

# The Sustainability of Ohio's Forest Resources

By Dan Balsler and Richard Widmann  
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## Overview

This report presents an analysis based on data gathered in Ohio by the Forest Inventory & Analysis (FIA) program. FIA is a national program of the Forest Service, U.S. Department of Agriculture, which conducts and maintains comprehensive inventories of the forest resources in the United States. FIA data collected since 1991 indicates that net growth has been twice that of removals with the net change amounting to an annual increase of 1.4 percent in inventory volume. This implies that the current level of removals is sustainable and that increases in timber volumes will continue. Forest sustainability in Ohio is addressed by looking at trends in growing-stock volume and measures of annual growth, removals and mortality. It is recognized that sustainability is a complex issue that takes in ecological, social, and economic processes occurring over multiple geographic and temporal scales and at times is defined more by what is not sustainable rather than what is. "Forest ecosystems are not sustainable if volume or biomass losses exceed growth over large areas or long time periods" (Shifley 2007). Assessing sustainability in terms of wood production and consumption and changes in total volume at the state level are broad measures, but ones that should not be overlooked. "The concept of large-scale, long-term, non-declining volume is clear, measurable, and deeply rooted in our conservation ethic" (Shifley 2007). The broad scale data and analysis presented in this report should not be used to draw conclusions on how individual owners manage their particular holdings.

The FIA Program collects, analyzes, and reports information on the status and trends of America's forests. The first inventory in Ohio was implemented in 1951 (Hutchison 1956). Subsequent periodic inventories were completed in 1968, (Kingsley and Mayer 1970), 1979 (Dennis and Birch 1981), and 1991 (Griffith et al 1993). Beginning in 2000, Ohio's forests have been inventoried annually (Widmann and others in press). In the annualized inventory, about 20 percent of the plots in the state are measured every year and each plot is revisited every 5 years. This annual inventory system allows for coverage every year and a 5-year reporting cycle. FIA maintains databases and makes tools available to access data through the Internet. Data from Ohio's recent inventories may be accessed through the Forest Inventory Data Online (FIDO) program at: <http://fia.fs.fed.us/tools-data/>, or the FIA Mapmaker program at: <http://www.fia.fs.fed.us/tools-data/other/default.asp>. FIA statistical procedures have been scientifically reviewed and data meet specific quality standards (Bechtold and Patterson 2005). To learn more about the FIA program visit: <http://www.fia.fs.fed.us>.

## Results

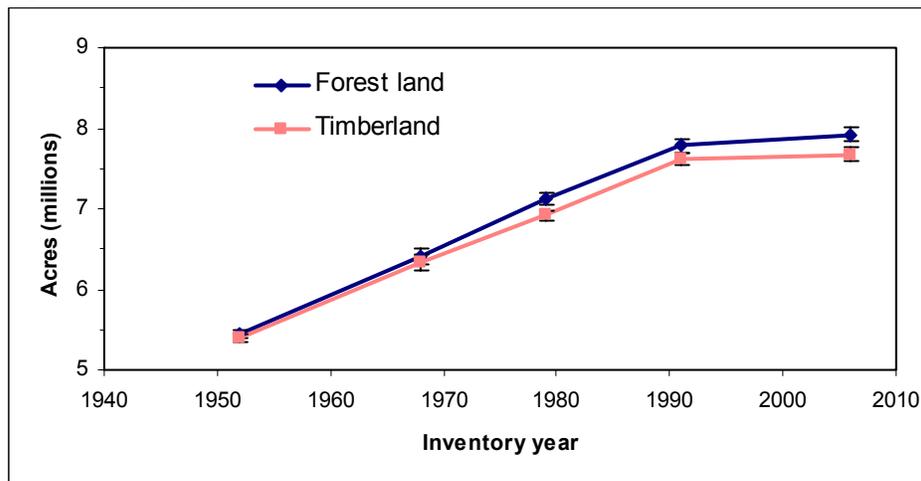
### Area

In 2006, Ohio's forest land area (including reserved and low-productivity land) totaled over 7.9 million acres (Fig. 1). Increases in forest land area have occurred over the last 50 years because of afforestation of agricultural land; although, since 1991, the forest land base has not significantly changed. Trends in timberland area (excludes reserved and low-productivity land) have closely followed those for forest land.

