AN ECONOMIC APPRAISAL OF THE STATE FORESTS OF MICHIGAN

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By

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AN ABSTRACT

Submitted to the Department of Forestry
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The 3,760,000 acres of the state forests of Michigan have been transformed in the past half century from a liability to the state to one of her more important assets. This study was undertaken in 1958 to determine just how important an asset the state forests were and to appraise the contributions that the products derived from the state forests made to the economy of the people of the state.

The economic contributions of three major classes of products of the state forests--timber, recreation, and wildlife--were examined.

First approximations of values from the state forests were the cash receipts obtained directly by the state for these goods and services. These represented only a small portion of the total economic contribution since large flows of additional goods and services were generated which multiplied the contributions of the forests before these products reached the ultimate consumers.

The approach used to determine the total contribution of these products was to follow the "commodity flow" method used by the U.S. Department of Commerce in its calculations of national income. In this method commodity production is traced forward from producer to consumer.

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The approach used to determine the total contribution of these products was to follow the "commodity flow" method used by the U.S. Department of Commerce in its calculations of national income. In this method commodity production is traced forward from producer to consumer.

Methods varied somewhat in determining consumer expenditures for the three classes of products. For products processed from timber, consumer expenditure was considered to be the sum of three components of the "commodity flow:" (1) the value of raw timber products; (2) value added through processing and manufacturing within Michigan; and (3) value added beyond manufacturing within Michigan.

The measure of recreation was limited to the recreational uses made of the state forests campgrounds. Data for volume of use and average expenditures were collected in a state forest campground survey made in the summer of 1959. Consumer expenditures were then calculated directly by multiplying the number of users times their average annual expenditures.

A similar procedure was followed in determining consumer expenditures for wildlife on state forests (limited to hunting and fishing). The total volume of use was derived from Michigan Department of Conservation Fish and Game Division surveys and average annual expenditures were determined by modification of the results taken from National Survey of Hunting and Fishing published in 1955 by the U.S. Fish and Wildlife Service.

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Consumer expenditures for products from Michigan state forests in 1957 were estimated as:

	Million dollars
Timber	107.9
Campground use	1.8
Hunting	12.9
Fishing	8.2
Oil and gas	5.6
Total	136.4

These expenditures were reduced to terms of income payments by subtracting all payments made to non-factors of production. Total income payments generated by the products derived from state forests in 1957 amounted to 100.5 million dollars.

Costs incurred in the development of Michigan's state forest have been relatively low. Since 83 percent of the area came into state ownership by tax reversion and exchange, land acquisition costs have amounted to only about two million dollars. Improvements and other investment costs total another five million dollars with the bulk of that occurring during the C.C.C. program. Operating costs are increasing annually, but reached only 2.6 million dollars in 1957.

Benefits from state forests dwarf costs in several perspectives. The estimated total capital value of standing timber of 130 million dollars is nearly 19 times greater than the investment costs incurred in obtaining it. Income payments generated in 1957 alone were more than twice as

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large as the aggregate costs of 48 million dollars for all the years of the state forests existence.

The outlook for the future indicates an increased demand for the products of Michigan's state forests. Indications are that the state forests have the necessary potential to adequately supply the anticipated increase in demand. With an increase in demand for the products, the benefits flowing from the forests will increase correspondingly. Based on U.S. Forest Service projections, by the year 2000, income from timber of the state forests will have risen to 402 million dollars and income from recreation and hunting and fishing will have increased to 14.2 million dollars, and 16.5 million dollars, respectively.

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I wish to express my appreciation to my major professor, Dr. Lee M. James of the Department of Forestry, Michigan State University for his advice and assistance during this study, and I wish to dedicate this dissertation to him.

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INTRODUCTION

Possibly the most important single asset in public ownership in Michigan today is the state forests. The almost four million acres of state forest land are available throughout the year for a variety of uses and strongly assert themselves in the economy of the state.

The present Michigan state forests have been built up primarily from formerly privately owned cut-over, burned-over lands and abandoned farms. A half century of public ownership has seen those "lands that nobody wanted" turn into lands that are indeed, in demand today. This change has come about not as a result of chance or good fortune but as a result of determined effort by determined men interested in a "wise use" policy of land management.

Since 1921, through the Department of Conservation, a professionally trained group of men has instituted a planned course of action of resource management. This has been a system of incurring costs in order to derive benefits. Some of their achievements are revealed by the record: (1) Forest fires--once the scourge of the cut-over lands of Michigan, have been reduced to an annual burn in 1957 of less than 7,000 acres. (2) Reforestation--close to 275,000 acres of land have been planted in state forests

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since 1906. Currently about 10,000 acres are planted annually. (3) Timber sales have risen from virtually no sales prior to 1940 to total sales with a volume equivalent to more than 130 million board feet in 1957. (4) State forest campgrounds have increased from 1 in 1929 to 100 in 1957, with plans to double that figure in the next few years.

Other progress includes game and fish management and research programs on state forests, special use permits, and leases, and a cooperative forest management program with private landowners, schools, and communities.

Do the results justify continued state ownership and management of forest lands? This simple question is not so simply answered, because it involved considerations bound up in the complexities of welfare economics. It is beyond the scope of this study to consider all of these intricacies. Further, it is not possible to measure the intangible values which flow from public ownership of land. This study does propose, however, to make an economic appraisal of the state forests insofar as costs and benefits can be measured.

It is the intent of this study to measure the flow of economic benefits from the state forests; to measure the economic costs involved in public ownership of these lands, and finally, insofar as possible to make a comparison of costs and benefits to determine the net benefits (if any) of state ownership.

The principal products to be considered in this analysis will be timber, recreation, and hunting and fishing. Supplying these goods and services has been declared the major objective in the administration of the state forests.[1] The measurement of the contribution of water will not be included in the scope of the present investigation. Water, as yet, is in a subordinate position to timber and recreation as an acknowledged object of forest land management in Michigan. Its evaluation might more appropriately be carried out in a section of the country where water values are of first importance.

Economic importance of the chosen products for analysis will be evaluated in terms of the contribution to the sum total of goods and services made available to the people of Michigan. This necessitates measurement of these goods and services. Many types of measurements of the value of resources can be made, all of them valid if they measure accurately what they purport to measure. Technical problems arise, however, when measures of different goods and services are made in different units and at different levels in the chain from the land to the final consumer. Measurements taken at different levels cannot properly be added together; for example, if recreation values are measured in terms of consumer expenditures, then a comparable analysis will require that wildlife, timber and other

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[1]Michigan Department of Conservation. Twelfth Biennial Report, (1943-44,) p. 55.

forest products be also measured in terms of consumer expenditures.

Cost items will include, primarily, the expenditures made by the various divisions of the Conservation Department, allocated as to the portion of the expenditure applicable to the state forests. However, to the greatest extent possible, the analysis will include all of the economic costs involved in public ownership of the state forests.

This study does not attempt to point out how to better administer the state forests. It does not consider whether Michigan has too much or too little land in state ownership; whether holdings need to be consolidated or boundaries adjusted in order to further implement management. Rather, the forests are considered as they occur at the present, and they are appraised as to what they contribute in their present form.

REVIEW OF LITERATURE

Although no previous attempts have been made to measure the total economic contribution of the state forests of Michigan directly, there have been a great many studies which have dealt with the measurement and technique of measurement of the items used in this study. These works can be classified usefully in terms of the major items with which they are concerned. The discussion which follows is accordingly organized under the headings of timber, recreation, and hunting and fishing.

Timber

There are a number of measurements of timber values which have some pertinence to the kind of appraisal this study is attempting to make.

A wide variety exists in the type of indices employed as measures. The importance of the timber economy may be measured by such items as: investments made in capital goods; compensation paid to employees; percentage of national income generated; the numbers of workers employed; or the amount of physical product produced. These measures are most commonly found in the various government publications published periodically by such agencies as the Bu-

reau of Census, Department of Commerce and Bureau of Labor Statistics.[1]

Another approach to the measurement of timber values is the varying of the level at which measurements are taken. In this manner, a measure of value might be taken at any point between the land and the consumer. We commonly hear such terms as, value on the stump, or delivered at the mill, or value at the retail market. These types of measures are found in rich profusion in the literature. Almost every forest industry, association and forest-oriented government agency or research center publishes such information regularly.[2]

A major study of the forest situation in the United States with emphasis on the measurement of the physical product is the Timber Resource Review.[3] Four indices were used to measure the role of timber products and the related timber connected industries in the national economy. The measures were: (1) employment, (2) compensation to employees, (3) national income and, (4) percent of physical

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[1]For a detailed listing of these publications, see the Appendix.

[2]Noteworthy publications of this type: Henry B. Steer, "Lumber Production in the United States, 1799-1946," (Washington: U.S.D.A. Miscellaneous Publication No. 669, 1948).

"Basic Forest Statistics for the United States as of January, 1945," (Washington: U.S. Forest Service, September, 1950).

Biennial Reports Vols. 1-19. Michigan Department of Conservation. Forest Division Section.

[3]Timber Resources for America's Future, (Washington: U.S. Forest Service, U.S.D.A., 1958).

structure raw materials.

Still another index of the economic importance of timber is the market value of the resource. Thus, in an estimate of the market value of forest land in 1946 made for a national balance sheet, H.R. Josephson based market value on the immediate sale value of all land and timber for timber use.[1] His estimate came to eight billion dollars, omitting public values in water production, recreation, and wildlife and also the value of improvements and equipment.

In Clawson's estimate of the total investments made on national forests as of 1956, the value of improvements and equipment is included in his total of 750 million dollars. Based on an adjusted average market price for stumpage, his estimate of the value of the standing sawtimber on the national forests for the same year was 3.8 billion dollars. This total did not include any allowance for the value of anything smaller than sawtimber, and no allowance for land value.[2]

Because of the obviously wide range of the scope of the economic effect encompassed by timber production, it

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[1]L.A. Reuss. "Land Utilization Data as Background Information for the National Balance Sheet and Approximation of the Value of Forest Land." Studies in Income and Wealth. Vol. 12 (New York: National Bureau of Economic Research, 1950), p. 233.

[2]Marion Clawson and Burnell Held, The Federal Lands: Their Use and Management, (Baltimore: John Hopkins Press, 1957), p. 250.

becomes a practical consideration of choosing the method of measurement to fit the appraisal. For the purposes of reasonableness, comparability, and feasibility of putting into practice, Palley chose the national income approach as a proposed method for measuring the economic importance of timber in Michigan.[1] He would calculate the value of timber products in Michigan as " . . . . the sum of three components, namely, the value of the raw products, value added by manufacture, and the value added beyond manufacture within the confines of the Michigan economy."

Palley's suggested approach followed closely the method used by James in his analysis of the income and values derived from timber products and manufactures. Since James' studies are more specifically related to our present appraisal, and since they constitute about the only source of analytical treatment of the measures of importance of the timber economy, considerable attention will be paid to them.

James made four studies using a similar technique. One was made at the national level,[2] one at a regional

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[1]Marshall N. Palley, "A Proposed Technique for Measuring and Comparing the Economic Importance of Timber and Wildland Recreation in Michigan," (Unpublished Ph.D. Dissertation, Michigan State University, 1956), p. 88.

[2]Lee M. James and James G. Yoho, "Income from Timber Products in the United States," Journal of Forestry, Vol. 51, (February, 1953), pp. 83-87.

level,[1] then a state level,[2] and finally a land ownership level within a state.[3]

His approach to the measure of income and values was comparable to the approach used in the U.S. Bureau of Census publications for much of the statistics were taken from them. He specifically defined the total income attributed to the timber industry as being made up of "raw timber products" (whole or slightly modified logs and bolts, also bark, stumps, and crude gum) and "timber manufacture" involving further processing of raw timber products not directly consumed. Income from raw timber was considered to be the total value of raw timber minus the value of unmarketed raw timber (mainly fuel wood and fence posts). Income from timber manufactures was regarded to be that part of value added which covered wages, salaries and net profits.

The point or level at which James made his evaluation of raw timber products was at the point of processing or consumption, before manufacturing, in terms of the total quantity produced and the average value per unit.

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[1]Lee M. James and William A. Duerr, "The South's Income from Timber Products," Southern Lumberman, (March 15, 1951), p. 50.

[2]_____"Timber Values from Michigan's Forests," Quarterly Bulletin, Michigan Agricultural Experiment Station, Vol. 34, (February, 1952), pp. 275-284.

[3]_____"Farm Woodlands and the Timber Economy of Michigan," Quarterly Bulletin, Michigan Agricultural Experiment Station, Vol. 43, (February, 1960), p. 563-583.

However, the income arising out of manufacture was not calculated in the same manner but was taken largely from the statistics presented in the U.S. Bureau of Census publication, Annual Survey of Manufactures. Value added by manufacture was defined as "value of products less the costs of materials, supplies, fuel, electric energy and contract work." Wood-using industry groups included in manufacturing were those listed by the Census under the following headings: lumber and products (except furniture); paper and allied products, wooden house furniture (except upholstered); wooden office furniture, and gum and wood chemicals.

In his national study, James calculated the annual output of raw timber products in the United States for 1950 to be worth 2.7 billion dollars. Further manufacture added 7.3 billion dollars for a total of 10 billion dollars. Income payments to individuals directly attributable to the production and manufacture of timber products for the same period amounted to eight billion dollars, which is 4.4 percent of the nation's total income of 182 billion dollars from all sources other than government payments.[1]

Applying the same technique that he used in this national study, James made an analysis of timber returns on a regional basis. He computed the value of the output of raw timber products from 12 southern states in 1948 to be 1.1 billion dollars in value. Value added by manufac-

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[1]James and Yoho, op cit., p. 85.

ture amounted to another 1.9 billion dollars. Of this, 3.0 billion dollar total, 2.3 billion was considered as income to the people of the South directly attributed to timber products.

At the state level, Michigan's output of raw timber products in 1948 was calculated to be worth 65.7 million dollars with the value added by manufacture contributing an additional 334.9 million. These values represented a total of 317 million dollars income to the people of the state which could be attributed directly to timber products. Pulp and paper were by far the most important products, as they accounted for nearly two thirds of the value added by manufacture.[1]

That timber manufactures are carried out to a high degree in Michigan is indicated by the high ratio of value added by manufacture to value of raw timber. In pulp and paper products, the ratio was about 15 to 1; in lumber, veneer and products, about 4 to 1. By way of comparison, the comparable ratios for the 12 southern states was 5 to 1 and 2 to 1.

In terms of employment (fifty 40-hour weeks a year), James calculated that Michigan forest industries provided an estimated 70,600 man-years of employment--22,400 in cutting the products in the woods and hauling them to mills;

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[1]James, "Timber Values from Michigan's Forests," p. 280.

and 48,200 in manufacture.[1]

James showed that the modified national income accounting approach in estimating values of timber products produced and manufactured can be applied to areas smaller than states, when he applied it to the farm woodlands in Michigan. It is true that the more localized studies are not as accurate as the national study, because the statistics from the source publications are made up on a national basis. The nationwide relationship between value added by manufacture and national income generated for an industry group is used to guide the relationships presumed to exist at the regional, state or smaller area levels.

In his study of farm woodlands in Michigan, James had to make further allocations which lead to a greater probability of error. To illustrate, the 1954 Census of Manufacturers reported the value added by manufacture in timber-products industries of Michigan to be 352 million dollars--73 million in lumber and timber basic products, 32 million in wooden furniture, 236 million in pulp and paper, and 11 million in miscellaneous wood industries. Since the farm woodlands supplied 14 percent of the timber basic products, 11 percent of pulpwood and 9.5 percent of the miscellaneous wood products, James applied these percentages to the appropriate statewide figures of value added by manufacture. Thus, he arrived at a value added by

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[1] Ibid.

manufacture of products from farm woodlands amounting to 41.7 million dollars by this method.[1]

Recreation

No aspect of the recreational use of wildlands has caused more discussion than the determination of values. Efforts to place quantitative measures on recreational values have a long history. As early as 1918, Waugh estimated the value of outdoor recreation in the national forests at 10 cents per person per hour.[2] In more recent years, efforts at evaluation have been greatly intensified and systematized.

Several methods of measurements have been used in these approaches, and it becomes useful to categorize them.

Volume of Use

Volume of use is not a clearcut measurement of the economic value of recreation, but it is a fundamental measure made of all public recreational areas such as national parks, national forests, state parks, etc. Usually, the volume is measured in number of visits or visitor days or on an annual basis, with further breakdowns on type of

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[1]Lee M. James, "Farm Woodlands and the Timber Economy of Michigan," p. 572.

[2]Frank A. Waugh, "Recreation Uses on the National Forests," (Washington: U.S. Government Printing Office, 1918).

use as well as quantity.[1]

Total Expenditures of Users

By far the most popular of the measurement methods for determining the value of recreation has been that of measuring the gross expenditures of the users with the inference made that the value of the recreational experience is worth whatever users spend in partaking of it. Estimates of such gross expenditures have been made by many groups--those interested in travel to national parks, those interested in travel of all kinds, those interested in tourist promotion within specific states, local Chambers of Commerce, and many others.[2]

Most of these studies follow similar procedures as recreational surveys. The problem of collecting significant data is approached by requesting travelers to give written answers on printed forms to such pertinent questions as place of residence, number in party, total length of the

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[1]For an excellent review of such a measure of recreational use see Marion Clawson, "Statistics on Outdoor Recreation," (Washington: Resources for the Future, 1958).

[2]Some of the more formalized studies are: Yosemite National Park Travel Survey, National Park Service, California Division of Highways and Bureau of Public Roads, (1953), Americans on the Highway, A Report on Habits and Patterns in Vacation Travel, American Automobile Association, sixth edition, (1956), The Travel Market Among U.S. Families with Annual Income of $5,000 or More, Research Department, The Curtis Publishing Company, (1955).

Many more studies exist. In his book Recreation Use of Wildlands (New York: McGraw-Hill Book Company, 1959), Chapter 7, p. 180, C. Frank Brockman listed 36 such studies.

trip (in days and miles), purpose of the trip (vacation, personal visit, business) length of the time spent in the area, type of accommodations used, total expenditure in the area, percentage of expenditure on various needs (food lodging, gas and oil, and the like) and the economic status of the traveler. Questionnaires of this type are distributed in a variety of ways; by highway patrol officers, by hotel and motel employees, by the administrative staff of recreational areas (e.g., rangers in national parks) by employees of service stations, by operators of ferries and toll bridges, by Chambers of Commerce and by automobile associations. The questionnaires are generally completed at the visitor's leisure and mailed to a central point for processing by experienced evaluators. As a result, a representative sample of visitor interests, preference, and expenditures is obtained which can be applied to the total tourist population.

Impact on Local Economy

The expenditure method has utility in measuring the impact of recreation on the economy of local communities, states, regions and the nation. Expenditures by recreationists stimulate business in the industries whose goods and services they buy. These industries prosper, and governments benefit from the real and personal property taxes, sales taxes, and income taxes which they pay. From the national standpoint, it is the total expenditure that counts,

but from the standpoint of the state or region, the amount spent within its borders is of most importance.

At least three studies measuring the impact of recreation on the local economy have been made in Michigan. In 1929, when the onset of the general depression made worse the already serious economic problems of the northern cut-over lands, Wilbur O. Hedrick at Michigan State College made a study of the contribution of recreation to northern residents and governmental units.[1]

The contribution of recreation was measured by Hedrick in terms of the assessed valuation in 1931 of recreational properties on the tax rolls of 189 townships and 2 city government units of the northern part of the Lower Peninsula of Michigan. The assessed valuation of recreational properties was determined for each affected taxing unit and expressed as a percentage of the total assessed valuation of all property within the jurisdiction of that unit. It was found that in as many as 20 of the townships, the major share of all property taxes was paid by the recreational properties.

Thus, Hedrick concluded that although the recreationist was an outsider and made his money elsewhere, through ownership of local land and improvements and through seasonal residence in the district, he made an economic con-

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[1]Wilbur O. Hedrick, Recreational Use of Northern Michigan Cut-Over Lands, Michigan Agricultural Experiment Station Bulletin No. 247, (1934).

tribution to the well-being of the full-time residents. The taxes levied on recreational properties owned by non-residents were held to be more than sufficient to offset the added costs of local government resulting from the needs of servicing these properties. One important saving was in connection with schools, since summer residents helped to support them but provided no children during the school year to add to the costs of building and operating the educational plant.

Two doctoral studies in the Geography Department at the University of Michigan carried the study of recreation as a local industry one step further.[1] They applied a common approach to a transitional county in the Lower Peninsula in which agriculture was still the dominant activity and to a wildland county in the Upper Peninsula in which timber and the forest industries were most important in the local economic life. They both measured the economic contribution of recreation as the sum of three types of income; namely income from retail sales, income from the sale of service, and income from the property taxes on recreational receipts. This method went beyond that of Hedrick by providing an estimate of business returns as well as gov-

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[1] Ross N. Pearson, "Recreation and its Significance in the Economy of Ogemaw County, Michigan," (Unpublished Ph.D. Dissertation, Department of Geography, University of Michigan, 1954) and William R. Brueckheimer, "The Significance of the Recreation Industry in Alger County, Michigan," (Unpublished Ph.D. Dissertation, Department of Geography, University of Michigan, 1954)

ernment returns engendered by recreational activity.

In solving the major problem of allocating the correct proportion of retail sales to recreation, both Pearson and Brueckheimer plotted curves showing per capita sales by months in the year. The trend of these curves reflected the marked difference of the buying of summer and fall visitors from winter residents. Similar seasonal curves for non-recreational counties showed no similar bulges in the vacation season. It was, therefore, inferred that the excess of sales in the summer months in Ogemaw and Alger counties over the winter months could be regarded as the increase of sales attributable to recreation. The peaks of the seasonal curves were more pronounced for recreational-sensitive lines of business, such as sporting goods establishments, eating and drinking places, and variety stores, than they were for the sales of general stores and filling stations.

Pearson estimated that the retail sales to recreationists were 10 percent of all retail sales in Ogemaw County in 1950. Brueckheimer also estimated the recreationists' share of retail sales in Alger County in 1951 to be 10 percent. Pearson's final tabulation of "Income and Recreation" came to a total of about one million dollars, of which 73 percent was income from retail sales, 22 percent income from sales of services, and 5 percent receipts of local government units for property tax or state government payments in lieu of property tax. Pearson observed that

the income from the sales of agricultural products in Ogemaw County at the farm in 1950 was 1.75 million dollars, and concluded that recreation was an important but not a leading activity in the county.

Brueckheimer similarly expressed the view that in Alger County, the shortness of the recreational season and the absence of full-time employment for any of the individuals who benefited from it, weighed heavily against regarding recreation as of primary economic importance. He was convinced that "timber cutting and processing remained the basic industries in the county."

National Income Method

Probably more satisfactory than using gross expenditures to measure the economic significance of forest recreation is to convert these expenditures to an income basis comparable to the concept used in the national-income accounting system. This is the approach suggested by Prewitt in a report made to the National Park Service in 1949.[1] His suggestion was:

> If recreation induces a certain expenditure which in turn generates national income, then it may be said that some indication of the benefit of recreation is how much of the national income is associated with the induced expenditure. Under this approach one would try to determine how much expenditure would be made for recreation on and off the area, and the income that this ex-

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[1]Roy A. Prewitt, The Economics of Public Recreation - An Economic Study of Monetary Evaluation of Recreation in the National Parks. National Park Service, (1949).

penditure would induce in the economy.

Palley suggests a somewhat similar approach on a single state basis.[1] His contention is:

> The economic contribution of recreation is the sum of the incomes accruing to wildland owners in a year through recreational use, plus the income component of the expenditures for new construction and producers durable goods contributing to the recreation industry plus the expenditures of government agencies for operations and investment in recreational improvements and facilities.

He further indicated that the economic contribution of recreation includes also the so-called secondary effects, or that part of national income originating in the foods and eating, the sports equipment, the transportation, etc., which can be attributed to forest recreation.

Palley's main concern was to convert the gross expenditure data for recreation to national income basis so that a valid comparison could be made with other forest product values on a similar basis. In his words:

> Gross expenditures by themselves represent too inclusive a measure of the contribution to the Michigan economy of recreation. The same reduction to "national income originating" as was proposed for the product of forest industries is called for in the case of the recreational products.

He suggests that a practical way of doing this would be to find the approximate percentage of retail sales which represents national income arising in wholesale and retail trade. His comparison of national income statistics

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[1]Palley, op. cit., p. 94.

with sales volumes figures from the Census of Business led him to suggest that the desired ratio of 20 percent of sales is the proportion which can be counted towards national income.

Other Measurement Considerations

In addition to the categories of methods of measurements discussed, there have been several significant articles written suggesting other approaches for the measurement of the importance of outdoor recreation. One of these is a recent address given by Marion Clawson for which he proposes a method by which demand curves might be constructed for certain recreational areas such as national or state parks.[1] This method would have utility in measuring recreation benefits insofar as pricing is set, but it would require the use of the expenditures or similar method in order to set a market price.

Likewise, the so-called "consumer surplus" method as advanced by Trice and Wood would require a scheme of pricing.[2]

Of considerable value as a framework in which comparative values of recreation and other uses can be made

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[1]Marion Clawson, "Methods of Measuring the Demand for and Value of Outdoor Recreation," Resources for the Future, Reprint No. 10. (February, 1959), pp. 9-30.

[2]Albert M. Trice and Samuel E. Wood, "Measurements of Recreation Benefits," Land Economics, Vol. XXXIV No. 3, (August, 1958).

is the benefit-cost analysis. This approach was developed by the U.S. Corps of Engineers for determining the probable effects on recreation for proposed water developments such as reservoir construction.[1]

In a government report advancing this type of analysis, it was suggested "that the benefits of recreational use be estimated by derived or estimated values based on informal estimates of the average values of these recreational facilities to prospective users."[2] This approach is used by the National Park Service, which determines the annual benefit by "multiplying the estimated average annual recreational attendance at proposed water-control developments by a computed market value for recreation." This market value is based on prices commonly charged at private recreational facilities for the types of recreation involved. The average value computed by the National Park Service is 1.60 dollars per visitor day.[3]

Another approach to the comparison of relative

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[1]For an excellent critique of the current approach to the benefit-cost analysis, consult R.J. Hammond, Benefit-Cost Analysis and Water Pollution Control, Food Research Institute, Stanford, University, (1959), Chapter II. pp. 17-39.

[2]U.S. Federal Inter-Agency River Basin Committee, Sub Committee on Benefits and Costs, Proposed Practices for Economic Analysis of River Basin Projects, (1950), p. 51.

