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Website: aede.osu.edu/people/sohngen.1/OER/
Email: oer_info@earthlink.net

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Economic and Policy Trends likely to Influence the Future of Forests in Ohio

By Brent Sohngen, AED Economics, Ohio State University

Forests provide many useful products to Ohioans –including wood products, habitat, and the preservation and enhancement of water quality. Currently, there are around 8 million acres of forestland in Ohio – or around 1/3rd of the total land in the State. Over the past century, the area of forests increased as productivity gains in agriculture reduced the need for agricultural land. Most agricultural experts agree that the productivity gains we have enjoyed for the last half century are likely to continue for some time. But does this mean that the area of forestland will continue to increase in the future? The rate of increase in forestland in Ohio was strongest in the 1960's and 1970's, when forestland expanded at around 1% per year. Since then, the rate of forestland expansion has decreased to around 0.5% per year.

Beyond the area of forests, the state, or stock, of forests also has important implications for Ohioans. To the landowner, the stock of forest is a private asset that can be managed and used to generate income. It also can be a place to recreate and to enjoy the outdoors. To the public, forests on private land are a large, but mostly un-quantified, public good. They accumulate and store carbon – the same element that some people worry may cause the world's climate to change when fossil fuels are burned. They provide habitat for countless species, including song-birds that make long trips back and forth from Ohio to Central and South America. Forests also are just nice to look at. Private forestland owners provide Ohio citizens immense public value. Understanding how local, national, and international trends may influence decisions private landowners make in the future regarding the management of their forests can provide important insights into the potential future flow of public benefits from private lands.

There are also around 1.1 million acres of public forestland in Ohio. Much of the debate in forestry in Ohio in recent years has revolved around management of public forests. The debate in Ohio has followed national trends. In the late 1980's, the U.S. Forest Service, owners of 100 million acres of US forestland, provided around 15% - 20% of annual harvests in country. By the mid-1990's, harvests from U.S. Forest Service land accounted for less than 5% of total U.S. timber harvested, as large areas of public forestland were withdrawn from the productive timberland base. Following these trends, harvests in State owned Ohio forests, and in the one U.S. National Forest in Ohio (the Wayne National Forest) declined substantially during the 1990's.

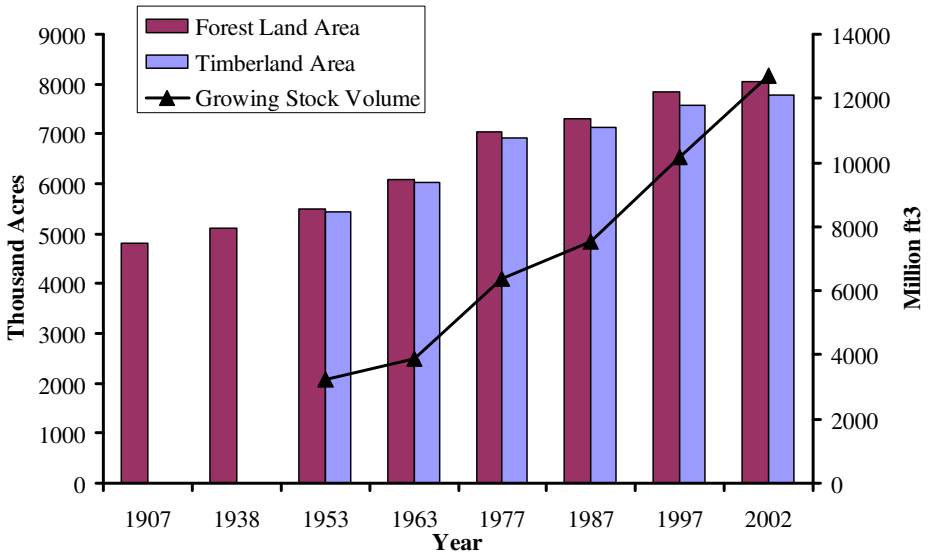
This article addresses economic aspects of several management and policy issues related to forestry in Ohio. First, the article describes historical trends in Ohio forests. Second, the article considers trends in timber management on Ohio private and public forests. To address timber management, two issues are considered, the growth of the stock of forests, and timber prices. Timber prices can have a large influence on the management of forestlands. Understanding what may happen to prices in the future can help illuminate the market pressures landowners may face to harvest their trees. Potential harvest and price trends for private timberland can also help policy-makers evaluate the efficiency of harvests on public timberland. Third, the article describes recent projections of potential future land use change in Ohio, including estimates of changes in forestland, cropland and developed land. The projections are based on a recently estimated model of land use in Ohio counties.