Ohio's forests are primarily occupied by hardwood species. The oak-hickory forest types comprise 54 percent of the forest land and maple-beech-birch types comprise 31 percent. These forests have been maturing as indicated by the continued increase in area of large diameter stands. In 2006, nearly two thirds of the timberland was occupied with sawtimber size stands while 13 percent was in either seedling, sapling or a non-stocked condition. The predominance of sawtimber-size stands is not unusual for hardwood forests managed primarily with selection harvesting methods, as is common in Ohio.

Private landowners hold approximately 88 percent of the forest land with the remainder belonging to public agencies. Of the nearly 7 million acres of forest land in private ownership, 84 percent is owned by families and individuals.

**Figure 1.--Area of forest land and timberland, Ohio, by inventory year. Error bars represent 67-percent confidence intervals.**

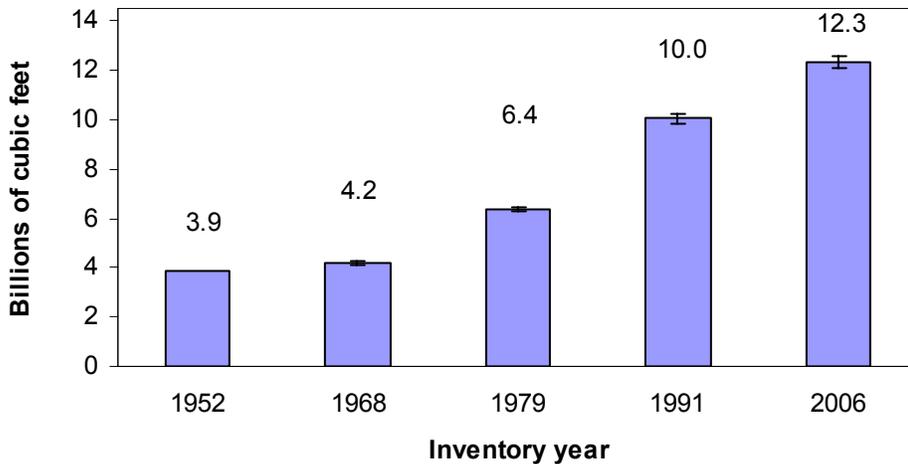


## Volume

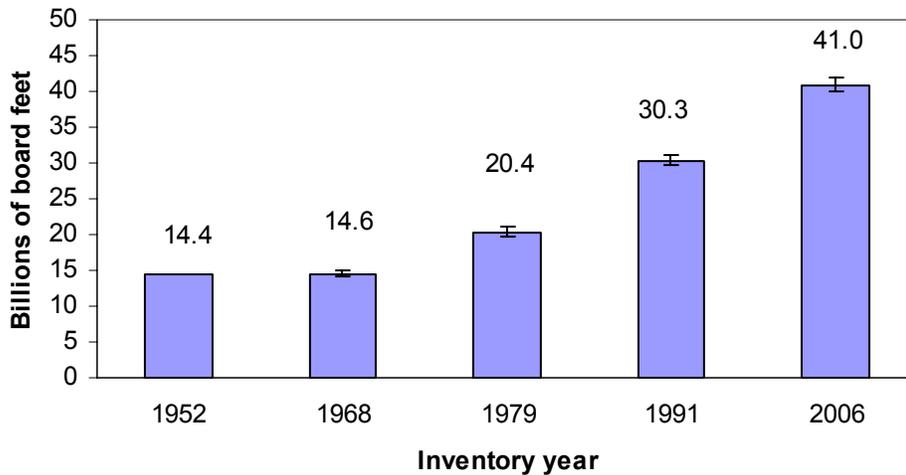
Ninety-two percent of the sound wood volume in live trees is contained in growing-stock trees. These are commercially important species with good form and are at least 5 inches in diameter at breast height. Rough and rotten trees account for 7 and 1 percent, respectively. The total volume of growing stock on Ohio's timberland has steadily increased since 1952 (Fig. 2). The 2006 estimate of 12.3 billion cubic feet is 22 percent greater than in 1991 and averages 1603 cubic feet per acre. Most of the gains in volume were in trees large enough to produce sawlogs (11.0-inches d.b.h. and greater for hardwood species). The portion of volume large enough to produce sawlogs, increased by 35 percent to 41 billion board feet (Fig. 3), and now averages 5,338 board feet per acre, more than double the sawlog volumes recorded in 1979. Continuous increases in volume have brought Ohio's timber resource to record levels in both total volume and volumes per acre.