[3]See August 1956 release of National Park Service, A Method of Evaluating Recreation Benefits and Costs of Water Control Projects.

values, sometimes referred to as the "marginal method" is discussed in a recent Master's thesis by William Atkinson.[1] This method involves the calculation of a ratio between the value of an area for timber production and its recreational use in man-days per year. This ratio expresses the value of the timber whose use is "foregone" if the area is devoted to recreational use in terms of its worth per man-day of such use. If ratios are calculated for a great number of areas now devoted to both recreational use and timber production, a narrow range of ratios marking the "margin" between the areas best suited to the two purposes can be delineated. If the ratio for a doubtful area whose relative values are in question is less than the marginal ratio, the indication is that the area is best suited for recreational use; if higher, for timber production.

A Michigan Land Use Committee suggests another possibility of a "marginal approach" in the determination of recreation.[2]

> One possibility lies in establishing an economic experiment designed to measure the values of sport fishing--for example, trout fishing. By establishing and controlling the probability of catch in different stream areas and forcing the fisherman to announce his pref-

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[1] William A. Atkinson, "A Proposed Method for the Recreational Evaluation of Forest Land," (Unpublished M. S. thesis, University of California, 1956) as cited in Samuel T. Dana, Problem Analysis Research in Forest Recreation, (Washington: U.S. Forest Service, 1957), p. 13.

[2] A report by the Wild Land Use Committee of the Michigan Lower Peninsula Forest Research Council, (February, 1957).

> erence order (through varying prices according to the opportunity of catching fish), it would be possible to improve our estimate of the value of this kind of recreation . . . . The same sort of an experiment might well be applied to other evaluation problems of a similar nature, such as the evaluation of State park areas, game fish versus pan fish, etc.

Having constructed a demand curve by this procedure, "the next step would be to construct a supply curve, which is simply a curve resting upon the cost of providing these opportunities. Where these two curves cross is the logical point of operation." Although this is a suggested possibility, there is nothing in the literature to indicate that this approach has actually been employed anywhere.

Wildlife

Attention in this study is restricted to the portion of wildlife values which is embraced in recreation, recognizing, however, that the economic importance of wildlife covers a greater range than the economic importance of wildlife in its recreational aspects. Embracing this broader view, King provided an inclusive list of the values of wildlife which might be included.[1] The value of wildlife would include the returns from any commercial operation of trapping, fishing, and fur and game farming. In addition to these readily appropriable sources of income from wildlife, he includes other items as the pollination

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[1]Ralph T. King, "Forest Geology and its Relation to a Wildlife Program as applied on the Huntington Forest, Roosevelt Wildlife Bulletin, Vol. 7, (1941), p. 469.

of clover seed, insects and rodent control furnished by wild creatures, and a wide variety of esthetic, social, recreational, and scientific values, most of which defy any accurate accounting.

In the restriction of this study to the recreational aspect, of particular interest are the studies which have been made which have measured the economic importance of fish and game in terms of the money spent by hunters and fishermen. Similar to the recreational travel surveys, this gross expenditure method is popular and has been widely used. In the past few years, about a fourth of the state fish and game agencies have made economic surveys of fishing and hunting in their areas. The way in which these surveys are made is by interviewing a sample of the population of hunters and fishermen in a state as to their expenditures made in buying certain classes of goods and services in connection with their recreation, then making the appropriate inferences as to the behavior of the entire body of anglers and hunters.

The classes of expenditures recognized in these state studies cover a wide range. The Massachusetts survey included not only expenditures for hunting and fishing in the field, but those for trap and target pistol shoot-

ing as well.[1] Wallace[2] added "Special Fees and Leases" in Washington and such marginal items as "cameras and camera supplies." The North Carolina study supplied the added category of expenditures for guides and payments to farm pond contractors.[3]

One study in Texas, in addition to questions in regard to expenditure, included a vast amount of detail relating to age, occupation, and success of hunters, types of leases, landowner revenues, relationships between domestic and wild game and similar material.[4]

Probably the most ambitious of these surveys was one conducted by Crossley S-D Surveys, Inc., for the Fish and Wildlife Service in 1955.[5] This survey was conducted on a nationwide basis using personal interview of persons 12 years old or above from a sample of households in every state as their source of data. Fishermen and hunters in-

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[1]Lawrence H. Conture, Seventy-Five Million Dollars a Year, Just for the Fun of It, Massachusetts Division of Fisheries and Game, (1954), p. 8.

[2]Robert F. Wallace, Economic Aspects of Wildlife Resources of the State of Washington, (Pullman; State College of Washington Business Studies Bulletin No. 19, 1952), p. 12.

[3]Howard C. Stains and Frederick S. Barkalow, Jr., The Value of North Carolina's Game and Fish, (North Carolina Wildlife Resources Commission, Raleigh; 1951).

[4]Henry C. Hahn, Jr., Economic Value of Game in the Edwards Plateau Region of Texas, (Texas Game, Fish, and Oyster Commission, May, 1951).

[5]National Survey of Fishing and Hunting, Fish and Wildlife Service, Department of the Interior, Circular 44, (1955).

terviewed were asked detailed questions about their expenditures in connection with their sport.

Because of the important use made of these findings in the present study, a detailed definition of the expenditure items is, therefore, presented as taken from the survey report.

Expenditures of persons who fished and/or hunted 1955[1]

Expenditure Item

Equipment:
- Hunting and fishing equipment
- Other

Trip expenditures:
- Food
- Lodging
- Transportation (auto expenses)
- Other

License and lease fees:
- Licenses and stamps
- Leases and privileges
- Duck stamps

Other expenditures (includes hunting dogs)

Equipment

Equipment expenditures included the cost and maintenance of equipment used specifically for hunting and fishing and of other equipment used primarily for fishing or hunting. Expenditures for purchase of equipment were included only if the equipment has been acquired by purchase or gift in the United States in the calendar year.

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[1] Ibid., p. 38-39.

Fishing equipment included rods, poles, reels, line, harness, nets, seives, minnow buckets, scales, ice-fishing gear, spear-fishing gear, and all other equipment used specifically for fishing.

Hunting equipment included guns and rifles, shells, and cartridges, bows and arrows, gunsights, targets, decoys, and calls and all other equipment used specifically for hunting.

Other equipment (listed only if used primarily for fishing or hunting) included tents and sleeping gear, cooking and eating utensils, special fishing and hunting clothing, lanterns, binoculars, boats and boat accessories, motors, trailers, cabins and other equipment if used primarily for fishing and hunting.

Trip expenditures

Trip expenditures were included only if the trip was made primarily for fishing and hunting, and in the case of a party trip, they included only the expenditures of the person interviewed.

For meals purchased during fishing and hunting trips, only that portion of the meal cost in excess of the average cost of home meals was included (6.50 dollars per person per week. U.S. Department of Agriculture, Household Economics Research Branch, September 1955).

Automobile transportation expense for fishing and hunting trip was computed at 3.5 cents per mile to cover

actual operating costs (gasoline, oil maintenance and tires), but not depreciation, insurance, or licenses (American Automobile Association Information Bulletin No. 93, March 1955). If four persons went together in an automobile on a fishing trip and one did not fish, the automobile expense applicable to each fisherman was the total divided by three, or 1 1/6 cents a mile.

Other trip expenditures included transportation other than by automobile, refreshments, bait, guide fees, rentals, entrance fees, charter fees, and pack-trip fees.

License and lease fees

In order to be recorded as a license holder in the survey, a person had to have purchased a fishing or hunting license during the calendar year 1955. If the initial interview in a household revealed that a certain member of the family had not fished during that year, that person was not interviewed as a 1955 fisherman and was not asked whether he held a 1955 fishing license (and similarly for hunting).

Other expenditures

Under other expenses are included club dues, subscriptions by magazines primarily for fishing and hunting, and all other expenditures not specifically classified but incurred as a part of fishing or hunting activities (includes dogs kept specifically for hunting).

In summarizing all expenditures, the National Survey

of Hunting and Fishing revealed that about 25 million hunters and fishermen in the United States spent almost three billion dollars on the above classes of expenditure items in 1955. The average fisherman spent 91.98 dollars annually, while the annual expenditure for the average hunter was 79.49 dollars.[1]

Michigan has had no comparable consumer surveys carried out among its sportsmen, but a quite different attempt at economic evaluation of wildlife benefits is found in a note published jointly by the Cooperative Extension Service and the Game Division of the Michigan Conservation Department on the annual value of the game and fur crop.[2] The fur harvest is valued in terms of the value of the pelts taken and game crop in terms of the estimated value of the meat in animals taken by hunters. All game species are valued at 75 cents per pound, with the exception of rodents such as woodchucks, which are valued at 25 cents. On this basis, pelts came to one million dollars in 1954, and edible meat from game animals and birds to nearly eight million.

Craighead's appraisal of the Jackson Hole elk herd of Wyoming reflected a similar attempt to measure the economic contribution of game in terms of the meat on the

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[1] Ibid., p. 28.

[2] Charles Schick, "Value of Michigan's 1954 Game and Fur Crop," (Cooperative Extension Service, Michigan State College and Michigan Conservation Department, Lansing; 1955).

carcasses of the annual kill.[1] He valued the elk at 50 cents per pound hog dressed and the cattle at 25 cents per pound alive in the wholesale markets. The local elk industry was held to be more valuable than the cattle industry both in total dollar value and in the number of Jackson Hole residents in whole or part dependent on it for a livlihood.

Where game populations become too high, they may cause extensive damage to other important resource values. Thomas estimated that deer damage to crops, fences, and livestock in Potter County, Pennsylvania, amounted to 148,000 dollars in 1951; gross income to farmers from hunters for lodging, board, and the like was 45,000 dollars, not counting the cost of providing such services to hunters.[2]

On the National Forests of Wisconsin, it was estimated in 1943 that damage by deer to plantations and natural reproduction during the preceding 10-year period totaled 547,500 dollars.[3]

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[1]John J. Craighead, "A Biological and Economic Appraisal of the Jackson Hole Elk Herd," (New York; New York Zoological Society and the Conservation Foundation, 1952).

[2]Donald Woods Thomas, "An Economic Analysis of Deer Damage to Farm Crops, and Income from Deer Hunters, (Potter and Monroe Counties, Pennsylvania; 1951), (Unpublished Ph.D. Dissertation, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, 1954).

[3]Earnest Swift, A History of Wisconsin Deer (Madison; Wisconsin Conservation Department Publication No. 323, 1946), p. 84.

Further Discussion of Methods Used

The technique used by James in his evaluation studies is in general, acceptable as a method for estimating timber values by the national income approach. However, there are some deviations which should be noted. In the matter of income derivation, James did not follow strictly the procedure as outlined in the Department of Commerce publication. The concept of income used in the publication, National Income, includes money payments to individuals for goods and services. These payments include wages and salaries, net profits, interest, and net rents. James excluded the "payments from government" in his study, and only included that part of value added which was covered by wages, salaries and net profits. This means that the value might be low, as interest and net rents as sources of value have been left out. Data on wages and salaries were obtained from various Census Bureau publications, but net profits were estimates based on numerous annual reports of timber products firms. Because this estimate of net profits was based on a small sampling of firms rather than the wide coverage made by government surveys, the reliability of the net profit figures derived by James might be decreased somewhat.

Also, in his studies, James counted the full value of the raw timber products sold as income; but, in theory at least, some allowances should have been made for the

non-income items which are included in gross product. These items would have been difficult to single out in the production of raw timber products and it is doubtful that they would change the final totals to a very great extent.

On the whole, James' method appears to be a satisfactory approach to measuring the values of the timber economy. With some modifications, the approach could be made more accurate.

On the recreational side however, there are some real shortcomings and limitations in using any of the measures discussed. Primarily the largest stumbling block is the prevalence of goods which have value but no price. What monetary value, for instance, could be placed upon a spectacular sunset, a magnificent mountain, or the hushed cathedral-like quality of a virgin coniferous forest?[1] Yet, such factors do have a monetary value, and we cannot overlook the fact that we make a monetary evaluation of subjective experiences all the time, as exemplified in the pricing of masterpieces of art, education, medical services, and other aspects of life.[2]

Secondary benefits, such as those measured by the expenditure method, are somewhat easier to estimate since they are reflected in more easily recognizable monetary

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[1]This point is well presented by M.L. Upchurch, "Economic Factors in Western Range Improvement," Journal of Farm Economics, XXXV, (December, 1953), p. 736.

[2]Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation, p. 3.

terms. Yet even in these instances, the returns are so interrelated with other personal activities, and so diffused through such a great variety of business channels that only the most careful and exhaustive studies can be expected to pinpoint them.

In using the total or gross expenditure method of measurement of recreational values, one has to be aware of such interrelation of activities. Just what expenditure should be included? How should it be divided geographically; how should it be divided functionally when the trip combines business and pleasure?

When using this method to determine impact on the local economy, the problem of dividing the expenditures geographically becomes even more important. In many cases, the full effect of the total expenditures is not felt in the area where the recreational opportunity lies. For this reason, units of local government are often unenthusiastic over crowds of outside visitors to a local recreation attraction.[1]

Another point to consider in evaluating the impact on local economies is size of the area to which the measurement is intended to apply. The size of the area chosen affects the point of view taken in measuring benefits. What may be a benefit from the standpoint of a local community may simply represent a transfer payment from other

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[1] Ibid., p. 7.

communities rather than the creation of new wealth. For instance, food bought while on vacation in one part of a state merely replaces food that would otherwise be bought at home in another section of the state.

Another serious shortcoming of the gross expenditure data is the lack of comparability between them and estimate of gross output in other activities. A conversion to national income levels would be the best method to make them more comparable. However, the chief objection to the national income method is the fact that it requires the accumulation of more comprehensive and diversified data which make its practical application more difficult. This might be remedied by the application of a derived percentage figure to expenditures at the retail level to convert those sales to national income basis (as suggested by Palley).

In considering the methods of measuring the relative values of recreation by the marginal approach as suggested by the Wild Land Use Committee in Michigan, one encounters more problems. A major difficulty in establishing control areas in order to find the price users are willing to pay for a certain use would be that the areas included in the experiment would almost certainly be in competition with areas where no attempt is made to charge what the traffic will bear. Users would certainly tend to avail themselves of equally attractive opportunities in free or low-priced areas, even though they might be willing to pay much more

in an unsubsidized market.[1]

The methods of measurement used in most of the fish and game surveys have the same weaknesses of the total expenditure method used elsewhere in the recreation field. Of special importance however, are the expenditure categories chosen for measure and their interrelations with other uses. For instance, it is doubtful that under the category of "other trip expenditure," of the National Survey of Hunting and Fishing, that "refreshments" bought during the trip should be charged entirely to hunting and fishing.

As to the second method of measurement of the value of wildlife, it appears erroneous to impute a value to wild meat, whether it be to the elk in Wyoming or to the wide range of game and fur-bearing animals of Michigan. The pursuit of game animals is a matter of sport except perhaps to the local residents of a game-producing area. In a sampling of two Pennsylvania counties, over 80 percent of the successful deer hunters reported that the sport they received in hunting was the chief reason for going deer hunting.[2] Since under ordinary conditions it is illegal to sell wild meat, there is no adequate market opportunity to define what the value of this meat would be.

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[1]See discussion in Dana, op cit., p. 14.

[2]William S. Lefer, "The Sociology of Deer Hunting in Two Pennsylvania Counties," (Unpublished Master's Thesis, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, 1953), p. 81.

DEVELOPMENT OF THE STATE FOREST SYSTEM

Historical Background

Early Land Disposal Policies

Following the War of 1812, the policy of the United States government was to alienate as rapidly as possible its large asset of public domain. This was partly because the young government needed funds and partly because of a basic national philosophy to develop a nation of freeholders. The feeling at that time was that such a policy of selling public lands to private individuals would be for the betterment of the nation in that private ownership would assure maximum production on the lands and would guarantee a certain equality in the distribution of wealth.[1]

This alienation policy continued for over 100 years with almost one billion acres of public domain disposed of by gift, sales, homestead and subsidy.

Areas near the seacoasts were the first settled, but as transportation facilities improved, lands farther inland came into demand. As early as 1814, land surveys were under way in Michigan and a federal land office in Detroit was

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[1]Richard T. Ely and George S. Wehrwein, Land Economics, (New York: The Macmillan Company, 1940), p. 90.

selling land.[1] Prices were low, terms easy, and the influx of new population began promptly.

The early demand was primarily for agricultural soil. Only a few people were interested in timber as such, and the hardwoods of southern Michigan were considered a nuisance to the settlers as they had to be cleared before the land could be farmed. Most of the lands sold in Michigan in this period brought no more than 1.25 dollars per acre, but mineral lands generally sold for 5.00 dollars per acre.

With the advent of statehood in 1837, the drive to get the public domain into private hands had new impetus. The new state government, with its growing budget to meet, began to dispose of lands as a means of raising funds.

The lands in the state's possession were lands transferred by act of the Federal Congress. The first appreciable grants to Michigan were for the support of public schools. Section 16 of each township was reserved for this purpose, and these sections amounted to over one million acres. Another 300,000 acres were received for state university and Land Grant College financing.

Following these grants came the transfer of the so-called swamp lands. These were lands which were designated to be so low and overflowed as to be unfit for agriculture. However, through errors in location, and abuse of the law, much of the land transferred in these grants was high and

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[1]Harold Titus, "The Land Nobody Wanted," (Michigan Agricultural Experiment Station, Special Bulletin 332, 1945), p. 4.

dry, and contained some of the finest stands of timber in the state. Six million acres of this class of land came to the state shortly after 1850,[1] and were put under the jurisdiction of the State Land Office which had been established in 1843.

Finally, about four million additional acres were deeded to the state for internal improvement such as canals, roads, and railways. A portion of these lands was given directly to private builders by the state as subsidies; some was sold to raise money for improvements.

Land passed quickly through the intermediary of state ownership into private hands. Most of it was sold cheaply from 75 cents to 2.00 dollars per acre with no regard for intended usage or size of purchase. This policy proved to be very convenient for the accumulation of large private holdings and the ensuing timber exploitation. By 1890, of the nearly 12 million acres in federal grants made to the state, only a half million acres remained unsold.[2]

Timber Exploitation Era

The lumbering which developed in the half century from 1850 to 1900 in Michigan was to lead the world in production and hasten the settlement of the Middle West. By 1840, settlements had already spread across the southern

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[1] Ibid., p. 4.

[2] Ibid., p. 6.

part of the state, and the hardwoods of the area were cleared and burned. With the exception of basswood and yellow poplar, most of the timber in this area was too heavy and hard to be handled by the equipment and mills of the day. What the settlers in Michigan and the Midwest needed was pine, and farther upstate the pine was to be had in some of the most magnificent stands the world has ever known.

Some of the finest pine stands in the state were growing along the tributaries of the Saginaw River--the Shiawassee, Flint, and Cass draining from the south and Thumb areas, and the most famous in this drainage basin, the Tittabawassee, with its branches, the Pine, Chippawa, Salt and Tobacco rivers.[1]

Lumbering in the Saginaw Valley reached its peak in 1882 when the great booming companies delivered 1,011 million board feet of logs to more than 100 mills which lined the mile stretch of the Saginaw River between Saginaw and Bay cities. The Saginaw area declined after the peak had been reached until 1897 when most of its pine was gone. Between 1851 and 1897, a total of nearly 23 billion board feet of logs went through the mills in the Saginaw Valley.[2]

While this area was flourishing, logging in the other

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[1]Michigan Agricultural Experiment Station, Michigan Log Marks, (Memoir Bulletin No. 4, November, 1941), p. 29.

[2]Ibid., p. 32.

sections of the state began to grow. On the Lake Michigan side, logs were moving toward Muskegon from as far north as Higgins and Houghton lakes down the long Muskegon River. The cut of pine in this area was equal to that of the Saginaw Valley, reaching its peak about the turn of the century. The pine along the Manistee River was logged in the same period and the ports of Muskegon and Manistee were sending a steady flow of lumber across the lake to Chicago, which had become the lumber capital of the world.

Railroads made their appearance in logging operations in the western Michigan pine, the first in about 1877. Their appearance made it possible to log areas remote from navigable streams and to deliver logs direct from the woods to the mill without the tremendous sorting operation involved in river drives. Mills did not have to be located on rivers, for a lake or pond for log storage would do. Thus, inland mill towns like Cadillac and Lake cities developed.

Concurrent with developments in the west side of the Lower Peninsula, logging progressed up the east side. The swift waters of the Rifle, AuGres, and AuSable rivers became legendary among the "river hogs" who risked life and limb riding the logs to the mills. Farther north, the Thunder Bay, Cheyboygan, Black, Pigeon, and Sturgeon rivers all became famous. Railroad shipment played an important part in the pine harvest in this northeast area also. A total of nearly 12 billion board feet of logs was drained

from this region.

Pine logging in the Upper Peninsula did not gain importance until about 1880 and lasted until about 1920. The rivers were, in general, short and too rocky and crooked for good log driving. However, the Menominee River, dividing Michigan and Wisconsin, became as important in this area as had been the Saginaw and Muskegon rivers in the Lower Peninsula, although the value of timber cut in its drainage basin was not as great.

The peak of Michigan's lumber production came in 1890 when the year's cut was about five and one-half billion board feet of lumber. Eighty percent of this was softwoods, mostly white and red pine which were logged and marketed together. The total pine cut during the 40 years of the harvest has been estimated at 160 billion board feet.[1]

Michigan's wealth of hardwood timber was generally ignored during the main part of the pine-cutting era. In the northwest corner of the Lower Peninsula, and in the western half of the Upper Peninsula, great areas of mixed northern hardwoods were found. Along the shores of the Great Lakes and on many of the islands, hardwoods had for years been cut for fuel wood for the lake boats. The charcoal industry in the mining areas also consumed large quantities, but the main cutting of northern hardwoods for lumber began about 1880 in the Grand Traverse and Charle-

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[1]Henry B. Steer, "Lumber Production in the United States," (1799-1946).

voix areas. Railroads were important in hardwood logging since logs could not be floated. The hardwood logging period lasted until about 1920 in the Lower Peninsula; it is still being conducted on a large, though declining scale in the remaining virgin hardwood stands in the western end of the Upper Peninsula.

The heavy amounts of slash that were left on the ground after the pines were cut set the stage for the final act of the degradation of the land by timber exploitation. Huge fires ravaged any young trees that may have been left for renewal of the stands. Not only was timber lost and reproduction killed, but towns, villages, and farms, were destroyed, frequently with great loss of lives. In 1871, the city of Manistee was destroyed by a fire which was one of several spreading clear across the state. An estimated two million acres burned that year. In 1881 another million acres burned in the Central and Thumb areas of the state, and finally in 1908, a total of 2.4 million acres were burned over the state.[1] This was the year that the town of Metz was destroyed with great loss of lives. In between these catastrophic years, thousands of acres were burned and re-burned destroying any chance of timber making a come-back on the cut-over lands.

During the excitement and the fever pitch of the pine logging, there was little thought of the future of the

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[1] J.A. Mitchell and H.R. Sayrs, Forest Fires in Michigan, (Michigan Department of Conservation in cooperation with the U.S. Forest Service, 1931), p. 9.

area after the logging camps and the mills had gone. Most people thought that farms would appear in the upper counties after the timber was cut, just as was happening in the southern counties of the state. The plow always follows the axe, so they reasoned.[1] In the words of Harold Titus:

> No consideration was given to the variety of soil textures, to topography, to distance from market and all the other factors that predetermine agricultural success . . . . Had the men just looked about them, they could have seen demonstrations of what might soon happen to whole regions . . . . The plow frequently was abreast of the axe in Michigan. All the upper counties were not densely forested. Great sweeps of plains were found in the pineries, perhaps the results of prehistoric fires. Such land was almost ready for the plow and men plowed it early--as early as the seventies in Ogemaw, Gladwin and Roscommon counties where the pine harvest was then only starting. Many of them grew crops too, though the soil was light-- or, anyhow, one crop, for the yield dwindled after the initial breaking and soon these pioneers moved on.[2]

In 1869 the first comprehensive Michigan law for the assessment of real property was enacted providing for the forfeiture of title in case of delinquency. Although this law was uncertain and it was not until 1893 that it became a sound, workable act which vested absolute title to tax delinquent descriptions in the state, it served to touch off a land boom that caused almost as much excitement as that attending the timber harvest.

As soon as forfeiture for non-payment of taxes became a probability, holders of large cut-over areas could

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[1] Titus, op. cit., p. 7.

[2] Ibid.

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[1] Titus, op. cit., p. 7.

[2] Ibid.

no longer hang on indefinitely without hope of realizing a return for these acres. So into the scene rushed the land speculators, who purchased large tracts of land from the tax-conscious owners, often for only a pittance. Then began the advertising campaigns to draw settlers to the cut-over regions. Many of these advertisements bordered on fraud. One railroad company, in a booklet published in 1875, pictured some of its land in Ogemaw County as follows:

> Lands timbered with maple, beech, basswood, and ash are everywhere regarded as fertile and well adapted to agriculture. A large part of these lands are of this character. In other parts, the soil is more sandy. Plains, quite free from timber, and nearly ready for the plow, are also to be found. These land, though offered at low prices ($10 to $25 per acre) possess the same qualities of soil as some of the best lands in England and the United States, and wherever lands of this kind have been subjected to intelligent husbandry adapted to their character, they have produced well, and with less labor than the heavier soils. It may be said in general that the lands are adapted to all the crops grown in this latitude.
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> Specimens from these lighter soils have been subjected to numerous examinations by eminent agricultural chemists, for the purpose of determining their productive ingredients, and in every case an abundance of lime, feld spar, and mia, as well as silica and common sand have been found to exist. As these last named minerals contain a large percentage of potash, the only thing which this variety of soil seems to lack is vegetable matter. A good supply of the latter will make it exceedingly fertile, and can easily be supplied by clovering or turning under blue grass sod.[1]

The great majority of the settlers who were attrac-

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[1] Ibid., p. 11.

ted to the state as a result of such advertisement were poor people. Rarely were they able to withstand the shock of even temporary setbacks. So, when crops repeatedly failed, and there was no employment available, they were forced to abandon their lands. Soon, through tax reversion, the state came again into possession of its public domain.

By 1890, the trickle of tax delinquencies had grown into a flood. In 1893, a period of great depression, this reverted land was designated as Tax Homestead Lands in an effort to get the land back into private ownership and listed on the tax rolls. Anyone might secure up to 160 acres by paying 10 cents an acre, residing on the property for five years, and making certain improvements. By 1896, only slightly over 40,000 acres had been acquired under these terms and in many instances, the homesteader existed in name only. More often the intent was to harvest what timber former loggers and forest fire had left, then let the land revert again to the state. This happened so often that the Legislature in 1889 made it lawful for the state to make outright sales of these tax reverted lands. In the following year, only 12,000 acres were disposed of at an average price of 38 cents per acre, but by 1908 over a million acres, once tax delinquent, had been resold.

