U.S. Forest Statistics Paint a Picture of Dynamic Growth and Renewal As Well As Problems Ahead

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Introduction

When forests reach the headlines, the news is rarely good. Moreover, when forests are the topic of one of those fundraising appeals that appear periodically in the mailbox, the news is *never* good.

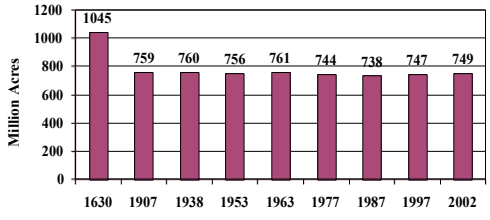
Messages in the media and bulk mail notwithstanding, what are the trends in U.S. forests? This report examines national forest statistics as gathered by on-the-ground forest survey crews representing federal land management agencies and state departments of natural resources, and as summarized by forest survey specialists in the nation's forest experiment stations. Based on this data, it turns out the current reality is far better than commonly reported, though the trends are not uniformly positive. Over time, and in region after region, what the data indicate is a remarkable record of dynamic growth and forest renewal following disturbance. However, several important indicators suggest problems ahead.

U.S. Forest Trends

Forest Area

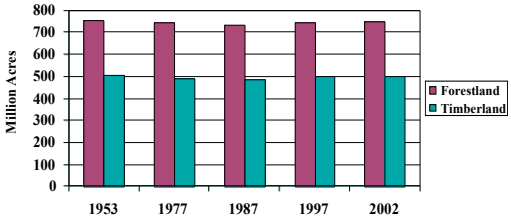
Surveys over the past 15 years have shown a pervasive belief that forests of the United States are disappearing. Reality does not mesh with that perception. In fact, the area covered by forests has remained remarkably constant over the past 100 years (Figure 1), with a recent trend toward increasing forest area. The area of timberland (forests that are available for periodic timber harvest) has similarly remained largely unchanged over an extended period (Figure 2). Timberland makes up about two-thirds of the forest area of the United States.

Figure 1
Forest Area in the United States
1630-2002



Source: Smith, et al., 2004.

Figure 2
Forest and Timberland Area in the United States, 1953-2002

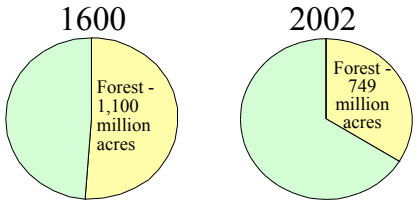


Source: Smith, et al., 2004.

The extent of forests in the United States today is about the same as in 1900, and about two-thirds of that estimated to have existed at the time of European settlement (Figure 3).

This stabilization of forestland acreage in the twentieth century has been attributed to implementation of modern agriculture and replacement of draft animals with mechanized tractors; both developments served to decouple population growth from the need to clear land for agriculture. Recent gains in forest cover are attributable to continuing reversion of marginal and abandoned agricultural land back to forest and to aggressive tree planting, especially in the southern U.S. The bad news in this story is that the population of the U.S. has quadrupled in the past century, from 76 million in 1900 to about 300 million today, with the result that the forest area *per capita* has declined accordingly – from about 10 acres in 1900 to less than 3 today (Figure 4). This trend is likely to continue into the foreseeable future, ensuring that conflicts over forest use and management will persist and intensify in the decades ahead. Even if the current forestland area is maintained through this century, an increasingly problematic proposition, population growth will reduce the forest area per capita to about 1.3 acres.

Figure 3
Forests now cover 68% of the land area in the U.S. that they did at the time of European settlement



Source: USDA - Forest Service

Figure 4
U.S. Forestland Area Per Capita
1785 - 2000

It is important to recognize that an unchanging extent of forests does not mean that forests cover exactly the same geographic area as in decades past. The reality is that forests and forest cover in the U.S. and worldwide are dynamic, changing in response to a number of events and trends. In just the past two decades, for example, the area of forest cover in the state of North Carolina declined by more than 1 million acres as a result of rapid increases in urbanization and second home development, and to a lesser extent by forest conversion to agriculture. During the same time period the area of forests in

