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The Economic Importance of Vermont's Sawtimber

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Abstract

This paper concentrates on the potential economic importance of Vermont's sawtimber. The timber industry employed over 9,000 workers in 1980, and the value of stumpage cut that year was worth approximately $459 million to the State's economy. Preliminary resurvey data indicate that sawtimber inventory now exceeds 14 billion board feet. Yet, sawtimber removals have averaged only 200 million board feet per year over the last 10 years. We used an input-output model called IMPLAN V1.1 to predict socio-economic impacts of several sawtimber production levels. The results indicate that improved markets for the existing resource could significantly contribute to the State's economy. If 50 percent of the projected annual growth could be marketed, an additional $152 million contribution could be made to the State's gross product and over 9,000 new jobs created.

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Introduction

The importance of forest resources in the State's economic base has long been recognized (Bonyai and Sendak 1982, Healy 1984, Kingsley 1977). Quantitatively estimating forest resource values, however, continues to be a challenge. Three recent and related projects that were analyzed for issues related to the economic importance of the State's forest resources were: (1) The Fourth Comprehensive Forest Inventory of the State (1983); (2) A Study of Alternative Futures for Vermont (1982); and (3) A State Forest Resources Planning Project (1980-85).

Forest surveys by the USDA Forest Service have been conducted in 1948, 1966, 1973, and 1983. From findings of the 1983 resurvey, the following information is pertinent to the wood fiber supply (Frieswyk and Malley 1985):

- Seventy-five percent of the State's land area is classified as timberland.
- Northern hardwoods type group make up 61 percent of all timberland.
- Volume of growing stock increased by 25 percent since the last survey (1973) with sawtimber volumes rising by 22 percent.
- The area of the sawtimber stand-size class increased by 45 percent since the last inventory.
- Sawtimber volumes on timberland averaged 3,163 board feet per acre; an increase of 22 percent since the last inventory.
- Sawtimber inventory increased to 14 billion board feet compared to less than 11.5 billion in 1973.
- However, annual sawtimber removals continued to average about 200 million board feet since 1973.

In January 1984, representatives of the forestry community were asked by the State Forester to set priorities on how the resurvey data should be analyzed. An analysis of the economic importance of forestry and forest-related industries was the top concern of the respondents.

The Vermont Futures Project of June 1982 also involved a cross-section of the State's forestry community.[1] These representatives assessed the current resource situation and proposed future goals (2030) for various forest resources. Some of the wood fiber goals are depicted in Table 1.

These goals, reached by concensus among resource experts, are based on biological supply relationships. The experts assumed that demand for the increased product flow from the forest will materialize through increased demand for the goods that require Vermont wood in their manufacture. Will such an increase in demand come about? The answer partly resides in the market place; it is beyond the scope of this analysis.

Table 1.—Wood fiber goals proposed by the Vermont Futures Project

Item	As of 1980	Desired for 2030
	Percent	*Percent*
Volume of annual growth harvested		
Cut and removed	16	47
Cut and left	24	6
Uncut	60	47
Cut as percentage of current annual growth, by owner class		
State/municipal	73	Slight increase
Federal	79	Slight increase
Industry	90	Same
Other private	25	Major increase
Wood uses		
Pulp	21	Decrease
Fuelwood	43	Major increase
Sawtimber	35	Increase

Source: Institute for Alternative Futures. Alternative futures for Vermont—a strategic workbook for forests, parks, and recreation. Montpelier, VT: Vermont Agency of Environmental Conservation, Division of Planning and Department of Forests, Parks, and Recreation; in cooperation with: Rutland, VT: U.S. Department of Agriculture, Forest Service, Green Mountain National Forest. Alexandria, VA: Institute for Alternative Futures; 1982. 114 p.

The latest effort in state forest resources planning began around 1980. A draft State Forest Resources Plan was out for public review in mid-1985. Extensive public participation identified major forest resource issues. The following strategies were recommended (O'Dell 1982) for Issue A, "Opportunities for timber, fuel, and fiber production."

- Explore new markets for high-quality, short pieces of hardwood lumber.

[1]Institute for Alternative Futures. Alternative futures for Vermont—a strategic workbook for forests, parks, and recreation. Montpelier, VT: Vermont Agency of Environmental Conservation, Division of Planning and Department of Forests, Parks and Recreation; in cooperation with: Rutland, VT: U.S. Department of Agriculture, Forest Service, Green Mountain National Forest. Alexandria, VA: Institute for Alternative Futures; 1982. 114 p.

- Promote products produced by Vermont's wood-using industry.
- Explore potential export markets and inform local manufacturers of possibilities.
- Encourage management for high-quality sawlogs.
- Initiate special programs to increase management for the regeneration, growth, and supply of white pine.
- Publish forest product market information.
- Support a timber commodities market.

Finally, a joint federal-state program review for forestry planning recommended that the socio-economic importance of selected forest resources should be determined using resurvey data trends, published economic reports, and final plan direction.[2]

Scope and Objectives

Our analysis focuses on sawtimber production for a variety of reasons. Vermont has a significant sawmill industry that is supplied largely from its own forest resource. Although much pulpwood is cut in the State, most notably in the northeastern counties, almost all of it is exported to other states. Therefore, the value added from pulpwood is considerably less than that from sawlogs. Other forest values—water, recreation, wildlife, esthetics—are not addressed in this analysis, though they clearly have a significant impact on Vermont's economy (Kingsley 1977).

Although the use of low-quality wood for fuel both as solid wood—primarily for home heating—and wood chips—primarily for electrical generation and cogeneration and for process steam—is on the rise, the model we used for the analysis was incapable of incorporating this relatively new demand. Similarly, reconstituted wood products such as waferboard and oriented strand board are likely to create new markets in the future for low-quality wood in Vermont. The model was incapable of anticipating when this demand would occur or how it will affect the economy.

The specific objectives of our analysis were to: (1) determine the potential economic impacts and relative importance of sawtimber to Vermont's economy, and (2) measure potential impacts to the year 1995 under various sawtimber production alternatives.

[2]Michaels, Joseph A.; Motyka, Conrad M. Vermont cooperative program review—planning assistance program. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry; 1984. 13 p. Unpublished report.