> Timber scavengers and land speculators watched the delinquencies like hawks, grabbing off small but certain values as they appeared on the lists. More second-growth timber was harvested, more land-hungry greenhorns were enticed to sections that had already been found wanting for agricul-

> ture, and then back to public domain the land went again.[1]

Creation of Forest Land Agencies

State Forestry Commission

As early as 1890 there was a small group of people who sounded warnings that the cut-over lands were not suited for farming and would not last in private ownership. However, they pointed out that these lands were far from worthless. They said that if fire were kept out of the young reproduction and that if pines were planted where none could start by themselves, then someday there would be a forest again!

> Suspicion lingers that the Legislature finally took action more to quiet this small but articulate group than to launch a new and logical program of land use, when in 1889, it authorized the establishment of a State Forestry Commission and dedicated certain tax-delinquent lands as Forest Reserves.[2]

It was not until 1903 that the Forestry Commission was born and two reserves were designated. That year marks the real beginning of forestry in Michigan. The Higgins Lake and Houghton Lake State Forest Reserves were comprised of 35,000 acres of tax reverted, cut-over and burned-over lands. This was a turning point in state land policy. It was an assertion by law and deed that Michigan

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[1] Ibid., p. 11.

[2] Ibid., p. 12.

had ceased considering its public domain as a transitory thing and was embarking on the policy of permanent ownership and actual administration of reserved areas.

Following this action in 1907, a legislative committee investigated the charges that the state was selling land at less than the value of the scattered timber on it.[1] Enough unsatisfactory facts concerning land affairs were turned up to result in the establishment in 1909 of the Public Domain Commission to replace the State Land Office.

Public Domain Commission

Progress in public forestry was slow until the Public Domain Commission was established in 1909 and a full-time State Forester appointed in 1910. One section in the act establishing this commission gave it the power to hold for forest reserve purposes land unfit for agriculture, stating that "at no time shall the amount set aside be less than 200,000 acres including present state reserves."

This new bureau brought fresh perspective to Michigan's land problem. The Commission was appalled by the timber scavengering and speculation on the cut-over lands and by the resultant social and economic ills. As a result, the prospective homesteaders of Tax Homestead Lands were more closely scrutinized. Finally this law was abolished and the remaining tax reverted lands were withdrawn from

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[1] Commission of Inquiry on Tax Lands and Forestry, (Lansing: Wynkoop Hallenberk Crawford Company, State Printers, 1908).

the market in 1913.

The Land Exchange Law of 1911 made possible the consolidation of state holdings by exchanging state land outside forest boundaries for federal and private lands inside. This was the only device by which state forests could be consolidated or expanded because no funds had been made available for purchase of lands.

This move opened the way for the creation of additional state forest reserves. By 1921 there were eight state forests with 170,000 acres under management and an additional 105,000 acres scattered in unmanaged and unnamed units.[1]

Department of Conservation

In 1921, the Public Domain Commission was replaced by the Department of Conservation. In this new department were merged the State Land Office, the Office of State Game Warden, the Fisheries Commission, and the Forestry Commission. Thus, all the offices and commissions having to do with the protection or development of the state's wild land resources were brought together under one administrative head. (Present organization of the Department of Conservation is shown in Figure 1).

One of the first steps taken by the new department was to cooperate with the universities of the state and

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[1]Norman F. Smith, Unpublished manuscript, "Michigan Forests and Forestry," (Michigan Department of Conservation, Forestry, 1947), p. 18.

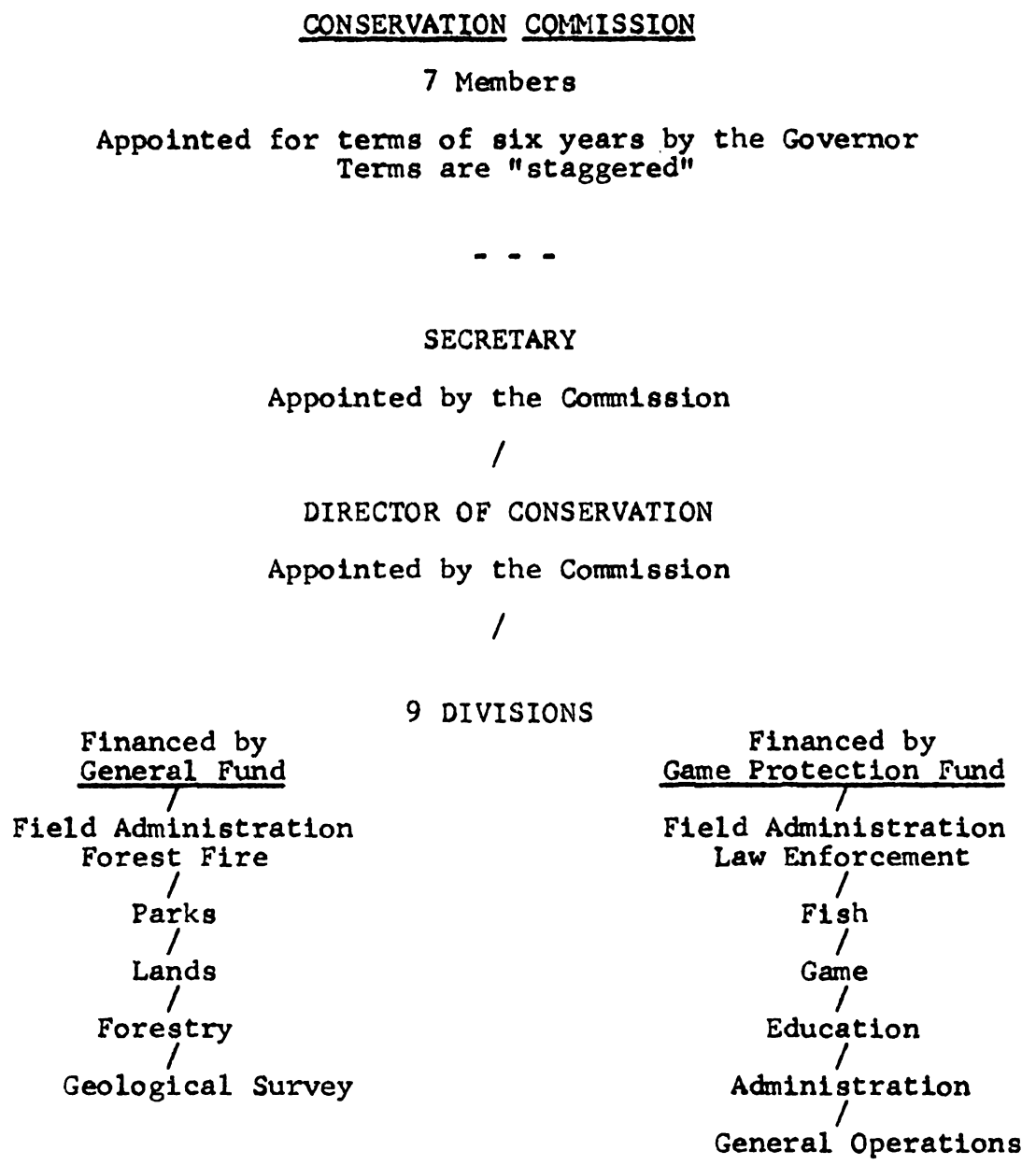

Fig. 1.--Organization chart of the Michigan Department of Conservation.

other interested parties in establishing a Land Economic Survey. This marked the first attempt to make a thorough study of the potentials of wild land areas of the state. Not only was the survey to make an inventory of the physical characteristics of the land, but social and economic conditions were to be considered in order that a decision be made as to whether the tax reverted lands should remain public or be returned to private ownership. The survey was conducted for a period of 11 years and covered half of the counties of the northern half of the Lower Peninsula and half of those in the Upper Peninsula.

The policy which gradually developed as a result of the survey's findings was to set aside for private ownership all descriptions which could be profitably used by private enterprise and which were not key factors in large public undertakings, and to retain for the state all those parcels which otherwise might simply be acquired, exploited and let drift back for non-payment of taxes. Also earmarked for continued public ownership were certain strategic areas such as water frontage, winter yarding grounds for deer, and choice range for other game.

During this 11-year period from 1922 to 1933, the state forests grew to 12 in number with a total state ownership of over 800,000 acres. In addition, seven game refuges totaling 54,000 acres had been established.

In March, 1933, the Civilian Conservation Corps was created by the federal government, and 42 camps were locat-

ed in the northern areas of Michigan. They were active in conservation work during the depression, but their activities tapered off from 1936 until their abolishment in 1942.

The depression intensified the land problems, but the reversion of lands to the state was suspended from 1933 to 1938 by a tax moratorium. However, in 1938, the policy of reversion was resumed. In 1939 alone, 2.2 million acres of tax delinquent land reverted to the state.

The task of classifying this land to assure its proper use was begun immediately. There were in existence newly-created County Land Use Planning committees whose purpose was to get local ideas on land use and to classify land as to its suitability for farming or other purpose. These committees had been formed with the assistance and direction of the Extension Service of Michigan State College as part of a Land Use Planning Program created in 1938 by the United States Department of Agriculture. The Conservation Department recognized the importance of local public opinion in matters involving lands, and wishing also to satisfy county and community needs, worked with these groups in classifying all state lands. Two major classes were considered: (1) lands to be retained in state ownership for public use, and (2) lands to be returned to private ownership. Lands in the first class were further classified as suitable for (a) state or national forests, game areas or parks, (b) county forests or parks, (c) township forests or parks, (d) municipal forests or parks, (e) school for-

ests, (f) airports, dump grounds, etc., (g) grazing under state permit, (h) other public uses. Lands in the second class were further classified into: (a) farming, (b) grazing, (c) private forestry, (d) private hunting and fishing, (e) commercial resort and recreational, (f) other private use.

It is interesting to note that in the opinion of this committee, about 90 percent of the dedications of the Conservation Department were considered sound, and they felt that only 127,800 of the nearly 2,000,000 acres involved should be returned to private ownership and use.[1] The recommendations were followed generally.

The importance of this cooperation between the County Land Use Planning Committee, Extension Service, and the Conservation Department lies in the fact that local people had a hand in the shaping of conservation areas and work in their neighborhoods and acquired a better understanding of the problems and goals of public land administration. Likewise, the department came to a better understanding of local sentiments and needs.

The last major step in the evolution of the state forests was the transfer on July 1, 1946 of the 1.411 million acres of the Northern Game Areas to the Forestry Division as part of the state forest system. Ten new forests were created from this acreage raising the number of

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[1]Titus, op. cit., p. 21.

forests to 22 with the present area of 3.76 million acres.[1]

The administration of the state forests is a function of the Forestry Division of the Conservation Department. The division is headed by a state forester with an organization as shown in Figure 2. The state is divided into 3 forest regions and 30 forest districts of which 7 are purely farm forest districts in southern Michigan with no state forest lands within their boundaries (Figure 3).

The District Forester supervises all activities on the dedicated state forest lands within his district. He also works with individuals and industry on matters pertaining to management of private timber land and the marketing and use of forest products. He works closely with the District Game Manager in carrying out game programs involving state forest lands, but the problems of law enforcement and fire protection are handled by the Field Administration Division of the Conservation Department.

The objectives of state forest management are based on planned land use policies which will provide the greatest economic and social returns to the people of the state. More specifically they are (1) the production of timber, (2) the supplying of facilities for public recreation and, (3) the creation of local economic stability. Thus, the

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[1]There is a total of 23 forests at present. The Allegan State Forest was created in 1940 when some 33,000 acres of abandoned farm lands in Allegan and Barry counties were acquired from the U.S. Forest Service under a long-term lease arrangement.

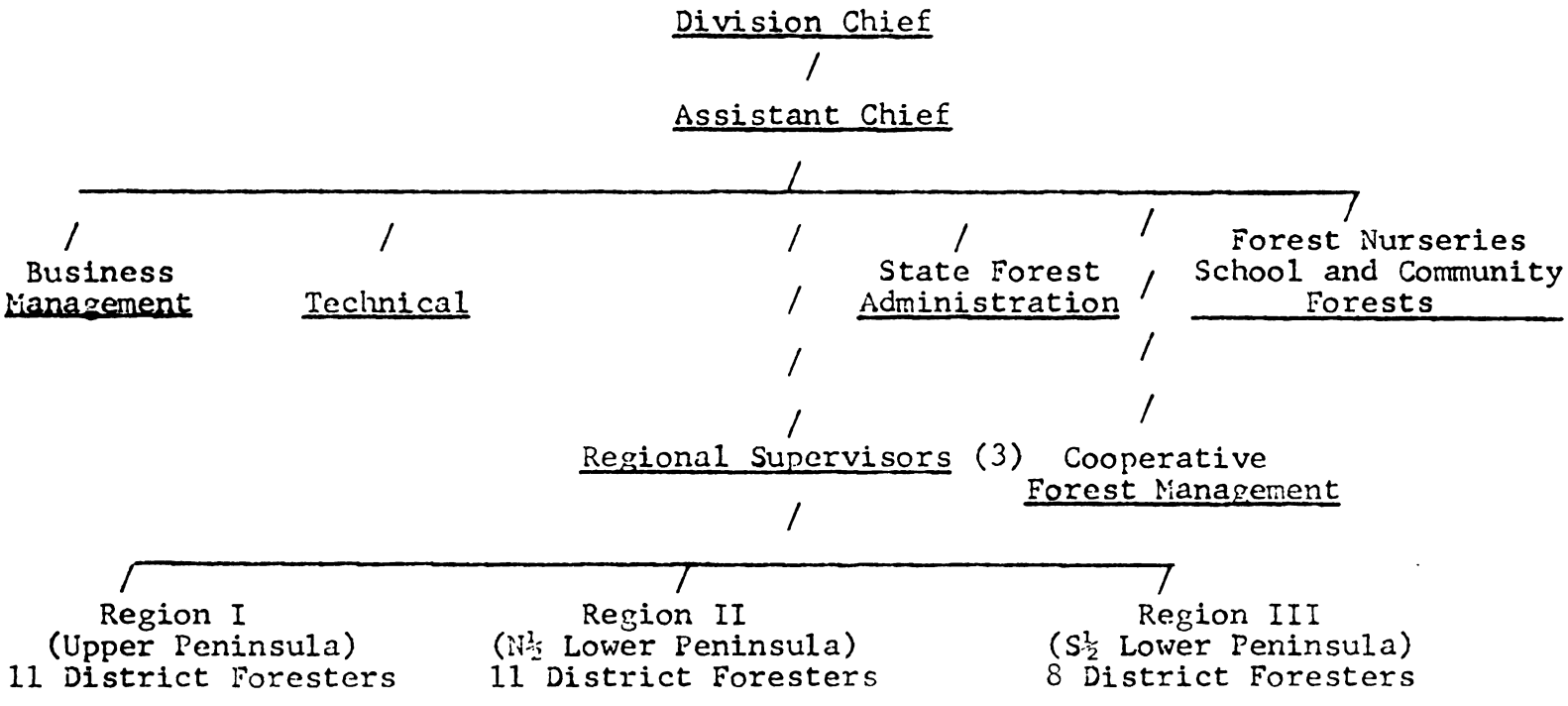

Fig. 2.--Organization chart of the Michigan Division of Forestry, 1960.

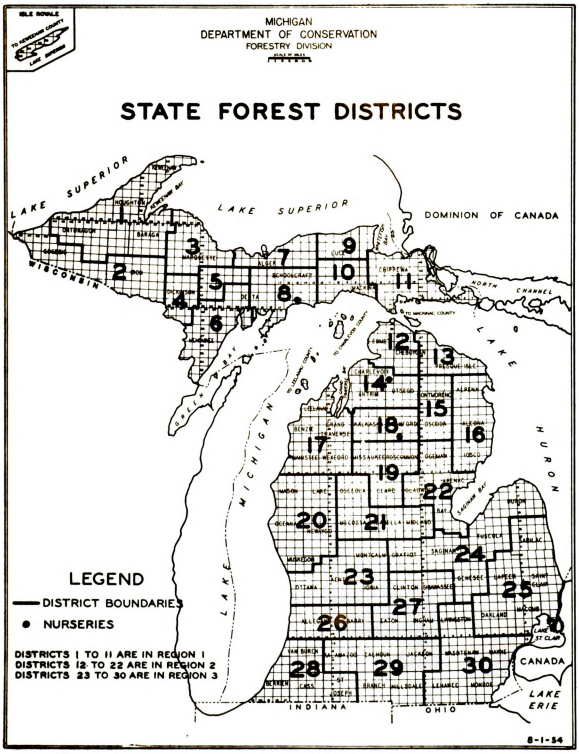

Fig. 3. -- Location of boundaries of State Forest Districts, 1960.

administration of the forests involves close coordination in reaching the first two objectives so that they in turn might help accomplish the third.

Methods of Land Acquisition

There have been three principal means by which the lands comprising the state forests in Michigan today have been acquired. In order of their importance they are: (1) tax reversions, (2) purchase and gifts, (3) exchange.

Tax reversion

It was indicated earlier in this chapter that there was a land boom generated in the cut-over lands in Michigan by land boomers and speculators starting in the 1870's.

Their enthusiasm kept land prices booming for years, but the collapse of their highly artificial market in cut-over land was certain to come sooner or later. The big break did come in the early 1920's with the slumping off of farm land values throughout the country. This break was further widened by the agricultural depression following World War I and the gradual loss of local markets caused by the shrinking importance of the lumber business.

As a result, lumber companies and others who held large areas of cut-over land in anticipation of selling them for farms began to allow them to go tax delinquent. By the late twenties and early thirties, there was a veritable flood of tax delinquencies.

The basis for much of this tax delinquency problem can be traced to such factors as high land valuation and low income, but the heart of the problem lay in the high cost of local government in the cut-over counties in relation to the limited nature of their tax base.[1] The over-optimism which led to the presumption that the north country would be soon a well-populated area of thriving farms, caused systems of local governments and service to be set up which involved higher costs than the local taxing rates were able to pay.[2]

The general property tax law (Act 206 PA 1893) was the act which vested absolute title of tax delinquent descriptions to the state, and in amended form it still provides the basis for tax reversion machinery in Michigan. Table 1 indicates that considerable use was made of this legislation from post World War I decade through 1932, and although a tax moratorium was allowed from 1933-1938, by 1941 the state had come into possession of approximately 4.5 million acres of tax reverted lands in the northern counties.

Existing state forest boundaries were expanded during the period to include a large percentage of this land as is shown in Table 2.

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[1]Barlowe, Raleigh, Administration of Tax-Reverted Lands in the Lake States, (Michigan Agricultural Experiment Station Technical Bulletin 225, December, 1951), p. 6.

[2]Ibid., p. 8.

TABLE 1

AREA OF TAX REVERTED LANDS TURNED OVER TO MICHIGAN DEPARTMENT OF CONSERVATION, 1921 - 1958[a]

Year	Acres of Reverted Lands	Platted Lots[b]
1921-22	42,932	9,389
1923-24	85,351	7,650
1925-26	79,906	5,167
1927-28	349,198	21,075
1929-30	498,436	6,687
1931-32	748,899	22,190
1933-38	No tax reversions	
1939	2,208,975	95,000
1940	147,502	6,028
1941	154,881	10,744
1942	58,002	2,811
1943	41,531	2,347
1944	22,199	2,280
1945	19,001	1,145
1946	6,286	630
1947	2,383	709
1948	2,142	608
1949	3,807	2,936
1950	4,435	4,109
1951	2,673	3,824
1952	3,554	3,952
1953	1,306	2,857
1954	380	3,778
1955	973	2,204
1956	452	2,246
1957	427	3,280
1958	428	13,174
Total area	4,486,069	235,850

[a]Michigan Department of Conservation, Biennial Reports, 1921-58.

[b]Platted lots and small parcels of property are counted as separate units and do not enter into the acreage tabulations.

TABLE 2

INCREASE IN AREA OF STATE FORESTS
1930-1958

Year	Acres
1930	604,475
1932	787,381
1934	888,263
1936	957,975
1938	1,049,042
1940	1,139,803
1942	1,851,320
1944	1,959,064
1946	2,020,972
1948	3,640,127[a]
1950	3,662,519
1952	3,726,899
1954	3,757,867
1956	3,751,738
1958	3,760,369

Source: Lands Division, Michigan Department of Conservation.

[a]Northern Michigan Game Areas added to state forests in 1946.

In 1946, 1.411 million acres of Northern Game Area lands were transferred to the Forestry Division creating 10 new state forests. By this time, land values were increasing, and tax reversions were greatly reduced; only about 6,000 acres were deeded to the state in 1946. With demands for wild land as recreational sites further increasing land values, tax reversion has practically ceased today.

As of June 30, 1958, the total net area of Michigan

state forests was 3,760,169[1] and of that total 3,170,500 acres, or some 83 percent, are tax reverted lands.

Land purchases

Prior to 1931, there were very few purchases of land by the state. The Game Division had purchased approximately 115,000 acres of game refuge lands at prices little higher than taxes due on them. However, the Game Protection Fund which consisted of receipts from license sales, was increasing each year and being accumulated in surpluses. Act 325 PA 1931, which created the Game Protection Fund, provided that 1.50 dollars of the fee received from the sale of deer hunter licenses should be used exclusively for the acquisition, protection, development and maintenance of game refuges and public hunting grounds. Therefore, these funds could be used in acquiring state forest lands because the state forests are open for public recreational use.

Primarily, the land purchased within state forest boundaries from 1931 to 1949 was from the 1.50 dollar deer license fund, and was purchased by the Game Division. Actually, the majority of the purchases were in the Upper Peninsula. The lands aggregated were administered as state game areas until 1946 when they were made state forests. Table 3 shows that purchases decreased considerably after 1946. In 1949, the legislature removed the earmarking of

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1. Not included are some 5,000 acres of undedicated lands outside of state forest boundaries.

TABLE 3

STATE FOREST LAND PURCHASED BY THE $1.50 DEER LICENSE FUND 1931-49, AND THE GAME AND FISH PROTECTION FUND, 1950-58[a]

Biennium	Land Purchased (acres)	Purchase Price (dollars)
1921-1930[b]	115,032	460,800
1931-1936[b]	43,380	104,941
1936-38	95,846	205,190
1939-40	65,672	142,234
1941-42	74,666	105,159
1943-44	47,285	114,858
1945-46	87,264	309,265
1947-48	13,311	50,502
1949-50	8,613	44,216
1951-52	17,069	144,654
1953-54	6,466	61,539
1955-56	8,937	121,672
1957-58	6,299	103,512
Total	589,840	1,963,542

[a]Derived from Michigan Department of Conservation, Biennial Reports, 1941-1958.

[b]These items are the consolidation of the early years of the program before extensive land acquisition began.

the 1.50 dollar deer license fund and purchases made since that time have been made by the appropriation of funds from the Game and Fish Protection Fund.

Total purchased lands of the state forests as of June 30, 1958 including fishing sites as well as game lands, were 589,840 acres, or approximately 17 percent of the total acreage.

Land exchanges

Act 193 PA 1911, authorized the exchange of state-owned lands for lands owned by individuals and by the United States Government. This provided a means by which the state forests and other conservation project areas were consolidated and blocked in.

Most land exchanges have been with the U.S. Forest Service. In 1936, the total acreage of state tax reverted land within national forest boundaries was about 350,000 acres. In 1958, by process of exchanges with the federal government, it was down to about 77,000 acres.

There were also many exchanges made with private landowners under which privately-owned lands were acquired within the boundaries of state forests in exchange for scattered, tax reverted state lands lying outside of state forest areas. In more recent years, because of the low rate at which tax reverted lands have been coming into state ownership, most of the exchanges involve lands within administered units. These exchanges requiring mutual agreement between the parties involved, are made where there is advantage to both the private landowner and the state. In some instances, these exchanges are initiated by the Forestry Division, while others are applied for by private owners. In some cases, exchanges are made for better patterns of ownership between the private owner and the state; other cases involve lands having agricultural possibilities which are conveyed to adjoining farmers in

exchange for lands better suited for forestry or other conservation use. In general, exchanges are made where there is a demonstrated need for an exchange.

In some exchanges, small high value acreage is acquired for larger acreages of low value land, but in all cases, the exchanges are made on an equal value basis under statutory requirements.

Present state forest acreage includes 410,884 acres which were acquired by exchange with both private landowners and the United States.

PRESENT CONDITION OF THE FORESTS

The state forests are located primarily in the so-called "north woods" area of the state. This includes all of the Upper Peninsula and the northern half of the Lower Peninsula. (See Figure 4 for map of locations within counties.)

The general topography of these regions varies considerably. In the western half of the Upper Peninsula are found the rocky uplands constituting the major mountain ranges of the state. The eastern part of the Upper Peninsula and the northern half of the Lower Peninsula tend to be flat to gently rolling country with a considerable number of lakes and swampy area present.

The soils of the region where state forests are located are of the podzolic type. Great local soil variations occur since there is considerable variability in the texture, fabric and minerological composition of the materials left by the glaciers which repeatedly covered the state in the geologic past. The soils of the state forests are predominantly light and sandy with Rubicon and Ogemaw the principal series.

