# ECONOMIC POTENTIAL OF INCREASED TIMBER AVAILABILITY IN NORTHCENTRAL PENNSYLVANIA[1]

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ABSTRACT. Long term forecasts of timber availability were developed for one of Pennsylvania's most valuable hardwood regions. An eight county region in north-central Pennsylvania was found to have a sawtimber supply capability that could triple over the next 60 years. Under a best case economic development scenario, a doubling of harvests could increase the value added in manufacturing within the region by 28%, representing an addition of $300 million per year to the regional economy.

## INTRODUCTION

TIMBER RESOURCES ARE GAINING increased attention within northeastern United States. In part, this relates to the gradual transition of these intermediate aged hardwood forests to a more marketable status. Allied with this change has been a moderate increase in the output of forest products and in the export of logs and lumber to foreign markets. The renewed interest in timber may also be attributed to a general search for alternate means of revitalizing Northeastern economies. Whether these forests can serve as a catalyst to development will depend on the long term production capability of the forests and the economic advantages available to resident industries.

In Pennsylvania, forests extend over 16.8 million acres, representing 58 percent of the state. While Pennsylvania ranks only 33rd in land area among all states, it is 12th in total commercial timberland (USDA Forest Service definition). This includes 20 billion cubic feet (bcf) of hardwood growing stock; more than any other state in the nation. About 50 percent was in sawtimber stands, representing 7 bcf of hardwood sawtimber (Powell and Considine 1982). The size and stature of this resource are also reflected in lumber production, with Pennsylvania ranked first among all states in hardwood lumber output during 1986 (National Forest Products Association 1987).

The State's present forest developed with only a minimum degree of forest management. Prior to 1880, timber harvesting was largely directed toward the more accessible pine and hemlock stands. Further commercial clear-cutting followed during the period 1880 to 1900, in tandem with the development and use of railroads for logging and hauling. By 1920, the remaining virgin and partially cut softwood stands had been clearcut (Marquis 1975). Much of this forest gradually regenerated to hardwood types, with the primary management effort directed to fire protection. Now, large portions of the forest are again reaching harvestable age.

The impending maturation of a large proportion of the state's timberland has led to some speculation that the timber production cycle experienced in Pennsylvania at the turn of the century could be repeated. However, neither the short term nor the long term productive capability of the major timbersheds have been quantified. The dynamics of forest management need to be explored in terms of their impact on future timber yields and economic benefits.

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A series of studies was initiated by Penn State's School of Forest Resources to evaluate timber availability within the northcentral region of Pennsylvania and to assess the current structure and future potential of the region's forest products industry. This paper describes (1) the results of a timber forecasting model organized to determine future timber availability within the region and (2) allied estimates of the economic activity that could be generated by an expanded harvest and increased utilization of timber within the region.

## DESCRIPTION OF THE STUDY REGION

The Allegheny Region, an eight county area located along the northern tier of Pennsylvania (Figure 1), was selected for study because it comprises one of the State's more valuable timbersheds. At the time of the 1978 state-wide inventory, the region was 84% forested and contained the largest per acre and total growing stock volumes of any of the eight forest survey units in the state (Powell and Considine 1982). It also included over 20% of the state's timberland, about 3 million acres. The more valuable northern hardwood types dominated, representing 69% of the timberland. Upland oak types were found along the southern portion of the region and comprised 21% of the timberland area. Nearly 55% of the acreage was classified as sawtimber stands, with 37% in poletimber and 7% in seedling/sapling (Considine and Powell 1980).

