Ohio

Highlights of the 1991 Forest Inventory

Area

Forest-land area in Ohio has changed dramatically since 1787 when the Northwest Ordinance dispersed public domain of Ohio lands. At that time, 95 percent of the land area was forested. Currently, Ohio is 30 percent forested, but that change has not been a straight-line decline from the time of early settlement until now. The current proportion actually represents an increase in the forest-land base since 1940 when forest land bottomed at 12 percent (Diller 1944).

Since that time, forest land has increased steadily. Birch and Wharton (l982) highlighted the reasons for these increases. Due to the changing nature of agriculture in the State, pasture land has been lost to development, and much has reverted to forest land. The high cost of removing trees has led developers of urban and suburban areas to use cropland first. As a result the lands in farms have declined steadily while forest land has increased. Timberland is the most common forest land cover.

Timberland is the classification of forest land that this survey was designed to estimate. Until the 1979 survey, timberland was called commercial forest land, which differs from timberland in name only. The amount of commercial forest land in Ohio has increased steadily since the first inventory was conducted in 1952 (Hutchinson 1954). That report showed 5,396,000 acres of commercial forest land. The current report indicates that Ohio now has 7,620,300 acres in timberland, an increase of approximately 41 percent.

Changes in the timberland base differ within the State. In the three-unit Hill Country (South-central, Southeastern, East-central), timberland area increased by 46 percent. In the three-unit Glaciated Region (Northeastern, Southwestern, Northwestern), the change in the timberland base was less, a 34 percent rise.

The remaining 297,200 acres of forest land is divided into four classes. Urban timberland, defined as timberland except for proximity to urban locations, accounts for 145,000 acres. Reserved forest land is next with 139,900 acres, followed by Christmas tree plantations with 9,800 acres, and unproductive forest land with 2,500 acres.

Private ownership accounts for 93 percent of the timberland. A further breakdown of the private category reveals that private non-industrial individuals own 56.3 percent, farmers own 23.3 percent, corporations own 11.3 percent, and forest industry owns the remaining 2.3 percent of the timberland acres. The 7

percent of public ownership is divided between the State with 4.3 percent and the Wayne National Forest with 2.5 percent.

A majority of the timberland area is now in sawtimber stands (53 percent). Seedling and sapling stands make up 24 percent of the area, and poletimber stands the remaining 23 percent. These breakdowns are fairly consistent in both the Hill Country and the Glaciated Region.

There were 43 forest types measured during the current inventory; of those, 6 types accounted for approximately 70 percent of timberland. Mixed central hardwoods accounted for 34.9 percent, followed by sugar maple/beech/yellow birch, 9.0 percent; mixed northern hardwoods, 7.7 percent; white oak/red oak/hickory, 7.6 percent; black ash/American elm/red maple, 5.6 percent; and black cherry, 4.8 percent.

Number of Trees

In the 40 years since the first inventory of Ohio's forest resources, many changes have occurred in the technical approach, data processing, and how information is tabulated. During each inventory, efforts were made not only to improve and refine the estimates, but also to provide more and varied information. Consequently, new ways of estimating area and volume have evolved. Through all the change, though, one element has remained constant - calculating number of trees. Normally used little to analyze the resource in the past the number-of-trees statistic now is considered beneficial because of its uniform nature, this statistic provides one of the best means for tracking trends between inventories.

For example, the current estimate of Ohio's timberland base shows that there are approximately; 113 growing-stock trees per acre (trees greater than 5.0 inches in diameter at breast height d.b.h.). During the last inventory in 1979, we estimated that there were approximately 92 trees per acre - a 22 percent increase. This represents a long-term trend since the earliest inventory conducted by the Northeastern Forest Experiment Station in 1968 showed only 67 trees per acre of timberland.

The most reasonable explanation for the recent increase is a rise in stocking levels within the State. Each diameter class showed a gain in the number of trees on an average acre in Ohio. As in recent inventories, the smallest diameter class contained the most trees per acre.

The numbers-of-trees statistic also can be used to accurately detail the composition of forests in Ohio. The overwhelming majority of trees is in the red maple species group - 12 percent. So approximately one out of every eight trees measured in Ohio was in the red maple group (see Species Groups of Ohio for a list of the species that form the species groups).