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ONTARIO
MINNESOTA
ONTARIO

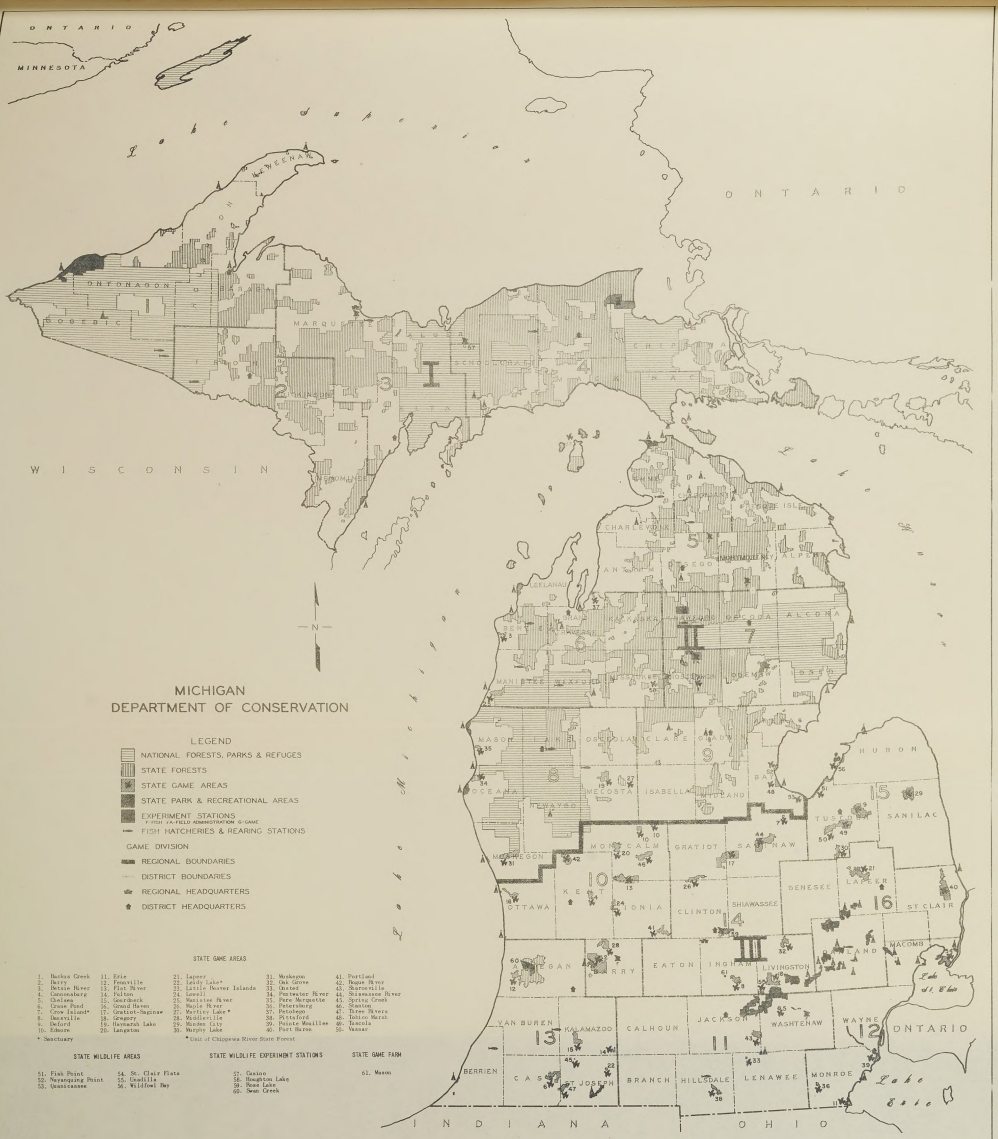

Fig. 4.-- Location of State Forests of Michigan, 1960

Timber

Inventory data in this chapter are derived from the Michigan State Forests' Continuous Forest Inventory, a system of periodically remeasured permanent sample plots begun in 1950.

Area

The present inventory of the timber resource of Michigan state forests indicates a rapid recovery from their denuded condition at the turn of the century. Today, some 2.8 million acres, or 76.7 percent of the total area of the state forests, are considered to be commercial forests. Almost two thirds of the forests are in hardwood types--mainly aspen, birch and northern hardwood (Table 4). Jack pine and swamp conifers--spruce, balsam fir, cedar and tamarack--dominate the softwood types.

Stand size distribution is still far from satisfactory, however, and reflects, in part, the generally young, second growth condition of the forests. Only 12 percent of the commercial forest is of saw timber size, while 46 percent is in pole-timber and 19 percent is in seedling or sapling or unstocked stands (Table 5). Much of the forest is of types that will not grow into sawtimber stands. Nevertheless, the forest types which can be brought to sawtimber are weighted too heavily to small stand sizes. They do not have the distribution from seedling to sawtimber stages

TABLE 4

DISTRIBUTION OF AREA BY FOREST TYPES FOR MICHIGAN STATE FORESTS 1959[a]

Forest type	Upper Peninsula		Lower Peninsula		All Forests	
	Thousand acres	Percent	Thousand acres	Percent	Thousand acres	Percent
Aspen - Birch	429.9	23.5	579.6	32.3	1,009.5	27.9
Oak	7.7	0.4	187.8	10.5	195.5	5.5
Northern hardwoods	231.1	12.6	181.2	10.1	412.3	11.3
Swamp hardwoods	48.0	2.6	32.0	1.7	80.0	2.2
Jack pine	135.4	7.4	251.7	14.1	387.1	10.7
White and red pine	60.9	3.4	41.3	2.8	102.2	3.1
Swamp conifer	446.3	24.4	144.6	7.6	590.9	16.0
Total	1,359.3	74.3	1,418.2	79.1	2,777.5	76.7
Open	164.7	9.0	203.8	11.4	368.5	10.2
Upland brush	18.4	1.0	51.7	2.9	70.1	2.0
Lowland brush	146.6	8.0	74.8	4.2	221.4	6.1

TABLE 4 CONTINUED

Forest type	Upper Peninsula		Lower Peninsula		All Forests	
	Thousand acres	Percent	Thousand acres	Percent	Thousand acres	Percent
Marsh and muskeg	106.1	5.7	18.1	1.0	124.2	3.3
Non-meandered water	16.3	0.9	5.2	0.3	21.5	.6
Roads and rights-of-way	11.2	0.6	19.2	1.1	30.4	.9
Other	7.6	0.5	1.0	---	8.6	.2
Total	470.9	25.7	373.8	20.9	844.7	23.3
All types	1,830.2	100.0	1,792.0	100.0	3,622.2	100.0

TABLE 5

DISTRIBUTION OF AREA BY SIZE CLASSES FOR MICHIGAN STATE FORESTS 1959[a]

Size Classes	Upper Peninsula		Lower Peninsula		All Forests	
	Thousand acres	Percent	Thousand acres	Percent	Thousand acres	Percent
Nonforested	470.9	26.2	373.8	20.9	844.7	23.3
Seedlings and saplings	415,0	22.7	275.8	15.5	690.8	19.3
Poles	701.4	37.9	957.1	53.3	1,658.5	45.7
Small sawtimber	185.6	10.1	164.2	9.1	349.8	9.6
Large sawtimber	57.2	3.1	21.1	1.2	78.3	2.1
All size classes	1,830.1	100.0	1,792.0	100.0	3,622.1	100.0

Source: Michigan Department of Conservation, Forestry Division inventory data.

[a]Data for Upper Peninsula is 1957.

needed for ultimate regulation of sustained sawtimber yields. Cutting practices of the Forestry Division attempt to effect a more satisfactory distribution of stand sizes than are now present.

The state forests in the Upper Peninsula have a larger portion of their area in large sawtimber stands than in the Lower Peninsula. These stands are made up predominantly of species of the northern hardwood type which were not as extensively logged and burned in the past as were the pine types. The Lower Peninsula has a greater acreage of pole timber than the Upper Peninsula.

Timber Volume

The total volume of 3.1 billion board feet of sawtimber and 14.2 million cords of growing stock is distributed among major species and types as shown in Table 6. Softwood species, principally white and red pine and hemlock, make up about a fourth of the sawtimber volume. Almost half of the hardwood sawtimber is of the northern hardwood species; namely, the hard and soft maple, beech, and birch. Total growing stock is distributed among species roughly in the same proportions as sawtimber.

Growth and Drain

Since there has not been a complete remeasurement made of the continuous inventory plots of the state forests, it is not possible to give explicit figures on annual growth

TABLE 6

DISTRIBUTION OF NET VOLUME OF GROWING STOCK BY FOREST TYPES FOR MICHIGAN STATE FORESTS 1959[a]

Forest type	Upper Peninsula		Lower Peninsula		All Forests	
	Thousand cords	Million bd. ft.	Thousand cords	Million bd. ft.	Thousand cords	Million bd. ft.
Aspen - Birch	1,977.4	294.2	2,408.5	381.8	4,385.9	676.0
Oak	75.8	5.4	944.9	204.8	1,020.7	210.2
Northern hardwoods	1,137.5	670.5	1,226.8	206.9	2,364.3	877.4
Swamp hardwoods	374.6	76.6	570.3	114.6	944.9	191.2
Jack pine	362.8	62.4	906.7	139.4	1,269.5	201.8
White and red pine	159.4	306.3	76.6	246.4	236.0	552.7
Swamp conifer	2,656.5	293.8	1,103.3	107.8	3,759.8	401.6
All types	6,744.0	1,709.2	7.445.0	1,401.7	14,189.0	3,110.9

Source: Michigan Department of Conservation, Forestry Division inventory data.

[a]Date for Upper Peninsula is 1957.

and mortality on state forests alone. However, based on a percentage of the total forests of Michigan as given in the Timber Resource Review, annual mortality from fire, insects, disease, windfall, and other destructive agents for the state forests is about 42 million board feet in sawtimber and 25 million cubic feet in growing stock.

Net annual growth can be calculated on the same basis at 4.8 percent of the sawtimber inventory or 148 million board feet, and 4.4 percent of the growing stock inventory or 79 million cubic feet.

Timber drain, which refers to the volume removed from inventory in the course of logging, is now much less than growth:

	Sawtimber (Million bd. ft.)	Growing Stock (Million cu. ft.)
Growth	148	79
Drain	15	30

This is one of the most cheering aspects of the timber resource situation on the state forests. Current net growth in total growing stock is 2.6 times greater than drain, but in sawtimber growth is almost 10 times as great as drain.

Changing Forest Inventory

The continuous inventory plots on nine state forests have recorded in dramatic fashion the recent changes tak-

ing place in Michigan state forests. Between 1953 and 1959 there has been a net increase of 22 percent in the number of trees five inches and larger in diameter (measured at breast height). In the same short period, cubic-foot folume has increased 38 percent. Stand sizes on these nine state forests have also moved upward sharply: seedling and sapling stands reduced from 502,000 to 276,000 acres despite the movement of 63,000 acres from non-forest condition to seedling and sapling; pole timber stands, up from 765,000 to 957,000 acres; small sawtimber stands, up from 78,000 to 164,000 acres; and large sawtimber stands, up from 10,000 to 21,000 acres.

Recreation

There is a wide variety of opportunities available for outdoor recreation on state forest lands. The state ownership of these lands allows free public access to some 3.8 million acres of forest land which contain at least 1,100 lakes and 3,600 miles of stream within state forest borders.[1]

The Forestry Division of the Conservation Department has recognized the growing demand for the use of the state forests as recreational areas and has implemented several

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[1]These figures for number of lakes and miles of stream are estimates based on a percentage of the total of 11,037 lakes and 36,350 miles of stream within the state from C.J.D. Brown "Michigan Lakes and Streams," Michigan Conservation Department, Fish Division Pamphlet No. 24. 1957. pp. 7.

programs of development to attempt to satisfy the need.

The campground system on state forests is one of the most important of the programs. From the first campground built in 1929, the number constructed and in use by the summer of 1959 was an even 100, containing a rated total of 934 campsites. Twenty-seven campgrounds were located in the Upper Peninsula and 73 in the Lower Peninsula. These camping areas are located on lakes (70) or rivers or streams (30) and are generally off the beaten path, away from stores, towns, electricity, and other conveniences. They are provided with the barest of necessities for outdoor living--tables, stoves, drinking water and pit toilets. For the most part they are small, laid out to accommodate 5 to 15 camping parties. Only 3 of the campgrounds normally accommodate over 30 camp parties, and these are on large lakes which get extra heavy use. Camping on state forest campgrounds is a free privilege, with a minimum of regulations. However, continuous camping at one campground is limited to 20 days. While camping is provided for specifically at the campground areas, it is permitted any place on the state forests not posted against such use.

Swimming is a popular sport on many lakes and rivers of the state forests. Of the 70 lakes on which campgrounds are located, 25 are rated as good swimming (firm, sandy bottom) and 22 as fair. At least three campgrounds are provided with bathhouses.

Picnicking is allowed anywhere on the state forests,

but only at the campgrounds are any facilities provided. At three of the lake campgrounds where local use of picnicking, boating, and swimming is heavy (Ely, Clear, and Bear lakes) picnic grounds are provided separately from the camping areas.

Boating is allowed on most lakes where there is public access. In addition, at least 100 public fishing sites furnish access for boats on lakes and rivers in the state forests.

It is obvious that the free access of state forest lands offers almost unlimited opportunity for hiking. This opportunity has been enhanced by the establishment of a foot trail system as an integral part of development of certain campgrounds. The trails range in length from one to six miles and are simply marked with a minimum of clearing or construction work.

Equally as unlimited as the hiking opportunities are the opportunities for enjoying the scenery of the state forests from forest roads and highways. Every state forest is liberally crisscrossed with roads, from super highways to two-rut logging roads. Two specially marked forest scenic drives have been completed as part of a recreation plan of the Forestry Division. These are located on back road forest areas where the traveler may enjoy peace and scenery, and learn something of forest uses and management. At the same time, he has the comfort of knowing he will not get lost.

To provide for that segment of the outdoor recreationists who are seekers of solitude, and for the student or scientist who wishes to study areas relatively untouched by man at least one "natural area" has been set aside in the state forests, with others to be definitely included in long range plans of recreational development.

Wildlife

The state of Michigan has an abundant supply of game and fish in its forests and streams as indicated by the fact that more people hunt and fish in Michigan than any other state. However, the task of making a specific inventory of the numbers of the game animals and birds and fish is a difficult one and even more unsurmountable would be the allocations of those numbers located specifically in the state forests. About all one can do is use the judgments of those in the best position to know. This discussion of the present condition of the Michigan state forests as to its wildlife is based upon oral information and printed materials from the Game and Fish Divisions of the Conservation Department.

The total estimated deer herd of northern Michigan (above Town line 16) is about 750,000.[1] A further rough estimate indicates that perhaps 200,000 of that total would be located on state forests.

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[1]From Game Division estimate based on fecal pellet-group surveys of 1959.

The total drain on the deer herd for the 1958 season was calculated at 170,500. Of that total 101,400 were legally harvested and 69,100 were found dead in the woods (either starved, or illegally killed during the season).

Other big game animals found in Michigan state forests are bear and elk. The bear are quite common in the Upper Peninsula with a take of about 500 annually. The elk were planted in the state forests in 1918 and their numbers have increased from 24 to about 1,200. However, there has never been an open season on them as legal big game.

The numbers of small game available are even more difficult to estimate than big game. The Game Division has conducted "post card" surveys which have reported the estimated kill as given in Table 7 for the various kinds of small game animals and fowl. The allocation for the state forests is estimated at about one fourth of the total for the two northern Michigan zones in which the state forests are found.

The Game Division is carrying on an extensive program to aid wildlife population on state and private lands. In northern Michigan forest lands a new Pittman-Robertson Project was set up in 1957 for special wildlife habitat development work. This project covers such work as planting shrubs, herbaceous seeding, herbicide spraying, controlled burning, disking, mechanical cutting, and small water improvements. In addition, deeryard cuttings of timber are arranged to supply supplemental feed during the critical

TABLE 7

ESTIMATED SMALL GAME KILL FOR NORTHERN MICHIGAN AND FOR STATE FORESTS, 1958

Species	Northern Michigan[a]	State Forests[b]
Pheasants	101,520	25,000
Ruffled Grouse	336,050	85,000
Ducks	210,020	55,000
Geese	12,400	3,500
Woodcock	44,070	12,000
Cottontails	279,800	70,000
Snowshoe hares	303,120	75,000
Squirrels	255,240	65,000
Raccoon	80,330	22,000

Source: Game Division, Michigan Department of Conservation 1959.

[a]Includes those counties north of Town line 16 in the Lower Peninsula and all of the Upper Peninsula.

[b]Approximately 25 percent of the kill for northern Michigan.

winter and early spring seasons.

All of the estimated 1,100 lakes and 3,600 hundred miles of stream in state forests are available for fishing where access is available. It must be understood that much of the lake and stream frontage was not tax delinquent land; hence, it did not pass into state ownership. However, all lakes and streams can be fished if access to them is provided. To furnish this access, the Fish Division has instituted a program of purchasing lands on streams and lakes to provide access for fishing and boating. Through 1957, 696 sites embracing approximately 49,000 acres with 225 miles of water frontage were acquired through purchase, exchange, and by gifts. These are developed and maintained with revenue from the sale of fishing licenses. These developed sites also serve as additional areas where camping can be enjoyed. Of the 696 sites purchased, about 140 of them are located within state forests and are administered by the Forestry Division.

The Fish Division conducts an extensive lake and stream improvement program to help improve fishing conditions on state waters. Such improvements for lakes include: experimental projects to manipulate fish populations to increase production of desirable game fish by such means as the use of rotenone and large seines; impounding of marsh areas or warm water lakes to improve spawning areas for northern pike; installation of fish shelters to concentrate fish in clear water lakes; the construction of barrier

dams; and the experimental control of aquatic plants.

Stream improvements are made primarily on trout streams and include measures to improve the stream channels, the construction of structures to provide pools and cover for trout, and the planting of vegetation to help stabilize erosion of stream banks.

ECONOMIC CONTRIBUTIONS OF THE STATE FORESTS

A first approximation of values from the state forests is in the cash receipts obtained directly by the state for various goods and services. These receipts represent direct income to the state and are of particular interest to state fiscal agents since the funds flow into the general fund and help to meet the general costs of state government operations.

Cash receipts for fiscal year 1957 are summarized in Table 8. Cash receipts are obtained from a number of sources, but two general sources of receipts--timber and nursery stock and oil and gas--stand out. Not only are timber sales the chief source of receipts, but their proportion of the total, 63 percent, has been increasing rapidly. Receipts from oil and gas leases and royalties have been declining both relatively and absolutely.

Cash receipts represent only a small portion of the economic contribution of the state forests to Michigan. Some of the more conspicuous services of the forests have no immediate sale or market value. Moreover, the products of the state forests represent only a first stage of value. They generate large flows of goods and services which multiply the contributions of the forests before their products

TABLE 8

CASH RECEIPTS FROM MICHIGAN STATE FORESTS, 1957

Source	Receipts (dollars)
Timber sales	815,410
Sale of nursery stock	150,041
Use permits	758
Grazing permits	1,592
Special permits	535
Mineral permits	3,737
Oil and gas leases	72,000[a]
Oil and gas royalties	250,000[a]
Total	1,294,073

Source: Michigan Department of Conservation. Nineteenth Biennial Report, 1957-58, Lansing.

[a]Lands Division estimates, based on assumption that 55 percent of total oil and gas leases and royalties came from state forest lands.

reach ultimate consumers.

In this chapter, the economic contributions of the state forests will be examined for three major classes--timber, recreation and wildlife. Cash receipts will be considered, but the chief emphasis will be placed on the economic activity generated at the final stages of consumption of the products of state forests.

Timber

In offering timber to the market, the Division of Forestry sells standing timber (stumpage) only. Logging and other forms of processing and manufacture are left entirely to private enterprise.

The state's timber sales policy is to conform with the going stumpage market and to set prices in line with private sales, allowing for differences in quality, volume, accessibility, and other influences on the value of stumpage. In pursuance of this policy, the Division of Forestry advertises and requires competitive bidding on all sales involving more than 1,000 dollars. Bidding can take two forms: a sealed bid, or public auction. The auction is the older established form of sale. However, since sealed bids are thought to provide more opportunity to small producers, they are being used more and more.

In either case, the procedure is similar. The Division of Forestry sets a base price (a conservative estimate of stumpage value) per unit of volume for each species offered for sale. The largest bonus offered by an acceptable timber operator determines the winning bid.

Two other methods are used with competitive bidding, but neither is used widely. In one, the cash bonus is eliminated; the sale contract goes to the bidder offering the highest stumpage price per unit of volume. In the other, the base price per unit of volume is eliminated; the win-

ning bid is determined by the largest lump sum cash payment offered.

The great number of small negotiated sales (where the values involved are less than 1,000 dollars) may appear to reflect an inefficient method of handling timber sales. However, it demonstrates a policy of fostering a competitive market and of providing timber locally for small independent producers, not a desire to maximize the revenues obtained from timber sales. In 1957, some 2,100 (more than 90 percent of the total) negotiated sales were made. They accounted for more than half of the total volume of wood sold from state forests.

Timber Sales

Prior to 1938, only a negligible amount of timber was sold from the state forests. Little merchantable timber was available on the overly exploited lands which had only recently come under the administration of the Division of Forestry. Of necessity, the foremost objective of administration was to protect the state forests and gradually to rebuild the timber-growing stock.

The early sales from 1938 to 1941 were minor; they consisted mostly of salvage material from windstorms and fire. However, with the advent of World War II in 1941, the number of timber sales, the volume of timber cut, and cash receipts from sales all moved up on a fast-rising curve. Changes came with greatly increased timber demand,

additional technical help to administer sales, improved timber inventories, and public acceptance of forest management.

The record of timber sales from 1941 to 1960 is shown in Table 9. Expansion has come at a strikingly ra-

TABLE 9

TIMBER SALES FROM MICHIGAN STATE FORESTS, 1941-1960

Year[a]	Number of Sales	Timber Volume Cut[b]	Cash Receipts
		M bd. ft.	dollars
1941	291	2,784	6,850
1942	447	10,790	25,860
1943	285	7,103	13,041
1944	757	16,222	54,748
1945	539	13,795	51,811
1946	856	28,955	72,121
1947	1,329	39,759	135,779
1948	1,394	42,814	155,684
1949	1,442	38,423	159,767
1950	1,530	33,991	149,215
1951	1,531	47,180	205,675
1952	1,439	57,934	296,466
1953	1,561	44,576	302,894
1954	2,267	69,657	474,199
1955	2,091	88,012	591,158
1956	2,267	98,748	672,181
1957	2,316	131,111	815,410
1958	1,775	113,657	709,761
1959	2,057	104,896	654,034
1960	2,223	135,802	795,816

[a]Fiscal year ending June 30 of year stated.

[b]All units of measure converted to board feet.

pid rate. Comparing the last five years with the first five years, number of sales has multiplied 4.5 times; volume of timber cut, 10.6 times; and cash receipts, nearly 23 times.

In Table 10, the product makeup of the timber output

TABLE 10

OUTPUT OF RAW TIMBER PRODUCTS FROM MICHIGAN STATE FORESTS AND FROM ALL MICHIGAN FORESTS 1957

Product	Unit of Measure	Output From State Forests[a]	Output From All Forests[b]
Pulpwood	Thousand cords	200	980
Sawlogs	Million bd. ft.	14	365
Veneer logs	Million bd. ft.	2	30
Misc. timber used in manufacturing	Thousand cu.ft.	*	1,883
Excelsior wood	Thousand cords	*	32
Chemical and charcoal wood	Thousand cords	76	210
Fuel wood	Thousand cords	1	800
Fence posts	Thousand pieces	225	6,739
Mine timbers	Thousand cu. ft.	383	3,728
Poles and piling	Thousand pieces	2	32
Hewn ties	Thousand pieces	16	41
Christmas trees	Thousand trees	5	1,820
Christmas greens	Thousand lbs.	874	2,372
Maple syrup	Thousand gal.	0	70

[a]Derived from Michigan Department of Conservation Nineteenth Biennial Report, 1957-1958, Lansing.

[b]Taken from Lee M. James, "Farm Woodlands and the Timber Economy of Michigan," Quart. Bul. 42(3): 563-83, Michigan Agricultural Experiment Station, East Lansing, February, 1960.

*Not segregated in state forests records.

from the state forests is detailed for a recent year, 1957. A great diversity of products is evident, although the major output is still in small timber and relatively low-quality products. Twenty percent of the pulpwood, and 36 percent of the chemical and charcoal wood produced in Michigan comes from the state forests. In contrast, the state forests turn out only four percent of the sawlogs, six percent of the veneer logs, and six percent of the poles and piling.

Despite the impressive trend of increase in the volume and value of timber sales from the state forests, the peak year output in 1957 (equivalent to 3.5 M board feet or 7 cords per 100 acres) represents only a small part of the output that is feasible within the limits set by management. The development of a program to place timber on the market in accordance with the dictates of technical management plans has grown slowly, and the Division of Forestry has not yet reached the point where it can offer the entire allowable cut[1] for sale. A more serious brake on output is the limited market for some species and some

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[1]Allowable cut is a concept used to indicate the volume that may be removed during a given period while building up or maintaining sufficient growing stock to meet specified growth goals. It is a tenuous concept in that it is based only partly on growth estimates; it takes into account a number of factors such as forest types, species composition, stand size classes, and the economic feasibility of logging operations. Under Michigan conditions, it is set well below actual growth to permit the building up of forest inventories to levels considered desirable by foresters.

areas. Time can be expected to remedy this situation, but for the present, many timber offerings are simply unattractive to would-be buyers. In 1953 and 1954, for example, the Division of Forestry offered for sale about 80 percent of the allowable cut of aspen in its Lower Peninsula forests, but only a third was actually sold.

Consumer Expenditures

The end of production in our society is the satisfaction of the wants of individuals. For this reason, to measure the value of timber products, it is desirable to take timber values as closely as possible to the points of final consumption.

One approach to such measurement would be to begin with the U.S. Department of Commerce Censuses of Retail Trade, adjusting the sales of retail establishments downwards for sales not made to individuals, and upwards for purchases individuals make which are not made in retail establishments. This approach presents several major difficulties in the measurement of timber product values. One difficulty stems from the problem of sorting out the components of sales of particular items on the broad Census classifications of retail establishments. For example, there seems to be no way of breaking down timber product sales from such a Census classification as "lumber, building, and hardware." Another difficulty arises from inevitable duplications. Furniture sales, for example, would duplicate lumber values already

listed in lumber sales. Paper product sales would duplicate pulp values listed in pulp sales.

The approach to consumer expenditures used in this study follows the "commodity flow" method used by the U.S. Department of Commerce in its calculations of national income. In this method, commodity production is traced forward from the producer to consumer. Consumer expenditures for products processed from Michigan timber are considered to be the sum of three components of the "commodity flow:" (1) the value of raw timber products, (2) value added through processing and manufacturing within Michigan and, (3) value added beyond manufacturing within Michigan.

The summation of values suggested does not represent, in a strict sense, consumer expenditures within the state for timber products taken from the state forests. Some understatement of expenditures is involved since the sale value of products at the manufacturing level includes more than the value of raw products and the value added by processing and manufacture. By Census definition, value added by manufacture is calculated by "subtracting the costs of materials, supplies, and containers, fuel, purchased electric energy and contract work from the total value of the shipments."[1] Thus, in approaching the sale value of manufactured products by adding the cost of timber raw material

[1] U.S. Bureau of the Census. Annual Survey of Manufactures: 1957 (Washington, D.C., 1959), p. 11.

terial to the value added by processing and manufacture, other raw materials are excluded as well as supplies, containers, fuel, purchased electric energy and contract work.

Nevertheless, for the purpose intended of approaching consumer expenditures for timber products so that these expenditures can be added to expenditures for other products of the forest measured more conveniently at the consumer level, the method used is considered satisfactory. In proportionate terms, the omission is probably not large. In any case, the method eliminates only those portions of value which do not strictly belong to timber.

