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THE ECONOMIC HANDLING
OF THE
WOODLOTS OF MICHIGAN
THESIS FOR DEGREE M. FOR.
FRANK HOBART SANFORD
1913

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THE ECONOMIC HANDLING

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WOODLOTS OF MICHIGAN.

by

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Being an
investigative study of woodlot
conditions and the economic
use of woodlands. Especial
reference being given to the
owners' attitude.

That the Michigan woodlots have suffered a gradual decline during the past twenty-five years, is readily conceded by all who are advised of the facts. But just how far this decline has gone and the most probable reasons for it, have not been made clear; not will the matter be righted for many years after the facts are known.

The general expression so commonly voiced in the words--"Well, the woodlot does not look as well as it used to" may be applied to seventy-five per cent of the woodlots of Central Michigan.

Observations along this line were first noted by the writer in 1905, since which time studies have been made and noted whenever and wherever possible, and especially in that part of Michigan south of a line from Saginaw to Muskegon, which constitutes the north boundary of the true woodlot area of the State. Woodlots have been examined in every county south of the line indicated; while woodlands of the counties of Jackson, Eaton, Ingham, Calhoun, Washtenaw, Hillsdale, Berrian, Cass,

Wayne, Oakland, Saginaw, and Ionia have been examined very fully. In following out the work indicated above, many other woodlot areas than those covered by this report were noted in a general way while traveling past them. Observations taken in this way from the carriage or the car window, proved of very great value later, when checking up conditions in various counties.

Several townships were studied thoroughly, viz.: In Jackson county, the townships of Sandstone, Parma, Tompkins and Springport; in Genesee county, the towns of Atlas, Grand Blanc and Gaines; in Ingham, the towns of Meridian and Lansing; in Ionia, the town of Easton; in Oakland, the town of Oxford and in Cass, the town of Penn. In all a few over five hundred wooded areas were examined to obtain the data for this report. The method employed, was in a general way, the same in all cases. The following items received the most careful consideration:--

1. The total area and the general condition of the stand; whether young second growth, or old mature timber.

2. Species predominating and drainage, or types.

3. Whether the area might not be more valuable for agriculture than for forests. This depended largely on topography and could not be determined with any degree

of satisfaction under the methods employed.

4. The uses made of the woodlot, the methods employed in the management, and a general view of the owner's ideas. It was necessary to meet and talk with the owners of the woodlots, regarding the profits and benefits they derived annually, and as well as their views, opinions and intentions; in this way the owner's attitude was made apparent and a closer relation revealed.

Owner's Attitude.

These talks often revealed more than was really stated, for many times in the owner's absence the renter's version was noted with interest and the reasons for the existing conditions were often thus revealed. It was further found that during the last twenty-five years, a very large per cent of the farms had either changed hands or gone into control of renters, either change usually working havoc with the woodlot.

The writer witnessed scores of answers to the query regarding the disposal of recently cut timber, as:--
"Yes, that made a part payment on the place, and besides, I needed the land for pasture."

So common was this attitude among renters and new purchasers that it was often considered futile to suggest a better system of woodlot management to them. Further, it was observed that the older men--those who had

owned and preserved their woodlots for the past thirty to fifty years, and also, the younger men who had received instruction or who were experienced earlier on their father's farms, were conservators and not wasters or careless users of the woodlot. Both classes were emphatic in expressing some well considered plans. From the standpoint of the forest enthusiast, as well as from the aesthetic viewpoint, this condition spells "disaster." But from the standpoint of economic development of the Michigan farm, it may be the reverse.

In conferences with good farmers, it was found that in many cases farm lands were too valuable to be permanently devoted to the growing of timber. The average farmer did not care to take upon himself the responsibility of devoting a part of his best agricultural land permanently to the growth of trees. Some considerable sentiment prevailed against any addition or improvement to the present forest lands, for the reason that the returns from timbered land were not large enough to justify the cost.

