of products from imports needed to meet rising consumption. Changes occur in the mix of types of forest products produced, with increasing emphasis on engineered and paper and paperboard products. Prices of forest products increase modestly over the next five decades, shifts occur in the regional concentration of forest products production, private land area remains relatively stable, and significant changes occur in the modes and intensities of forest management for private timberland owners.

This article sets the stage for the articles by Adams, Ince and Durbak, and Alig et al. that present detailed results of the current RPA Timber Assessment (Haynes, in press) and provide analyses of past trends and future projections. The final article in the series discusses some of the policy and management implications emerging from these results.

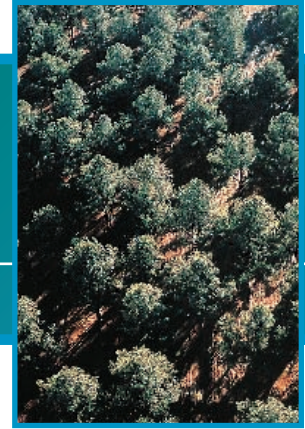
### Definitions

“Forest sector” and “forest sector models” are important concepts in appreciating the articles in this series. By *forest sector*, we mean all aspects of forest use and management that affect timber production, from basic land tenure issues to harvesting, production, and consumption decisions in all types of markets. This approach is no different than that taken in agricultural and other industrial sectors in the US economy. Informal forest sector analysis methods have long been among the tools available to foresters. *Forest sector models* are characterized by a systems view of forestry’s biological and social processes. This systems view can be used to explore the biological development of forest resources and the attendant dynamics of the forest industry over time and under alternative futures and management strategies. A basic premise is that we can emulate various relations that describe (or mimic) biological and socioeconomic processes.

### Models Used

*Figure 1* (p. 11) illustrates the modeling framework used to develop timber market projections for the current assessment. This type of framework has been referred to as a *bioeconomic* model, as it combines both biological and economic elements. Four distinct models make up this framework:

- The Timber Assessment Market Model (TAMM) is a spatial model of



the solid wood and timber inventory elements of the US forest products sector and of softwood lumber and oriented strand board (OSB) production in Canada (Adams and Haynes 1980, 1996; Haynes and Adams 1985). It provides annual projections of volumes and prices in the solid wood products and sawtimber stumpage markets and links both solid wood and pulp and paper to the timber inventory model.

- The North American Pulp and Paper (NAPAP) model is a detailed regional market model of the pulp and paper sector. The basic structure and methodology are described in Zhang et al. (1993, 1996) and Ince (1999). The NAPAP model applies conventional regional market modeling techniques to compute annual market equilibria for wood raw material inputs and output commodities of the pulp and paper sector.

- The Aggregate Timberland Analysis System (ATLAS) was developed to model timber inventories at multiple geographic scales (Mills and Kincaid 1992). It simulates growth, harvest, land-use change, forest-type change, and shifts in timber management for approximately 356 million acres of private timberland and 134 million acres of national forest timberland in the conterminous United States. ATLAS aggregates US plot-level timber inventory data upward as a collection of age classes, adjusting

these classes over time to simulate the growth and development of the forest.

- The AREACHANGE model was used to project land-use and forest-type changes at regional and national scales (Alig 1985). AREACHANGE operates in two phases. First, area changes in major land uses are projected to provide regional estimates of total timberland area by ownership. In the second phase, the system projects area changes for major forest types on each ownership. Price projections from other parts of the current assessment modeling system are used as one of the inputs in the first phase of the projections, and projections of management intensity class changes from the ATLAS model are used as an input in the second phase.

As illustrated in *figure 1*, timber removals from TAMM and NAPAP are fed into ATLAS, leading to adjustments in timber inventories (and via AREACHANGE shifts in broad-scale vegetation conditions). Changes in timber inventories in turn influence timber supply in TAMM and NAPAP, and timber prices affect land-use decisions in AREACHANGE. These models operate on an annual basis, solving iteratively for market equilibria over an initial historical period that goes back to the 1970s and then projects 50 years into the future. The economic models (TAMM and NAPAP) are built on spatial equilibrium concepts that solve for

the simultaneous equilibrium in both regional product and stumpage markets. The models have been extensively tested and frequently updated and improved by their application in the RPA assessments and related research efforts.

### Major Assumptions

Because only portions of the national and global economies are explicitly modeled in the timber assessment system, many other important background conditions that influence the forest sector must be recognized by means of assumptions. The assumptions for macroeconomic activity, public policy, trade flows, fuelwood use, and public timber harvests play particularly critical roles.

*Macroeconomic activity.* Projections of population and general economic activity are the foundation for analyses of the demand side of forest products markets and for parts of the supply side as well. Key assumptions include:

- The US population is expected to grow by 126.1 million, reaching 394 million in 2050. Growth in the core population (ages 18–65) falls and averages only 0.5 percent per year, slowing the labor-force growth rate.