Value of raw timber products

The first step in the approximation of consumer expenditures is the calculation of the value of raw timber products.[1]

In 1957, the state forests yielded raw timber products worth 7.8 million dollars, about 11 percent of the total value of raw products from all forests in Michigan (Table 11). Pulpwood is the dominant item, representing 70 percent of the value of raw products from the state forests. Chemical and charcoal wood ranks next, accounting for 13 percent of the total. The raw products of relatively high unit value--veneer logs, sawlogs, and poles and piling--account for only 13 percent of the total. These relationships

[1]Raw timber products refer to whole or slightly modified logs and bolts. Their value is calculated at the point of processing or consumption, but before manufacture.

TABLE 11

VALUE OF RAW TIMBER PRODUCTS FROM MICHIGAN STATE FORESTS AND FROM ALL MICHIGAN FORESTS 1957

Product	Value From State Forests[a]	Value From All Forests[b]
	thousand dollars	thousand dollars
Pulpwood	5,500	26,950
Sawlogs	770	20,075
Veneer logs	240	3,600
Misc. timber used in manufacturing	*	518
Excelsior wood	*	512
Chemical and charcoal wood	988	2,730
Fuel wood	15	12,000
Fence posts	79	2,020
Mine timbers	115	1,118
Poles and piling	11	176
Hewn ties	32	76
Christmas trees	7	2,565
Christmas greens	35	94
Total	7,792	72,812

[a]Output statistics for state forests from Table 11 multiplied by unit values of wood products delivered to processing plants or to wood concentrators if products are not processed further. Unit values were those used by James in calculating the value of raw timber products from all Michigan forests.

[b]Taken from Lee M. James, "Farm Woodlands and the Timber Economy of Michigan," Quart. Bul. 42(3): 563-83, Michigan Agricultural Experiment Station, East Lansing, February, 1960.

*Not available from state forest records.

emphasize the predominantly small size and low quality of the timber resource currently available for harvest on the state forests.

Value added through processing and manufacture

Value added through processing and manufacture is taken to be the sum of two components reported by the U.S. Bureau of the Census: (1) value added by manufacture[1] and, (2) expenditures for new plant and equipment. A third possible component--net investment of government--has been omitted from consideration because it is small and cannot be readily determined for timber production alone.

Value added in major timber industry groups for the whole state of Michigan was obtained from the 1957 Annual Survey of Manufactures, with group totals broken down according to the value relationships among component timber industries shown by the detailed 1954 Census of Manufactures. Each industry group covered and the corresponding value added for 1957 is as follows: lumber and products (except furniture), 57.9 million dollars; pulp and paper products, 325 million dollars; wood furniture (except upholstered), 37.7 million dollars; and miscellaneous wood products, 14.6 million dollars.

One industry group of consequence to this analysis which is not listed separately by the Census is "wood chemicals and charcoal." Value added for this group was estimated to be approximately four times the value of the

[1]Value added by manufacture is calculated by subtracting the costs of materials, supplies, and containers, fuel, purchased electric energy, and contract work from the total value of the shipments.

raw wood product.[1] This relationship indicates a 1957 value added for wood chemicals and charcoal of 10.? million dollars in Michigan.

Again, as in the calculation of the value of raw wood products, the method used tends to underestimate the true value. In lumber, for example, there is a question as to whether the Census has sampled fully the production of numerous, elusive, portable sawmills. In furniture, a large but unspecified amount of wood is used for products not designated by the Census as wood furniture. Such omissions as have occurred are not important in the overall framework of this analysis, but they need to be recognized to point up the conservatism in the values calculated.

To reduce value added for Michigan to that portion of value added which rests on the timber output of the state forests, the preferred steps in procedure are as follows: (1) to determine the fraction of value added for Michigan which is dependent on wood produced in the state and, (2) claim for the state forests a portion of the value calculated in step (1) based on the ratio of the raw wood output from the state forests to the raw wood output from all forests in Michigan.

A study by John Hanson[2] makes it possible to follow

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[1]Relationship obtained from members of the industry by correspondence.

[2]John Hanson, "Wood-Using Industries of the Lower Peninsula," Michigan Conservation, Vol. XX, pp. 13, 14, 27-29, January to February, 1951.

step (1) in the procedure above for major industry groups other than pulp and paper. Hanson found that, on the average, 40 percent of the raw timber used by the timber industries of the Lower Peninsula came from Michigan forests. On this basis, 40 percent of the value added within the state could be considered dependent on Michigan raw timber output. This would indicate that 44 million dollars of value added in the lumber and products, wood furniture and miscellaneous wood products groups can be counted as originating in the forests of Michigan. For wood chemicals, and charcoal, an industry tied closely to Michigan sources of wood supply, the corresponding figure for value added which rests on timber produced in the state is some 10 million dollars.

Further reduction of value added to that portion which is dependent on state forests is based on the ratio of raw wood output from state forests to the raw wood output from all forests in Michigan. These ratios are 4 percent for sawlogs and veneer logs, 36 percent for chemical and charcoal wood. Hence, the value added from state forest timber can be calculated at 1.8 million dollars for the lumber and products, wood furniture, and miscellaneous wood products industry groups, and 3.6 million dollars for the wood chemicals and charcoal group.

To calculate value added from state forest timber in the Michigan pulp and paper industry, a different procedure is necessary. Hanson's estimate of the proportion of raw

timber supplied from within the state can no longer be considered reliable because of the profound changes which have taken place in the pulp and paper industry in the past decade.

The approach taken for the pulp and paper industry was to determine the "value added per cord of wood base" and multiply by the number of cords of pulpwood produced from the state forests. The key item here is "value added per cord of wood base." Using the East North Central Region (the Census designation for the five states of Wisconsin, Michigan, Indiana, Illinois, and Ohio) to minimize the influence of cross-boundary flows in pulpwood and pulp and paper, consumption of pulpwood in 1957 (plus the pulpwood equivalent of net imports of pulp and paper[1]) was divided into value added for the pulp and paper industry in the same region. The result, 149 dollars per cord of pulpwood, was multiplied by the 200,000 cord yield of pulpwood from the state forests, indicating the appropriate value added figure for the state forests to be 69.8 million dollars.

In summary, the value added through processing and manufacture of timber products in Michigan was 446.1 million dollars in 1957, of which 17 percent (or 75.2 million dollars) was based on the timber products yield of the state

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[1]The pulpwood equivalent of net imports of pulp and paper was published for the United States in Timber Resources for America's Future (op. cit., p. 425). Over the period 1946-1955, the pulpwood equivalent averaged 26 percent of the volume of pulpwood consumption.

forests.

Value added beyond manufacture

The third and last stage in the process of deriving consumer expenditures for timber products is the calculation of value added beyond manufacture. This is an important level of measurement, taking in the considerable economic functions of transportation, wholesaling and retailing.

Local data applicable to the timber products industries are not available, but an approximation can be approached through suitable modifications of national data. The Forest Service reported data in Timber Resources for America's Future showing that wholesaling and retailing of timber products added 22 percent and transportation added 18 percent to national income arising from the production and manufacture of timber products.[1] The total of 40 percent is too large for application to Michigan since transportation does not play the proportionate role within the state that it plays on the national scene. Reducing the allowance for transportation from 18 to 8 percent indicates a total income addition for wholesaling, retailing and transportation of timber products in Michigan amounting to 30 percent. There may be a slight error in this modification, but the chances are that the error is in understating the values inherent in transportation, wholesaling and retailing. This is in accord with the procedures ad-

[1] Op. cit., p. 368.

opted throughout the method of approximating consumer expenditures for timber products wherein such errors as have been introduced are those leading to understatement rather than overstatement of the values involved.

Income is not the same as value added, but there is a close and fairly direct relationship which will be brought out subsequently in the discussion of income from timber products. If income from the transportation, wholesaling and retailing of timber products can be said to add 30 percent to the income from the production and manufacture of timber products, then value added beyond manufacture of timber products will add approximately the same percentage to value determined at the point of manufacture.

Following the reasoning above, value added beyond manufacture for timber products from the state forests is calculated for the year 1957 at 24.9 million dollars.

Summary of consumer expenditures

It was pointed out earlier that consumer expenditures for timber products could be approached through the summation of three components of the "commodity flow:" value or raw timber products, value added through processing and manufacture, and value added beyond manufacturing. The resulting total tends to be an underestimate, but it is close enough to indicate the general magnitude of consumer expenditures.

Consumer expenditures for timber products originating in the state forests and in all forests in Michigan,

determined by the "commodity flow" method, are summarized in Table 12. Expenditures for products originating in

TABLE 12

CONSUMER EXPENDITURES FOR TIMBER PRODUCTS FROM MICHIGAN STATE FORESTS AND FROM ALL FORESTS IN MICHIGAN BY COMMODITY FLOW COMPONENTS 1957

Component	Timber From State Forests	Timber From All Michigan Forests
	million dollars	million dollars
Value of raw products	7.8	72.8
Value added through processing and manufacture	75.2	446.1
Value added beyond manufacture	24.9	155.7
Total	107.9	674.6

the state forests totaled 108 million dollars in 1957, some 18 percent of the consumer expenditures for timber products originating in all Michigan forests.

Examined in terms of the "commodity flow," the great multiplication in values from standing timber to consumer is most striking. Timber sales from the state forests in 1957 aggregating 815,000 dollars in cash receipts for stumpage yielded raw products (7.8 million dollars) worth nearly 10 times as much, and final products (107.9 million dollars) worth 132 times as much. Stated more simply, each

dollar's worth of timber sold from the state forests resulted in 132 dollars' worth of expenditures by final consumers.

Income

The estimate of consumer expenditures just discussed is a gross measure of the contribution of timber products to the economy. It was built up by a series of calculations following the commodity flow approach used by the U.S. Department of Commerce in its estimates of gross national product (GNP). Some omissions, minor in importance, were involved; but the end result can be viewed as roughly equivalent to the portion of GNP which is assignable to timber products in Michigan.

National income is a related measure of economic value commonly used by the Department of Commerce. It is that portion of GNP which represents the returns to the factors of production: wages and salaries and other compensation supplements, income of unincorporated enterprises, net income of persons from rental of property, corporate profits (with adjustments for inventory valuations), and net interest.[1] To derive national income from GNP, nonfactor payments in GNP must be excluded. These exclusions are capital consumption allowances (depreciation, capital outlays charged to current expense, and accidental damage

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[1] U.S. Office of Business Economics. U.S. Income and Output, Department of Commerce (Washington, D.C., 1958).

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[1] U.S. Office of Business Economics. U.S. Income and Output, Department of Commerce (Washington, D.C., 1958).

to fixed capital), indirect business taxes (taxes chargeable as business expenses, mainly excise and business property taxes), and business transfer payments (payments which are not in return for a corresponding productive service, illustrated by gifts to non-profit institutions and consumer bad debts).

It would be difficult to argue that national income is superior to GNP as a measure of economic importance. Both measures are close to the consumer level, and for this reason, both are highly satisfactory measures for the purposes of this study. The position taken here is simply that national income, as a measure of the returns to the factors of production, is a simpler and more readily comprehended concept that GNP which adds various non-factor payments to national income. In subsequent analysis, wherein the costs of the state forests will be compared with the benefits derived, benefits will be carried to the level of national income.

At this point, to derive national income from the GNP generated in Michigan by timber products, it is necessary to establish the quantitative relationships between the two measures.

On the basis of the overall economy, the relationship between GNP and national income is notably constant. Over a 20-year period, national income comprised from 83 to 85 percent of GNP in almost all years.[1] Only a few dev-

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[1] U.S. Income and Output, op. cit. p. 8.

iations occurred, and these were extremely minor. The average relationship, 84 percent, is considered appropriate for reducing two levels of the timber "commodity flow"--value of raw products and value added beyond manufacture--to income.

The major component of the "commodity flow"--value added by manufacture--requires a more drastic reduction for conversion to income. The magnitude of the reduction can be determined specifically for the forest-products industries by comparing the Census estimates of value added with the Department of Commerce estimates of "national income originating" for the forest products industries. In 1952, national income originating was 80 percent of the value added by manufacture in the forest industries.[1] Since then, the percentage has been dropping, probably mainly because of the greater relative weight of the item of depreciation in the pulp and paper industry which looms larger in the total forest products industry picture. The percentage dropped to 78 in 1954 and 76 in 1956.

Using the appropriate current ratios--84 percent for value of raw products and value added beyond manufacture, and 76 percent for value added by manufacture--gross prod-

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[1]Although their study was based on 1950 data rather than 1952, James and Yoho "Income From Timber Products in the United States," Journal of Forestry 51(2): 83-87, February 1953) arrived at the same 80 percent figure by adding up the payments to the factors of production in the timber products industries and comparing the total with value added by manufacture.

uct (consumer expenditures) has been refined to national income in Michigan originating in timber produced from the state forests and, for comparative purposes, from all forests in the state (Table 13). Income for products

TABLE 13

INCOME PAYMENTS ORIGINATION IN TIMBER PRODUCTS FROM MICHIGAN STATE FORESTS AND FROM ALL FORESTS IN MICHIGAN BY COMMODITY FLOW COMPONENTS 1957

Component	Timber From State Forests	Timber From All Michigan Forests
	million dollars	million dollars
Income from raw products	6.6	61.2
Income from processing and manufacture	57.2	339.0
Income added beyond manufacture	21.5	130.8
Total	84.3	531.0

originating in the state forests totaled 84 million dollars in 1957, 16 percent of the 531 million dollars of income for timber products originating in all Michigan forests.

Recreation

Forest recreation has been recognized as a source of wealth and as a form of land use in Michigan for some 30

years.[1] The desire for forest recreation has increased under the impact of expanding population, increased leisure, and greater economic well-being. At the same time, the psychic need for recreation as an antidote to the stresses and strains of modern living has been increasing.

The result of the various pressures has been to greatly stimulate public participation in all forms of outdoor recreation. Michigan's state forests, extensive in area and broadly distributed, have shared in the great upsurge of outdoor recreational use. They lend themselves admirably to such diverse forms of recreation as hunting and fishing,[2] hiking, motoring, picnicking, camping, winter sports, boating, swimming, nature study, scientific research, and meditation.

Unfortunately, a full evaluation of the economic contributions of the state forests in terms of recreation is not possible from the data at hand. The analysis here is limited to recreation based on campground use. Obviously, much state forest recreational use is extended to lands beyond the established campgrounds, since camping and other recreational use is permitted throughout the state forests and not merely on designated areas. Consequently,

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[1] An early reference is K.C. McMurry, "Use of Land for Recreation," Annuals of the Association of American Geographers, XX (1930), 7-20.

[2] For the purposes of this study, hunting and fishing will be considered separately from other forms of forest recreation. They will be discussed in another section of this chapter.

the data presented relating to campground use greatly understate the full value attributable to state forest recreational use.

A system of forest campgrounds has been established by the Division of Forestry in order to accommodate the large numbers of recreationists who visit the state forests on outings or vacations. In the development of these areas, it has been the policy of the Division to retain as much of the natural aspect of sites as possible. As a result, the majority of the campgrounds are in secluded spots, providing bare necessities for outdoor enjoyment--tables, stoves, drinking water and outdoor toilets. All campgrounds are located on lakes or streams with fishing or bathing usually available. The campgrounds are usually small, varying from 1 to 20 acres in size and accommodating generally from 5 to 15 families.

Since the first campground was established in 1929, 100 campgrounds have been established (Table 14). Correspondingly, the volume of use has expanded, but it is impossible to determine the actual numbers of users in past years. Table 14 also lists the number of registered campers by bienniums, but these figures are presented merely to indicate the general trend to campground use, not the actual volume of use. Campground registrations are voluntary; they account for only a portion of the actual numbers of users, as will be demonstrated shortly, and the relation between registrations and users in any year may be highly

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TABLE 14

NUMBER OF STATE FOREST CAMPGROUNDS AND REGISTERED CAMPERS, 1929 TO 1958

Biennium	Number of Campgrounds	Number of Registered Campers
1929-30	5	*
1931-32	5	5,000
1933-34	9	*
1935-36	17	11,000
1937-38	20	*
1939-40	40	27,374
1941-42	42	79,424
1943-44	42	35,700
1945-56	42	57,909
1947-48	75	150,274
1949-50	76	139,736
1951-52	86	70,000
1953-54	85	86,000
1955-56	85	153,000
1957-58	100	105,000

Source: Files of Division of Forestry, Michigan Department of Conservation.

*Not available.

variable.

Volume of Use

To obtain a current, reliable estimate of the volume of campground use in state forests, an on-the-ground study was undertaken by the writer in the summer of 1959.

From a stratified grouping based on the July and August registration figures for 1958 for 93 of the campgrounds, 4 randomized samples of 30 campgrounds each were

chosen, and each sample visited over a week's time.[1] The study began on July 1, and was continued through a two-month period with four samples taken on alternate weeks. Every camping party with a tent or trailer was interviewed. Data were collected which would give among other things: (1) the percentage of persons registering at campgrounds; (2) the average size of camping parties and, (3) the average length of stay.

The study is described in detail in the appendix. Briefly, the method used to calculate camper use was to consider the study as four weekly checks and to compute the average use per week, weighted as to number of campgrounds checked each day. By this method, a total of 232,780 camper-days use was calculated for the nine-week period of July and August (excepting the Allegan State Forest). The recorded registration figures of the Department of Conservation for the past 10 years indicated that the months of July and August represented 60 percent of the total year's usage, and on this basis, campground use for 1959 (again excepting the Allegan State Forest) would be approximately 388,000 camper-days. Camping use of the five campgrounds in the Allegan Forest--17,000 camper-days--was calculated on the basis of actual counts of tents and trailers made through July and August by the maintenance crew multiplied

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[1]The five campgrounds in Allegan Forest and the two campgrounds on Beaver and Bois Blanc Islands were not included in the grouping.

by the average size of camping party.

In total, campground use of the state forests of Michigan amounted to 405,000 camper-days in 1959. Since the average stay was eight days, the number of campers is estimated at 50,000.

The state forest campgrounds are used extensively for forms of outdoor recreation other than camping; for example, picnicking, hiking, bathing, boating, and water-skiing. Some of the non-camper daytime users, specifically picnickers, bathers and water-skiers, were counted in the 1959 summer study. The tabulations indicated 45,000 user-days of picnicking, and 41,000 user-days of bathing and water-skiing.

No attempt has been made in this phase of the study to cover recreational uses of the state forests independent of established campgrounds. Such uses could prove to be more significant than campground uses. For example, in compiling data for the President's Outdoor Recreational Resources Review Commission, the Forestry Division found that 1959 registrations at six winter sports areas retained in state forest ownership accounted for 44,000 user-days. Again, an actual count of canoes in 1959 on the AuSable and Manistee rivers (primarily within one state forest) indicated 25,000 user-days of canoeing on these two rivers. Uses such as berry and mushroom picking and hiking were estimated to involve 77,000 users. As for sight-seeing motorists, the most numerous of all forest recreationists, a

realistic estimate cannot be made at this time.

Consumer Expenditures

The volume of recreational use of state forest campgrounds reflects one aspect of importance which can be measured relatively easily, but in itself it does not express value. For the latter purpose, consumer expenditures is the commonly accepted measure used in most studies of outdoor recreation. As was pointed out in the section on Timber, national income may be a preferable index of value, but consumer expenditures is a satisfactory measure which is closely related to national income. So far as forest recreation is concerned, the approach to measuring the value in terms of national income must be preceded by the measurement of consumer expenditures.

Camper use of campgrounds

To develop an appropriate estimate of expenditures by campground users, a formal questionnaire was sent to a random selection of 320 campers who had previously been interviewed at campgrounds in the 1959 summer study of campground use. (See appendix for copy of questionnaire.) Some 65 percent of the mailing (206 questionnaires) was returned in completed, usable form.

Direct and equipment expenditures per camper-day by users of state forest campgrounds are averaged in Tables 15 and 16. The expenditures summarized are those associ-

TABLE 15

AVERAGE DIRECT EXPENDITURES PER CAMPER DAY BY USERS OF STATE FOREST CAMPGROUNDS SUMMER 1959

Item	Spent at Home[a]	Spent in Michigan Travel or at Camp	Total Direct Expenditure	
	dollars	dollars	dollars	percent
Groceries and beverages	0.35	1.06	1.41	48
Gasoline and oil, car services and repairs	0.14	0.66	0.80	27
Restaurant meals		0.19	0.19	7
Sundries--paper plates, ice, first aid supplies, insect repellent etc.	0.03	0.12	0.15	5
Cooking fuel and boat fuel	0.03	0.10	0.13	4
Boat rental and bait	0.02	0.07	0.09	3
Commercial entertainment		0.05	0.05	2
Miscellaneous expendable items	0.02	0.08	0.10	3
Total	0.59	2.33	2.92	99

[a]Expenditures at home by Michigan residents only, in preparation for state forest camping.

[b]Total less than 100 percent due to rounding.

TABLE 16

AVERAGE EQUIPMENT EXPENDITURES PER CAMPER USER OF STATE FOREST CAMPGROUNDS, 1959

Item	Spent at Home[a]	Spent in Michigan Travel or at Camp	Total Direct Expenditure	
	dollars	dollars	dollars	percent
Tents, trailers, and sleeping equipment	10.70	1.53	12.23	57
Boats, boat trailers, motors, etc.	5.80	0.09	5.89	28
Fishing equipment, waders, tackle, etc.	0.59	0.29	0.88	4
Stoves, coolers, and cooking utensils	0.68	0.18	0.86	4
Clothing	0.46	0.28	0.74	3
Lanterns, axes, other accessories and tools	0.35	0.07	0.42	2
Miscellaneous items	0.28	0.17	0.45	2
Total	18.86	2.61	21.47	100

[a]Expenditures at home by Michigan residents only, in preparation for state forest camping.

ated with the camping experience, including purchases made at home in preparation for camping trips as well as those made in travel or at campground areas. Expenditures made by non-residents[1] before entering Michigan have been eliminated.

[1]Non-residents accounted for 13 percent of all camper visits to Michigan State Forest campgrounds in 1959.

Direct expenditures, 75 percent of which were for food and travel, averaged 2.92 dollars per camper-day. Equipment expenditures for a full year averaged 21.47 dollars per camper.

In Table 17, total expenditures in Michigan by campers

TABLE 17

TOTAL EXPENDITURES BY CAMPER USERS OF STATE FORESTS CAMPGROUNDS 1959

	Direct Expenditures	Equipment Expenditures	All Expenditures
	thousand dollars	thousand dollars	thousand dollars
Spent at home[a]	940	135	1,075
Spent in Michigan travel or in camp area	212	833	1,045
Total	1,152	968	2,120

[a]Expenditures at home by Michigan residents only, in preparation for state forest camping. Michigan residents accounted for 87 percent of all camping visits.

users of the state forest campgrounds have been summarized for the year 1959. The figures shown need interpretation and modification for the purposes of this analysis, but on a gross basis, some 1.1 million dollars was spent on items of direct consumption and 1.0 million dollars on the more durable equipment items.

Not all of the camping expenditures recorded above can properly be used as a measure of value originating in

the state forests. The food bill, for example, insofar as it duplicates the food bill that would have been incurred had the campers remained at home, cannot be credited to forest recreation. Other purchases, including a portion of the clothing, fall similarly into the category of transferred payments; that is, they are merely transferred from one portion of the state (home) to another portion of the state (the scene of recreation activity). These transfers would be quite important in a study of local economic benefits, but in a statewide study, they have little application.

To determine in detail what portion of campers' expenditures represents duplication of ordinary home expenditures, and what portion represents additional expenditure chargeable to state forest recreation is a complex problem. For our purposes, a broad simplification should be appropriate. Only groceries and beverages will be deducted from the reported camping bill. This may be an excessive deduction for food, but an error here would easily be compensated for by overlooking the possibilities of transferred expenditures in other items.

Adopting the procedure above, the initial estimate of 2.120 million dollars for consumer expenditures in Michigan based on camper use of state forest campgrounds in 1959 will be reduced to 1.565 million dollars.

Non-camper use of campgrounds

Expenditures by users of state forest campgrounds

for forms of recreation other than camping were not determined directly by questionnaire. An indirect method of calculation of expenditures for non-camper users has been employed based on claiming a portion of the appropriate expenditures per user-day made by campers.

The assumption was made that direct expenditures per user-day would be the same for non-campers as for campers with respect to restaurant meals, sundries, and miscellaneous expendable items. Transportation of relatively short distances was assumed to be a daily need by non-campers; the expenditure was estimated at 70 cents per user-day. Other direct camper expenditures have been ignored as being largely inapplicable to day-users of campgrounds.

Equipment expenditures applicable to non-campers is a more troublesome estimate, mainly because of the difficulty of relating the number of user-days to users. Of equipment expenditures by campers, the item of tents, trailers, and sleeping equipment does not apply to non-campers, and no more than half of the expenditures for other items could be assumed to be applicable. On this basis, the equipment expenditure per non-camper would be merely 10.75 dollars. Translating this figure into expenditure per user-day, an estimate of 1.35 dollars was arrived at. There may be considerable error in the latter estimate, but its possible influence on the total state forest recreational value is slight.

Consumer expenditures in Michigan based in picnick-

ing, bathing and water-skiing at state forest campgrounds in 1959 can now be summarized as follows:

Direct expenditures per user-day	$1.15
Equipment expenditures per user-day	1.35
Total	$2.50
Total expenditures per user-day x 86,000 user-days	= $215,000

Non-campground uses

There is no sound basis for the calculation of non-campground recreational use of the state forests either in terms of volume of use or in terms of consumer expenditures. A partial count of canoes indicated 25,000 user-days of canoeing in 1959. Registrations showed 44,000 user-days in 1959 in six winter sports areas, but the estimate of 77,000 berry pickers, mushroom pickers, and hikers cannot be presumed to be complete, and the number of motoring sightseers cannot even be guessed. Moreover, we have no sound basis available for estimating unit expenditures for any of these groups of recreational users.

We can only emphasize that the estimates of consumer expenditures for state forest recreation are limited to campground users. Expenditures by non-campground users might be greater, but since no sound basis for appraisal is available, these expenditures are overlooked in this summary. This is in keeping with the conservative approach taken throughout this chapter in placing dollar values on

the products and services of the state forests.