Ohio Forest Trends

Since the early 1900's, the area of forestland in Ohio has expanded as land formerly used to grow crops was abandoned (Figure 1). From 1953 to 2002, the area of forestland increased by 0.8% per year. Over the same time period, the growing stock of forests – a measure of the volume of trees – has increased even more rapidly, by 2.8% per year. Currently, Ohio has around 8 million acres of forestland. Most of this land is classified as highly productive timberland, and most forestland is private. Total government ownership accounts only for 10% of total forestland in Ohio.

Current estimates suggest that the volume of wood in Ohio forests is around 12.7 billion ft^3 of wood (U.S. Department of Agriculture, Forest Service, FIA Database). This is enough timber volume to build 3.7 million houses, or nearly 2 years worth of houses for the entire U.S. at current rates of building (1.6 – 1.9 million new starts per year in recent years). Most of the volume is on private land, and most of the volume (85%) is hardwoods. Over 60% of the volume on timberland in Ohio is classified as being large enough to provide saw-logs (generally greater than 7" in diameter). Annual harvests are estimated to be around 176 million ft^3 per year (U.S. Department of Agriculture, Forest Service, Timber Product Output Database), indicating that only about 1.3% of Ohio's forest volume is harvested each year.

Figure 1: Historical Forestland Area, Timberland Area, and Growing Stock Volume in Ohio Forests (US Department of Agriculture, Forest Service, 2002).



Growth in Ohio's forests continues to out-pace harvest withdrawals and mortality from pests, storm damage, and other disturbances. Between 1991 and 2002, the net volume of trees in Ohio's forests increased by approximately 230 million ft^3 per year. In total, the net volume of trees in Ohio grew 2.0% per year, or 1.8% per acre per year (Table 1). Net volume accounts for total growth less harvest withdrawals and mortality from disturbance, so gross growth in Ohio's forests was likely above 3.1% per year over this period. Net growth rates were greatest in pine forests, although these represent a small proportion of overall forest area. Elm-Ash and Maple-Beech-Birch forest types had the next largest rates of growth.

In comparison to the rest of the country, Ohio's forests are doing well. For the United States as a whole, there are approximately 747 million acres of forestland and 503 million acres of timberland. The total growing stock volume of timber in the United States is around 836 billion ft^3. Since the early 1900's, the total area of forestland in the U.S. has declined slightly. Ohio has approximately 1.5% of total

timberland area and volume in the United States. The rate of growth in Ohio forests, however, is faster than the nation as a whole. Between 1987 and 1997 the net growth per acre in U.S. forests was approximately 0.7% per year, compared to 1.8% per year for Ohio forests. Nationally, 42% of all forests and 41% of growing stock volume are owned by Federal, State, or local government agencies. In Ohio, only around 11% of forests and 9% of growing stock volume are owned by government agencies. As with most other eastern states, most of Ohio's forests are held privately, and are slightly more productive on average than forests owned by the governmental entities.