Overview of Vermont's Timber Economy

Current Economic Significance

According to Bonyai and Sendak (1982), timber industry employed more than 9,000 workers in 1980 and paid about $110 million in gross wages. This employment figure represented nearly 5 percent of all workers in the State and 18 percent of all those employed in manufacturing. The estimated value of stumpage cut that year was $9.2 million which in turn was worth approximately $459 million to the State's economy after secondary and tertiary impacts. The lumber and wood products industry had 333 establishments. Sawmills consumed about 211 million board feet of timber in 1980. The state is a net exporter of softwood sawlogs and a net importer of sawlogs overall. Overseas exports accounted for only 3 percent of all wood product shipments. Healy (1984) says that between 1970-80:

- The largest increase of employed persons in forest product related occupations was in timber cutting and logging—744 more people than in 1970 or a 140 percent increase.
- Nationally, forest product related occupations grew by only 9 percent compared to Vermont's 66 percent growth. For every person directly engaged in a forest product related job activity, there were 1.3 additional workers doing nondirect forest related work.
- Employment in forest product related industries expanded by 33 percent.

Sawtimber Resource Trends

Since World War II sawtimber removals hit a high of 273 million board feet in 1951 and a low of 127 million in 1971. Hardwood-softwood mix by volume is 65-35 percent. About 90 percent of the commercial forest land is currently in private ownership. Average removal over the last 10 years (1974-83) was 198 million board feet (Gove 1983). Resurvey data (Frieswyk and Malley 1985) indicate that sawtimber inventory has risen from 6.5 billion board feet in 1966 to nearly 14 billion in 1983—a 115 percent increase. Average annual net growth, gross growth minus mortality and cull increment, for sawtimber was only 175 million board feet in 1966; rose to 262 million by 1972, and was approaching 500 million board feet in 1983. Average annual net growth exceeds removals by more than 100 percent. Figure 1 shows the relationship between inventory, growth, and removals. Projection estimates are based on extrapolated resurvey data.

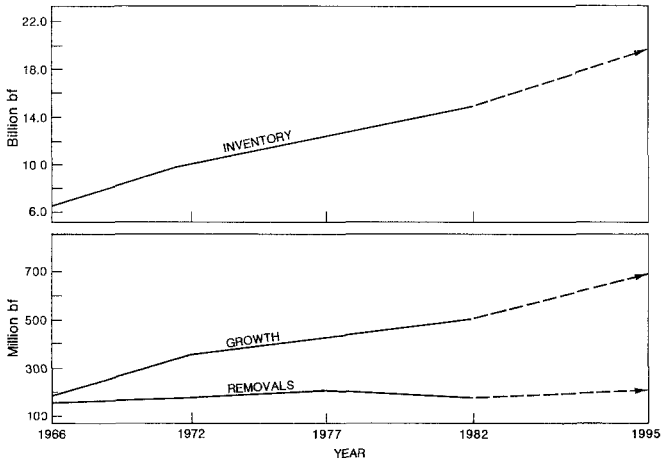

Figure 1.—Sawtimber inventory, average annual net growth (Frieswyk and Malley 1985), and removals (Gove 1983), 1966–95.

Marketing Opportunities and Constraints

Despite the rising inventory and widening gap between growth and removals, Vermont remains a net importer of sawlogs. Part of this imbalance is due to mills located on or near the State border that get their supply from neighboring states such as New York, Massachusetts, and New Hampshire. Only 3 percent of the 200 million board feet currently being harvested is reaching foreign export markets (Bonyai and Sendak 1982). One of the reasons for this small export ratio is the relatively poor quality of the sawtimber. Grade 1 logs accounted for only 1 percent of the pine and 9 percent of the hardwood sawtimber in 1972. 1983 data indicate an increase to 5 percent for pine and 11 percent for hardwood. As the sawtimber in the smaller size classes grows into larger size classes, the percentage of grade 1 sawlogs will increase, improving marketability.

Several other probable factors constrain sawtimber harvest including lack of owner awareness on nonindustrial private holdings, increasing numbers of absentee owners, and constrained timber sale preparation budgets on some public lands.

Estimating Economic Potentials

I-O Models—IMPLAN V1.1

Input-output (I-O) models have traditionally been used to characterize a developed economy. Vermont's economy can be described through an analysis of the interdependence among producing sectors. Each sector not only produces goods or services but also is a consumer, purchasing other goods and services for use in its production process. These relationships among industry inputs and outputs were developed into a general theory of production by Wassily Leontief in the 1930's. Leontief's original Input-Output Table of the United States showed how each sector of the economy depended on every other sector (Leontief 1951).

Input-Output tables for the U.S. economy are periodically prepared by the Bureau of Economic Analysis, U.S. Department of Commerce, using data directly obtained from reporting industries. The Bureau does not prepare regional or state Input-Output tables. Regional or state models are generally constructed either by directly surveying all the industries in the study area ("survey-based") or by methods that modify the national model ("nonsurvey-based"). Survey-based models are generally viewed as superior to nonsurvey tables because they are more accurate for the region of interest. But, they are also more expensive and require substantial lead time to develop the survey, conduct it, and then compile the table. By contrast, nonsurvey models rely on a variety of economic statistics gathered by public agencies and private firms. Individual regional or state models are then estimated using average inter-industry production relationships, regional activity levels, and regional trade balances that define the trade relationships between the region and the rest of the world.

Several assumptions are inherent in an I-O model analysis (Convery 1977). Some of the major ones are:

- Inputs are used by industries in fixed proportions.
- All inputs are assumed to be available as expansion in production occurs.
- The accounting period is 1 year.
- Each industry has a single product output.

The I-O model is therefore classified as a static model. That is, it paints a picture of the economy at the instant in time for which the data were collected. However, I-O is used as a planning tool to study, for example, impacts on the economy caused by changing production over time from an industry—in essence, studying a dynamic process with a static model. This can be a problem as new industries emerge, old ones fail, and technology generally advances changing factor proportions.

This problem is evident in this analysis. The "new" industry of fuelwood production is not represented in the model so we cannot study its impact on the economy. Similarly, we anticipate that reconstituted board products will emerge as an important wood-using industry in Vermont in the near future. It too is not in the model and future impacts cannot be analyzed.