- Consumer price index (CPI) inflation will stabilize at about 3 percent per year, providing a stable inflationary environment that leads to stronger investment and productivity growth.



## Highlights of the Current RPA Timber Assessment

The current RPA Timber Assessment reveals an evolving US forest sector in the century between 1952 and 2050. Over the next 50 years, we can expect output from the forest products sector to increase, as well as the share of products from imports needed to meet rising consumption.

We will see a changing mix of types of forest products produced, rising prices, shifts in regional concentration of production, and significant changes in the modes and intensities of forest management for private timberland owners. Some specific highlights of the assessment are listed below.

### CONSUMPTION

- US consumption of forest products (lumber, panels, and paper) will expand 39 percent, to 310 million tons by 2050. This increase is less than one-third the annual rate of increase over the past 33 years.
- Increased consumption will be met by increases in US timber harvest; log, chip, and product imports; and use of recovered paper.
- Per capita US consumption of forest products will remain static while per capita US timber harvest will decline.

### IMPORTS

- Canada is expected to be the primary source of imports, but imports from non-Canadian sources are also expected to increase.
- Canada's share of US softwood lumber consumption is expected to decline from just over 35 percent in 2010 to 25 percent by 2050, while the share of imports from other countries (e.g., Eastern Europe, Scandinavia, and the Southern Hemisphere) is expected to increase from 2 percent to 15 percent of US softwood lumber consumption.
- Canada's share of US paper and paperboard consumption will rise to 17 percent by 2010, then return to an earlier level of 12 percent by 2050. Other countries' share will increase from 3 percent currently to 10 percent in 2050.
- Net imports' contribution to consumption will continue their long-term increase, from an average of 9 percent in recent decades to 18 percent by 2050.

### PRICES

- Sawtimber prices will increase 0.5 percent per year through 2050, versus an annual increase of 1.9 percent since 1952.
- Despite generally rising prices, stumpage markets in the West for small-diameter logs will continue to be weak.
- Pulpwood prices will remain at or below recent levels, then turn upward at the end of the projection period.

### TIMBER HARVEST

- US timber harvest is expected to increase 24 percent by 2050, less than one-half the annual rate of increase for the past 44 years. Softwoods will increase 30 percent and hardwoods 17 percent.
- All of the increase will be in nonsawtimber trees, mostly in the South and from NIPF lands.
- With declining share of lumber and plywood production, virtually all of the increase in harvest will be in nonsawtimber trees used for paper, paperboard, and composite products.
- The share of harvest from NIPF lands will increase from 61 to 64 percent.
- Softwood timber inventories will increase 53 percent, mostly on public timberlands. Hardwood inventories will rise 27 percent.
- While softwood inventories will rise in all regions, there are regional differences for hardwoods, with private hardwood inventories declining in the South and expanding in the North.
- The bulk of the nation's timber harvest will occur in the East and especially in the South.
- By 2050, about 54 percent of softwood lumber harvest will come from plantations that occupy about 30 percent of US private softwood timberland, or 9 percent of all US timberland.

### PRODUCTION

- Production will shift toward pulp and paper products; the share from lumber will decline; and the share of composites will remain steady.
- Among solid wood products, oriented strand board (OSB) production will largely displace softwood plywood; hardwood lumber production will grow more slowly than softwood lumber production; softwood lumber imports will rise in the near term; and after 2015 softwood lumber production will shift largely to the South and, to a limited degree, the Pacific Northwest.
- Pulp, paper, and paperboard production will increase the most in the South, mainly in the South-Central region.

- Real gross domestic product (GDP) grows at 1.9 percent per year on average. Labor compensation will grow just at the rate of productivity, so wage and salary growth remains noninflationary.

- Real crude oil prices will rise at about 2 percent per year, mineral prices will rise at less than 2 percent, and agricultural prices will continue to fall in real terms.