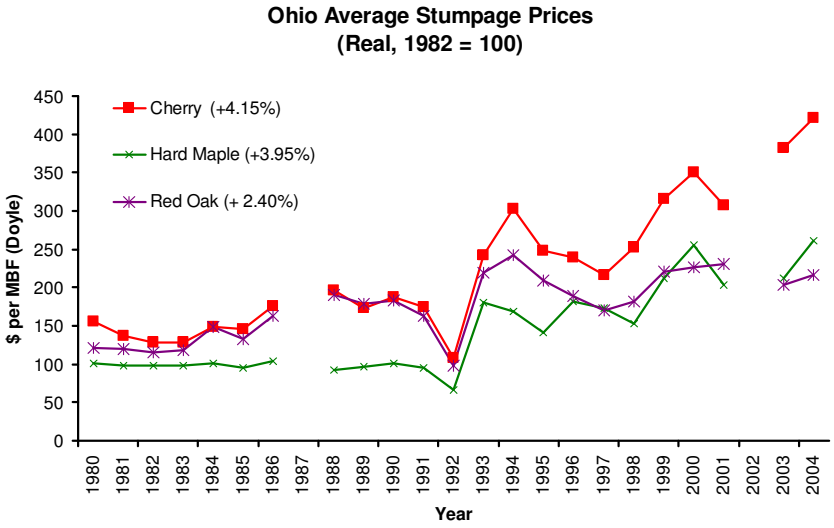
Table 1: Net Annual Growth (1991 – 2002) of different RPA forest types and ownerships
Source: US Department of Agriculture, Forest Service, FIA Database.

	Total	Fed	State	Private
		% growth (net) per acre		
Pine	5.8%	--	3.6%	6.3%
Oak - Hickory	0.9%	1.0%	-0.1%	0.9%
Elm Ash	2.8%	0.5%	-0.3%	3.2%
MBB	2.9%	0.7%	-0.6%	3.0%
Total	1.8%	1.7%	-0.7%	1.9%

Ohio Timber Prices and Forecasts

One important economic factor influencing management in forests is the price of timber. Since the early 1900's, timber prices in the United States have risen at about 4% per year in real terms (Sohngen and Haynes, 1994). Sustained increases in timber prices during the 20th century occurred as old growth stocks were drawn down, strong economic and population growth occurred with industrialization of the U.S. economy, and most recently, more stringent environmental controls were placed on timber harvesting operations. Continued strong growth in timber prices in recent years suggests that accessible timber in the United States has become more scarce. That is, landowners appear to have higher reservation prices for harvesting their forests, perhaps because they derive large, non-market amenity values from their existence.

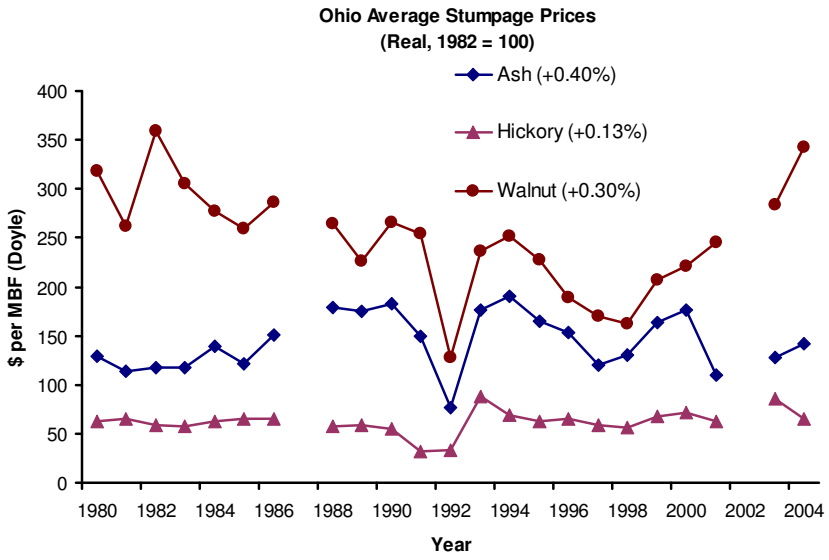
Figure 2: Ohio Average stumpage Prices for Cherry, Hard Maple, and Red Oak (Source: Ohio Timber Price Report, Various Years)