Nevertheless, the sawtimber-using industries are a part of the model. We do not anticipate that they will decrease in

significance over the future we are analyzing (to 1995). And, we expect that the factor proportions will remain roughly fixed for these industries over the period of analysis.

IMPLAN V1.1 is an I-O Model with predictive capabilities (Alward and Palmer 1983). It was selected as the primary economic tool for the sawtimber analysis.

IMPLAN V1.1 data base consists of two major parts: (1) a national-level technology matrix that indicates the proportion of inputs needed to produce outputs, and (2) estimates of sectoral activity for final demand, final payments, gross outputs, and employment for each county in the nation. The 466 Sector National Technology Matrix, which is used to estimate local purchases and sales, was derived from the Department of Commerce's 1972 national input-output table updated to 1977. The USDA Forest Service has announced that a revised software system will be available in late 1985 (IMPLAN V2.0), and the fully revised system with data base updated to 1982 will be operational in early 1986 (USDA Forest Service 1984).

Despite the built-in limitations inherent in any I-O Model and the 1977 data base for the IMPLAN V1.1 System, IMPLAN V1.1 was selected as the analysis tool because for many purposes it predicts reasonably well, and it is inexpensive to use.

These components of IMPLAN V1.1 were used in the Vermont Sawtimber Analysis:

REGION—Enables the user to develop a set of border totals (final demand, final payments, total gross outputs, and employment) for the impact area being studied. In this analysis, it was the 14-county area of Vermont.

SCALE—Utilizes the national technical coefficients and the regional border totals to estimate a set of regional purchase coefficients. Prepares a balanced set of regional accounts including competitive and non-competitive imports, as well as domestic exports.

SMASH—Enables the user to aggregate the 466 industry sectors to concentrate the analysis on the sectors of special interest. In this analysis, three sectors were important to sawtimber production: Sawmills and planing mills, veneer and plywood, and household furniture.

INVERT—Converts the regional set of accounts constructed using SCALE or SMASH to a predictive model by calculating the Leontief inverse for the open (without households endogenous) and closed (with households endogenous) models.

IMPACT—Enables analyst to manipulate economic vectors for final demand, and total gross output to calculate economic impacts for employment, income and changes in population.

Sawtimber Alternatives

Sawtimber alternatives were based on the following question: If markets were expanded to accommodate increased sawtimber production, what would be the economic impacts on Vermont's economy?

Data used and assumptions made include:

1. Timber mix was 70 percent hardwood and 30 percent softwood.

2. Unit of production used was millions of board feet (MMbf).

3. Timber production was assumed to impact mainly three sectors: SIC (Standard Industrial Classification) 137 Sawmills and Planing Mills; SIC 142 Veneer and Plywood; SIC 150 Household Furniture. Further analysis down the chain of production was not realistic, since the sources of supply could not be distinguished.

4. The timber share assigned to these sectors was 50 percent SIC 137, 10 percent SIC 142, and 40 percent SIC 150.

5. Value per unit in 1977 dollars of finished product assigned to each sector was: $175 per Mbf for sawmills and planing mills, $545 per Mbf for veneer and plywood, and $1,000 per Mbf for household furniture.

6. All production changes were assumed to take place by the end of 1995.

Four sawtimber production change alternatives were analyzed:

Alternative 1—Impact of 175 MMbf production level based on the 1982 output (current or base).

Alternative 2—Impact of a 20 percent increase in production based on improved markets. Production would increase to 210 MMbf per year.

Alternative 3—Impact of a 20 percent decrease in production. Production would drop to 140 MMbf per year.

Alternative 4—Impact of being able to market 50 percent of the projected growth to 1995. Projected net annual growth (see figure 1) is estimated to be 775 MMbf. The new production level target would be 388 MMbf per year.

See Table 2 for the alternative data used in the IMPLAN run.

Table 2.—Alternative data for IMPLAN V1.1

Alternative	Sector impacted	Cost per Mbf	Production level assigned
		Dollars	*MMbf*
1	137	175	88
(175)	142	545	18
MMbf	150	1,000	69
2	137	175	105
(210)	142	545	21
MMbf	150	1,000	84
3	137	175	70
(140)	142	545	14
MMbf	150	1,000	56
4	137	175	194
(388)	142	545	39
MMbf	150	1,000	155

Projected Economic Impacts

Table 3 summarizes potential economic impacts resulting from IMPLAN V1.1 runs. Table 3 is not a replication of the IMPLAN V1.1 output, but rather an interpretation of the results. For instance, the IMPLAN V1.1 impact report projects changes in value added. The sum of value added is used as an approximation of gross state product (GSP)—the total value of all goods and services produced in a year. Copies of the total change impact reports can be found in the Appendix.

These data represent estimates based on 1977 transaction coefficients. The relative differences between alternatives probably have more validity than the actual numbers. IMPLAN V1.1 impacts are categorized as direct (affecting only the sectors with the production change), indirect (impacts on support industries such as services and retail trade), and induced (an effect on the household sector as a consequence of the increased production from the direct and indirect effects). Data in Table 3 represent total impact or the sum of direct, indirect, and induced. Finally, "jobs" are comprised of a mix of full-time and part-time employment.

Findings and Conclusions

Although Vermont has an inventory of 14 billion board feet of sawtimber, only a small fraction of it is being marketed. Removals have averaged only 200 MMbf per year over the last 10 years—less than half of the average net annual growth. Quality is a problem but is improving as small sawtimber grows into the larger size classes.