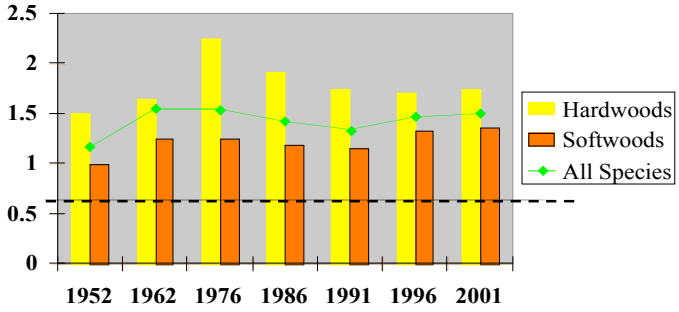
Mississippi increased by about the same amount, due largely to tree planting on former agricultural land under the Conservation Reserve Program and to reversion of other lands to forest cover. It is worth noting that forest loss in North Carolina was principally in the natural pine, upland hardwood, and mixed pine-hardwood cover types, whereas gains in forest cover in Mississippi were concentrated in new pine plantations. Thus, significant changes are occurring in the character of the nation's forests even though overall forest acreage is remaining largely static.

Maintaining the current extent of forest (and associated values and benefits) in the United States throughout the next 100 years will likely be a significant challenge given that the population is expected to double within that time frame. To provide insight into the forestland's ability to handle consumer demands in the future, a review of trends in forest growth and removals, timber inventory, average tree diameter and age, and overall forest health, follow.

Forest Growth and Removals

The record of forest growth in relation to forest removals across the U.S. over the past half-century provides a testament to the accomplishments of forestland managers. Despite rising population, wood consumption, and harvest levels, the ratio of forest growth to removals has been trending upward in recent years (Figure 5 and Table 1). Net forest growth is the sum of all new growth minus all losses due to decay, insects, fire, wind, and other such events. Removals include volumes extracted in harvesting, land clearing, and similar activities. A net growth to removals ratio of exactly 1.0 indicates that new growth is exactly equal to the rate of removals. A ratio of greater than 1.0 indicates that growth exceeds the rate of removals, and thus that the volume of standing trees is increasing over time (Figures 6 and 7).

Figure 5
Net Growth/Removals Ratios – U.S., 1952-2001



Source: USDA - Forest Service RPA Assessment, 2000; Smith et al., 2004.

Table 1
Forest Growth/Removals Ratios – U.S., 1952-2001

Year	Softwoods	Hardwoods	Total
1952	1.00	1.50	1.17
1962	1.25	1.65	1.55
1970	1.23	2.01	1.48
1976	1.25	2.25	1.54
1986	1.19	1.92	1.42
1991	1.15	1.75	1.33
1996	1.33	1.71	1.47
2001	1.36	1.74	1.46

Source: Smith, et al., 2004.

Figure 6
Standing Timber Inventory – U.S. 1952-2002

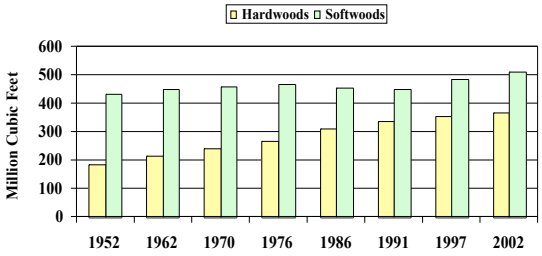
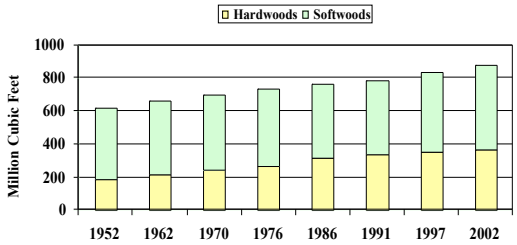
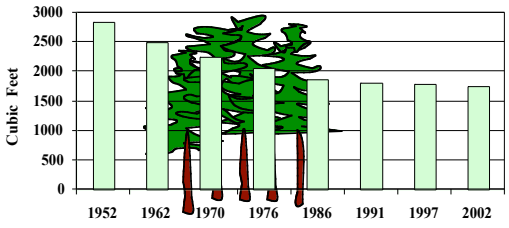


Figure 7
Standing Timber Inventory – U.S., 1952-2002



Given the pervasive and negative impact of population growth on forest area per capita it is interesting to consider the impact of population growth on the per capita volume of wood contained within the nation's forests. In the case of softwoods, both growing stock and large tree volume are declining on a per capita basis, although both numbers are increasing on an absolute basis.