Balancing the rise in economic scarcity, however, is the establishment of plantations elsewhere. In the U.S. South, for example, over 30 million acres of softwood plantations have been cultivated in the last 50 years. The forest products industry has become a large diversified, global industry, and many U.S. and European companies are investing resources in developing countries rather than their home countries. In the last 30 years, over 185 million acres of fast-growing plantations have been established in other countries. These two trends, combined with continued productivity gains in the manufacture of forest products (i.e., getting more usable product from the same number of trees) and continued recycling efforts, are likely to limit future price growth. *The most recent projections of future prices suggest that timber price growth will moderate over the next several decades* (Haynes, 2003; Daigneault et al., 2005).

Within Ohio, timber prices have trended upward for most species since the 1980's (Figures 2 & 3). The most valuable species are Cherry, Hard Maple, Red Oak, and Walnut. Prices for Cherry, Hard Maple, and Red Oak have risen by 2 – 4% per year, with the largest increases occurring after 1994. Walnut, Hickory, and Ash prices, in contrast, have remained fairly stable over the period. The largest increases in prices occurred after 1994, an effect potentially related to the withdrawal of large areas of federal land in the Western U.S. from timber harvesting activity (Wear and Murray, 2004).

Figure 3: Ohio Average stumpage Prices for Ash, Hickory, and Walnut (Source: Ohio Timber Price Report, Various Years).



Assessing Future Trends in Management on Private Land

The trends in forest stocks and timber prices suggest that Ohio forests are likely to undergo substantial transformation in the future. Forestland area expansion and growth in the stock of forests has been strong in Ohio for several decades. Gross annual growth is approximately 3.1% per year. Prices are rising between 0 and 4% per year. The total market value of Ohio forests is currently growing around 3 – 7 % per year. This is a positive trend that benefits Ohio forestland owners in terms of rising real asset value. It also benefits all Ohioans in terms of improved biological integrity within the State's boundaries.

Modeling studies suggest that future price growth will moderate due to increasing productivity in the forest products industry, increased plantation establishment in the U.S. South and other countries, competition from foreign regions, and other factors (Haynes, 2003; Daigneault et al., 2005). *Current estimates suggest that average price growth for sawtimber will be around 0.2% to 0.6% per year for the next several decades.* Prices for some higher quality species, such as Red Oak, Cherry and Maple, could rise more rapidly due to scarcity and slower growth rates. Pulpwood prices are expected to be stable or decline slightly (Haynes, 2003). These projections, of course, are highly dependent on forecasts of demand, which remain fairly stable. Continued increases in real income in developing countries, like South America, China, and India, however, could increase price pressure in unknown ways in the future.

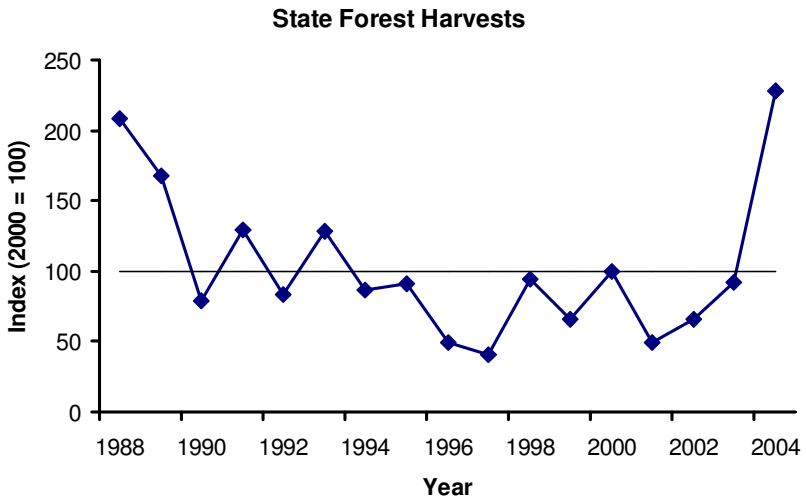
The net growth in Ohio forests is expected to slow in the coming years as current young stocks mature. As growth rates slow, landowners will have increasing incentives to harvest their forests. There is also a substantial opportunity cost associated with holding mature forest stocks, particularly if price growth moderates as the models suggest. ***The current inventory and market signals suggest that timber harvests in Ohio forests are likely to increase in future years as landowners take advantage of the value currently held on forestlands.***