Yellow-poplar is the leading species by volume, accounting for 12.2 percent of total board-foot volume followed by white oak and hickory. Together the oaks represent 26.7 percent of total board-foot volume and maples 15.3 percent. Ninety-six percent of Ohio's sawtimber volume is in hardwood species.

**Figure 2.--Growing-stock volume of crop trees 5 inches DBH and greater on timberland by inventory year, Ohio, 1952, 1968, 1979, 1991, and 2006. Error bars represent 67-percent confidence intervals.**



**Figure 3.--Board foot volume of crop trees 11 inches DBH and greater on timberland by inventory year, Ohio, 1952, 1968, 1979, 1991, and 2006. Error bars represent 67-percent confidence intervals.**



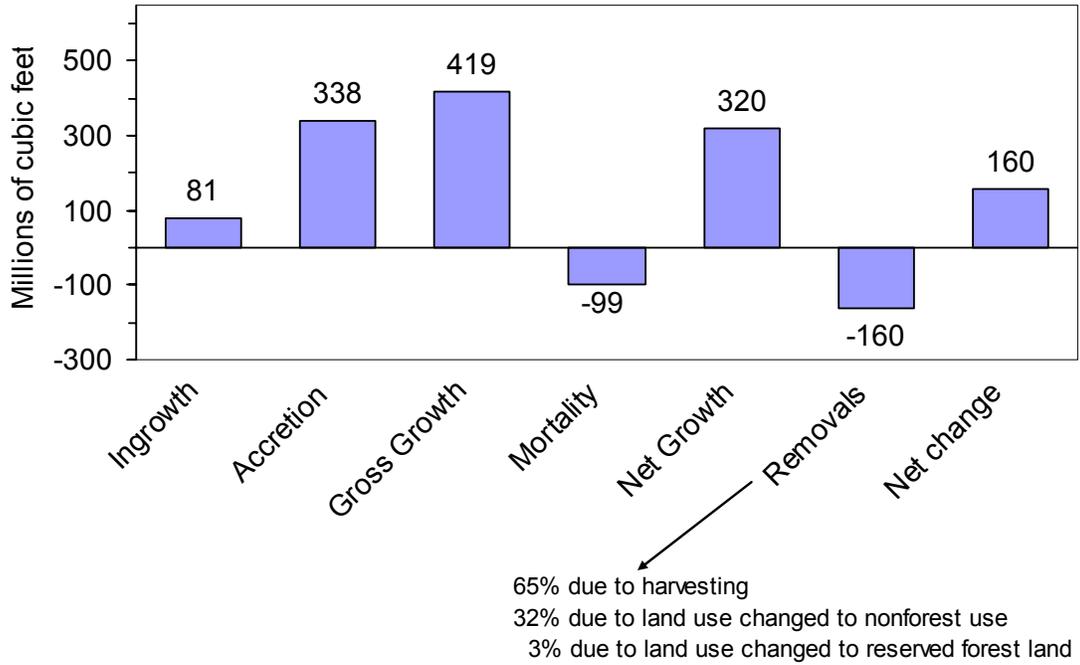
### **Annual Growth, Removals, and Mortality**

During the last 50 years in Ohio, the growth of trees has greatly outpaced mortality and removals. The most recent inventory revealed that since 1991, on an annual basis, the gross growth totaled 419 million cubic feet (Fig. 4). Eighty-one percent of this growth was accretion (growth on trees that were at least 5 inches in diameter at the time of the previous inventory) and 19 percent was ingrowth (trees that were less than 5 inches and grew to at least 5-inches in diameter). Annual mortality averaged 99 million cubic feet resulting in a net growth of 320 million cubic feet. Removals include trees harvested from land that remains in timberland, trees on timberland that have been reclassified to reserved forest land, and trees lost because the forest was converted to a non-forest use. Removals of trees due to harvesting and land use change averaged 160 million cubic feet, leaving an annual surplus or net change of 160 million cubic feet. About two-thirds of the removals were due to the harvesting of trees, with the remainder was due to changes in land use. As a percentage of the inventory, gross growth was 3.8 %, mortality was 0.9 %, net growth was 2.9 %, removals was 1.4%, and net change was 1.4 %.