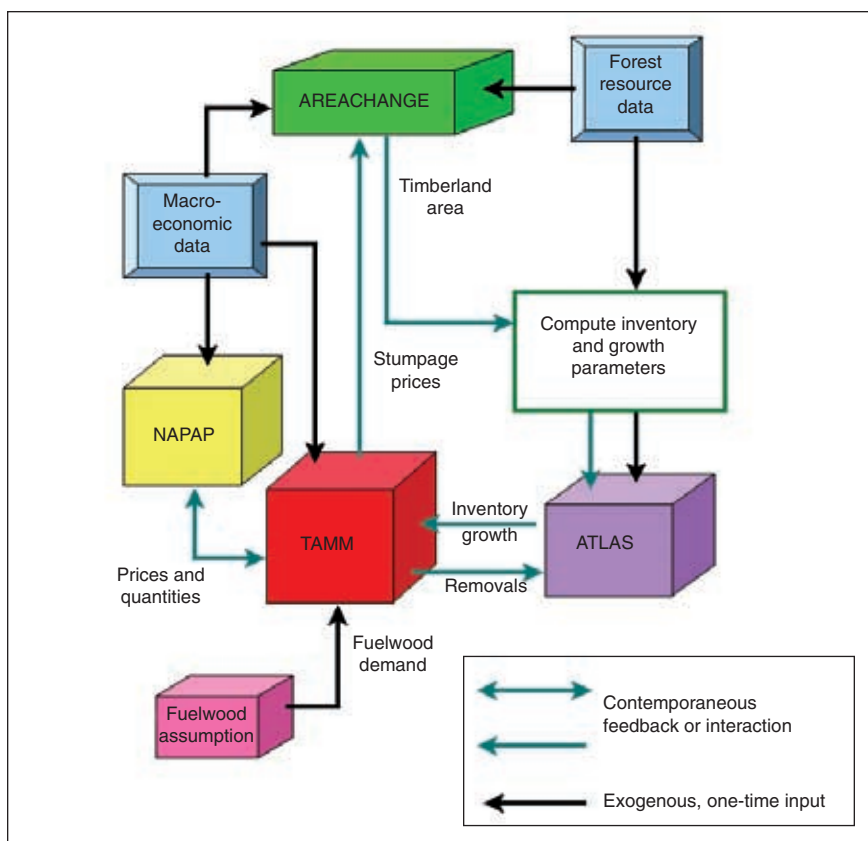
- Housing starts will average 2 million per year, exceeding the formation of new households (which average 1.4 million per year) because of rising numbers of second homes and higher-than-historical replacements of existing units.

*Public policy.* No fundamental changes are assumed in existing government policies or regulations relative to public or private forestlands or environmental protection, including policies and laws relating to paper recycling.

*Trade flows.* The United States currently relies on imports for about 20 percent of forest products consumption; at the same time, exports account for about 13 percent of US production. Imports will increase to 26 percent of consumption, and exports will decline to 10 percent of production by 2050.

The projections recognize the continued importance of Canada as both a source and market for US products and assume that past trends toward harvest restrictions on public lands will continue. As a consequence the analysis assumes a substantial increase in the importance of non-Canadian softwood lumber imports. At the same time, tropical timber products are expected to play a small role in US consumption, and the United States will continue to be a net exporter of forest products to developing countries. World timber supplies are expected to be abundant over the projection period, due in large part to improved management and the expansion of the area of plantations in several regions. We assume trade agreements and accompanying tariff reductions will continue to contribute to world economic growth and have a positive effect on both the composition and patterns of trade.

*Fuelwood demand.* National projections of roundwood used for fuel were derived from Department of Energy projections of total wood energy use in



**Figure 1. Schematic of the assessment model.**

the residential, industrial, commercial, and utility sectors. Roundwood use for fuelwood, after peaking in the late 1980s at 3.1 billion cubic feet, has fallen to 2.36 billion cubic feet in 2000 and is projected to rise slowly to 3.46 billion cubic feet by 2050.

*Technology change.* Product recovery for solid wood products is projected to increase at about the same rate as in recent decades. The analysis does not foresee the introduction of any new paper and paperboard production processes over the projection period, but the mix of processes shifts toward those that use more recovered paper.

*Public land harvest levels and inventory.* Softwood harvest from public timberlands has fallen from 30 percent in 1970 to 13 percent in 1997 and is projected to be 10 percent by 2050. For federal lands, these reductions reflect shifting societal goals for land management. The largest reductions in harvest are in the Rocky Mountain and Pacific Northwest regions. Accompanying these reductions in harvest is a 70 percent increase by 2050 in public softwood timber inventories. In 2000, 15 percent of

national forest timberlands held trees more than 150 years old; by 2050 this proportion will increase to 33 percent.

The situation is different for hardwoods, where the “other public” ownerships (especially some state lands) are locally important sources. National forest inventories are projected to increase 78 percent for hardwoods by 2050. The other public inventories are expected to continue increasing during the next five decades, but late in the projection period the difference between harvest and growth narrows for hardwoods. Some of this is due to reductions in net growth as stands mature and growth rates slow.

### Closing Thoughts

The RPA assessments have helped shape views of the future of the US forest sector and have improved the information available to land managers, the public, and government and nongovernment agencies. They have played several roles. First, they have helped guide land stewardship decisions. Second, they have provided a source of scientific knowledge about market and resource behavior over

time for inclusion in policymaking. And this improved information has improved decisions. Third, the assessments have proved useful for educating interested publics. The assessments illustrated the price, consumption, and harvest impacts of a wide range of possible shifts in supply and demand, both in the product and stumpage supply markets. These numerous “what-if” scenarios have helped mold the views of decisionmakers and various stakeholder groups about common forest policy issues.

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