Estimates from Haynes (2003) suggest timber harvests will increase around 0.7% per year in the Northern U.S. (a region that includes Ohio) over the next 50 years. The net effects of forest growth and removals for timber markets imply that forest stocks will continue expanding in the region, but that the net annual growth in hardwood forest stocks in the Northern U.S. will slow over the next 50 years. Estimates from Daigneault et al. (2005) indicate stronger increases in harvests in this region, with total harvests increasing by around 1.2% per year over the next 20 years. As a consequence of stronger increases in harvests, net annual growth is projected to decline more precipitously in Ohio forests in the study by

Daigneault et al. (2005). *Both models substantiate the view that both forest inventories and timber harvesting activity in Ohio will expand in the next couple of decades.*

Trends in Public Timber Harvests

Figure 4: Harvests from State Forestland, relative to base year, 2000 = 100. (Source: Data courtesy of the Ohio Department of Natural Resources, Division of Forestry).



An additional issue to consider in Ohio is the role of public timberland. The Ohio Department of Natural Resource, Division of Forestry (Ohio DOF) is one of the largest public owners of timberland in Ohio. Harvests on state forestlands account for around 7% of total state harvests, although they declined during the 1990's (Figure 4). Inventory information suggests that Ohio DOF forests are more mature on average than private lands – i.e., they have about 6% more volume per acre, and are growing more slowly on average. There is consequently high market value in harvesting State forests. There is also likely to be high value in holding these relatively older forests for environmental or recreational purposes.

An important policy question that Ohio faces revolves around the disposition of forests in the public trust. Additional harvesting would provide economic benefits to the state in terms of timber revenues, but it could detract from the aesthetic or other values people in the state hold for those forests. Today, policy makers have a rare opportunity to focus management on public lands on other benefits, such as recreational or other environmental benefits, without having substantial adverse economic consequences on markets. *With strong projected growth in timber inventories on private land and the moderate price forecasts from modeling studies, industrial harvesting on State forestland does not appear to be necessary to help limit price growth or to sustain the forest products industry in the future in Ohio.* Of course, there are many reasons to manage forests, such as fire prevention, insect control, salvage harvesting after storms or infestations, to improve recreational resources, or to enhance other environmental amenities. Focusing policy decisions on these issues may provide a compelling basis for future management decisions.

Projecting Future Trends in Ohio Forestland Area

Historical trends in Ohio suggest that forestland area and forest inventories have generally expanded in the past 50 years. Will these trends continue? A recent study by Choi et al. (2005) assesses this question with a model that predicts Ohio land uses over a 40 year projection period (2000 – 2040). The model estimates land use in three categories in Ohio counties, cropland, urban land, and forestland. The

estimates are built on land use information from the 1982, 1987, 1992, and 1997 U.S. Department of Agriculture Natural Resources Inventory. The value of land in agriculture, the value of land in forests, population, distance from city centers, and land quality are all used as variables to estimate parameters that predict the proportion of land devoted to the three different uses in each county.

To make projections into the future, returns to cropland (cropland rental value), returns to forestland (forestland rental value), and population are projected for the periods 2010, 2020, 2030, and 2040. Crop land rental values are assumed to rise at 2% per year. Although crop prices have remained stable or declined in recent decades, crop production has increased due to increasing yields. Forestland rental rates are also expected to rise, albeit at slower rates of 0.6% per year due to slowly rising real prices in forestry. Population in Ohio is assumed to increase 26% over the 40 year project period (2000 – 2040). We choose a relatively high rate of population growth in Ohio based on a long-term assumption of strong economic growth that attracts new residents. Most of this increase in population is expected to occur in suburban counties surrounding major cities.