Vermont Future's work has encouraged the forestry community to:

Table 3—Alternative impacts

Alternatives	Contribution to GSP[a]	Net increase or decrease from base	Number of jobs	Net increase or decrease in number of jobs from base	GSP percent of total economy	Percent change of GSP from base	Jobs, percent of total economy	Jobs, percent change from base	Additional people affected[b]
	Millions of dollars					—	(1.6)	—	—
Base year	(45)[c]	—	(3,494)	—	(2.0)	—	[3.3]	—	—
(1977)	[123][d]	—	[7,429]	—					
(175 MMbf)					[5.4]	(+0.4)	(1.9)	(+0.3)	(1,621)
+ 20 percent	(54)	(+ 9)	(4,231]	(+ 737)	(2.4)	[+1.1]	[4.0]	[+0.7]	[3,434]
(210)	[149]	[+ 26]	[8,990]	[+ 1,561]	[6.5]	(−0.4)	(1.3)	(−0.3)	(1,481)
− 20 percent	(36)	(− 9)	(2,821)	(− 673)	(1.6)	[−1.1]			[3,159]
(140)	[99]	[− 24]	[5,993]	[− 1,436]	[4.3]		[2.7]	[−0.6]	
50 percent potential	(99)	(+ 54)	(7,812)	(+ 4,318)	(4.3)	(+2.3)	(3.5)	(+1.9)	(9,500)
(388)	[275]	[+152]	[16,600]	[+ 9,171]	[12.0]	[+6.6]	[7.5]	[+4.2]	[20,176]
Total economy 1977	2,289		222,087						

[a]Gross state product—value of all goods and services produced in one year.
[b]Based on an average of 2.2 people supported by each new job. (Population to jobs ratio.)
[c]Numbers in parentheses represent data for sectors 137, 142, and 150 only.
[d]Numbers in brackets represent data for all 466 sectors.

- Increase the volume of annual growth harvested significantly (from current 16 percent to 47 percent).
- Increase harvesting on nonindustrial private land.
- Increase fuelwood and sawtimber production at the expense of pulpwood.

The statewide forest resource plan will place much emphasis on strategies for marketing development and increasing exports.

The existing timber resource as assessed from the recent resurvey, the desired future for that resource, and planned strategies for realizing that future give Vermont the potential to realize some important economic development from its sawtimber supply. Highlights from the IMPLAN analysis indicate that:

- For every additional 1 MMbf of sawtimber marketed, another 42 jobs can be supported . . . 17 within the three sectors directly affected and another 25 jobs in sectors incurring indirect and induced changes.
- The supporting sectors that would benefit most from increased sawtimber production are: retail trade (SIC 433), wholesale trade (SIC 432), and professional and personal services (SIC 440).
- A marketing effort that could increase sawtimber production by 20 percent would mean an additional $26 million to the State's economy. Over 700 new jobs would be created in the sawlog portion of the State's timber industry and a total of 1,561 jobs throughout Vermont's economy. Sawtimber's contribution to the gross state product would exceed 6.5 percent. Nearly 3,500 people would be supported by these new employment opportunities based on the current population to job ratio.
- Approximately 9 new mills would be needed to process the additional sawtimber output.
- Failure to improve markets and/or increase out-of-state shipments could mean the loss of $24 million and 1,400 jobs. More than 3,000 people could be adversely impacted.
- On the other hand, if a vigorous marketing effort was able to capture 50 percent of the projected (1995) annual growth, some very significant socio-economic impacts could be realized:

  —$152 million increased contribution to Vermont's gross state product.

  —More than 9,000 new jobs.

  —More than 20,000 people supported by new employment opportunities.

  —More than 50 new mills would be needed to process the additional sawtimber output.

Vermont has an opportunity to help create its desired future for sawtimber production through successful implementation of its statewide plan—and make some significant contributions to its economic base.

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Appendix

Definition of Terms

Average annual net growth. The change, resulting from natural causes, in growing-stock or sawtimber volume of sound wood in growing-stock or sawtimber trees during the period between surveys, divided by the length of the period. Components of average annual net growth include the increment in net volume of trees that are present at the beginning of the period and that survive to the end (accretion), plus average annual ingrowth, minus average annual mortality, and minus the net volume of trees that became rough or rotten during the period (cull increment).

Average annual removals. The net growing-stock or sawtimber volume of trees harvested or killed in logging, cultural operations—such as timber stand improvement—or land clearing, and also the net growing-stock or sawtimber volume of trees neither harvested nor killed but growing on land that was reclassified from commercial forest land to noncommercial forest land during the period between surveys. This volume is divided by the length of the period.

Board foot. A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent.

Domestic final demand. The sum of all purchases for consumption by consumers both inside and purchases for consumption and use in production by consumers and industries outside the region but inside the United States. Domestic final demand includes the sum of personal consumption expenditures, capital formation, inventory change, state and local government expenditures, federal government expenditures, and domestic exports.

Employee compensation. Wages and salaries (including benefits) paid to employees by the firms within each sector.

Grade 1 log. A tree generally 14 inches or larger in diameter at breast height, at least 10 feet in length without trim, and having a minimum of 5/6 clear cutting on each of the three best faces.

Gross state product (GSP) Value of all the goods and services produced in a state over a 1-year period.

Growing-stock trees. Live trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings; that is, all live trees of commercial species except rough and rotten trees.

Hardwoods. Dicotyledonous trees, usually broad leaved and deciduous.

Industry. A firm or group of firms that assemble inputs in a production process and produce an output or group of outputs.

Nonindustrial lands. Privately owned forested lands other than forest industry.

Population/employment ratio. Population/employment ratios are developed in the IMPLAN System by dividing the regional population by the total employment. This ratio is a determination of the number of dependents that are associated with an employee.

Sawlog. A log meeting regional standards of diameter, length, and defect, including a minimum 8-foot length and a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods.

Sawtimber trees. Live trees of commercial species at least 9.0 inches d.b.h. for softwoods or 11.0 inches for hardwoods containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

Sawtimber volume. Net volume in board feet, International ¼-inch rule, of sawlogs in sawtimber trees. Net volume equals gross volume less deductions for rot, sweep, and other defects that affect use for lumber.

Sector. An industry or group of industries that is grouped together in an Input-Output model to reduce size of the model but that still accounts for all industries.

SIC Standard Industrial Classification codes used by the Bureau of Economic Analysis, U.S. Department of Commerce.

Stand-size class. A classification of forest land based on the size class (that is, seedlings, saplings, poletimber, or sawtimber) of growing-stock trees in the area.

Softwood. Coniferous trees, usually evergreen, with needles or scalelike leaves.

Timberland. Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization.

Timber removals. The growing-stock or sawtimber volumes of trees removed from the inventory for roundwood products, plus logging residues, volume destroyed during land clearing, and volume of standing trees growing on land that was reclassified from commercial forest land to noncommercial forest land.