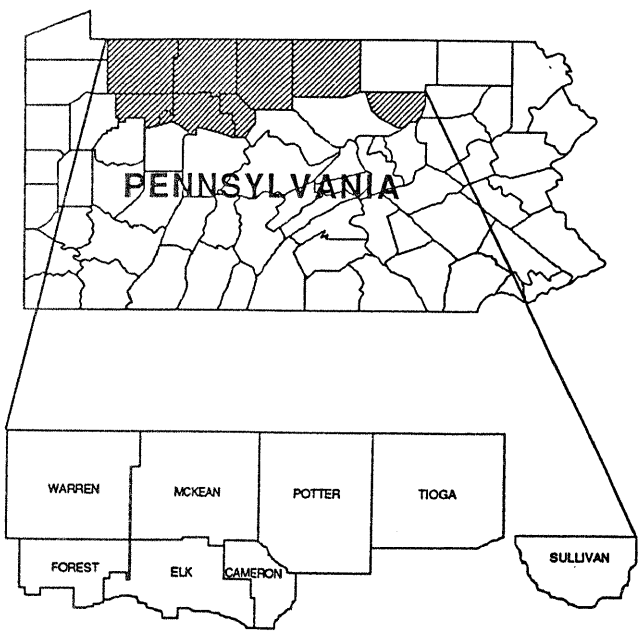


Figure 1. The Allegheny Region of Pennsylvania.

Timberland within the region was actively managed by both the public and private sectors. Forty-two percent of the timberland was under public management, including the U.S. Forest Service, the Pennsylvania Bureau of Forestry and the Pennsylvania Game Commission. Over 17% of the timberland was managed by the forest products industry and an additional 10% was owned by nonforest-based industries. The remaining 31% was owned by farmers and other private non-industrial classes (Considine and Powell 1980). Over 60% of the private timberland was situated on tracts exceeding 200 acres in size, with 45% in tracts over 1000 acres. An active forest management attitude was prevalent within these properties, with 72% of the private timberland controlled by owners who had harvested in the past (Birch and Dennis 1980). Owners who had not harvested in the past most often cited immature timber as their primary constraint.

A sizeable forest products industry was identified within the Allegheny Region (Westman et al. 1985). In 1981, there were 480 forest product establishments within the region, comprised of 356 logging contractors, 89 sawmills and 35 secondary manufacturers (Table 1). Sawtimber consumption within the region was estimated at nearly 150 million board feet (mmbf), Doyle scale, per year. However, over 85% of the lumber output was exported, with the economic benefits of secondary manufacture captured elsewhere.

Overall, the forest products industry was of moderate importance to the region's economy. Eighteen percent of the value added from manufacturing within the region was derived from the forest products industry, amounting to $196 million in 1981. Nearly 4000 full-time workers were employed by this industry group, representing 15% of the total employment and wages/salaries developed by the region's manufacturing industries. Over one half of the financial contributions from the forest product industry were organized from the pulp and paper sector, underscoring the relative importance of this particular sector.

An initial study of sawtimber availability in the Allegheny Region by Strauss and McWilliams (1987) provided a starting point for timber assessments. The TRAS stand projection model (Larson and Goforth 1974) was used to estimate sawtimber availability over a three decade period, 1980 to 2010. Model forecasts indicated an increase in sawtimber availability, to an average annual level of 425 mmbf (International 1/4") in the 1990's. However, in the third decade, the potential output fell to an average annual level of 318 mmbf. The restricted planning horizon available to the TRAS-based model, in combination with the forecast of a potential decline in the region's production capability, were sufficient causes for developing an expanded timber projection model.

Table 1. Economic characteristics of the forest products industry in the Allegheny Region, 1981.

| Sector | No. of Firms | Employment (full time equiv) | Income ($ million) | Value of Shipments ($ million) | Value Added ($ million) |
|---|---|---|---|---|---|
| Logging | 356 | 861 | 14.4 | 49.9 | 34.6 |
| Sawmills | 89 | 1153 | 13.3 | 65.9 | 36.8 |
| Wood mfg. (pallet/dimen/ furniture) | 29 | 735 | 9.7 | 33.6 | 15.8 |
| Pulp/paper | 6 | 1184 | 27.4 | 216.5 | 109.3 |
| Totals | 480 | 3933 | 64.8 | 365.9 | 196.5 |

PROCEDURES

Timber Projections - An improved timber projection system was developed for the region using the USDA Forest Service FORPLAN model (Strauss and Lord 1988). Access to FORPLAN version II was made available by the USDA Forest Service through the Allegheny National Forest headquarters at Warren, Pennsylvania.