Figure 8
U. S. Softwood Growing Stock Inventory Per Capita, 1952-2002

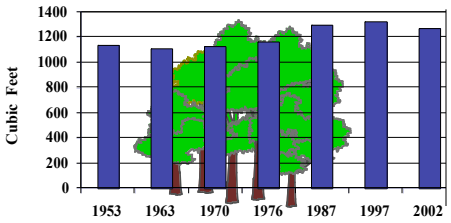


Source: Smith, et al., 2004.

Hardwood growth, on the other hand, has been so rapid relative to removals in recent decades that per capita volumes of both growing stock and large trees (sawtimber) have increased despite the ongoing downward impact of population growth (Figures 9 - 11). This trend is unlikely to persist going forward, however, as forest growth slows in

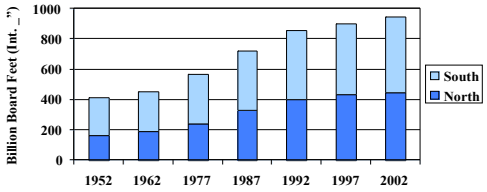
response to increasing age of forest stands, and as loss of hardwood cover to urbanization and conversion to softwood plantations continues. Thus, what is currently a good news story may quickly become an area of serious concern.

Figure 9
U. S. Hardwood Growing Stock Inventory Per Capita, 1953-2002



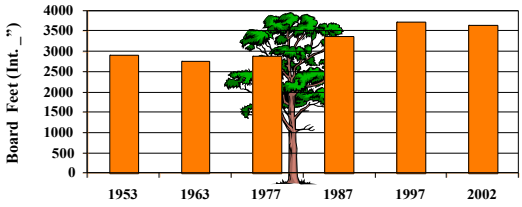
Source: Smith et al. 2004; U.S. Census Bureau 2004.

Figure 10
U.S. Hardwood Sawtimber Inventory, 1952-2002



Source: Powell, et al., 1994; USDA - USFS RPA Assessment, 2000; Smith et al., 2004.

Figure 11
U. S. Hardwood Sawtimber Inventory Per Capita, 1953-2002

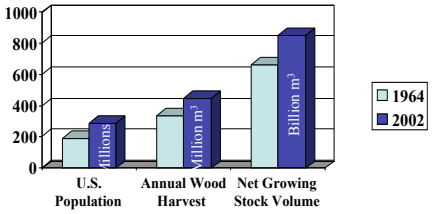


Source: Smith et al. 2004; U.S. Census Bureau 2004.

Overall, in the course of the past 38 years, net growing stock volume of the forests of the United States have increased by over 29 percent at the same time that the population has grown by 50 percent. As noted earlier, this is a testament to the success of forest land managers across the nation. This is not, however, the whole story. Another reason why the volume of trees has increased in the face of expanding wood consumption is that the U.S. has increasingly built dependency on imported wood, and softwood in particular, to fulfill wood consumption needs (Figure 13). As shown in Figure 13, net softwood lumber imports have increased by a stunning 140% since 1990. Were the U.S. providing all of its own wood needs, the nation would still have a positive net growth to harvest ratio for softwoods, but by a very thin margin.

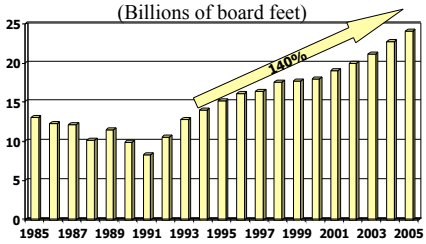
Recent trends highlight an increasingly evident reality – that status quo is insufficient to meet the needs of the future. Expansion of fast-growing pine plantations will help domestic wood production keep pace with growing domestic consumption. Even so, net wood imports are likely to increase, with an increasing proportion of imports also originating in fast-growth plantations.

Figure 12
U.S. Population, Wood Harvest, and Net Forest Growing Stock Volume, 1999 and 2002



Source: U.S. Census Bureau, 2005; Smith et al., 2004.