Income

To reduce consumer expenditures for campground use of the state forests to terms of income payments to the factors of production within Michigan is a somewhat more complex problem than was the case for timber products from state forests. In the case of timber, value of product was determined at each level of the commodity flow and value could be reduced to income payments on the basis of easily recognized general relationships between gross product and income. In the case of recreation, the product is reflected in a mixture of goods and services. The purchase of services generates an income flow which can be claimed for Michigan, but the purchase of goods for recreation (the greater part of the total expenditure) generates income payments which flow in all directions, much of it outside of Michigan.[1]

The special problem to be faced is not how to reduce consumer expenditures to income payments, but how to reduce consumer expenditures for a great variety of goods and services to income payments within Michigan. Any attempt at precision in the solution of this problem would involve a

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[1]For example, the purchase of gasoline in Michigan for recreational travel generates some income flows within the state, but a large part of the total income payments will move out to centers of refining (usually out of the state) and to sources of the raw material (again, usually out of the state).

major project in itself, both as to technique formulation and the collection of pertinent data. Such refinement is not necessary here. The magnitude of the income payments to be allocated to Michigan and elsewhere is of modest proportions. Thus, a fairly large error is tolerable; it would not greatly affect the appraisal of overall economic benefits from the state forests, nor would it greatly affect the relationship between costs and benefits.

In the latest published Census of Business which presents a detailed breakdown of retail sales and value added by manufacture (1954), retail sales in Michigan for the principal categories of items purchased by campers was 2.9 billion dollars in comparison with 600 million dollars of value added by manufacture within the state of these same categories of items. This suggests that the value added within Michigan from manufacturing the goods used by state forest campers is about 21 percent of the retail sales value of these goods. Converted into terms of income, the 21-percent figure is reduced to 18 percent.[1]

At another level of the commodity flow (value added beyond manufacture), Palley[2] has shown that income payments derived from wholesaling and retailing services beyond manufacture represent about 20 percent of the final sales value.

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[1]Based on the average relationship previously discussed between GNP and national income for the whole economy.

[2]Palley, op. cit., p. 99.

It can be assumed, then, that the income payments generated in Michigan by consumer expenditures of state forest campground users for wholesaling and retailing services represent about 20 percent of final sales value (consumer expenditures).

The first level of the commodity flow--income from raw products--and transportation (which was omitted from the level of income added beyond manufacture) remain to be considered. There is no ready means for accurately measuring either of these missing components of the commodity flow, but guided by relationships established in the analysis of income payments generated by timber products, it may be assumed the missing components would add to the income total about 12 percent of consumer expenditures.

Consumer expenditures by campground users of Michigan state forests may now be refined to income payments by using a reduction factor of 50 percent. Consumer expenditures by camper-users which can be credited to state forests totaled 1.565 million dollars in 1959 and non-camper users of the campgrounds spent an estimated 215,000 dollars. The combined expenditure of 1.78 million dollars reduces to 890,000 dollars in income payments within Michigan.

Wildlife

The economic importance of wildlife, of animals existing in the wild state, covers a greater range than the economic importance of wildlife in its recreational aspects.

An inclusive list of values would contain such items as the return to trappers from the sale of pelts and the income derived from commercial fishing and from fur and game farming. Also included might be such items as insect and rodent control furnished gratuitously by wild creatures and the pollination of fruit trees and field crops.

No broadly inclusive concept of wildlife will be attempted in this analysis of the economic contributions of wildlife on the state forests of Michigan. The concern here is limited to the hunting of game animals and sport fishing. The measures of importance used are the same as were used in the appraisal of the recreation--volume of use, consumer expenditures, and income payments.

Volume of Use

In itself, volume of use does not reveal economic importance, but it is a useful indicator and serves as a necessary first step in the calculation of consumer expenditures.

Big game hunting

Michigan has some of the heaviest big game hunting pressures of any state in the nation. The sale of deer licenses has increased from somewhat over 150,000 in 1937 to about 500,000 (including bow and arrow licenses) in 1958.

The estimate of the number of deer hunters on state forests was developed by the Division of Forestry in con-

sultation with biologists in the Department of Conservation's Game Division. The number of deer hunters in each county was allocated to private and public lands on the basis of hunter-area ratios in different localities. The number of public-land hunters was then allocated to federal and state lands on the basis of federal-state acreages in each county. Estimates for the various counties were totaled, indicating that some 190,000 deer hunters (38 percent of the total) hunted on state forests--26,000 in the Upper Peninsula, 164,000 in the Lower Peninsula.

Small game hunting

Small game in Michigan is pursued even more extensively than big game. The number of small game licenses totaled some 704,000 in 1958, considerably larger total than deer licenses.

A laborious method was used by the Division of Forestry to get at the number of small game hunters on state forests. Beginning with reports on the species of small game hunted and the land cover types associated with each species, the Division made allowances for hunter movements from places of license issue to areas hunted and allocated to state forests numbers of hunters of each game species on the basis of the percentage of the relevant land cover types found within state forest boundaries. Use of this method indicated, for example, that virtually no pheasant hunting took place on the state forests. In total, the

method indicated that 42,000 small game hunters (six percent of all small game hunters) hunted on state lands.

Sport fishing

Fishing is even more popular than hunting in Michigan. The inland waters of approximately 11,000 lakes and 36,000 miles of streams, to say nothing of the hundreds of miles of shoreline on the Great Lakes, attract many thousands of fishermen each year. With license sales as a measure, there were 956,000 fishermen in Michigan in 1958; the total would be 1,074 million (including 207,000 trout fishermen) if 98,000 temporary 15-day permits were included.

There are no methods available for estimating accurately how many fishermen use waters within the state forests. It would be difficult to even design a valid sampling method to obtain such an estimate since there are many streams and lakes within the boundaries of state forests which are completely surrounded by state-owned lands except for the immediate water frontage. About one sixth of Michigan's streams are located within state forest boundaries.

Access is the critical factor. Fishermen have the legal right to fish all waters as long as they remain in a boat or in the stream-bed, and it is by furnishing public access that the state forests greatly increase the fishing waters available to the public.

A useful guide to the estimate of the volume of sport fishing in the state forests is provided by the known fish-

ing intensities of three fishing research areas located in state forests. On these areas, fishermen averaged 346 per mile of stream and 249 per lake in 1958. This is about twice the fishing intensity that applied to the waters of the whole state. It indicates that the state forests are visited by 20 percent of the state's fishermen--a much larger percentage of the state's fishermen than would be suggested by merely comparing state forest area with total land area.

Nevertheless, it is the opinion of Fish and Fisheries Division biologists that the intensity of fishing in the state forests is less than is indicated by the fishing research areas. To conform with this appraisal, the 20-percent figure will be scaled down to 15 percent. Using the 15-percent figure, the number of fishermen in 1958 on waters within the state forests is calculated at 160,000.

Consumer Expenditures

With estimates of the numbers of hunters and fishermen on state forests available for 1958, it is necessary only to multiply by appropriate estimates of annual expenditures per sportsman to derive consumer expenditures attributable to the state forests.

No suitable study of sportsmen's expenditures is available for Michigan, but the U.S. Fish and Wildlife Service's intensive study, National Survey of Hunting and Fishing, can be adapted to the purposes of this analysis.

The expenditure items listed in the National Survey of Hunting and Fishing (cited in Review of Literature), require modification before they can be applied to hunting on the state forests.

The"other trip expenditures" was eliminated because it contained expenditures for entrance fees, pack trip fees, and guide fees; these fees are not ordinarily encountered in hunting on Michigan state forests. The item "leases and privileges" was omitted; state forests offer free access and hunting privileges. The item "other expenditures" was overlooked because it was made up of elements such as club dues, magazine subscriptions, and purchase of dogs; these expenditures are not necessarily involved in the hunting experience.

With the exceptions noted above, all items listed in the National Survey were accepted as being applicable to hunting on Michigan state forests. Even "food" was retained as a legitimate item of expense (it had not been counted under Recreation) because the National Survey included only that portion of food costs which was in excess of food costs at home.

Using the adjusted expenditure figures from the National Survey of Hunting and Fishing and applying them to the estimates of numbers of hunters on state forests in 1958, consumer expenditures for hunting on the state forests may be calculated as follows:

Big Game

Direct expenditures per hunter		$17.85
Equipment expenditures per hunter		42.90
Total		$60.75
Total expenditure per hunter x 190,000 hunters	=	$11,542,500

Small Game

Direct expenditures per hunter		$ 9.05
Equipment expenditures per hunter		23.66
Total		$32.71
Total expenditure per hunter x 42,000 hunters	=	$ 1,373,820
Total expenditures for big and small game	=	$12,916,320

Fishing

Expenditure items listed in the National Survey for fresh-water fishermen were accepted whenever they appeared applicable to fishing in Michigan state forests. The same categories of items which were eliminated in the analysis of Hunting--"other trip expenditures," "leases and privileges," and "other expenditures"--have been eliminated here for similar reasons. All other items listed in the National Survey were accepted as being applicable to fishing in Michigan state forests.

Using the adjusted expenditure figures from the Na-

tional Survey and applying them to the estimate of fishermen in state forests in 1958 previously made, consumer expenditures for fishing on the state forests may be calculated as follows:

Direct expenditures per fisherman		$21.74
Equipment expenditures per fisherman		29.76
Total		$51.50
Total expenditure per fisherman x 160,000 fishermen	=	$8,240,000

Income

The reduction of consumer expenditures for hunting and sport fishing to income payments to the factors of production in Michigan can be done simply. Many of the expenditures made by sportsmen in pursuit of their sport resemble those made by recreationists using state forest campgrounds. Since the reduction factor which applied to campground recreation was 50 percent, a similar reduction factor can be presumed to apply to hunting and sport fishing on the state forests.

Applying a 50-percent reduction to consumer expenditures by sportsmen, income payments generated within Michigan by hunting and fishing activities on the state forests may be calculated as follows:

Big game expenditures of	$11,542,500 x 50% =	$ 5,771,250
Small game expenditures of	$ 1,373,820 x 50% =	686,910
Fishing expenditures of	$ 8,240,000 x 50% =	4,120,000
Total income payments		$10,578,160

Miscellaneous Products

Cash receipts are obtained by the state of Michigan for a number of products other than timber from the state forests. These receipts were detailed for the year 1957 in Table 8. They included some 322,000 dollars in oil and gas leases and royalties, 150,000 dollars for sales of nursery stock, and 6,600 dollars for a miscellany of special grazing use and mineral permits. These are items of direct income to the state which flow into the general fund.

Consumer Expenditures

Although a number of the miscellaneous products generate considerably greater values at higher stages of consumption, it is not likely that the result justifies the complexities of the calculations involved. The one exception is the item of oil and gas, with an immediate sale value of 250,000 dollars as a product of state forest land and a considerably expanded value when it reaches ultimate consumers.

Oil and gas production from the state forests in 1957 included 631,000 barrels of crude petroleum, 45.5 million cubic feet of gas, and 26,000 gallons of liquid petroleum

gas. The raw product was worth 1.9 million dollars, and value added by manufacture was 2.4 million dollars. Value added beyond manufacture could not be computed from Census data; but assuming the same mark-up in value from point of manufacture to retail that was derived for timber products--30 percent--value added beyond manufacture would be set at 1.3 million dollars.

Values at the three levels of the commodity flow may now be added up to approximate consumer expenditures in Michigan as follows:

	Million dollars
Value of raw products	1.9
Value added by manufacture	2.4
Value added beyond manufacture	1.3
Total	5.6

The total, 5.6 million dollars is a gross measure of the value of oil and gas products from the state forests to the economy of Michigan.

Income

Refining the estimate above of consumer expenditures for oil and gas products from state forests into terms of income payments can only be done on a crude basis. It will be assumed that the reduction from gross product to income will parallel the relationship which exists for the national economy between GNP and national income. On this basis,

income payments in Michigan originating in oil and gas products of the state forests totaled 4.7 million dollars in 1957.

All Products

In summary, the state forests of Michigan yield a large volume of products which bring some revenues into the state treasury, but whose economic contribution to the state is best measured at the later stages of consumption. Timber sales represent only a minute fraction of the values created at the points of final consumption. Recreation and wildlife values, important as they are when measured at ultimate points of consumption, have no immediate sale or market value as products of the state forests.

Volume of Use

Timber sales in 1957, including principally 200,000 cords of pulpwood and 76,000 cords of chemical and charcoal wood, aggregated a combined wood volume equivalent of 131 million board feet. Cash receipts from these sales totaled some 815,000 dollars.

Cash receipts to the state treasury from the sale of nursery stock, oil and gas leases and royalties, and a miscellany of special grazing use and mineral permits amounted to 479,000 dollars. In total, all cash receipts from products of the state forests reached 1.294 million dollars in 1957.

Campground use of the state forests of Michigan amounted to 405,000 camper-days in 1959. Other uses of the campgrounds included 45,000 user-days of picnicking, and 41,000 user-days of bathing and water-skiing.

The volume of non-campground use included in 1959 some 44,000 user-days in six winter sports areas and 25,000 user-days of canoeing on two rivers largely within state forests; but the estimate of 77,000 berry-pickers, mushroom pickers and hikers may be low, and the number of motoring sight-seers cannot even be guessed.

The number of deer hunters on the state forests in 1958 was estimated to be 190,000. Small game hunters were estimated at 42,000. Fishermen on publicly accessible waters within the state forests were estimated at 160,000 in 1958.

Consumer Expenditures

Consumer expenditures for products from Michigan state forests have been estimated on an annual basis as follows:

	Million dollars
Timber	107.9
Campground use	1.8
Hunting	12.9
Fishing	8.2
Oil and gas	5.6
Total	136.4

For practical purposes, the estimates above may be dated 1957. Actually, campground use applies to the year 1959, and hunting and fishing apply to the year 1958.

For all cases, the estimates tend to be conservative. In particular, the recreation estimate based on campground use is low since it has been confined to recreation on the limited campground areas and excludes both camping and the more extensive forms of recreation over the bulk of the state forest areas.

Income

Annual consumer expenditures for products of the state forests have been reduced to terms of income payments to the factors of production within Michigan as follows:

	Million dollars
Timber	84.3
Campground use	0.9
Hunting	6.5
Fishing	4.1
Oil and gas	4.7
Total	100.5

The same observations about conservatism in estimates apply here as to the estimates of consumer expenditures. It should be emphasized that the reduction from consumer expenditures to income is of greater magnitude than would be indicated by Department of Commerce general

relationships between national product and income. However, a special effort has been made in this analysis to eliminate from the estimates income flows to factors of production beyond the boundaries of Michigan. Our concern is limited to measuring the economic importance of the state forests to the people of Michigan.

COSTS OF THE STATE FORESTS

Costs play an extremely important role in our society in directing many of the decisions concerning the ownership and use of land resources. Along with the prospects of benefits, cost considerations help to dictate the purposes for which land resources will be developed and the timing of these developments.

Land costs fall into two major categories--the operating costs that arise in the day to day use of already developed resources and the various investment costs associated with the development of land resources for particular uses.[1]

Investment Costs

Land purchase

Since the state forest acreage is made up predominantly of lands which reverted to the state through tax delinquency on the part of the former owners, acquisition costs for land have not been high. As was discussed in the second chapter, most lands of the state forests which have been purchased were former game reserves which were made

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[1]Raleigh Barlowe, Land Resource Economics, Englewood Cliffs: Prentice Hall, Inc., (1958), p. 219-20.

state forests in 1946. They were purchased with earmarked funds from 1.50 dollar Deer License Fund created in 1931, and the majority of the purchases were made in the period 1931 to 1946. Since 1950, the few land purchases which have been made have been from the Game and Fish Protection Fund.

Total land purchases incorporated into the state forest system aggregated 589,840 acres from 1921 to 1958. The total cost was 1,968,542 dollars; average cost was 3.33 dollars per acre. Purchases dropped rapidly after 1950, although per acre costs rose sharply:

Decade	Purchase cost (dollars)	Land purchases (acres)
1921 - 30	460,800	115,032
1931 - 40	452,365	204,898
1941 - 50	624,000	231,139
1951 - 58	431,377	38,771
	1,968,542	589,840

Other investment

Ideally, these investment costs would be broken down to show all capital outlays made on the state forests. However, an examination of the Department of Conservation fiscal records shows that this would be an almost impossible task. First of all, there are 10 divisions within the Department, and at least 8 of them work directly or indirectly on projects involving state forest lands. Many of the investment costs become joint costs between several divisions. For instance, the district office building may house di-

vision offices of the Forestry, Field Administration, Game, and Fish divisions. If all divisions spent all their time working on projects involving state forests, then there would be no problem. However, this is not the case, and the problem of allocating costs to the various divisions remains.

In Table 18, investment costs on the state forests since the beginning of the state forest system are tabulated by programs (as estimated by the various divisions of the Department of Conservation). The total of 7.0 million dollars includes land purchase costs of about 2.0 million dollars and other investment costs of 5.0 million dollars. Other investment costs of 5.0 million dollars are broken down again into 1.4 million dollars of regular disbursements and 3.6 million dollars of construction value created by the Civilian Conservation Corps.

The high concentration of investment other than the acquisition under the C.C.C. program is notable. Established by the federal government in 1933 as one of a number of challenging programs designed to combat the Great Depression, the C.C.C. was intended primarily to relieve the acute national condition of widespread distress and unemployment, but it had a corollary objective "to provide for the restoration of the country's depleted natural resources and the advancement of an orderly program of useful public works."

The C.C.C. program reached a peak in 1935; it tapered

TABLE 18

TOTAL DISBURSEMENTS FOR PROGRAMS OF THE MICHIGAN CONSERVATION DEPARTMENT WHICH CAN BE CHARGED TO THE STATE FORESTS, 1921 TO 1958

Program	Operating Costs[a]	Investment Costs[a]
	thousand dollars	thousand dollars
Forestry	5,442	547
Reforestation	1,536	153
Game	2,780	589
Game refuge	1,452	1,591
Fish	3,248	158
Law enforcement	5,105	18
Field administration	6,395	288
Education	271	-
Lands	376	36
Administration	765	-
General operations	1,249	-
Predator control	292	-
Training school	118	-
C.C.C. program[b]	1,600	3,600
Total	30,629	6,980

[a]These figures represent only that portion of total Conservation Department expenditures which can properly be allocated to state forests.

[b]Based on private contract rates for similar work of investment and operations.

off as economic conditions improved, and it was finally liquidated in 1943, during World War II. The program was concentrated on federal and state lands, but it was extended to county, municipal, and private lands also. In Michigan, as many as 42 camps were constructed, each with a working force of about 200 men. The C.C.C. contributed greatly to improving Michigan's forests and parks. Its capital improvements in Michigan included the following: (1) construction of 221 buildings, 41 fire lookouts, 5,600 miles of truck trails and forest roads, 1,350 miles of fire lines, and 1,094 miles of telephone lines; (2) construction of 123 fish-rearing ponds and improvements on 1,209 miles of stream; and (3) construction of 42 state forest campgrounds and improvements on some 30 state parks.

Estimated costs of C.C.C. construction (3.6 million dollars) and operations (1.6 million dollars) on Michigan state forests represent normal costs if the same activities had been undertaken as a part of regular state forest operations. Actual costs were considerably larger. They involved social programs beyond strictly conservation objectives and could not fairly be charged to state forest investments and operations.

Investment costs other than land purchases made on the state forests were very small up until the time of the C.C.C. program. The C.C.C. construction costs represent the peak of the investments, with a marked decline at the close of this program and during the war years. In the

past decade, investment costs made on state forests have risen sharply as the various programs of the Conservation Department have greatly expanded their operations:

Decade	Investment costs other than land purchase (dollars)
1921 - 30	100,000
1931 - 40	3,800,000
1941 - 50	300,000
1951 - 58	800,000
	5,000,000

Operating Costs

Operating costs are all those costs which are incurred annually in the administration of the state forests (including the activities of all branches of the Department of Conservation). These costs include such major items as wages and salaries for personnel, supplies, materials, contractual services, equipment and structure depreciation, and repairs.

Estimates of operating costs incurred for the complete span of years of state forest operation, 1921 to 1958, are also shown in Table 18. (As with the investment costs, this tabulation is based upon estimates by the various divisions of the Department of Conservation.)

The total bill for operating costs of 30.6 million dollars averages out to slightly more than 800,000 dollars

per year. Of course, annual costs have not been constant; they have risen from an average of about 265,000 dollars during the decade of the 1920's to an average of 1,850,000 dollars during the 1950's. Currently, for fiscal year 1957, operating costs for the state forests of Michigan are estimated at 2.6 million dollars (See Table 19).

TABLE 19

TOTAL DISBURSEMENTS FOR PROGRAMS OF THE MICHIGAN CONSERVATION DEPARTMENT CHARGED AS OPERATING COSTS TO THE STATE FORESTS, 1957

Program	Operating Costs
	(Thousand dollars)
Forestry	506
Reforestation	290
Game	146
Fish	187
Law enforcement	388
Field administration	380
Lands	26
Administration	217
Predator control	3
Training school	15
In lieu tax payments[a]	451
Total	2,609

[a]Added in the breakdown of operating costs, although treated separately in the discussion of this chapter.

It is interesting to note that even at the 1957 level of operating costs of 2.6 million dollars, this still amounts to an annual cost of only about 70 cents per acre of state forest lands.

Payments to Counties in Lieu of Taxes

State owned lands are not subject to assessment by local taxing units on their regular ad valorem assessment rolls. Inasmuch as local units of government operate from returns in the form of taxes received on lands located in their units, the Michigan Legislature provided a means whereby the Department of Conservation would make payments in lieu of taxes on state lands which came under its jurisdiction.

Under Act 116, PA 1917, provision was made for the payment of 10 cents per acre each year on all lands under the jurisdiction of the Department except on certain state park lands and lands purchased by this Department since 1933 lying south of Town line 16. By Act 151, PA 1956, this annual payment was increased to 15 cents per acre.[1]

For those lands purchased south of Town line 16, Act 182, PA 1954, provides for assessment by the Tax Commission, with payments in lieu of taxes based on the equalized tax rate of each municipal unit. No payment is made for special assessments, nor are buildings on the prop-

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[1] 19th Biennial Report, op. cit., p. 205.

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[1] 19th Biennial Report, op. cit., p. 205.

erty subject to assessment.[1] No state forest lands fall in this category. The Allegan State Forest is located south of Town line 16, but since it was not purchased but obtained by lease from the U.S. Forest Service, it is included under Act 116, PA 1917.

An additional payment in lieu of taxes is made to counties under provisions of Act 155, PA 1927. This Act provides that one payment of 25 cents per acre be made on tax reverted lands which are withdrawn from sale and reserved for conservation purposes. This arrangement would allow the state to extinguish any tax equities that the local units had in the lands with this one blanket payment. Budget allotments for this purpose have been limited; consequently, these payments have been confined to payments on tax reverted lands disposed of through exchanges for lands acquired by the Department and dedicated to public conservation purposes.

The total amount of the payments made to counties in lieu of taxes for the state forests has been calculated by multiplying the net acreage of the state forests in each year by the per acre payment as follows:

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[1] Ibid.

		Thousand dollars
Payments under Act 116, PA 1917		
1917 - 1926 at 5¢ per acre	=	154
1927 - 1955 at 10¢ per acre	=	7,578
Payments under Act 151, PA 1956		
at 15¢ per acre	=	1,691
Payments under Act 155, PA 1927		
at 25¢ per acre	=	246
Total		9,669

This total figure of almost 10 million dollars is quite a sizeable one. It can be justified in the sense that it has in some measure compensated for the so-called "social costs" of dedicating lands into public ownership for conservation purposes.

These social costs are often a result of land development. They represent the social returns and satisfaction foregone because of the development processes, and are more subtle than operation or investment outlays, because they must be measured in terms of individual and group sacrifices.[1]

In the case of the state forests, the social costs were borne by the people of the local government units who suffered from a restricted tax base when the state lands were withdrawn from the tax rolls. As a consequence, the legislature saw fit to provide the system of 10 cents per

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[1]Barlowe., op. cit., p. 225.

acre payments to local governments to help make up for the deficiency in tax receipts.

There is some question as to whether there was a deficiency in tax receipts of local governments at all when the state forests were withdrawn, because almost 90 percent of the lands involved were not producing any revenue at the time of their withdrawal and had not produced any for some years previously.

The 10 cents per acre was an arbitrary amount decided on by the legislature, but a comparison made with actual tax payments on private land of a similar character in counties with a high percentage of state forest land indicated that the 10 cents per acre was not far below the actual taxes levied.[1] The average tax on the lands sampled was 17.08 cents per acre, but the median tax was only 12.50 cents per acre. Since the sample reflected the value of improvements and the state lands have no taxable improvements on them, a comparison corrected for the effects of improvements would show an even closer relationship between the two figures.

A common type of payment made in lieu of taxes by various other states and the federal government for public property consists of paying the local government unit a certain percentage of the gross receipts obtained from the

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[1]John H. Eichstedt, "Payments in Lieu of Taxes on Public Lands Under the Jurisdiction of the Michigan Department of Conservation," (Papers in Public Administration No. 16, University of Michigan, 1956), p. 14.

sale of products from the public land within that unit. This is a means of taking into consideration the productivity of the areas in determining the size of the in-lieu payment. This practice is followed in lands controlled by the U.S. Forest Service which returns 25 percent of the gross receipts to local units of government.[1]

If 25 percent of the gross state forest receipts had been the basis for payments to local government, the returns would have been far less than the 10 cents per acre paid. There wouldn't have been any payments until about 1942, and even as late as fiscal year 1953, payments would have amounted to only about 1.75 cents per acre.[2] However, in 1957, such an arrangement would have returned about 8.5 cents per acre, and it appears likely that the rapidly increasing gross receipts of the state forests would soon raise this payment considerably.

It appears that local governments have been amply compensated in the past for the withdrawal of lands from their tax rolls for dedication to state forests.

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[1]Clawson & Held, The Federal Lands, p. 261.

[2]Eichstedt, op. cit., p. 20.

COMPARISON OF COSTS AND BENEFITS

Economic contributions of the state forests and costs of investment and operations have been described in earlier chapters. In this chapter, comparisons will be made between costs and benefits.

Investment Versus Capital Value

Total investment in the state forest system has been held to the strikingly low figure of 7.0 million dollars. Because most land acquisition was accidental and such land as was purchased was acquired at prices that appear very low today, the total acquisition bill amounts to 2.0 million dollars. All other investments total 5.0 million dollars.

In terms of present value, the investment is negligible. No attempt will be made to appraise the sale value of the state forests, but it is an interesting exercise to calculate the value of the timber growing-stock which has developed as a result of protection and management.

The present timber values which have accumulated on the state forests are values which can be credited to state forest management. These accumulated values can be calculated by applying current unit prices to total volumes

present on state forests. Of the 23.7 billion board feet of sawtimber (11 inches plus) and 86.5 million cords of pole sized timber (5 to 11 inches) found in the commercial forests of Michigan, the state forests contain the following:

	Softwoods	Hardwood
Sawlogs - (Million bd. ft)[1]	1156.1	1954.8
Pulpwood - (Million cords)[1]	5.3	8.7

The average unit stumpage prices for these volumes were applied to arrive at the total value of standing merchantable timber (five inches or over) on dedicated state forest lands as follows:

Class of Timber	Unit Values[2]	State Forest Volumes	Total Value
Softwood sawlogs	$18.64 per M bd.ft.	1156 MM bd.ft.	$20,548,000
Hardwood sawlogs	34.58 per M bd.ft.	1955 MM bd.ft.	67,604,000
Softwood cordwood	3.98 per cord	5300 M cords	26,394,000
Hardwood cordwood	1.55 per cord	8700 M cords	13,485,000
Total value for dedicated state forest land			$128,031,000

To the 128 million dollars worth of standing timber

[1]Volumes from Michigan Department of Conservation, Forestry Division inventory data.