The general FORPLAN model is organized from several basic components: an objective function, a planning horizon, analysis areas, prescriptions, yields, activity variables, and constraints (Johnson et al. 1986). The objective function for the regional model was directed to maximizing the non-discounted harvest of sawtimber over a 100-year planning horizon (Lord 1985). The planning horizon was divided into 10 decades beginning in 1980 and ending in 2079. A sawtimber measure was used in the objective function, rather than a combined sawtimber and pulpwood measure, to reflect the primary objective of most hardwood management strategies.

The region's timberland was stratified among 75 potential analysis areas based on five ownership groups, three broad forest types, and five age classes. Conceptually, an analysis area represents a distinct homogenous resource unit available to management by its owners. Ownership groups included the USDA Forest Service, the Pennsylvania Bureau of Forestry, the Pennsylvania Game Commission, private ownerships with properties over 200 acres in size, and private ownerships with properties under this size. The latter subdivision of private timberland accounted for larger property ownerships having a better potential for long term management and a greater likelihood of more intensive management. The three forest strata were the oak types, the northern hardwood types, and the allegheny hardwood type. The latter is a variant of the northern hardwoods and typically has higher percentages of black cherry, ash and yellow poplar.

Stand age classes were derived from stand size class information. Stand age classes were 1-30 years, 31-50 years, 51-70 years, 71-90 years, and 91 years or older and corresponded to respective stand size classes of seedling/-sapling, poletimber, small sawtimber, large sawtimber, and large sawtimber exceeding a 90 year rotation age (Strauss and McWilliams 1987). Forest type and age class distributions for the ownership groups were developed from inventory information maintained by the public agencies and, in the case of private ownership, from the USDA Forest Service plot data acquired during the 1978 forest survey of Pennsylvania.

Silvicultural prescriptions were represented in the regional FORPLAN model as a sequence of harvesting activities. Timing options for each prescription described the range of ages or periods in which the treatments could be implemented, e.g. rotation or thinning ages. The selection of alternative silvicultural prescriptions for the regional model was based on a previous survey of ownership groups in the Allegheny Region (Strauss and McWilliams 1987).

Four prescriptions were defined, represented by three combinations of intermediate and final harvests for even-aged management and a selection management system for uneven-aged management. The even-aged silvicultural prescriptions generally followed a rotation length of 85 to 115 years. During the rotation, the stands received from zero to two thinnings. Rotations of up to 155 years were allowed on the public ownerships to facilitate their general management strategies. Following final harvest, the model assumed that all analysis areas would be regenerated to their original type.

On the Allegheny National Forest, the proposed management plan recommended certain production ceilings and a nondeclining even flow management policy for the forest (USDA Forest Service 1985). For the state ownerships, annual harvests were constrained to 1% of their even-aged forests, consistent with their area control policy. From 10 to 25% of their properties were also managed on an uneven-aged basis.

The only management strategy on private lands was even-aged. On large tracts, the financial objectives resulted in rotation ages of 85 to 115 years. In order to model the more intensive management of larger tracts, two-thirds of the large tracts received two commercial thinnings, with the remaining acreage subject to one thinning. On small private tracts, stands were harvested at any time between 85 and 105 years. Intermediate thinnings were not scheduled on small ownerships to represent their less intense management effort.

The timber yield coefficients for the study were based on growth and yield tables originally developed by the USDA Forestry Sciences Laboratory for the Allegheny National Forest FORPLAN model. Although the 0.5 million acre national forest is in the western portion of the Allegheny Region, the yield tables were considered acceptable for the entire region.

Economic Impact - In addressing the potential economic impact of future sawtimber harvest within the Allegheny Region, certain assumptions were made regarding the magnitude and direction of this commercial enterprise. The logic of these assumptions will be addressed in a subsequent section of this paper. First, it was assumed that the regional sawtimber harvest would double over a 20 year period. This level of production, in the vacinity of 50 mmcf per year, would be within the bounds of the available supplies predicted by the turn of the century.