Each owner or renter interviewed was induced to state as far as possible, his views and attitude toward woodlot improvement and maintenance. The following are some of the questions asked to obtain that information:--

1. Does your woodlot pay? This question usually

started talk which was carefully guided by other questions until the desired information was secured, such as:--

1. Amount of fuel per year and value?
2. Head of stock pastured?
3. Timbers cut?
4. How do the returns from the woodlot compare, acre for acre, with the returns from farm land?
5. Do you plan to improve the woodlot?

Such interviews revealed that there were three rather well defined classes of woodland owners.

Class 1. Those men who considered the woodlot an indispensable adjunct to the farm and who were doing what they considered the proper thing for its preservation. Usually they freely acknowledged the woodlot to be a poor business proposition, but were unwilling to convert the standing timber into cash and the soil into farm land, because of sentiment. They were attached to the woodlots and could afford to maintain them as such.

Class 2. Those men who were fully acquainted with the present woodlot condition and were not satisfied with the results from it. They were ready to change their old methods for better. They looked at the woodlot from an economic standpoint rather than a sentimental. Many of them had compared the money returns of

the wooded acres with the income from the farmed acres and were not satisfied with the showing made. Others were talking of cutting and clearing portions of their woodlots, because of the need of greater acreage and higher returns. The acknowledgement of this last condition was usually made with some reluctance by the owner. Sentiment was strong in him still, but the demand that the land be made to produce more was stronger.

Class 3. This class included a large class of owners and renters who use the woodlot as they would a supply depot, taking out the timber and fuel most easily obtained, regardless of young growth or future yield. They pasture every acre every year. They seem to act on the motto--"There is enough for us--let the future look out for itself." Or as one "self-made" farmer expressed himself--"Well, the boy can look out for himself like I had to; nobody spent any money growing timber for me." The handling of woodlots by this class means only one thing eventually, viz.: A depleted and worthless woodlot of poor cull species, and a materially lessened inheritance to the "boy" who takes the farm a few years hence.

An attempt made to determine the number of owners belonging to each class was not satisfactory, but a careful estimate places them about as follows:--

Class 1.-----40 %

Class 2.-----35 %

Class 3.-----25 %

On account of an apparent indifference regarding the work and often a reluctance to make positive statements, a number of men who might rightly belong to Class 1 or 2, were necessarily placed in Class 3, thus making that class somewhat too large.

A few outlined definite plans for handling their wooded holdings. In most cases these plans were for cutting only. They were systematically removing the timber from the more valuable lands. Their ultimate aim meant the conversion of timber into cash, and woodlot into plowland. Only in a few of these examples, was there found any sentiment favoring systematic growing of trees for woodlot purposes.

One example in southern Ingham county illustrates the exception. The owner of a large farm is planting the odd irregular patches and exposed hillsides for permanent woodlot purposes. His present timber lands are being cleared because they are level and better suited for farming. He plans to cut systematically from the woodlots as fuel and farm demands, until the new plantings become available. Another man near Watervliet, recently made plans to gradually establish his woodlot on eroded land, by planting, and to clear the

woodlot which stands on good rich level land. The ultimate result will mean the utilization of all good land of the farm for farming, and the poorer lands for the growing of fuel-posts and general purpose timbers.

Other Wood Crops.

In a few instances the writer found that special or product crops were being taken from some portions of the farm woodlot annually. The two important crops in this line are Maple sugar and nuts. Strictly speaking, such business is orcharding and not forestry; nevertheless, it is considered as a part of the woodlot returns, and as such, goes far toward raising the annual revenues of the woodlot.

There is little question but that woodlots of hard Maple and Shagbark Hickory, Walnut and Butternut should and will be the last to be cleared to make way for more intensive lines of agriculture. The present returns are from five to twenty dollars per acre, per year for the products alone, and with systematic care, proper thinning and selection cutting, the incomes should be increased.