On the basis of these projected changes in land rents for crop and forest uses, as well as demand for urban uses from a rising population, urban land is expected to increase by around 900,000 acres between 2000 and 2040, or around 0.7% per year (Table 3). The expansion of urban land is estimated to use slightly more forestland for development than cropland, however, both cropland and forestland are expected to decrease in the coming years, by around 0.1 – 0.2% per year.

Table 3: Land Use Projections for Ohio (Choi et al., 2005)

	2000	2010	2020	2030	2040	Net change 2000 - 2040	Annual % Change
				Million Acres			
Forest	6.1	6.0	5.9	5.7	5.6	(0.5)	-0.2%
Crop	13.0	12.8	12.7	12.6	12.6	(0.4)	-0.1%
Urban	3.0	3.2	3.4	3.6	3.8	0.9	0.7%

Qualitatively, these results suggest a substantial departure from historical land use trends. Forestland is projected to decline more rapidly than cropland, whereas in the past cropland area declined more rapidly while forestland area increased. Urban land is expected to increase. *Each additional person in Ohio is estimated to "use" about 0.5 acres of land, with around 0.3 acres coming from forestland and around 0.2 acre coming from cropland.*

Conclusions

The area of forestland in Ohio has expanded over the past century from less than 5 million acres to more than 8 million acres. For the most part, these increases in forestland area have resulted from increasing productivity in agriculture, which has reduced the demand for land to produce crops. The volume of wood in Ohio forests has also increased in the past half century from less than 4 million ft^3 in the 1950's to more than 12 million ft^3 today. This increasing area and stock of forests provides many benefits for Ohioans, ranging from nice views, to habitat, to protection of water resources.

Currently, the net rate of growth in Ohio forests appears to be around 1.8% per year, or around 230 million ft^3 per year. Currently Ohio extracts about 176 million ft^3 per year, indicating that gross growth in forests (net growth plus harvests) is around 406 million ft^3 per year, or 3.1%. Over time, these growth rates can be expected to moderate as Ohio's forests mature. Historical trends in prices in Ohio range from less than 1% increases in prices for species like Ash and Hickory, to 2% - 4% for species like Red Oak, Hard Maple, and Cherry. These two trends suggest that harvesting is likely to increase in Ohio forests over the next 20 – 40 years due to the increasing opportunity costs landowners have for holding mature forest stands. Projections from large scale timber models indicate that the trend towards increasing

stocks of forests in Ohio will continue for 1 – 4 decades, but also that harvests will increase during this time period.

Most of the additional harvesting in Ohio will occur on private lands, not surprisingly because private landowners hold over 85% of the land and the stock of timber. Federal and State landowners currently hold mature to over-mature stocks. State and Federal owners could raise revenues by increasing harvesting activity in a sustainable way. However, with strong projected growth in timber inventories on private land and the moderate price forecasts from modeling studies, there may be few compelling reasons to increase industrial harvesting on State forestland. This does not preclude the many other sound reasons to manage forests, such as fire prevention, insect control, salvage harvesting after storms or infestations, to improve recreational resources, or to enhance other environmental amenities.

While the stock of forests is likely to continue increasing for the next 20 – 50 years as younger forests mature, the results of a recent land use change model suggest that the area of forests could stabilize and potentially decline in the next 40 years due to urban expansion. The estimates indicate that 500,000 acres could be converted from forests to urban uses over a 40 year period, or around 12,500 acres per year. These results of course, rely on strong assumptions about population increases in Ohio (26% growth over a 40 year period). If economic growth does not materialize and population in Ohio does not expand as expected, the area of forests will likely remain stable.

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