Three general scenarios were established to identify certain assumed levels of manufacture imposed on the region's forest products industry. In the "minimal" case all of the increased sawtimber would be harvested by resident logging companies but only one half would be processed by resident sawmills. This would double the production level in the logging sector and increase production by 50% in the sawmill sector, with the remaining logs exported from the region. A 50% expansion in output was also depicted among wood manufacturers (pallet, dimension and furniture). In the "moderate" case, a doubling of output was assumed for both the sawmill and the secondary wood manufacturing sectors. The third scenario, a "best" case situation, assumed a doubling of production in all four sectors, including the pulp and paper sector. To reflect the added harvest of roundwood required by pulp manufacturing, the logging sector's output was increased an additional 30%.

Changes in employment, income and value added, brought about by the alternate levels of production, were based upon the industry structure identified in 1981 (Table 1). In the case of the logging sector, the percentage change in output was applied directly to employment, income and value added. Thus, a doubling of output also doubled the latter three measures. For the remaining three sectors, the percentage change in output was also applied to value added, but a more moderate increase was made to employment and income. For the sawmill sector, only 90% of the output gain was applied to employment and income. Thus, a 50% increase in output resulted in a 45% increase to employment (and income). This reduction assumed a future technical ability of expanding output with a less than proportional increase in labor. In the wood manufacturing sector, labor increases were held to 85% of the output gain and, for the pulp/paper sector, the advantage was placed at 75% of the output gain.

Finally, an estimate was included of the secondary, or indirect, effects that an expanded forest products industry would have upon other manufacturing industries in the region. Economic evaluations of West Virginia's forest products industry (Zinn and Jones 1987) and Vermont's sawtimber-based industry (Michaels et al. 1986) provided estimates of these indirect, or multiplier, effects. Employment and income multipliers for the sawmill, wood manufacturing and pulp/paper sectors were in the range of 1.55 - 1.60, with the value added multipliers placed at 1.55 - 1.70. Since neither study identified logging as a separate sector, no multiplier effect was projected.

It should be noted that the multiplier values used for the Allegheny Region could be slightly higher than warranted due to their being organized from state-wide economic studies. Technically, an entire state has a more integrated economy than an area the size of the Allegheny Region, thereby providing a higher multiplier effect between industrial groups. However, this study also took a conservative stance by not including the tertiary, or induced, effects generated by the expenditure of employee incomes within the region. In the previously cited studies, the composite effect of indirect and induced demands provided multipliers ranging from 2.2 - 2.6 for the forest products industry. Although the indirect multiplier values used within the Allegheny Region may be somewhat overstated, they are probably within bounds of the composite multiplier.

## RESULTS

Timber Projections - A major increase in available sawtimber was forecast for the Allegheny Region over the 100-year period (Table 2). Starting from a level of 280 million cubic feet (mmcf) in decade 1, the model projected general increases in sawtimber availability throughout the next six decades, reaching a peak volume of more than 950 mmcf in both decades 6 and 7. A modest decline was registered in the eighth decade, followed by an additional drop of 27% in the final two decades. Estimated peak production was more than triple the level forecast in the first decade.

Sawtimber by ownership groups was in direct proportion to the amount of land controlled by each group (Table 2). The private to public ratio increased slightly over the study period, ranging from 62:38 for the first three decades to 58:42 for the last three decades. This shift reflected the effect of the even flow management strategies on public lands, coupled with a gradual decline in timber availability from private lands.