Types of Woodlots.

Ignoring all factors save that of probable future timber crop, we find that there is a wide range in the kinds of woodlots. Many are ideally located as permanent woodlands, occurring on the poorest, most inac-

cessible land of the farms--too hilly to farm or too wet for cultivation and impossible to drain; while others are located on the main roads--near the farm house--on heavy flat lands, capable of yielding large farm crops. The following types of woodlands occur with greatest frequency:--

Type 1. The timber stand of all ages on steep hilly land, usually of rather light, gravelly soil or sand or clay which washes badly when the timber is removed. The species of trees on this type are mixtures usually of Black, White and Red Oaks, Cherry, Blue Beech, Ironwood, Dogwood, Sassafras and often some of the Poplars. (See Fig. 1.)

Type 2. The same hilly condition with timber of one age class present or with many age classes lacking; denoting either recurrent fires or frequent grazing. The species composing such a type may be somewhat mixed but only a limited number of medium to large sized trees to the acre; and of such species as White Oak, Red Oak, Black Oak and Cherry. There is usually a noticeable lack of underbrush and no reproduction; grass is usually present. (See Fig. 2.)

Type 3. The low swamp stand of Cedar, Black Ash, and Tamarack where drainage is difficult or impossible (See Fig. 3.)

Type 4. The lowland type composed either of mix-

ed species, such as Elms, Ashes, Basswood, Swamp Oak, Burr Oak, Sycamore, Maple, Tulip, Gum and Beech or nearly pure stands of Hard Maple by selection. Practically even age and little or no young growth. Capable of drainage, usually. (See Fig. 4.)

Type 5. The dense second growth stands of White Oak, Black Oak, Red Oak, Cherry, Beech, Hard Maple, Tulip, Ironwood, Sassafras, Birch and Poplar growing on the rolling loams--not pastured because too dense. (See Fig. 5.)

Type 6. Dense second growth Maple stands, after cutting of old timber clear. A mass of young seedlings and sprouts from one inch to four inches--six inches in diameter; not pastured because too dense. (See Fig. 6)

Type 7. Stump lands of all soils with sprouts in scanty stand--pastured. (See Fig. 7.)

The park-like stand of mature reserve cull trees--the common wooded pasture. Other isolated stands were found but did not recur often enough to warrant classification as types.

Types 1 and 5 are found with great frequency in several counties, viz.:-- Jackson, Oakland, Ingham, Ionia and promise more from a permanent woodlot standpoint, than any of the other types, for the reasons--

1. The soil is better suited to wood crops than to agriculture.



2. A great variety of species of useful woods is favored and thus makes rapid growth and meets many demands.

In general, the reproduction of species is fully looked after by natural reseedling. The light pasturing of such woodlands does little harm since the growth of young seedlings is usually too dense, and even the application of periodic thinning out of the weaker individuals for purposes of fuel, would relieve the crowding and give the light to those trees capable of making the best use of it. In the woodlots examined in this class, no efforts along this line were noticed. In fact, out of several hundred woodlots examined, no examples of silvicultural thinning or other silvicultural practices were found. But on the contrary, all cutting appeared to be entirely haphazard, with no regard for the possible effect of such cuttings on the future timber crop. The condition is universally one of lack of management, and therefore, the effect on the woodlot tends toward the reduction of its productivity.

Object.

The object of this study has been, among other things, to determine whether the woodlot has a chance in the next few decades to compete as a crop with the other farm crops growing on the same kind of land. This

is a question that can only be answered in a speculative manner. By careful study of present conditions and values, and by comparisons with prices of farm crops and farm lands with those of forest lands, we may be somewhat definite in our prediction regarding the future farm woodlot situation.

Basing all study on the present valuation and use of land, we are able to definitely classify farm woodlot lands into two great divisions, as:--

Div. 1. Lands best suited to agriculture.

Div. 2. Lands best suited to growing of timber.