[2]Unit values based on actual state forest sales data for year 1957.

on the 3,760 million acres of dedicated state forest lands can be added (by similar calculation) 2 million dollars' worth of timber of the 77,000 acres of undedicated state lands.

This huge timber capital value of 130 million dollars alone is nearly 19 times greater than Michigan's investment in state forest land and timber. It is about two and one-half times as large as Michigan's total expenditures--investment, operating costs and payments to local units of government in lieu of taxes--for the state forests since the beginning of the state forest system.

Receipts Versus Operating Costs

The state forests are not comparable to a private business, so that the same kind of financial appraisal is not appropriate. Benefits go far beyond receipts for the sale of products from the land, as was demonstrated in an earlier chapter; nevertheless, it is pertinent to note how receipts, which represent direct income to the state, offset the operating costs of the state forest system.

Total receipts and total operating costs

Total operating costs go back in time to 1903, although they did not become significant before the establishment of the Department of Conservation in 1921. Budget costs of 31.2 million dollars plus 9.7 million dollars in payments in lieu of taxes (which will be considered as op-

erating cost for our purposes) make a total outlay of 40.9 million dollars from 1903 to 1958.

Cash receipts have a much shorter history; they were negligible before 1940. Their cumulative total reached 16.6 million dollars in 1958, broken down as follows:

Source of receipts	Thousand dollars
Sale of timber (stumpage)	5,263
Sale of nursery stock	936
Sand and gravel	52
Use permits	50
Old buildings and equipment	62
Gas and oil--lease and royalties	10,275
Total	16,638

Total cash receipts from state forest operations extending from 1903 to 1958 represent 40 percent of total operating costs over the same period.

Annual receipts and operating costs

Annual operating costs (including, preferably, payments in lieu of taxes) are still substantially larger than cash receipts, but receipts have been gaining steadily in recent years. Whereas the ratio of operating costs to cash receipts was 1 to 2.5 in 1946, the ratio had dropped to 1 to 2 in 1957.

Oil and gas revenues accounted for most of the receipts in earlier years, but timber sales have now come

into the foreground. Oil and gas revenues peaked in 1952; the subsequent decline has been more than offset by the increase in receipts from timber sales. By 1957, timber sales accounted for 815,000 dollars of revenue, 63 percent of all cash receipts.

If the trends in annual operating costs and cash receipts are projected, the two curves will cross in the year 1985 (Figure 5). Beyond 1985, we can expect that cash receipts will become increasingly greater than the operating costs of the state forests.

Current Income Payments Versus Costs

In public forest accounting, cash receipts represent only a small portion of the benefits to be recorded. Some of the more conspicuous services of the forest have no immediate sale or market value, and both tangible products and services generate large income flows before they reach ultimate consumers.

The significant economic comparison is between the income payments to the factors of production in Michigan and the costs to the state.

Income payments in 1957 from the sale of state forest products and the recreational uses made of the state forests have been conservatively calculated at 100 million dollars. In contrast, 1957 operating costs of the state forests (including payments in lieu of taxes) were 2.6 million dollars. Benefits, in this instance, are about 40 times greater

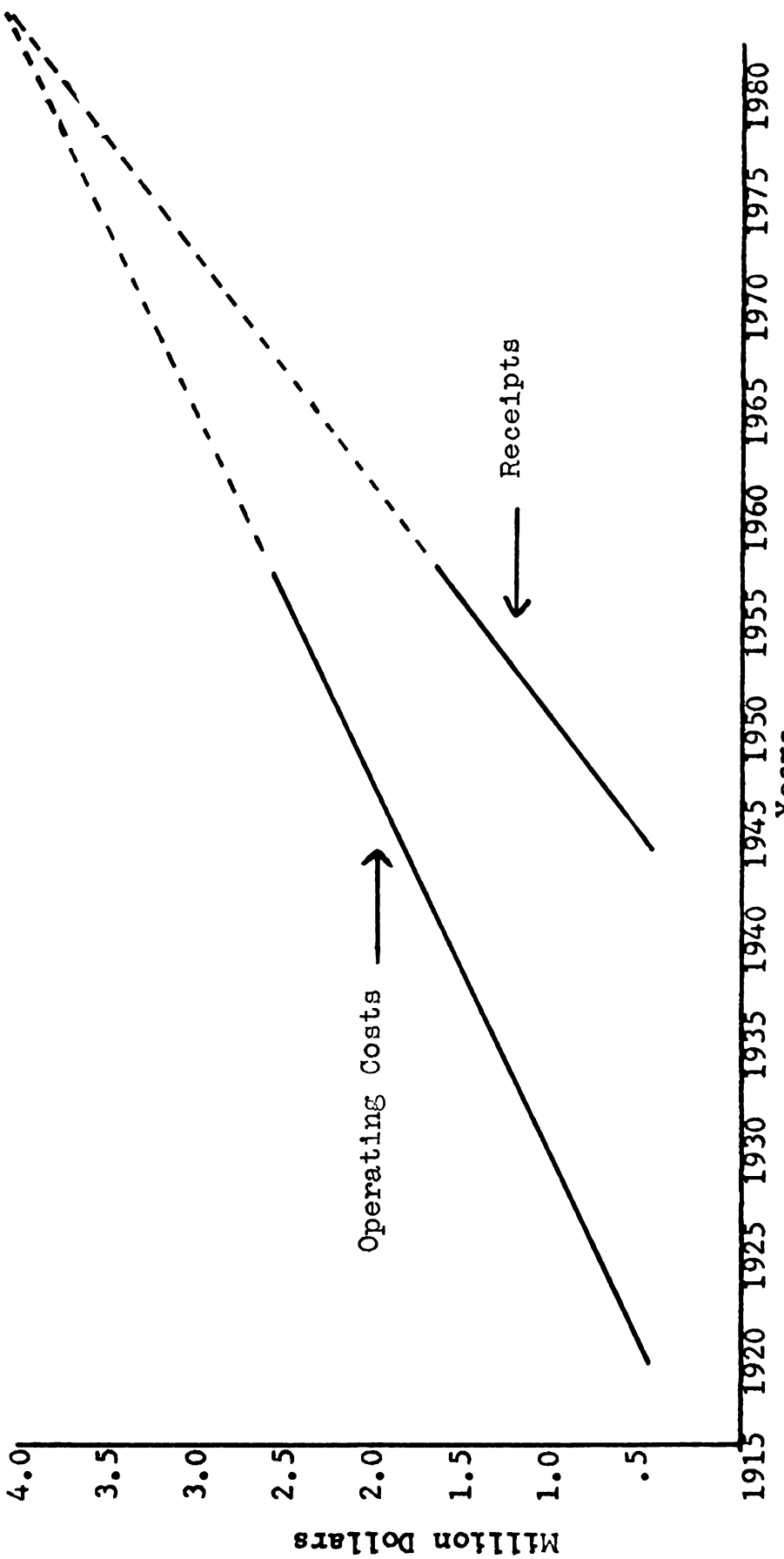

Fig. 5.--Trends in annual operating costs and annual receipts from Michigan State Forests, 1903-1957, with projection into the future.

than costs. Moreover, this extremely favorable ratio is rapidly becoming larger.

Benefits dwarf costs in yet another perspective. Total costs of the state forest system--investment, operations, and payments in lieu of taxes--from 1903 to 1958 aggregated some 48 million dollars. Income payments generated in 1957 alone were more than twice as large as the aggregate cost figure for all years.

Benefits Beyond Income

If all the benefits derived from the state forests could be counted, the benefit-cost ratio would be far more favorable than it has been shown. There is a wealth of additional values stemming from the three product categories discussed--timber, recreation, and wildlife--which cannot be measured in terms of market value expressed in dollars.

There are purely aesthetic values of a stand of timber far beyond any set stumpage prices. No realistic dollar value can be placed in the water retention powers of a well-stocked stand. A well-managed state forest not only produces high quality wood products, but high quality water as well. What is the price of stabilized soil and regular stream flow?

Outdoor recreation, including hunting and fishing, offer far more than the secondary benefits of total expenditures made in the pursuit of such recreation.

Brockman[1] suggests some of the intangible benefits derived from the recreational use of wild lands:

> (1) Improved efficiency of the individual in his daily tasks, through provision of opportunities for periodic release from daily routine, resulting in increased national productivity and wealth. (2) Increased national productivity resulting from the development in individuals of new or latent skills, broader interests, greater knowledge, and deeper perceptions, through educational and inspirational values of outdoor recreation. (3) Stimulated use of public recreational facilities and maximum dispersion of benefits noted above by provision of a wide variety of recreational opportunities at the lowest possible per capita cost. This is of particular importance to low income groups. (4) Reduced need or lower expenditures for extensive law-enforcement program, correctional institutions of various kinds, mental hospitals, and the like.

All of these benefits listed are latent in the opportunities available in recreation on state forest lands. Such recreation lands offer people the opportunity to release physical and mental energy, foster broader interests and knowledge, develop better citizenship and individual responsibility, and relieve themselves of the stress and strain of modern life. Ideally, as a result of a more contented, energetic and forward-looking outlook developed in our citizens, the benefits of such lands are reflected in the state's economy through increased production. The degree of their effect, however, in dollars and cents, is impossible to evaluate.

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[1]Brockman, Recreation Uses of Wild Lands, p. 181.

OUTLOOK FOR MICHIGAN STATE FORESTS

An economic appraisal of the state forests would be incomplete without a look ahead to the future. The benefits that have been appraised are of recent origin; they have been expanding at an increasing rate; they represent only a small portion of the benefits that may accrue under fuller management and utilization.

Ideally, the look ahead should include both costs and benefits. However, the appraisal will be confined to benefits. Costs may rise at the same rate, at a higher rate, or at a lower rate. This is a relatively unimportant matter for our purposes. The disparity between costs and benefits is so vast at present that any increase in costs that might be visualized as necessary to achieve anticipated benefits would be dwarfed. Actually, benefits have been rising more rapidly than costs, and the indications are that this situation will continue for a long time.

The appraisal of benefits will be carried to the year 2000. There are two phases to this appraisal: (1) the demand for goods and services that may develop, and (2) the ability of the state forests to meet the visualized demand for goods and services.

The appraisal of future demand could take several

forms. One form of future appraisal is to forecast, to make a judgment in qualitative terms of what is most likely to happen. Another approach is by means of projection. Starting from given or assumed levels, and proceeding on the basis of assumed future events, the future course of the item under study is projected.

A third approach to the future, less intuitive than a forecast and less rigid and dogmatic than projections, might be called an approximate projection, or simply an estimate.[1] This will be the choice of approaches used in this chapter in considering the future outlook for Michigan state forests. Projections will be made based on certain factors, and reasonable assumptions will be chosen to give an indication of future production and developments. Yet, it is preferable to modify these projections and assumptions with a large amount of "judgment," to keep them in the realm of reasonableness.

Population Estimates

Basic to any specific estimates of the future are data on the probable or expected populations in the areas involved. It is common knowledge that the population of this country has grown greatly and regularly, from the time of the first white settlers to the present, and it

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[1]This is the approach used by Marion Clawson, Burnell Held and Charles H. Stoddard, Land for the Future, (Baltimore: John Hopkins' Press, 1960), p. 4.

is generally assumed that there will be a continued high rate of population expansion in the future. Accurately forecasting the magnitude of such increases, however, is a very hazardous undertaking, and most of the best projections and predictions of the past quarter century have been seriously in error.

Such key factors as the birth rate, the mortality rate, and immigration and emigration certainly have a profound influence on any population projections. Since these factors are primarily psychological and sociological phenomena in the United States, their complexity is a challenge for the population predictors.

There have been several predictions made of a long-range population increase. It might be useful to our study to consider at least three of the more important ones. A study by the Stanford Research Institute[1] projects population on only one set of assumptions and carried it only as far as 1975. Population was projected on the assumption of a gradual decline in birth rate to the 1946 level. As a result, the projected total population for 1975 was 212 million.

A more detailed study was undertaken by the Forest Service in 1955.[2] In order to keep the analysis within

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[1]Stanford Research Institute, America's Demand for Wood 1929-1975, a report to the Weyerhauser Timber Company, Tacoma, Washington, 1954.

[2]Timber Resources for America's Future, op. cit.

reasonable limits of work and space, three major sets of assumptions were chosen for their projections. These assumptions gave rise to "Lower," "Medium," and "Upper" levels of projections for a variety of items including population, gross national product and income. For the population increase, the "Lower" level is based upon the Bureau of Census Series B projections for 1975, and the population for 2000 is estimated by the extension of those projections. These results give a projected population total for 1975 of 215 million and 275 million for 2000. The "Medium" level uses the same estimates of population as the "Lower," but the "Upper" level employs the Census AA projection which yields a total population of 228 million in 1975 and of 360 million in 2000.

In a recent study of land use in the future for Resources for the Future, estimates were made for the population in 1980 and 2000 which are somewhat of a compromise between the "Upper" and the "Medium" levels of the Forest Service.[1] The RFF projections show 240 million people for 1980 and 310 million for the year 2000.

Now, all three studies indicate that there will be a substantial increase in population. Since the "Medium" level of projection is to be used for considering the magnitude of the future demand for timber, its population projections will also be accepted in this study. This

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[1]Clawson, Held, and Stoddard, op. cit., p. 11.

means that we can look for total population of the United States to increase from about 180 million in 1960 to 215 million in 1975 (a 20-percent increase) and 275 million in 2000 (a 50-percent increase). The North Central region, which includes Michigan, is expected to increase by about 30 percent by 1975 and by 58 percent from 1960 to 2000.[1]

Let us consider how this estimated population increase along with other basic assumptions of other pertinent factors should affect the future outlook of the state forests.

Timber

Timber is the product of the greatest economic importance that is produced on the state forests at present. What is the outlook for its future production on these lands?

Future Demand for Wood

Many factors enter the estimate of the future demand for forest products. There is, first of all, the matter of the total population and its various components. Since one major use for wood is dwelling construction, perhaps the most important population factor is the rate at which new households are being formed.

The size of the gross national product and of per-

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[1] Timber Resource for America's Future, op. cit., p. 12.

sonal disposable income also affects the demand for wood. Except for firewood, there seems to be no forest product whose consumption declines as income rises. With higher incomes and larger industrial output, more forest products will be consumed if supplies are adequate and the relative prices are unchanged.

Lastly, and perhaps most important of all, what will be the role of wood and its products compared with the role of its substitutes? The future competitive relations among wood and its known substitutes and perhaps new products may be critical to the demand for wood fiber.

The Forest Service has made careful projections of future demand for timber products under various assumptions.[1] The projections of the three major sets of assumptions are shown in Table 20. Gross national product is estimated on the basis of certain assumptions as to size of working force, hours of work per week, and real output per man hour. In general, for the "Lower" and "Medium" projections, this means a slightly slower rate of increase in gross national product per capita in the future than in the past. The crucial assumption in the "Medium" level which makes it different from the "Lower" level, is that there will be "no change in relative prices; trends in future price of timber products will, in general, parallel price trends of

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[1] Timber Resources for America's Future, op. cit., p. 369.

TABLE 20

PROJECTED DEMAND FOR FOREST PRODUCTS, 1975 AND 2000 UNDER ALTERNATIVE ASSUMPTIONS BY THE FOREST SERVICE[a]

Item	Unit	1952	Projection 1975		Projection 2000		
			Lower	Medium	Lower	Medium	Upper[b]
Total population	million persons	157	215	215	275	275	360
Gross national product	billion dollars	350	630	630	1,200	1,200	1,450
New construction expenditures	billion dollars	32.3	*	*	*	*	*
Input of physical structure materials[c]	billion units	5.9	8.3	8.3	12.2	12.2	14.7
Domestic consumption of:							
Sawlogs for lumber	billion bd.ft.	41.5	47.6	55.5	54.8	79.0	90.0
Pulpwood	million cords	35.4	65	72	90	100	125
All timber products including fuel wood	billion cu.ft.	12.3	14.2	16.2	17.9	22.4	26.2

[a]Derived from Clawson, Held, and Stoddard, Land for the Future (Baltimore: John Hopkins Press, 1960), Table 20.

[b]The Forest Service had an upper limit for 1975 based on 228 million people and $645 billion gross national product, but the difference in timber consumption, compared to the medium estimate, was too small to be considered significant.

[c]Quantities of various physical structure materials purchasable at 1935-39 prices.

*Not available.

competing materials."[1]

Sawlogs for lumber

All three levels of the Forest Service study indicate there will be a higher level of lumber consumption in 1975 than in 1952, and much higher consumption in 2000. The "Medium" level projects a 34-percent increase for 1975 and a 90-percent increase for the year 2000. These increases do not assume constant per capita consumption of timber products to the year 2000. Even with constant price relationships, some differences in consumption appear probable. If present per capita uses of timber products were continued until 2000, total wood demand in that year would be considerably above those projected.

To meet the long-range demand levels assumed under its "Medium" projections, the Forest Service has set a goal for itself of a threefold increase in sawtimber cut from the national forests.[2] This goal combines projected national needs with an estimation of what the national forests can reasonably be expected to yield under intensified management. The assumption is made that if an overall increase of 90-percent in sawtimber production is needed, a larger increase will be necessary on dedicated timber-growing lands such as national forests to compensate for the expected

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[1] Ibid., p. 371.

[2] U.S. Forest Service, Program for the National Forests, (Washington: Miscellaneous Publication No. 794, 1959), p. 9.

failure of extensive small private holdings to achieve any increase in yield.

The same reasoning can be applied to Michigan's state forests. If Michigan as a whole is to double its output of sawlogs in 2000 to meet the demand levels projected to that date, the state forests, like the national forests, will have to point for a tripling of sawlog output. Michigan's state forests will need to yield annually about 32 million board feet by 1975 and about 46 million board feet by 2000.

Pulpwood

Future demand for pulpwood is largely dependent upon future demand for paper, paperboard, and various non-paper products of woodpulp. If viewed from the past, then we should expect vastly increased consumption in the future, for surely the past rise in consumption of pulpwood in the United States has been phenomenal. Pulpwood consumption (including wood equivalent of imported pulp and paper) has increased from about 2 million cords in 1900 to 35 million cords in 1952 and to about 42 million cords in 1955, almost a 2000-percent increase.

In view of this extraordinary rapid increase of pulpwood production in the past, the Forest Service has indicated a much larger rise in future pulpwood consumption than for sawlogs. The "Medium" level increase for 1975 is about 100 percent of the consumption in 1952, and by 2000

the increase is almost 200 percent of the 1952 quantity used.[1] However, this estimate was made in 1955, and since then at least two later estimates of future pulpwood consumption have been made which differ sharply from the Forest Service estimates. The Business and Defense Services Administration (B.D.S.A.) of the U.S. Department of Commerce, in 1959, projected the requirements for pulpwood to 134 million in the year 2000 and Resources for the Future (R.F.F.) indicated the requirements would be as high as 240 million cords by 2000. These estimates represent increases of 362 and 610 percent, respectively. Assuming that these latest estimates are fairly sound, then it becomes obvious that the Forest Service "Medium" level estimate for pulpwood requirements is too conservative. For this study, we will consider that the magnitude of the increase for 2000 over the 1952 level of consumption is about 400 percent.

Assuming that the public lands' share of increase will have to be at least one-fourth larger than the average for all forest lands in the United States (as was done for sawlogs), it is not unreasonable to estimate that the present pulpwood production of 200,000 cords on the state forests of Michigan will have to increase at least five times by the end of the next four decades in order to meet the estimated demand. As large as this increase may seem,

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[1] Timber Resources for America's Future, op. cit., p. 422.

the projection for future production is still at a slower rate than in the past. The future rate of increase is about 4 percent per year, whereas the rate of increase from 1946 to 1957 has been 15 percent per year.

Supply

The estimates presented of increased wood demand in the future suggest a a greatly expanded role for the state forests in supplying wood products. By the year 2000, the demands visualized will call for increased output for the state forests of 200 percent in sawlogs, 400 percent in pulpwood, and 100 percent in miscellaneous wood products.

The question arises, will the state forests be able to sustain such greatly expanded output?

The answer is yes, for at least three important reasons. First of all, production could be increased substantially within the present limits set by management, since the actual cut of many species is far below the estimated allowable cut. This is primarily due to a lack of local demand for particular species and products in many localities.

Secondly, the Division of Forestry is following a policy of building up timber growing stocks which will increase the volume of growth in the future markedly. Very little cutting of green timber was allowed prior to 1940 and even at present, the allowable cut is still calculated

to be no more than about 25 percent of the net annual growth. This policy has permitted a phenomenal building up of growing stock in the past, and the trends are continuing, perhaps even more rapidly. For instance, recent continuous inventory plot remeasurements for nine state forests in the Lower Peninsula showed a net increase over a six-year period (1953 to 1959) of 24 percent in stocking of trees over five inches in diameter, and a 42 percent net gain in volume.

Finally, as cultural operations of management are stepped up on the state forests, yields will inevitably expand. Two studies made in Michigan have supported this expectation. Well managed stands on average sites were found to grow much more timber than the usual run of stands--about twice as much in total growing stock, and three or four times as much in sawlog volume.[1]

In the light of these observations on the potential for expanding production on the state forests, there is little doubt that the market demands anticipated in the year 2000 can be met and sustained.

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[1]John L. Arend, et al. "Growth of Unmanaged Oak - Hickory Wood Lots in Southern Michigan," U.S. Forest Service, Lake State Forest Experiment Station - Technical Note No. 327, (1950).

William M. Zillgitt, "Stocking in Northern Hardwoods Under the Selection System." Society of American Foresters Proceedings (1947), p. 320-27.

Other wood products

The Forest Service's "Medium" level projection of demand for veneer bolts, piling, poles, posts, ties, mine timbers, and miscellaneous wood products indicates an increase of 14 percent by 1975, and 76 percent by the year 2000. Assuming again, that the public lands' share of increase will have to be at least one-fourth larger than the average for all forest lands, the demand for miscellaneous wood products from the state forests will increase by 20 percent in 1975 and by 100 percent in the year 2000.

Fuel wood is one product in which there has been a great decline in demand in the past and continued decline is assumed for the future. The shift to petroleum products for fuel is largely responsible. Looking ahead, it is also likely that much wood that has been burned as fuel wood--trimmings, edgings, and other sawmill or woods waste--will be used for pulp. Such a trend has already developed strongly in other regions.

Recreation

Demand

The future demand for outdoor recreation should logically hinge upon the growth of population, increase in income, increase in the amount of leisure time, and improved methods of traveling. We cannot say for certain that these relationships do occur since their measurement is hampered

by the economic data which usually do not conform to the shape needed for this purpose. However, two major studies of the expenditures made for recreation in the United States indicate that, in the past, expenditures for recreation have increased with an increase in population, income, and leisure time.[1]

What will be the demand for outdoor recreation in the year 2000? Clawson attempts to point out the general direction and even indicates the probable magnitude of such demand in his latest book.[2] He is concerned primarily with the land areas involved in recreation in the future, but in order to arrive at the area needed in the future, he had to estimate the total use which would cause that need.

In order to implement his study, Clawson classified outdoor recreation areas into three broad groups: (1) user-oriented areas, (2) resource-based recreational areas and (3) intermediate areas.

The essential characteristics of the user-oriented areas is that they be located close to their users; the physical characteristics of the resources are secondary to the location factor, although good physical characteristics are important here, as well as elsewhere. Examples of this class of areas are children's playgrounds, playing fields

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[1]Frederic Dewhurst et al., America's Needs and Resources, (New York: Twentieth Century Fund, 1955), and the editors of Fortune, The Changing American Market, (Garden City, New York: Hanover House, 1955).

[2]Clawson, Held, and Stoddard, op. cit., pp. 184-193.

for games of all kinds, swimming pools, local parks, and the like as well as zoos, museums and other similar improvements.

At the other extreme are the resource-based recreation areas whose essential characteristic is their superior natural features. The activities enjoyed there are quite different from the activities of a more organized kind enjoyed in the user-oriented areas. For the most part, the resource-based recreational area is included in a federal landholding such as a national park or national forest, or is in private ownership, such as an ocean beach or major lake.

Between these two extremes is a type of recreational area which may be termed "intermediate." The intermediate area must be within reasonable distance--perhaps one or two hours' travel time--of most of its users, and it is intermediate in that its physical characteristics are important but not dominant. Typically, a recreation area of this kind is a state park, possibly a large municipal park; ideally, it contains attractive forests and waters and is used for somewhat more extensive recreational undertakings than are the city parks and playgrounds.

Clawson compared the use made of these three types of recreational areas in 1956 to projected use in 2000:

Type of recreation	1956 (million visits)	2000 (million visits)
User-oriented[1]	1,000 plus	3,750 plus
Intermediate[2]	312	5,000
Resource-based[3]	116	5,000

The user-oriented potential recreation demand in the year 2000 was based on the assumption that there will be 310 million people living in the United States at that time, and that 250 million of them will live in cities. He further assumes that the average urban person will use a municipal park 15 times or more during the year.

The estimate of use of resource-based areas extends present trends (about 10 percent annual growth rate) but it is arbitrarily reduced to about half of what a mere trend extension would produce. It was assumed that the publicly owned areas of this type would not be much larger than at present; not only is there fairly strong sentiment against further major extension of federal ownership of land, but more basically, there is little land physically suitable for some of these categories that is not federally owned. A greater probability is that a larger part of the total area of federal lands will be used primarily for recreation

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[1]Using city and county parks as an index of this type.

[2]Using state parks and federal reservoir as a measure of this type.

[3]Using the national park system, national forests, and federal wildlife refuges as a measure of this type.

in the future.

The potential recreation demand in intermediate-type areas is built upon the assumption of 15 or more visits per capita annually. This is far less than an extension of past trends would indicate. To meet the increased use, eightfold expansion of areas is needed, and even then the assumed use per acre in 2000 would be about double the present per acre use.

The state forests, by definition, would be considered in the category of Clawson's "intermediate" type of recreational area, although they are not entirely comparable with state parks and federal reservoirs which he includes in this category. Certainly, the intensity of use measured in visits per acre is in no way comparable to the state parks and reservoir areas. They average about 35 visits per acre while the state forests probably have no more than about 13 visits per 100 acres.