Over the 100-year period, 85% of the available sawtimber was provided from final harvests, with the remainder coming from

Table 2. Projected sawtimber harvests from the Allegheny Region by decade and ownership group, 1980-2079.

| Decade / Ownership: | Allegheny National Forest | Pa. Bureau of Forestry | Pa. Game Commission | Private Small Tract | Private Large Tract | Total |
|---|---|---|---|---|---|---|
| Size: m acres | 433.6 | 489.4 | 215.0 | 1,068.5 | 683.1 | 2,889.6 |
| | | | Volume in mmcf | | | |
| 1 | 46.8 | 62.8 | 17.1 | 52.5 | 101.2 | 280.4 |
| 2 | 89.4 | 58.9 | 24.0 | 77.6 | 202.6 | 452.5 |
| 3 | 99.4 | 79.0 | 52.6 | 225.8 | 184.5 | 641.3 |
| 4 | 98.4 | 115.5 | 57.6 | 141.2 | 166.6 | 579.3 |
| 5 | 105.7 | 111.8 | 53.3 | 261.9 | 226.8 | 759.5 |
| 6 | 118.4 | 118.4 | 46.2 | 188.0 | 492.8 | 963.8 |
| 7 | 126.3 | 153.8 | 80.5 | 176.5 | 414.6 | 951.7 |
| 8 | 129.2 | 123.4 | 49.2 | 29.7 | 548.6 | 880.1 |
| 9 | 112.8 | 152.8 | 74.1 | 163.5 | 132.3 | 635.5 |
| 10 | 109.2 | 129.3 | 42.2 | 36.4 | 341.7 | 658.8 |
| Total Sawtimber | 1035.6 | 1105.7 | 496.8 | 1353.1 | 2811.7 | 6802.9 |
| Swtbr. from thin./sel. | 97.1 | 223.7 | 191.7 | 0.0 | 472.8 | 985.3 |
| Total Pulpwd. | 544.8 | 982.6 | 418.6 | 1110.8 | 2178.5 | 5235.3 |
| Pulp from thin./sel. | 146.6 | 503.6 | 256.6 | 0.0 | 1088.9 | 1995.7 |

thinnings and selection harvests (Table 2). The proportion of sawtimber coming from final harvests increased over the study period, with 70% organized in the first three decades and 89% in the final seven decades.

A total of 5.2 billion cubic feet of pulpwood was available for harvest during the 100-year period (Table 2). The distribution of the pulpwood output by ownership groups was also in proportion to the size of the ownerships. About 38% of the pulpwood originated from intermediate thinnings and selection harvests. A moderate decline in pulpwood availability was registered due to the gradual advance in the forest's age structure and associated reduction in commercial thinnings.

Within the private ownerships, a cyclical pattern of available timber was evident. This was attributed to the initial imbalance in age classes within these ownerships, in combination with the assumed management strategy of releasing all timber to the market at rotation age. A gradual increase in private sawtimber harvests was evident over the first six decades in tandem with the substantial acreages of large sawtimber (Table 2). Following, a considerable drop was forecast, as removals exceeded stand replacement.

On public lands, the sustained production strategies resulted in a uniform increase of sawtimber throughout the study period. Within state properties, an increased output was evident, with the area control strategy also resulting in a backlog of old growth stands (> 110 years). Fluctuations in output levels were largely attributed to variations in commercial thinning operations. On the National Forest, the nondeclining even flow constraint held total output to a range of 130-158 mmcf per decade. By the fourth decade, the forest was capable of maintaining its upper limit of production through rotation harvests, thereby eliminating the need for thinning operations. Longer rotation lengths were evident on public ownerships during the latter decades, with the average stand age of harvested material exceeding 140 years.

The cumulative effect of the forest's growth and proposed harvest was a better balance of age classes within the aggregate forest. Initially, nearly 95% of the timberland was in poletimber and sawtimber size class material. By the midpoint of the study, approximately 45% of the timberland was harvested and reestablished to seedling/sapling and poletimber sized stands. The primary imbalance by the midpoint was in the 51-70 year class stands (small sawtimber) that developed from the initial shortages of seedling/sapling class stands in the first decade. By the conclusion of the study the distribution among the stand classes was 32% in seedling/sapling, 27% in poletimber, and 41% in sawtimber stands. This general balance was found on both public and private forests.