Total final demand. Total final demand is the sum of personal consumption expenditures, capital formation, inventory change, state and local government expenditures, federal government expenditures and foreign exports. Except for foreign exports, these expenditures represent purchases by entities within the region from producing sectors both within and outside the region.

Total gross output. The value, in producer prices, of all outputs produced by the industries in a sector during 1977. Total gross output is the sum of all sales of an industry during a calendar year. It also includes net inventory change, which includes the value of outputs produced during the year and not sold, also the value of output in process at the end of the year minus the value of the output on hand and in process at the beginning of the year.

Total value added. The sum of employee compensation, indirect business taxes, rent, profits, interest, dividends, and depreciation expenses equals total value added. Value added is essentially the income accruing to society when an output is produced and sold.

Veneer log. A roundwood product from which veneer is sliced or sawed that usually meets certain minimum standards of diameter, length, and defect.

*** VERMONT IMPACT AREA ***
ALTERNATIVE 02: 2 BASE YEAR
ANALYSIS OF CHANGE IN FINAL DEMAND
TOTAL CHANGE IN STANDARD TGO-RELATED FLOWS

IMPACT REPORT #6.224
DATE 02/14/85
PAGE 01

	SECTOR	FINAL DEMAND (MM$)	TGO (MM$)	EMPLOYEE COMP INCOME (MM$)	PROPERTY INC (MM$)	TOTAL INCOME (MM$)	VALUE ADDED (MM$)	EMPLOYMENT (NUMBER OF JOBS)
1	AGG*AGRICULTURE & NURSER	.6099	3.0632	.3197	.7584	1.0781	1.1823	40.58
11	FORESTRY AND FISHERY PRO	.0970	2.6923	.5037	1.1543	1.6580	1.7088	66.48
12	AGRICULTURAL, FORESTRY,	.0088	.3228	.1106	.0370	.1476	.1540	14.52
29	AGG*STONE,SAND,GRAVEL	.0004	.1446	.0509	.0357	.0866	.0902	2.42
51	NEW CONSTRUCTION	.0000	.0000	.0000	.0000	.0000	.0000	.00
52	MAINTENANCE AND REPAIR C	.0000	2.5496	1.2411	.2043	1.4454	1.4546	50.11
56	AGG*SMALL ARMS	.0397	.0433	.0238	.0029	.0268	.0273	.79
59	AGG*FOOD PROCESSING	3.6761	5.7537	.7437	.1916	.9353	1.0594	51.61
107	AGG*TEXTILES & CLOTHES	1.5302	2.8970	.7159	.1558	.8717	.8885	79.48
136	LOGGING CAMPS AND LOGGIN	.0005	8.6035	1.0633	1.2417	2.3049	2.3910	151.06
137	AGG*PRIMARY SAWTIMBER US	15.4017	29.8874	6.7572	3.5516	10.3089	10.5550	700.21
140	AGG*SECONDARY SAWTIMBER	.0864	2.0286	.4711	.2433	.7144	.7336	61.89
142	VENEER AND PLYWOOD	9.8112	15.3681	3.4388	1.7556	5.1944	5.3161	327.31
150	WOOD HOUSEHOLD FURNITURE	69.3037	69.4582	23.7031	4.2571	27.9602	28.6458	2466.79
153	UPHOLSTERED HOUSEHOLD FU	.0011	.0011	.0003	.0001	.0004	.0004	.03
154	AGG*NON WOOD FURNITURE	.0494	.0596	.0168	.0029	.0196	.0201	1.53
163	AGG*PAPER PRODUCTS.	.3603	4.0133	.8459	.4754	1.3213	1.3632	52.28
176	AGG*PRINTING & PUBLISHIN	.6521	2.3907	.7887	.2833	1.0720	1.0936	65.17
191	AGG*NON METAL MFG	.5346	5.8658	1.6122	.5222	2.1343	2.2609	121.25
254	AGG*METAL MFG	.1209	2.3445	.6268	.2092	.8360	.8554	43.08
306	AGG*MACHINES,MACHINE TOO	.0386	.7687	.3146	.0689	.3835	.3934	22.63
336	AGG*ELEC & ELECTRONIC MF	.3680	.8350	.2901	.0725	.3630	.3701	17.88
376	AGG*TRANSPORTATION EQUIP	.2353	.3769	.1157	.0070	.1227	.1265	6.58
390	AGG*OTHER CONSUMER GOODS	.5940	.9418	.3561	.0619	.4180	.4252	27.04
420	AGG*TRANSPORTATION	1.4814	4.5505	1.8866	.6312	2.5178	2.7249	136.48
427	AGG*TELEPHONE,RADIO,TV	1.9824	3.8537	1.5801	1.1563	2.7364	3.0893	79.04
429	AGG*UTILITIES	2.6633	6.0621	.8866	1.5327	2.4192	2.8653	52.61
432	WHOLESALE TRADE	3.9571	9.9145	4.0615	1.8249	5.8864	7.3845	325.07
433	RETAIL TRADE	14.5330	14.9384	6.6921	2.5171	9.2092	11.6891	866.30
434	AGG*FINANCE & INSURANCE	4.1705	7.6283	2.8443	.8504	3.6947	4.0799	213.39
439	OWNER-OCCUPIED DWELLINGS	12.5747	12.5747	.0000	10.6654	10.6654	10.6654	.00
440	AGG*PROFESSIONAL & PERSO	5.5704	11.9217	2.9326	3.4051	6.3377	7.9654	247.61
441	HOTELS AND LODGING PLACE	.7896	1.0211	.3724	.1701	.5426	.5900	83.21
447	EATING AND DRINKING PLAC	5.6213	6.7530	2.1883	.2504	2.4387	2.8642	327.92
449	AGG*RECREATION SERVICES	1.0725	1.3697	.4176	.1829	.6005	.7587	105.77
451	AGG*MEDICAL & SOCIAL SER	8.7148	9.0736	5.1703	.6971	5.8673	5.9770	544.64
458	AGG*GOVERNMENT ENTERPRIS	.9902	2.0223	1.1702	.1426	1.3127	1.3178	76.09
466	SCRAP, USED, AND SECONDH	.2372	.3179	.0000	.0000	.0000	.0000	.00
	TOTAL	167.8784	252.4114	74.3126	39.3194	113.6320	123.0871	7428.86

CHANGE IN POPULATION = 23081.