What is the potential of the state forests in supplying additional campground facilities for a projected increase in intensity of use 16 times that of the present? Certainly, it would appear that the potential is great and that there should be no physical limitations in supplying these needs. At present, there are about 100 state forest campgrounds having an aggregate area of not more than 1,000 acres. Compare this with the 3.8 million acres of state forests. It is true that each acre of forest is not a potential campground site, but certainly there is

more than an adequate number of desirable locations to furnish at least the eightfold increase in area which Clawson estimates as desirable by the year 2000.

It is noteworthy that the Forestry Division plans to double the number of state forest campgrounds within the next three or four years. These are being supplemented by marked hiking trails and scenic drives to add further to the recreational enjoyment of these publicly owned lands.

Hunting and Fishing

Hunting and fishing use are usually measured in terms of licenses rather than "visits," which make it difficult to compare them on the same basis as other recreational uses. We do not know how many visits the typical license holder makes during the year, but according to the National Survey of Hunting and Fishing in 1955, the typical (median) fisherman fished on nine and one-half days during the year, and the typical (median) hunter hunted on eight and one-half days during the year.

While hunting and fishing have gained in popularity, the increase in numbers of licenses issued is at a far lower rate than the increase in use of recreation areas. On the national scene, the average annual percentage increase in the post war years for hunting and fishing has been only 2.7 and 4.5 compared to an average percentage increase of about 10.0 for other forms of outdoor recre-

ation.[1]

In Michigan during this period, the annual percentage increase in hunting licenses sold has been about 3.0 or slightly above the national average, while the percentage increase for fishing licenses sold during the post war years has been only about 2.0 compared to the 4.5 average over the whole nation. However, Michigan has a higher ratio of both hunting and fishing license holders per 100 persons of population than the national average. In Michigan, in 1957, 14.4 out of every 100 persons bought a fishing license, and 15.1 bought hunting licenses (both small and big game combined). This compared with the national average ratio of 11 and 8.5 for fishing and hunting, respectively.

The ratios of hunting and fishing license holders to total population of Michigan has held quite stable over the past 12 years. If we can assume that it will continue to do so for the next 40 years, then we can estimate that the demand for hunting and fishing will be tied quite closely to the population increase. A 58-percent increase in population in Michigan from the present to the year 2000 would also mean a similar increase in the number of hunters and fishermen. However, since public lands are likely to attract a larger share of the total hunting and fishing population due to increased posting of private lands, it is

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[1]Clawson, Held, and Stoddard, op. cit., p. 150.

reasonable to assume that the increase of hunting and fishing use on state forest lands by 2000 will be in the order of 75 percent.

The outlook for the state forests to absorb this increase in hunting and fishing use is good. No doubt it will mean a shifting of pressures from the area closest to the population centers to more distant points, but this will be profitable both to the hunter and fisherman and to the fish and game population. When game numbers are not reduced or controlled by hunting pressures, the populations tend to increase beyond the capacity of their critical winter food supply.

Extensive programs of game and fish management are being carried out on the state forests of Michigan for the express purpose of maintaining an adequate supply of fish and game for future harvest. Even the timber harvests are planned with the idea of supplementing those management programs. The cut-over areas create openings beneficial to game, and the logging roads provide increased access for the sportsmen into the forests.

Projected Benefits

If the state forests keep pace with the projected national economic development and the attendant needs for timber, recreation and wildlife of the projected population for the year 2000, benefits will rise accordingly.

If the output of timber products from Michigan state

forests expands along the lines of the foregoing estimates, the value of pulpwood output will increase five times; sawlog output, three times; and other wood products, two times. Timber sales in the year 2000 will amount to some 3.6 million dollars at 1957 prices. This is a highly conservative estimate of stumpage sales' values, since stumpage values have risen far more rapidly than general prices over the past 40 years, and there is no reason to assume that they will not continue to diverge upward from general prices over the next 40 years.

Value of raw timber products from the state forests will rise from 7.8 million dollars in 1957 to 32.8 million in 2000 based on 1957 prices. Value added by manufacture again based on 1957 relationships will reach 362 million dollars in 2000. Value added beyond manufacture is calculated at 118 million dollars. Thus, gross product (consumer expenditures) for timber products of the state forests, calculated by summation of three components of the "commodity flow," will total 513 million dollars in the year 2000. Using appropriate current ratios--84 percent for value of raw products and value added beyond manufacture, and 76 percent for value added by manufacture--consumer expenditures can be refined to national income in Michigan originating in timber produced from the state forests; the estimate comes to 402 million dollars.

The 16-fold increase visualized in recreational use of the state forests by the year 2000 will mean a corres-

pondingly large increase in expenditures and income generated. Campground use in 1959, which included 405,000 camper-days of use and 86,000 user-days of picnicking, bathing, and water-skiing based on campgrounds, will expand in the year 2000 to a prospective 6,480,000 camper-days of use and 1,376,000 user-days of picnicking, bathing, and water-skiing. These estimates do not touch on the considerable recreational uses of state forests independent of established campgrounds.

Consumer expenditures of 1.8 million dollars in 1957 by camper-users, and non-camper users of state forest campgrounds will rise by the year 2000 to a prospective 28.5 million dollars. These expenditures, in turn, will represent some 14.2 million dollars of income payments in Michigan.

An expansion in hunting and fishing activity on the state forests by the year 2000 is expected to be about 75 percent greater than in 1958. This will mean 332,000 deer hunters, 73,000 small game hunters, and 160,000 fishermen in the state forests. Hunting expenditures will increase to 22.6 million dollars, and fishing expenditures will increase to 14.4 million dollars. In terms of income payments within Michigan, consumer expenditures will reduce to 11.3 million dollars for hunting and 7.2 million dollars for fishing.

Other sources of income from the state forests--oil and gas leases and royalties, sale of nursery stock, and

special grazing use and mineral permits--are not projected because of the lack of an adequate basis for such projections. Nevertheless, even with the omission of these miscellaneous items and large omissions within the recreational category, the economic activity dependent on the use of the state forests in the year 2000 reaches an imposing total--575 million dollars of consumer expenditures and 435 million dollars of income to the people of Michigan (Table 21).

TABLE 21

ESTIMATED CONSUMER EXPENDITURES AND INCOME PAYMENTS GENERATED IN MICHIGAN FROM PRODUCTS AND SERVICES OF THE STATE FORESTS IN THE YEAR 2000

Item	Consumer Expenditures	Income Payments
	million dollars	million dollars
Timber	519	402
Campground use	28.5	14.2
Hunting	22.6	11.3
Fishing	14.4	7.2
Total	578.5	434.7

The estimated increase in income payments from some 100 million dollars in 1957 to 435 million dollars in 2000 represents an increase at a rate of some four percent compounded annually.

APPENDIX A

STATE FORESTS OF MICHIGAN JUNE 30, 1958

UPPER PENINSULA

State Forest District	Net State Ownership	Gross Area Within Boundaries	Percent State Owned	Counties in Districts
	Acres	Acres		
Region I				
Baraga	131,187	303,970	43	Keweenaw, Houghton, Ontonagon, Baraga
Escanaba River	163,804	248,740	66	Marquette, Alger
Grand Sable	202,391	317,040	64	Alger, Schoolcraft
Iron Range	77,148	112,380	69	Iron, Gogebic
Lake Superior	224,932	337,625	67	Luce, Chippewa
Mackinac	309,205	436,495	71	Mackinac, Luce, Chippewa
Manistique River	163,776	230,670	71	Schoolcraft, Delta, Alger
Menominee	123,598	245,780	50	Menominee, Delta
Michigamme	116,759	301,740	39	Marquette, Alger
Munuscong	116,985	248,653	47	Chippewa, Mackinac
Sturgeon River	216,012	301,550	72	Dickinson
Totals	1,845,797	3,084,643	60	

APPENDIX A CONTINUED

LOWER PENINSULA

State Forest District	Net State Ownership	Gross Area Within Boundaries	Percent State Owned	Counties in Districts
	Acres	Acres		
Region II				
Alpena	74,479	121,280	61	Alpena, Iosco, Alcona
AuSable	290,643	493,560	59	Crawford, Kalkaska
Black Lake	146,288	190,430	77	Cheboygan, Presque, Isle
Chippewa River	60,793	115,920	52	Osceola, Mecosta, Isabella, Midland
Fife Lake	188,914	247,686	76	Leelanan, Benzie, Grand Traverse, Manistee, Wexford
Hardwood	188,653	306,228	62	Emmet, Cheyboygan
Houghton Lake	326,039	535,720	61	Missaukee, Roscommon, Clare
Ogemaw	182,004	278,880	65	Arenac, Ogemaw, Gladwin, Bay
Pere Marquette	59,788	101,960	59	Lake, Mason, Oceana, Newaygo, Muskegon
Pigeon River	177,064	270,065	65	Charlevoix, Antrim, Otsego

APPENDIX A CONTINUED

LOWER PENINSULA

State Forest District	Net State Ownership	Gross Area Within Boundaries	Percent State Owned	Counties in Districts
	Acres	Acres		
Thunder Bay River	189,445	292,440	65	Montmorency, Oscoda
Total	1,884,009	2,954,169	64	
Region III				
Allegan	32,472	47,160	69	Allegan, Barry
Grand Totals	3,760,369	6,085,972	62	

APPENDIX B

Source of Data on Income and Product

United States Government Publications

United States Bureau of the Census

Census of Population and Housing, 1950 (Decennial)

Census of Agriculture, 1955 (Quinquennial)

Census of Manufactures, 1954 (Periodic)

Census of Business, 1954 (Periodic)

Annual Survey of Manufactures, 1957 (Annual)

County and City Data Book, 1958 (Periodic)

County Business Patterns (Quarterly, jointly with U.S. Bureau of Old-Age and Survivors Insurance)

U.S. Department of Commerce, Office of Business Economics

National Income, 1954 (Periodic) book length supplement to the Survey of Current Business

Survey of Current Business:

National Income Number, July 1957 (Annual)

Personal Income by States, September, 1957 (Annual)

APPENDIX C

Michigan State Forest Campground Survey
1959

Selection of Campground Sample

The population of campgrounds to be sampled was considered to be 93 of the 100 in the state forests. The five campgrounds in the Allegan State Forest and two campgrounds located on Bois Blanc and Beaver islands were not included because of their isolation from the rest of the group.

The 93 campgrounds ranged in size from a high of 80 rated campsites to a low of only 2 campsites. This made some stratification necessary before selection was made. However, since the rated size of the campground did not always correlate directly with its use, stratification was made according to the registered visits recorded in July and August of 1958.

A randomized selection was made of 4 sets of 30 campgrounds with each set containing 10 campgrounds which had received fewer than 200 visits the summer before, and 20 campgrounds which received more than 200 visits during the previous summer.

Using this type of random selection, 71 of the to-

tal population of 93 campgrounds were chosen to be visited at least once. Since a total of 120 campgrounds was visited many were visited twice and some even three times. The 22 campgrounds which were missed completely were all of small capacity with comparatively light use.

Method of Sampling

The sampling was made on alternate weeks starting July 1 through August 21, 1959. A set of 30 campgrounds was visited in the course of a six-day period as generally one day was allowed for traveling from Lansing to the Northern part of the state.

Every camping party with a tent, trailer, station wagon or other means of overnight camping was interviewed using the questionnaire form as shown in Sample 1. A summary of the camping information for each campground was recorded on a summary sheet (Sample 2).

Analysis of Data

Representatives from a total of 726 camps were interviewed in the 120 campgrounds over the 4 alternate week visits. An additional 112 camps were unattended when visited.

The study indicated that only about 15 percent of the overnight campers in state forest campgrounds voluntarily sign the register sheet.

The 726 camps represented a total population of 3,625

SAMPLE 1

Date_____Name of Campground_____

Address of User: City_____ State_____

Did you register? yes__ no__ For how many_____

Total in party_____

Length of stay in campground_____ Is this your destination? yes__ no__ If "no," where?_____

Primary individual interest: Camping___Fishing___Bathing

__Boating__Overnite__Other__

Equipment: Trailer____ Tent____Boat____Stove____

Do you use campground stove for: Cooking____Campfire____

Have you stayed at this campground before? yes___ no____

Have you stayed at other state forest campgrounds?

yes___ no____

Do you feel the facilities are adequate? yes___ no____

If no, indicate: Tables __ Garbage Disposal__

Toilets __ Water supply __

Stoves __ Other __

Remarks:

SAMPLE 2

Date_____ Time_____ Campground_____

Total Camping Parties_____ Total Registered_____

Total Campers_____

Day Use: Picnicking_____

Fishing_____

Bathing_____

Boating _____

Other_____

Total camp - day use_____

Campground Checklist
(Condition, adequacy, etc.)

Cleanliness:

Toilets:

Garbage:

Register Box:

Stoves:

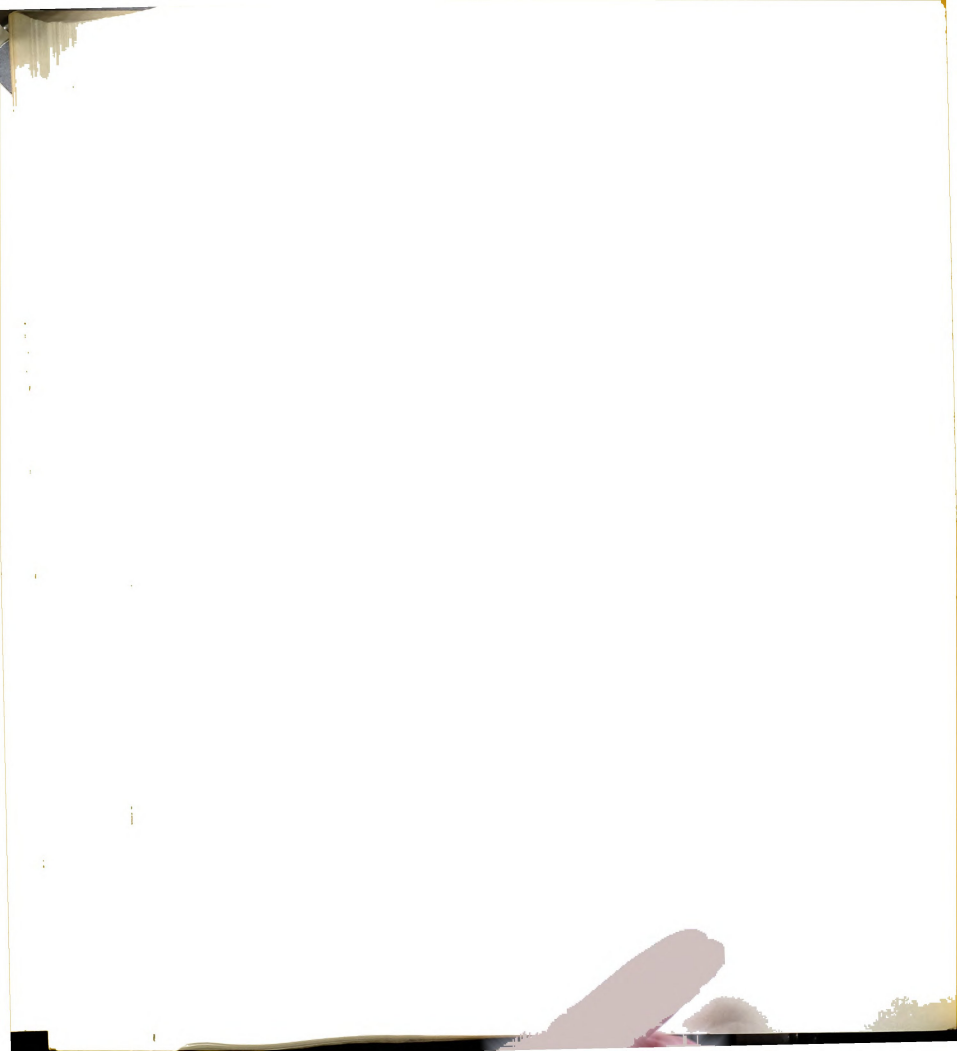
Tables:

Wood Supply:

Signs:

Hazards:

Remarks:



people with a weighted average of just slightly under 5 persons per camping party.

The average length of stay of each party was determined to be eight days.

Total camper-day use was calculated by the following procedures:

1. A tabulation was made for each of the four trips of the number of campgrounds visited on each day of the week, and the number of camps they contained.
2. From this tabulation, the average number of camps for each day of the week was calculated.
3. This average number of camps for each week day calculated for the sample was expanded to a statewide population on the basis of the ratio of the average number campgrounds included in sample for each day to total campgrounds within state forests.
4. These expanded daily averages when added together totaled an average use per week of 5,173 camps.
5. Since each camp had an average of five persons, the total camper-day use became:
   5 x 5,173 or 25,865.
6. The total camper-day use for the nine-week period of July and August would then amount to:
   9 x 25,865 or 232,780 camper-days.

APPENDIX D

Camper Expenditure Survey

Sample 3 is the type of questionnaire sent to a random selection of 320 campers who had previously been interviewed at campgrounds in the 1959 summer study of campground use, in order to develop an appropriate estimate of expenditures by campground users.

SAMPLE 3

Name_____ Address_____

Campground_____ _____

Direct Expenditures for your trip from _____ to _____

	Spent at Home (Dollars)	Spent at Camp or in Travel in Michigan (Dollars)
Gasoline & Oil, Car Service & Repairs	XXXXXXX	_____
Meals Out	XXXXXXX	_____
Groceries & Beverages	_____	_____
Fuel for Cooking & Boats	_____	_____
Sundries - paper plates, first aid, sun lotion, tooth paste, insect dope, ice, etc.	_____	_____
Entertainment - games, books, boat rental, bait, shows, etc.	_____	_____
Miscellaneous expendable items - (list items)		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Camping Equipment Expenditures in 1959 only

Tents, Trailers, & Sleeping Equipment	_____	_____
Stoves, Coolers & Cooking Utensils	_____	_____
Accessories & Tools - lanterns, axes, etc.	_____	_____
Boats, Boat Trailers & Motors, etc.	_____	_____
Fishing equipment - waders, tackle, etc.	_____	_____
Clothing	_____	_____

Miscellaneous - (list items) _____ _____

_____

_____

_____

Is fishing equipment used for fishing trips not connected with camping? yes__ no___

Is boat used for trips not connected with camping? yes__ no___

How many days did you spend camping during 1959? _____

How many of these camping days were spend in Michigan State Forest Campgrounds? _____

Total miles traveled in Michigan on your camping trip. _____

BIBLIOGRAPHY

American Automobile Association. American on the Highway, A Report on Habits and Patterns in Vacation Travel. sixth edition, 1956.

Arend, John L. et al. Growth of Unmanaged Oak-Hickory Wood Lots in Southern Michigan. U.S. Forest Service, Lake States Forest Experiment Station, Technical Note No. 327, 1950.

Atkinson, William A. A Proposed Method for the Recreational Evaluation of Forest Land. Unpublished M.S. thesis, University of California, 1956.

Barlowe, Raleigh. Administration of Tax Reverted Lands in the Lake States. Michigan Agricultural Experiment Station, Technical Bulletin 225, December, 1951.

Barlowe, Raleigh. Land Resource Economics. Englewood Cliffs: Prentice Hall, Inc., 1958.

Brockman, C. Frank. Recreational Use of Wildlands. New York: McGraw-Hill Book Company, 1959.

Brueckheimer, William R. The Significance of the Recreation Industry in Alger County, Michigan. Unpublished Ph.D. dissertation, Department of Geography, University of Michigan, 1954.

Clawson, Marion. Methods of Measuring the Demand for and Value of Outdoor Recreation. Resources for the Future. Report No. 10, February, 1959.

Clawson, Marion. Statistics on Outdoor Recreation. Washington: Resources for the Future, 1958.

Clawson, Marion and Held, Burnell. The Federal Lands: Their Use and Management. Baltimore: John Hopkins Press, 1957, p. 250.

Clawson, Marion, Held, Burnell and Stoddard, Charles H. Land for the Future. Baltimore: John Hopkins Press, 1960.

Conture, Lawrence H. Seventy-Five Million Dollars a Year Just for the Fun of It. Massachusetts Division of Fisheries and Game, 1954.

Craighead, John J. A Biological and Economic Appraisal of the Jackson Hole Elk Herd. New York: New York Zoological Society and the Conservation Foundation, 1952.

Curtis Publishing Company. The Travel Market Among U.S. Families with Annual Income of $5,000 or More. Research Department, 1955.

Dana, Samuel T. Problem Analysis Research in Forest Recreation. Washington: U.S. Forest Service, 1957.

Dawhurst, Frederick et al. America's Needs and Resources. New York: Twentieth Century Fund, 1955.

Eichstedt, John H. Payments in Lieu of Taxes on Public Lands Under the Jurisdiction of the Michigan Department of Conservation. Papers in Public Administration No. 16, University of Michigan, 1956.

Ely, Richard T. and Wehrwein, George S. Land Economics. New York: The MacMillan Company, 1940.

Fortune Magazine. The Changing American Market. Garden City, New York: Hanover House, 1955.

Hahn, Henry C. Jr. Economic Value of Game in the Edwards Plateau Region of Texas. Texas Game, Fish, and Oyster Commission, May, 1951.

Hammond, R.J. Benefit-Cost Analysis and Water Pollution Control. Food Research Institute, Stanford University, 1959.

Hanson, John. Wood Using Industries of the Lower Peninsula. Michigan Conservation, Vol. XX January, February, 1951.

Hedrick, Wilbur O. Recreational Use of Northern Michigan Cut-Over Lands. Michigan Agricultural Experiment Station Bulletin No. 247, 1934.

James, Lee M. and Deurr, William R. Farm Woodlands and the Timber Economy of Michigan. Quarterly Bulletin, Michigan Agricultural Experiment Station, Vol. 43, February, 1960.

_____. The South's Income from Timber Products. Southern Lumberman, March 15, 1951.

_____. Timber Values from Michigan's Forests. Quarterly Bulletin, Michigan Agricultural Experiment Station, Vol. 34, February, 1952.

James, Lee M. and Yoho, James G. Income from Timber Products in the United States. Journal of Forestry, Vol. 51, February, 1953.

King, Ralph T. Forest Geology and its Relation to a Wildlife Program as Applied on the Huntington Forest. Roosevelt Wildlife Bulletin, Vol. 7, 1941.

Lefer, William S. The Sociology of Deer Hunting in Two Pennsylvania Counties. Unpublished M.S. thesis, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, 1953.

McMurry, K.C. Use of Land for Recreation. Annuals of the Association of American Geographics, XX, 1930.

Michigan Agricultural Experiment Station, Michigan Log. Marks, Memoir Bulletin No. 4, 1941.

Michigan Commission of Inquiry on Tax Lands and Forestry. Lansing: Wynkoop and Hallenberk Crawford Company, State Printers, 1908.

Michigan Department of Conservation. Biennial Reports, Vols. 1-19.

Mitchell, J.A. and Sayrs, H.R. Forest Fires in Michigan. Michigan Department of Conservation in Cooperation with the U.S. Forest Service, 1931.

Palley, Marshall N. A Proposed Technique for Measuring and Comparing the Economic Importance of Timber and Wildland Recreation in Michigan. Unpublished Ph.D. dissertation, Michigan State University, 1956.

Pearson, Ross N. Recreation and its Significance in the Economy of Ogemaw County, Michigan. Unpublished Ph.D. dissertation, Department of Geography, University of Michigan, 1954.

Prewitt, Roy A. The Economics of Public Recreation - An Economic Study of Monetary Evaluation of Recreation in the National Parks. National Park Service, 1949.

Reuss, L.A. Land Utilization Data as Background Information for the National Balance Sheet and Approximation of the Value of Forest Land. Studies in Income and Wealth. Vol. 12, New York: National Bureau of Economic Research, 1950, p. 233.

Schick, Charles. Value of Michigan's 1954 Game and Fur Crop. Cooperative Extension Service, Michigan State College and Michigan Department of Conservation, Lansing, 1955.

Smith, Norman F. Michigan Forests and Forestry. Unpublished manuscript, Forestry Division, Michigan Department of Conservation, 1947.

Stains, Howard C. and Barkalow, Frederick S. The Value of North Carolina's Game and Fish. North Carolina Wildlife Resources Commission, Raleigh, 1951

Stanford, Research Institute. America's Demand for Wood, 1929-1975. A Report to the Weyerhauser Timber Company, Tacoma, Washington, 1954.

Steer, Henry B. Lumber Production in the United States, 1799-1946. Washington: U.S.D.A. Miscellaneous Publication No. 669, 1948.

Swift, Earnest, A History of Wisconsin Deer. Madison: Wisconsin Conservation Department, Publication No. 323, 1946.

Thomas, Donald W. An Economic Analysis of Deer Damage to Farm Crops, and Income from Deer Hunters (Potter and Monroe Counties, Pennsylvania, 1951). Unpublished Ph.D. dissertation, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University, 1954.

Titus, Harold. The Land Nobody Wanted. Michigan Agricultural Experiment Station, Special Bulletin 332, 1945.

Trice, Albert M. and Wood, Samuel, E. Measurement of Recreation Benefits. Land Economics, Vol. XXXIV No. 3, August, 1958.

Upchurch, M.L. Economic Factors in Western Range Improvement. Journal of Farm Economics, XXXV, December, 1953.

U.S. Bureau of the Census. Annual Survey of Manufactures: 1957. Washington, D.C., 1959.

U.S. Federal Inter-Agency River Basin Committee, Sub-Committee on Benefits and Costs, Proposed Practices for Economic Analysis of River Basin Projects, 1950.

U.S. Fish and Wildlife Service. National Survey of Fishing and Hunting. Department of the Interior, Circular 44, 1955.

U.S. Forest Service. Basic Forest Statistics for the United States as of January, 1945. Washington: September, 1950.

U.S. Forest Service. Program for the National Forests. Washington: Miscellaneous Publication No. 794, 1959.

U.S. Forest Service. Timber Resources for America's Future. Washington: 1958.

U.S. National Park Service. A Method of Evaluating Recreation Benefits and Costs of Water Control Projects. August, 1956.

U.S. Office of Business Economics. U.S. Income and Output. Department of Commerce, Washington, D.C., 1958.

Wallace, Robert F. Economic Aspects of Wildlife Resources of the State of Washington. Pullman: State College of Washington Business Studies Bulletin No. 19, 1952.

Waugh, Frank A. Recreational Uses on the National Forests. Washington: U.S. Government Printing Office, 1918.

Yosemite National Park Travel Survey. National Park Service, California Division of Highways and Bureau of Public Roads, 1953.

Zillgitt, William M. Stocking in Northern Hardwoods under the Selection System. Society of American Foresters Proceedings, 1947.

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