Number of Growing-stock Trees Per Acre

Species Group	1979	1991

Red Maple	7.7	13.5
Elm	6.7	10.5
Hickory	9.7	9.8
Sugar Maple	6.7	9.7
White Ash	7.3	8.7
Black Cherry	5.0	7.9
Select White Oak	7.8	7.3
Yellow-poplar	4.8	6.7
Other Red Oaks	5.0	4.7
Select Red Oaks	3.4	3.7

Wildlife habitat also can be identified from the number of tree stems and the number of shrub stems. Particularly important are the number of trees with nesting cavities and most common browse species.

Sawtimber Volume

Ohio forests continue to mature. As they do, sawtimber volumes per acre will increase. The 1952 survey reported that sawtimber volume averaged 2,075 board feet per acre of timberland. By 1991, average sawtimber volume climbed to more than 4,000 board feet per acre. There are two main reasons for this tremendous rise. As stated earlier, stocking levels in all diameters classes rose since 1952. Also. sawtimber growth has continued to outpace removals on an annual basis.

While sawtimber volume has increased throughout the entire State, there have been significant regional differences in the degree to which these increases have occurred. The Glaciated Region had the largest average with 4,300 board feet per acre, while the Hill Country had approximately 3,900 board feet per acre. Though the Hill Country is a more heavily forested, it is also more heavily harvested. This, combined with the small tracts of land that are not harvested regularly in the Glaciated Region, results in a higher average sawtimber volume per acre in this region.

There also has been a shift in the species groups that make up the largest percentages of volume. While the select white oaks group continues to have the largest amount of volume, the percentage of overall volume has decreased. The order of the other groups remained basically unchanged except for red maple which jumped from tenth to fourth in sawtimber volume. It feel short of being ranked third by fewer than 25 million board feet.

Sawtimber Volume Per Acre by Species Groups

Species Group	1979	1991

Select White Oaks	445	454
Yellow-poplar	268	400
Hickory	245	328
Red Maple	127	325
Other Red Oaks	330	314
Sugar Maple	191	295
White Ash	189	285
Select Red Oaks	227	273
Black Cherry	97	231
Beech	131	215

Larger diameter trees are important for three reasons. First, from an aesthetic viewpoint, larger trees are more stately, and appeal to both owners and users of Ohio timberlands. Second, the larger the tree, the higher the potential lumber yield. But most important, large trees are especially valuable because quality tends to increase as the size of the tree increases. We found that nearly two-thirds of the total sawtimber volume in Ohio - 62 percent - was in larger trees (trees larger than 15.0 inches d.b.h.). Forty-three percent of this larger tree volume is in tree grades 1 and 2.

Quality volume is defined as trees larger than 15.0 inches at breast height with a tree grade of 1 or 2. Yellow-poplar had the largest amount of total quality volume. Other leading species groups in terms of quality volume are select white oaks, select red oaks, other red oaks, and white ash.

The yellow-poplar and select red oaks groups each had approximately 64 percent of their total large sawtimber volume classified as quality volume. Other leading species in percentage of large sawtimber that was quality volume are white ash, other white oaks, and select white oak.

While there are more red maple trees than any other species (see Numbers of Trees), this group ranked 11th in total large sawtimber volume, and only 18 percent of the group was quality volume.

Growing-stock Volume

As with sawtimber volume, growing-stock volume has increased dramatically. Current estimates reveal that there are 1,334 cubic feet of growing-stock volume per acre of timberland. This represents a rise of approximately 750 cubic feet per acre since the 1952 inventory, or approximately 20 cubic feet per acre per year. Again, increased stocking levels and a positive annual growth to removals ratio help to explain this upward trend.

Slightly less than the state average, growing-stock volume in the Hill Country averaged 1,300 cubic feet per acre. At 1,392 cubic feet per acre, the Glaciated Region averaged slightly more than the State average.

As mentioned previously, the Glaciated Region contains many large sawtimber stands in fragmented blocks. This contributes significantly to higher sawtimber volumes per acres. But the region also has a history of agricultural land reverting to timberland. As croplands revert to forests, seedlings and small trees naturally predominate. As the trees top the 5-inch d.b.h. mark, they become ingrowth and add significantly to the growing-stock volume.