*** VERMONT IMPACT AREA ***
ALTERNATIVE 03: 3 PLUS 20 PERCENT
ANALYSIS OF CHANGE IN FINAL DEMAND
TOTAL CHANGE IN STANDARD TGO-RELATED FLOWS

IMPACT REPORT #6.224
DATE 02/14/85
PAGE 01

	SECTOR	FINAL DEMAND (MM$)	TGO (MM$)	EMPLOYEE COMP INCOME (MM$)	PROPERTY INC (MM$)	TOTAL INCOME (MM$)	VALUE ADDED (MM$)	EMPLOYMENT (NUMBER OF JOBS)
1	AGG*AGRICULTURE & NURSER	.7381	3.7009	.3863	.9163	1.3026	1.4284	49.03
11	FORESTRY AND FISHERY PRO	.1174	3.2205	.6026	1.3808	1.9833	2.0440	79.53
12	AGRICULTURAL, FORESTRY,	.0107	.3895	.1335	.0446	.1781	.1859	17.52
29	AGG*STONE,SAND,GRAVEL	.0005	.1753	.0617	.0433	.1049	.1094	2.94
51	NEW CONSTRUCTION	.0000	.0000	.0000	.0000	.0000	.0000	.00
52	MAINTENANCE AND REPAIR C	.0000	3.0827	1.5006	.2471	1.7476	1.7588	60.59
56	AGG*SMALL ARMS	.0480	.0524	.0288	.0036	.0324	.0330	.96
59	AGG*FOOD PROCESSING	4.4492	6.9630	.9000	.2318	1.1319	1.2821	62.46
107	AGG*TEXTILES & CLOTHES	1.8521	3.5088	.8671	.1887	1.0558	1.0762	96.26
136	LOGGING CAMPS AND LOGGIN	.0006	10.2850	1.2711	1.4844	2.7554	2.8583	180.58
137	AGG*PRIMARY SAWTIMBER US	18.3770	35.9394	8.1255	4.2708	12.3964	12.6923	842.00
140	AGG*SECONDARY SAWTIMBER	.1045	2.4666	.5728	.2959	.8686	.8920	75.25
142	VENEER AND PLYWOOD	11.4464	18.1262	4.0560	2.0707	6.1267	6.2702	386.05
150	WOOD HOUSEHOLD FURNITURE	84.3676	84.5556	28.8552	5.1824	34.0377	34.8722	3002.97
153	UPHOLSTERED HOUSEHOLD FU	.0013	.0014	.0004	.0001	.0005	.0005	.04
154	AGG*NON WOOD FURNITURE	.0598	.0722	.0203	.0035	.0238	.0244	1.85
163	AGG*PAPER PRODUCTS.	.4361	4.8703	1.0266	.5769	1.6035	1.6543	63.44
176	AGG*PRINTING & PUBLISHIN	.7892	2.8951	.9550	.3431	1.2981	1.3243	78.92
191	AGG*NON METAL MFG	.6470	7.1123	1.9548	.6331	2.5879	2.7414	147.02
254	AGG*METAL MFG	.1463	2.8341	.7577	.2529	1.0106	1.0340	52.08
306	AGG*MACHINES,MACHINE TOO	.0468	.9299	.3805	.0834	.4639	.4758	27.38
336	AGG*ELEC & ELECTRONIC MF	.4454	1.0106	.3511	.0882	.4393	.4479	21.64
376	AGG*TRANSPORTATION EQUIP	.2848	.4557	.1399	.0085	.1484	.1530	7.95
390	AGG*OTHER CONSUMER GOODS	.7190	1.1405	.4313	.0750	.5062	.5150	32.74
420	AGG*TRANSPORTATION	1.7930	5.5042	2.2820	.7635	3.0456	3.2960	165.09
427	AGG*TELEPHONE,RADIO,TV	2.3994	4.6656	1.9129	1.3999	3.3129	3.7400	95.69
429	AGG*UTILITIES	3.2235	7.3338	1.0725	1.8542	2.9267	3.4664	63.65
432	WHOLESALE TRADE	4.7893	12.0007	4.9160	2.2089	7.1250	8.9384	393.46
433	RETAIL TRADE	17.5895	18.0795	8.0992	3.0464	11.1456	14.1470	1048.45
434	AGG*FINANCE & INSURANCE	5.0477	9.2323	3.4424	1.0293	4.4717	4.9378	258.26
439	OWNER-OCCUPIED DWELLINGS	15.2194	15.2194	.0000	12.9085	12.9085	12.9085	.00
440	AGG*PROFESSIONAL & PERSO	6.7420	14.4275	3.5490	4.1208	7.6698	9.6396	299.65
441	HOTELS AND LODGING PLACE	.9557	1.2357	.4507	.2059	.6566	.7140	100.70
447	EATING AND DRINKING PLAC	6.8035	8.1737	2.6487	.3031	2.9517	3.4668	396.90
449	AGG*RECREATION SERVICES	1.2980	1.6578	.5055	.2214	.7268	.9182	128.02
451	AGG*MEDICAL & SOCIAL SER	10.5477	10.9819	6.2576	.8437	7.1013	7.2340	659.18
458	AGG*GOVERNMENT ENTERPRIS	1.1984	2.4475	1.4162	.1725	1.5887	1.5948	92.09
466	SCRAP, USED, AND SECONDH	.2871	.3847	.0000	.0000	.0000	.0000	.00
	TOTAL	202.9821	305.1322	89.9315	47.5029	137.4344	148.8750	8990.35
	CHANGE IN POPULATION =	27932.						