Economic Impacts - The proposed doubling of sawtimber output over a 20 year period could result in varying economic impacts, depending on the extent of accelerated manufacture by resident industries. In the "minimal" case, the doubling of output by resident loggers and a 50% increase in sawmill and secondary wood manufacturing resulted in over 2000 new jobs and a $29 million increase to wage and salaries for regional manufacturing (Table 3). This expansion also created an additional $79 million in the regional value added from manufacturing, representing a 7% gain over the 1981 level. Forty four percent of this gain was organized from the logging sector, with 33% credited to the combined sawmill and wood manufacturing sectors and the remaining 23% to the indirect demand placed on other manufacturers.

By doubling the output from the sawmill and wood manufacturing sectors, as identified in the "moderate" case, the region would realize a further increase in employment of 1,295 persons, with an additional $17 million placed in salaries and wages. Value added by manufacture would increase by another $43 million, for a total gain of 11% beyond the 1981 level.

The third expansion, this time in the pulp and paper sector, provided 1700 new jobs, $34 million more in wages and salaries and $182 million more in value added. Total value added was $304 million, representing a cumulative increase of 28% above the 1981 level.

## DISCUSSION

Future Markets - Some assessment of the region's overall ability to market an increased supply of sawtimber can be made from recent evaluations of hardwood markets. The national forecast for hardwoods calls for a tripling of product demand over the period 1980-2030 and a doubling of sawtimber supply, leading to an increase in the real prices for certain products (USDA Forest Service 1982). Real price increases have now been confirmed for various species indigeneous to the Allegheny Region over the period 1964-86 (Kingsley and DeBald 1987). In part, the increased production in hardwoods has been bolstered by an increased demand for logs and lumber from foreign markets (Araman 1987, Gregory 1987). Overall, the national and international demands for hardwood products complement the region's timber production capability and should stimulate the marketing of available supplies.

Previous forest surveys of Pennsylvania have shown a gradual increase in sawtimber harvests from the Allegheny Region during the past three decades (Ferguson 1958, Ferguson

Table 3. Potential economic impacts resulting from an expansion of forest products manufacturing in the Allegheny Region.

| | Δ Output | Δ Employ | Δ Income ($ mil) | Δ Value Added ($ mil) |
|---|---|---|---|---|
| Minimal Case: | | | | |
| Logging - | 100% | 860 | 14 | 35 |
| Sawmills - | 50% | 510 | 6 | 18 |
| Wood Mfg. - | 50% | 310 | 4 | 8 |
| Pulp/paper - | 0% | | | |
| Total Direct | | 1680 | 24 | 61 |
| Total Indirect | | 450 | 5 | 18 |
| Total | | 2130 | 29 | 79 |
| Moderate Case: | | | | |
| Logging - | 100% | 860 | 14 | 35 |
| Sawmills - | 100% | 1035 | 12 | 36 |
| Wood Mfg. - | 100% | 620 | 9 | 16 |
| Pulp/paper - | 0% | | | |
| Total Direct | | 2515 | 35 | 87 |
| Total Indirect | | 910 | 11 | 35 |
| Total | | 3425 | 46 | 122 |
| Maximum Case: | | | | |
| Logging - | 130% | 1120 | 18 | 45 |
| Sawmills - | 100% | 1035 | 12 | 36 |
| Wood Mfg. - | 100% | 620 | 9 | 16 |
| Pulp/paper - | 100% | 885 | 20 | 110 |
| Total Direct | | 3660 | 59 | 207 |
| Total Indirect | | 1430 | 21 | 97 |
| Total | | 5090 | 80 | 304 |

1968, Bones and Sherwood 1979). A 20% increase in harvests occurred between the 1950's and the 1970's, with the average annual consumption in sawtimber of 21 mmcf increasing to 25 mmcf by the 1970's (Figure 2). The 1981 study of the region's forest products industry also supported this general trend, showing an annual sawtimber consumption of 24 mmcf, excluding log shipments to outside regions (Westman et al. 1985).