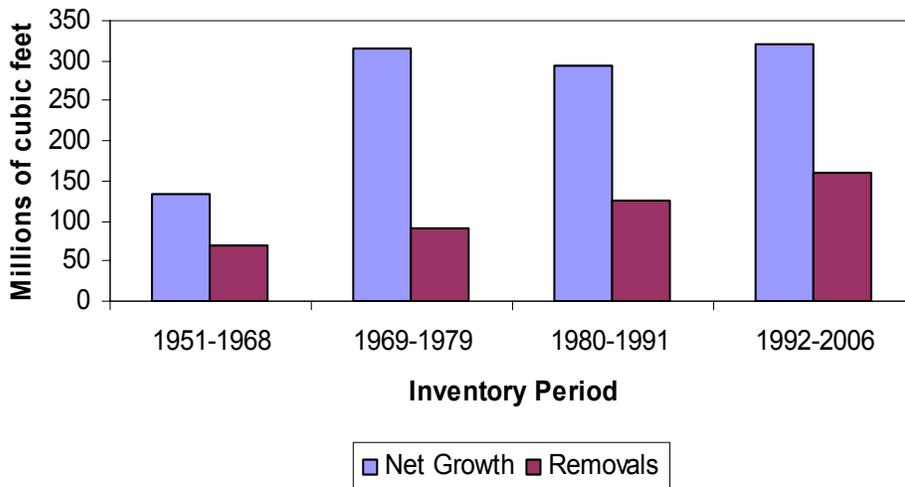
The net change of 160 million cubic feet was nearly the same as during the 1980-91 inventory period, though all the components were higher (Fig. 5). Higher growth was offset by higher mortality and removals.

The ratio of growth-to-removals (G/R) averaged 2.0:1 for the period 1992-2006, but varied considerably between major ownership groups and species. On publicly owned timberland G/R averaged 2.6:1 while on all privately owned timberland G/R averaged 2.0:1. Of the major species growing in Ohio, red maple, sugar maple and yellow-poplar have the highest ratios of growth to removals, 4.1, 2.8, and 2.6:1 respectively.

**Figure 4.--Average annual components of change in growing-stock volume. Ohio, 1991-2006.**



**Figure 5.--Average annual net growth and removals of growing-stock volume on timberland by inventory period**



## Summary

Today's well-stocked forests are a result of net growth consistently outpacing removals during the last half century and the surplus accumulating in the forest. Increases in volume have occurred while these same forests have supplied a steady stream of wood to Ohio's forest products industry. Since 1991, net growth has been twice that of removals with the net change amounting to an annual increase of 1.4 percent in inventory volume. This implies that the current level of removals is sustainable and that increases in timber volumes will continue. This is true since nearly two-thirds of removals are due to harvesting, and trees regenerate and thrive after harvesting so long as the land remains in forest. The small portion of removals due to timberland being reclassified to reserved forest land will continue to provide benefits other than timber products. However, the nearly one-third of removals due to conversion of timberland to non-forest uses threatens sustainability because such changes are usually permanent. As a result, future timber growth from these lands is lost, as are related benefits, like the recharge of groundwater aquifers and conservation of forest habitats.

Commercial timber harvests can be used as a tool in maintaining ecologically sustainable conditions and retaining working forests. The economic returns from harvests provide an incentive to private owners to maintain land in forest and practice sustainable management. Continuous monitoring of Ohio's forests by FIA provides current assessments of forest conditions and will alert those concerned to changes in the current balance between growth and removals.

## Literature Cited

- Bechtold, William A., Patterson, Paul L. 2005. The enhanced Forest Inventory and Analysis program--national sampling design and estimation procedures. Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station 85 p.
- Griffith, Douglas M.; DiGiovanni, Dawn; Witzel, Teresa ; Wharton, Eric H. 1993. Forest statistics for Ohio, 1991. Resour. Bull. NE 128. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 169 p.
- Hutchinson, O. Keith; Morgan, James T. 1956. Ohio's forests and wood-using industries Forest survey release no. 19. U.S. Department of Agriculture, Forest Service, Central States Forest Experiment Station. 40 p..
- Kingsley, Neal P.; Mayer, Carl E. 1970. The timber resources of Ohio. Resour. Bull. NE-19. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 137 p.

Shifley Stephen R. In: Deal, R.L., tech. ed. Integrated restoration of forested ecosystems to achieve multiresource benefits: proceedings of the 2007 national silviculture workshop; 2007 May 7-10; Ketchikan, AK. Gen. Tech. Rep. PNW-733. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 37-47

Widmann, Richard H.; Balser, Dan; and others. (in press) Ohio's forests 1991-2006. NRA Resour. Bull. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.

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