*** VERMONT IMPACT AREA ***
ALTERNATIVE 04: 4 MINUS 20 PERCENT
ANALYSIS OF CHANGE IN FINAL DEMAND
TOTAL CHANGE IN STANDARD TGO-RELATED FLOWS

IMPACT REPORT #6.224
DATE 02/14/85
PAGE 01

	SECTOR	FINAL DEMAND (MM$)	TGO (MM$)	EMPLOYEE COMP INCOME (MM$)	PROPERTY INC (MM$)	TOTAL INCOME (MM$)	VALUE ADDED (MM$)	EMPLOYMENT (NUMBER OF JOBS)
1	AGG*AGRICULTURE & NURSER	.4920	2.4669	.2575	.6108	.8683	.9521	32.68
11	FORESTRY AND FISHERY PRO	.0783	2.1470	.4017	.9205	1.3222	1.3627	53.02
12	AGRICULTURAL, FORESTRY,	.0071	.2596	.0890	.0297	.1187	.1239	11.68
29	AGG*STONE,SAND,GRAVEL	.0004	.1168	.0411	.0289	.0700	.0729	1.96
51	NEW CONSTRUCTION	.0000	.0000	.0000	.0000	.0000	.0000	.00
52	MAINTENANCE AND REPAIR C	.0000	2.0549	1.0003	.1647	1.1649	1.1724	40.39
56	AGG*SMALL ARMS	.0320	.0350	.0192	.0024	.0216	.0220	.64
59	AGG*FOOD PROCESSING	2.9657	4.6412	.5999	.1545	.7544	.8546	41.64
107	AGG*TEXTILES & CLOTHES	1.2345	2.3389	.5780	.1258	.7038	.7173	64.17
136	LOGGING CAMPS AND LOGGIN	.0004	6.8567	.8474	.9896	1.8369	1.9055	120.39
137	AGG*PRIMARY SAWTIMBER US	12.2514	23.9596	5.4170	2.8472	8.2642	8.4615	561.33
140	AGG*SECONDARY SAWTIMBER	.0697	1.6444	.3818	.1972	.5791	.5947	50.16
142	VENEER AND PLYWOOD	7.6309	12.0841	2.7040	1.3805	4.0844	4.1801	257.37
150	WOOD HOUSEHOLD FURNITURE	56.2450	56.3704	19.2368	3.4549	22.6918	23.2481	2001.98
153	UPHOLSTERED HOUSEHOLD FU	.0009	.0009	.0003	.0000	.0003	.0003	.03
154	AGG*NON WOOD FURNITURE	.0399	.0481	.0135	.0023	.0159	.0163	1.23
163	AGG*PAPER PRODUCTS.	.2907	3.2466	.6843	.3846	1.0689	1.1028	42.29
176	AGG*PRINTING & PUBLISHIN	.5260	1.9298	.6366	.2287	.8653	.8828	52.61
191	AGG*NON METAL MFG	.4313	4.7413	1.3031	.4221	1.7252	1.8275	98.01
254	AGG*METAL MFG	.0975	1.8894	.5051	.1686	.6737	.6893	34.72
306	AGG*MACHINES,MACHINE TOO	.0312	.6199	.2537	.0556	.3092	.3172	18.25
336	AGG*ELEC & ELECTRONIC MF	.2969	.6737	.2340	.0588	.2928	.2986	14.43
376	AGG*TRANSPORTATION EQUIP	.1898	.3038	.0933	.0056	.0989	.1020	5.30
390	AGG*OTHER CONSUMER GOODS	.4792	.7602	.2875	.0500	.3374	.3433	21.83
420	AGG*TRANSPORTATION	1.1951	3.6691	1.5212	.5090	2.0302	2.1971	110.05
427	AGG*TELEPHONE,RADIO,TV	1.5993	3.1100	1.2751	.9332	2.2083	2.4930	63.79
429	AGG*UTILITIES	2.1486	4.8885	.7149	1.2360	1.9509	2.3106	42.43
432	WHOLESALE TRADE	3.1923	7.9997	3.2771	1.4725	4.7495	5.9584	262.29
433	RETAIL TRADE	11.7243	12.0509	5.3986	2.0306	7.4292	9.4257	698.85
434	AGG*FINANCE & INSURANCE	3.3645	6.1540	2.2946	.6861	2.9807	3.2914	172.15
439	OWNER-OCCUPIED DWELLINGS	10.1445	10.1445	.0000	8.6042	8.6042	8.6042	.00
440	AGG*PROFESSIONAL & PERSO	4.4939	9.6171	2.3657	2.7468	5.1125	6.4256	199.74
441	HOTELS AND LODGING PLACE	.6370	.8237	.3004	.1372	.4377	.4760	67.12
447	EATING AND DRINKING PLAC	4.5349	5.4483	1.7655	.2020	1.9675	2.3108	264.56
449	AGG*RECREATION SERVICES	.8652	1.1050	.3369	.1476	.4845	.6121	85.33
451	AGG*MEDICAL & SOCIAL SER	7.0306	7.3200	4.1711	.5623	4.7334	4.8219	439.38
458	AGG*GOVERNMENT ENTERPRIS	.7988	1.6314	.9440	.1150	1.0590	1.0631	61.39
466	SCRAP, USED, AND SECONDH	.1914	.2564	.0000	.0000	.0000	.0000	.00
	TOTAL	135.3113	203.4081	59.9502	31.6654	91.6157	99.2418	5993.16
	CHANGE IN POPULATION =	18620.						

*** VERMONT IMPACT AREA ***
ALTERNATIVE 05: 5 50 % PROG GROW 1995
ANALYSIS OF CHANGE IN FINAL DEMAND
TOTAL CHANGE IN STANDARD TGO-RELATED FLOWS