A positive trend in pulpwood removals has also been evident in the Allegheny Region (USDA Forest Service series). Between the 1960's and 1970's, pulpwood harvests doubled, increasing from 76 mmcf per decade to 152 mmcf. Furthermore, the initial six years removal rate in the 1980's was 56% higher than for the same period in the 1970's.

Availability of Timber Supplies - The TRAS model of the region's forest system (Strauss and McWilliams 1987) showed a potential doubling of sawtimber output when comparing the 1970's harvest rate to the 1980's avail-

ability level. However, nearly 45% of this increase was obtained from intermediate harvests. The second decade's available supply was near constant, followed by a 24% decline in the third decade (Figure 2). Over the 30 year period, the TRAS-based model provided 25% more sawtimber than the FORPLAN model. This was largely attributed to the alternate structure of the two models and, to a lesser extent, their alternate sources of growth and yield information.

Basically the TRAS model was less flexible in its identification of available sawtimber, with potential supplies organized from the various management plans at their earliest release date. In contrast, the timber maximizing design of the FORPLAN model took advantage of the forest's growth function over the 100-year study period and deferred some proposed harvests to later periods in time. In general, both studies supported the doubling of sawtimber availability over a 20-30 year period. In the TRAS-based model, the gain was more immediate, with a major portion organized from lower valued intermediate harvests. The FORPLAN model showed a stronger, long term timber supply capability, largely supported by final harvests.

Economic Potentials - The proposed doubling of sawtimber harvests over the next 20 years could provide a variety of economic gains to the region, ranging from a moderate increase of 7% in the value added by manufacture to a maximum of 28%. The explanation for this variation is fairly simple; as more timber is processed by resident industries, the greater the value added to the economy.

The forest products industry organized within this region consists of two major divisions: a sawmill/wood manufacturing complex dependent on sawtimber and a pulp/paper complex based upon roundwood. These divisions are largely separate in their timber demands, however, their combined raw material needs support the intergrated harvesting design of most forest plans. A similar compliment would also be created by the roundwood needs of a particleboard or flakeboard industry. Within the Allegeheny Region, one of the key limits to the further development of either pulp and paper or particleboard manufacturing is the shortage of softwoods. However, certain advances in the manufacture of disposal paper product and variable density boards hold sufficient promise for the increased use of hardwoods by these industries (USDA Forest Service 1982).

Also, the implied joint expansion of the region's sawmill and wood manufacturing sectors, as presented by this paper, should not be interpreted as a formal technical linkage. During 1981, less than 15% of the resident sawmill production was marketed within the region. As such, a sufficient