Figure 13
U.S. Net Imports of Softwood Lumber
1985-2005
(Billions of board feet)

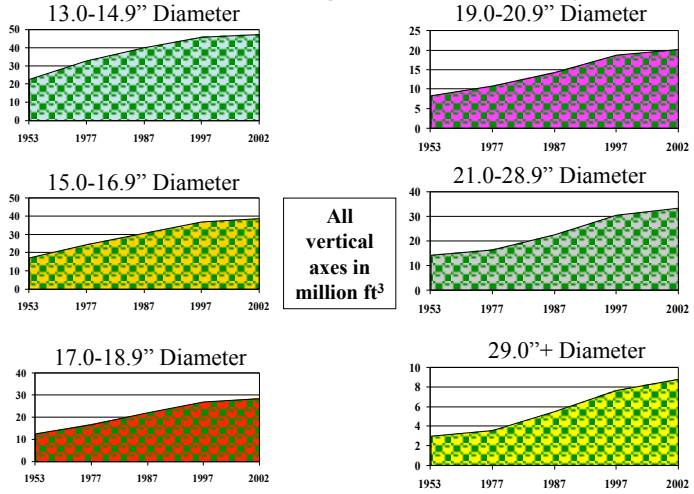


Source: J. Howard, U.S. Forest Products Laboratory, 2003; data for 2003/2005 from Random Lengths.

Average Diameter and Age

As net growth has exceeded removals year after year, and as inventories have grown, the volume of trees in each diameter class has tended to increase. For hardwoods, growth of inventories has occurred over the past 55 years in every diameter class (Figure 14) and in every region of the nation. Similarly, the average age of trees has increased steadily.

Figure 14
U.S. Hardwood Growing Stock Inventory, 1953-2002

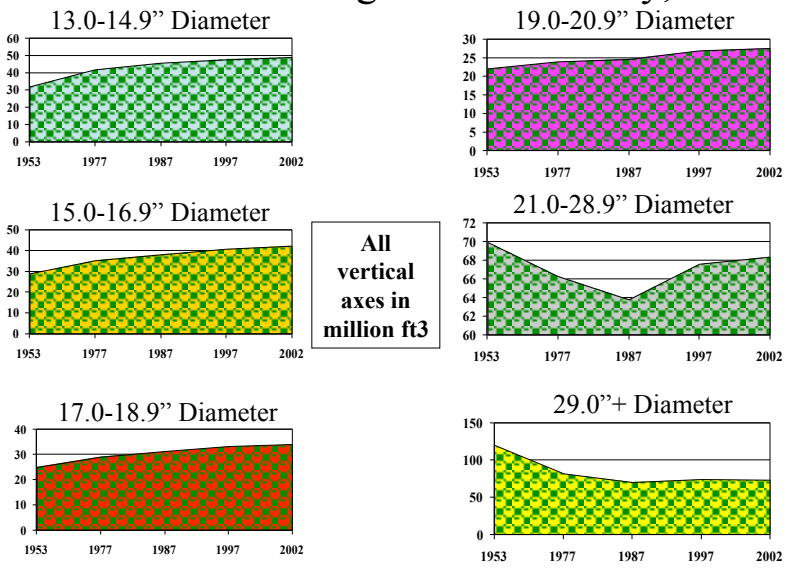


Source: Powell, et al., 1994; USDA - Forest Service RPA Assessment, 2000; Smith et al., 2004.

The softwood average diameter picture is a bit different than for hardwoods. In the softwood category, growth of inventories occurred over the past 55 years in all diameter classes up through 19.0 to 20.9 inches (Figure 15). However, in the 21.0 through 28.9 inch diameter class volumes declined sharply from 1951 through 1987, then increased sharply from 1987 to 2002. The same decline occurred in the 29.0+ inch category through 1987, with a stabilization of volume thereafter. It is interesting to note that the shift from loss to gain of volume in large diameter trees corresponds closely with implementation of the 1992 Spotted Owl Recovery Plan and preceding court injunctions

in the Pacific Northwest. It is likely that the average age of standing softwoods also trended downward prior to 1987, with average age now on the increase. Whether this trend continues will depend upon future management and harvest strategies.

Figure 15
U.S. Softwood Growing Stock Inventory, 1953-2002



Source: Powell, et al., 1994; USDA - Forest Service RPA Assessment, 2000; Smith et al., 2004.

Forest Health

Of all the column inches dedicated to discussion of forests in recent years, by far the greatest number have been devoted to the issue of forest health. Both the proponents of greater levels of forest harvesting, and interest groups opposed to harvest appear to agree that the nation has a forest health problem.