IMPACT REPORT #6.224
DATE 02/14/85
PAGE 01

	SECTOR	FINAL DEMAND (MM$)	TGO (MM$)	EMPLOYEE COMP INCOME (MM$)	PROPERTY INC (MM$)	TOTAL INCOME (MM$)	VALUE ADDED (MM$)	EMPLOYMENT (NUMBER OF JOBS)
1	AGG*AGRICULTURE & NURSER	1.3630	6.8350	.7134	1.6923	2.4056	2.6380	90.55
11	FORESTRY AND FISHERY PRO	.2168	5.9545	1.1141	2.5529	3.6670	3.7793	147.04
12	AGRICULTURAL, FORESTRY,	.0197	.7195	.2465	.0824	.3289	.3433	32.36
29	AGG*STONE,SAND,GRAVEL	.0010	.3236	.1138	.0799	.1938	.2019	5.42
51	NEW CONSTRUCTION	.0000	.0000	.0000	.0000	.0000	.0000	.00
52	MAINTENANCE AND REPAIR C	.0000	5.6930	2.7712	.4562	3.2274	3.2480	111.90
56	AGG*SMALL ARMS	.0887	.0968	.0532	.0066	.0598	.0610	1.78
59	AGG*FOOD PROCESSING	8.2154	12.8572	1.6619	.4281	2.0900	2.3674	115.34
107	AGG*TEXTILES & CLOTHES	3.4198	6.4784	1.6009	.3484	1.9493	1.9869	177.73
136	LOGGING CAMPS AND LOGGIN	.0012	19.0176	2.3503	2.7447	5.0949	5.2851	333.90
137	AGG*PRIMARY SAWTIMBER US	33.9538	66.3721	15.0060	7.8873	22.8933	23.4399	1554.98
140	AGG*SECONDARY SAWTIMBER	.1930	4.5520	1.0570	.5460	1.6031	1.6462	138.86
142	VENEER AND PLYWOOD	21.2576	33.6059	7.5198	3.8391	11.3588	11.6249	715.74
150	WOOD HOUSEHOLD FURNITURE	155.6787	156.0257	53.2449	9.5628	62.8078	64.3478	5541.21
153	UPHOLSTERED HOUSEHOLD FU	.0024	.0025	.0008	.0001	.0009	.0009	.08
154	AGG*NON WOOD FURNITURE	.1105	.1333	.0375	.0064	.0439	.0450	3.42
163	AGG*PAPER PRODUCTS.	.8053	8.9901	1.8950	1.0649	2.9598	3.0537	117.10
176	AGG*PRINTING & PUBLISHIN	1.4572	5.3454	1.7633	.6335	2.3968	2.4452	145.71
191	AGG*NON METAL MFG	1.1947	13.1306	3.6089	1.1689	4.7777	5.0611	271.42
254	AGG*METAL MFG	.2702	5.2337	1.3992	.4671	1.8663	1.9055	96.17
306	AGG*MACHINES,MACHINE TOO	.0864	1.7171	.7026	.1539	.8565	.8786	50.55
336	AGG*ELEC & ELECTRONIC MF	.8223	1.8660	.6483	.1629	.8112	.8271	39.96
376	AGG*TRANSPORTATION EQUIP	.5259	.8416	.2584	.0157	.2741	.2825	14.69
390	AGG*OTHER CONSUMER GOODS	1.3276	2.1058	.7962	.1384	.9347	.9508	60.45
420	AGG*TRANSPORTATION	3.3108	10.1640	4.2140	1.4099	5.6239	6.0864	304.85
427	AGG*TELEPHONE,RADIO,TV	4.4304	8.6145	3.5321	2.5848	6.1169	6.9056	176.69
429	AGG*UTILITIES	5.9521	13.5422	1.9805	3.4239	5.4044	6.4009	117.54
432	WHOLESALE TRADE	8.8434	22.1586	9.0772	4.0786	13.1559	16.5042	726.51
433	RETAIL TRADE	32.4786	33.3834	14.9551	5.6251	20.5802	26.1222	1935.95
434	AGG*FINANCE & INSURANCE	9.3204	17.0473	6.3563	1.9005	8.2568	9.1175	476.87
439	OWNER-OCCUPIED DWELLINGS	28.1022	28.1022	.0000	23.8353	23.8353	23.8353	.00
440	AGG*PROFESSIONAL & PERSO	12.4489	26.6400	6.5531	7.6085	14.1620	17.7993	553.30
441	HOTELS AND LODGING PLACE	1.7646	2.2817	.8322	.3802	1.2124	1.3185	185.94
447	EATING AND DRINKING PLAC	12.5626	15.0924	4.8907	.5596	5.4503	6.4013	732.86
449	AGG*RECREATION SERVICES	2.3968	3.0611	.9333	.4088	1.3421	1.6955	236.38
451	AGG*MEDICAL & SOCIAL SER	19.4760	20.2777	11.5546	1.5578	13.1123	13.3574	1217.17
458	AGG*GOVERNMENT ENTERPRIS	2.2129	4.5193	2.6150	.3186	2.9336	2.9448	170.04
466	SCRAP, USED, AND SECONDH	.5301	.7103	.0000	.0000	.0000	.0000	.00
	TOTAL	374.8407	563.4922	166.0574	87.7304	253.7877	274.9130	16600.47
	CHANGE IN POPULATION =	51576.						

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Michaels, Joseph A.; Stone, M. Brian; Sendak, Paul E. **The economic importance of Vermont's sawtimber.** NE-RP-587. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1986. 12 p.

This paper concentrates on the potential economic importance of Vermont's sawtimber. The timber industry employed over 9,000 workers in 1980, and the value of stumpage cut that year was worth approximately $459 million to the State's economy. Preliminary resurvey data indicate that sawtimber inventory now exceeds 14 billion board feet. Yet, sawtimber removals have averaged only 200 million board feet per year over the last 10 years. We used an input-output model called IMPLAN V1.1 to predict socio-economic impacts of several sawtimber production levels. The results indicate that improved markets for the existing resource could significantly contribute to the State's economy. If 50 percent of the projected annual growth could be marketed, an additional $152 million contribution could be made to the State's gross product and over 9,000 new jobs created.

Headquarters of the Northeastern Forest Experiment Station are in Broomall, Pa. Field laboratories are maintained at:

- **Amherst, Massachusetts, in cooperation with the University of Massachusetts.**
- **Berea, Kentucky, in cooperation with Berea College.**
- **Burlington, Vermont, in cooperation with the University of Vermont.**
- **Delaware, Ohio.**
- **Durham, New Hampshire, in cooperation with the University of New Hampshire.**
- **Hamden, Connecticut, in cooperation with Yale University.**
- **Morgantown, West Virginia, in cooperation with West Virginia University, Morgantown.**
- **Orono, Maine, in cooperation with the University of Maine, Orono.**
- **Parsons, West Virginia.**
- **Princeton, West Virginia.**
- **Syracuse, New York, in cooperation with the State University of New York College of Environmental Sciences and Forestry at Syracuse University, Syracuse.**
- **University Park, Pennsylvania, in cooperation with the Pennsylvania State University.**
- **Warren, Pennsylvania.**