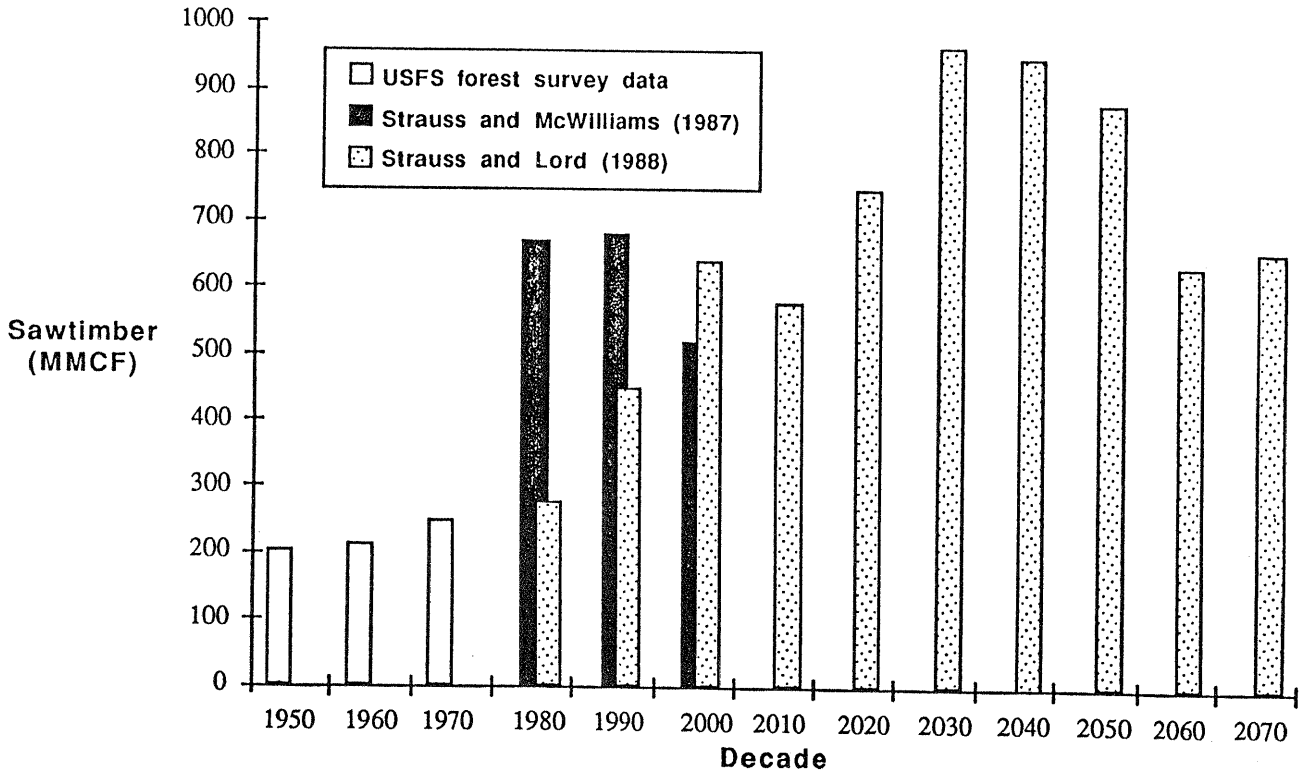


Figure 2. Historic and projected sawtimber harvests for the Allegheny Region.

supply of lumber already exists for an expansion of the secondary wood manufacturing sector. In a similar fashion, there already exist abundant supplies of roundwood for an initial expansion of the pulp and paper or particleboard sectors.

## CONCLUSIONS

The timing and magnitude of the future timber supplies predicted by the model are, in general, supported by information on this resource base. First, the existing volume of timber within the Allegheny Region has been confirmed through the continuing series of forest surveys and updates. Second, the growth inherent to this resource supports the predicted increase in timber availability. This progression has been modeled and shown to be consistent with the predicted advance of age classes and prescribed rotation ages.

The most debatable aspect of the model is its inability to predict the actual volumes of timber that will be marketed. The availability data reflect an optimal scenario, largely based on the management desires of the forestry profession. Although this advice is closely considered on public forests, it may not be consistent with the future decisions of the private sector, nor with the economic realities of timber markets. In short, more or less timber could be marketed depending on the long term demand for this commodity.

Regardless, a major sustained expansion in sawtimber production can probably be expected from the Allegheny Region. This note of optimism is supported by the increasing world demand for hardwood timber resources and by this region's ability to provide a quantity and quality of timber unmatched by any other timbershed. An unresolved question is whether the expansion in timber harvests will foster an increase in the region's forest products industry.

Economic development within the overall forest products sector will depend on something more than just the provision of ample timber supplies. Assuming that an expanded demand will develop for the finished products, the development of manufacturing centers within the Allegheny Region will require a particular blend of capital, labor and raw material inputs under the secondary influence of investment and tax incentives, transportation networks and proximity to available markets. If this composite of factors can be found elsewhere and in a more advantageous setting, then these industries will locate or expand according to the relative advantages provided by alternate sites. Timber can serve as an important catalyst to industrial development but it may not be the most dominant force. Should future industrial growth locate elsewhere, then the best that can be expected for the Allegheny Region will be the continued export of logs and lumber to outside regions.

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