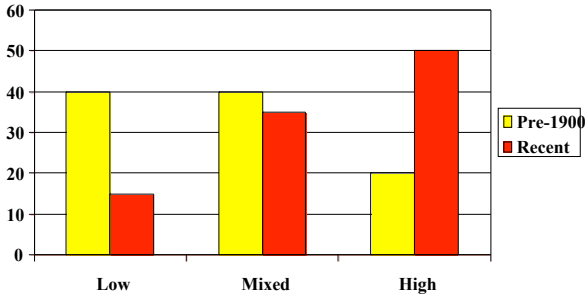
On the one hand, the global spread of exotic pests has placed great stress on U.S. forests, as wave after wave of insects and various fungal diseases have spread from ports of entry for imported goods. On the other hand, forest health issues related to increasing stem volumes in forests nationwide, and particularly in federally managed forests of the western U.S., have captured national attention. It is the latter problem that is currently front and center in national forest policy debates, since this is the primary cause of a number of years of increasingly devastating forest fires as well as the primary basis for the recent *Healthy Forests Initiative* of the Bush Administration.

The spread of exotic pests is being fought state by state and region by region by a small cadre of dedicated scientists and through implementation of a phalanx of regulations designed to slow the rate of movement. The forest health problems related to increasing volumes of standing timber are for the most part being addressed in the nation's courts.

A primary objective of the Healthy Forests Initiative is to reduce biomass volume in forests of the West through an aggressive program of forest thinning. A number of those opposed to the Initiative offer several arguments, including the idea that these stocking levels are not unnatural, that nature will solve the problem over time, that the use of prescribed fire is preferable to thinning, and that the Initiative includes loopholes that can be exploited for commercial harvesting and new road construction. Supporters of the Initiative and the thinning it encourages respond that these stocking levels are unprecedented, that the use of prescribed fire is far too risky at this point as there is no assurance that a controlled burn will remain controlled, that increasing construction of primary and vacation homes in forested areas preclude use of fire as a management tool in ever-larger areas, and that the program offers substantial benefits that far outweigh the risks of exploited loopholes. As the arguments drag on, the problem continues to get worse, raising the possibility that nature will, in fact, present a solution in the form of unimaginably catastrophic fires across the western U.S.

An example of the current situation is provided in a recent report prepared for the Oregon Forest Resources Institute. In western Oregon, where the vast majority of forested land is under the management responsibility of the federal government, only 4% of net growth is being removed annually via timber harvest, with a volume equivalent to 26% of annual net growth lost to natural mortality each year. In addition, current forests are known to have denser canopies, a higher proportion of fire intolerant species, and fewer large trees compared to a century ago. The net result is a far higher than historical probability of high severity fire (Figure 16). The situation is only marginally better in eastern Oregon. Currently the pace of forest thinning is such that about 140 years will be required to restore forest fuel conditions to historical norms. As noted in the recent report " . . . high net growth levels combined with high mortality and low removals may jeopardize long-term ecosystem health, with increased risk of insect infestation and high-severity fire as well as foregone economic opportunities." The comment regarding lost economic opportunities is particularly interesting in view of the substantial and growing U.S. net import dependence for softwood lumber.

Figure 16
The Proportion of Stands of Low Severity, Moderate Severity, and High Severity Fire Regimes in the Northwestern U.S., Pre-1900 and Recent



Source: Quigley et al., 1996 as reported by Peterson et al., 200 5.

In summary, it does appear that concerns regarding forest health are well founded. However, it is not clear that any politically acceptable solution can be found within the near term. Finding solutions, or conversely an inability to do so, represents a vitally important wild card for the future.

The Bottom Line

Notable achievements in forest conservation within the United States marked the 20th century, with stabilization of forest acreage, significant improvements in growth to harvest ratios, increases in timber inventories in the face of increasing wood consumption, and increasing tree diameters across most size classes. However, these achievements have generally gone unnoticed by the consuming public. Now, several issues including population growth and associated growth of consumption, as well as an apparent inability to effectively address forest health issues, cloud the future of U.S. forests. Whether a report of forest conditions at the end of this century will show continuation of positive trends or something different has yet to be determined. It is clear, however, that actions taken in the relatively near term will, to a large extent, determine future forest conditions.

Dr. Jim Bowyer is a professor within the University of Minnesota's Department of Bio-based Products (part time) and an Elected Fellow of the International Academy of Wood Science. He is the current Chairman of the Tropical Forest Foundation, Chairman of the Minnesota Bio-fiber Council, Member of the Governance Board of the Temperate Forest Foundation, and Past President of the Forest Products Society (93-94), and of the Society of Wood Science and Technology (87-88).

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