Red maple has become the dominate tree species in growing-stock volume. In 1979, the red maple species group ranked 8th in growing-stock volume. Currently it leads all other species. With the exception of the other red oaks (which fell from 3rd to 7th), other species groups remained fairly constant. Besides the red maple group, only black cherry more than doubled its growing-stock volume per acre. The other white oaks and black locust were the only groups to show a decline in per acre averages.

Growing-Stock Volume Per Acre By Species Groups

Species Groups	1979	1991
Red Maple	53	127
Select White Oaks	115	124
Hickory	87	119
Yellow-poplar	71	115
Sugar Maple	65	106
White Ash	67	101
Other Red Oaks	81	87
Black Cherry	41	86
Select Red Oaks	55	74
Elm	36	66

There were three species groups with more than two-thirds of their volume in trees whose diameter is less than 15.0 inches d.b.h. (red maple, hickory, and black cherry). The four oak species groups had less than half of their volume in those smaller trees, with the select red oaks reporting the least with 39 percent. The statewide estimate for growing-stock volume in the smaller trees is slightly less than 61 percent.

Species like red maple and black cherry have natural fast growth rates. These and similar pioneer species such as aspen, black locust, white ash, and yellow-poplar-all have a relatively high proportion of their volume in the smaller diameter classes. These trees will continue to mature but will not contribute as much to the larger volume classes because they tend to remain relatively small-size trees. Oaks and hickories, on the other hand, tend to have higher proportions of their volumes in the larger diameter classes. These species are also more heavily harvested.

Growth and Removals

More than 98 percent of the plots that were visited at the previous survey in Ohio were remeasured in 1990-91. Because of this large remeasurement, the estimates of net growth and net change are considered to be very accurate. This provides an opportunity to look at real change from survey to survey, rather than the difference between estimates taken at two different surveys based on different procedures.

The method of calculating change was modified somewhat. The current volume of a tree is calculated based on the current diameter, tree class, and height. The previous volume is calculated using the previous diameter, tree class, and a previous height that is regressed from the current height. This eliminates bias that occurs when a tree's height is measured at different surveys with potentially different inventory procedures. The difference between the volumes is net change. Different types of trees (e.g., mortality, accretion, removals) contribute to the different components of total net change between inventories.

As in the past, both growing-stock and sawtimber had positive ratios of annual net growth to removals. However, not all species groups showed this positive trend. Looking at growing-stock first, the red maple group had the highest annual net growth.

Other groups with large totals are yellow-poplar, sugar maple, white ash, and black cherry.

While annual net growth is important, the ratio between growth and removals is a more significant statistic. Not only can it explain how the resource has changed in the past, but it gives some insight to future trends. All species together showed a 2.4:1 ratio of average annual net growing-stock growth to removals. Again, the red maple group led with a ratio of 5.7:1. White pine followed at 5.2:1, but was only 13th in total net growth. Other groups with high ratios are: elm, sycamore, sugar maple, and yellow-poplar. Only other white oaks showed a negative ratio of growing-stock volume (more removed than was growing).

Average annual net growth and removals of sawtimber reveals a somewhat different picture. Yellow-poplar topped the list in total annual net growth. It was followed by select white oaks, red maple, white ash, and black cherry. White pine led in terms of growth to removals with a ratio of 7.5:1. Other leading groups are: black locust, red maple, aspen, and elm. Average annual net growth of both select white and select red oaks barely outpaced removals. Three groups had negative ratios: other red oaks, other white oaks, and beech. The average of all species in terms of sawtimber-1.8:1-did not have as large a positive ratio as did growing-stock.

For complete information, refer to the statistical summary report:

Griffith, Douglas M.; DiGiovanni, Dawn; Witzel, Teresa L.; 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.

A statistical report on the fourth forest inventory of Ohio conducted in 1988-90. Findings are displayed in tables containing estimates of forest area, number of trees, sawtimber volume, growing-stock volume, biomass, growth, and removals. Data are presented at three levels: state, geographic unit, and county.