With the increasing valuation of farm land, we must acknowledge that in a decade or two at most, our land classes are bound to change. With the rise in price of good farm land, the poorer lands will feel a corresponding rise. The areas of true farm forest soil will be reduced for the following reasons:--

1. The long term investment is not popular with the agriculturist. He desires to turn his capital at short intervals or annually.

2. The returns from farm crops on the so-called forest soil under proper methods of agriculture, will exceed forest crop returns.

3. The term Forest Soil, in the farming region of counties named will, with the advent of more intens-



ive methods, become obsolete.

The soil on the Michigan farm that is so poor that it comes under the definition of Forest Soil, viz., a soil that will yield no farm crop in paying quantity and is thus fit only for the growing of trees, is in such small acreage that it may justly be ignored.

The so-called Forest Soils of Type 1 are those soils which are so hilly, permanently wet, periodically flooded or else broken by stream or other obstacles, as to render them difficult of being profitably farmed. They are not soils deficient in plant foods as a rule. Many woodlots of Jackson, Ingham, Calhoun and Ionia counties are on light land of gravel, sandloam and sand; but nevertheless, very fertile if properly handled, though at present designated as Class 1 or Forest Soils.

Taking up the consideration of the several types of woodlots common to these counties, from the standpoint of profit or economic management, it is necessary to make three groups of the seven types.

Group 1. The first group will consist of those types which stand on strictly good agricultural soil. It may be that lack of drainage is the only factor and, in many examples, was the only reason why the land was classed as Forest Soil--as Types 3, 4, 5 and 6 are grouped here. Type 4, because of the valuable and semi-mature

timber which on account of the low price and lack of demand for the soil, may be allowed to stand a decade or more before harvest and when the timber is harvested, clearing will be more economical than reforestation.

For the same reason, Type 6 should be retained in Group 1. Man must aid Nature by systematic thinning and selection, in order to attain maximum increment in both height and diameter. A longer period to maturity would demand lower priced land if thus handled.

Group 2. In this Group, Type 7 stand alone as being held through sentiment largely, and from an economic standpoint, would pay better if placed under the plow.

Group 3. --Permanent woodlots.-- Types 1 and 2 are included here. Type 1 should be maintained as a permanent woodlot because:--

1. Land at present is not economically farmable.
 2. The timber stand holds the soil by preventing erosion.
 3. Yields large annual growth at low land rental.
- Type 2 warrants some outlay of planting and seeding to bring it into condition of Type 1, and maintained for the same reasons.

In Group 1, the timber is in full stand and awaits only the time when the annual rental of the land of agriculture, far exceeds the wood return.

In Group 2, the greater value of the land for agri-

culture is entirely apparent. The present stand of timber is broken or culled or else very young and patchy, and of little or no value as growing stock.

In Group 3, the greatest value lies in producing a crop of timber. As stated above, the time will probably come when even such lands will be too valuable for use of timber production; but for the next generation or two, at least, wood is the best crop.

Methods of Estimation of Reproduction.

The Square Rod Method. By selecting the average spots in the woodlot, small plots one rod square were laid off with considerable accuracy. On these plots all seedlings and saplings were counted and species recorded. Usually the rule of one such sample plot to each two and one-half acres was followed. The necessary computations were later made and record tabulated. This gave the desired data for each woodlot covering the reproduction.

The one-fourth acre method of estimating the stand was used in determining the stand values. But these were not desired in the study and consequently, were not taken regularly.

As an incident in the work, it was found that some little time spent in giving the owner an ocular estimate of his timber served to increase his regard of the work and consequently aided in the securing of data.

Examinations covering contiguous woodlots, taken in order over a definite portion of the township, gave the following results as to reproduction:--

Location.	:Woodlots :without :reproduc- :tion.	:Woodlots :having :scanty re- :production- :under 300 :per acre.	:Woodlots :having in- :ferior spe- :cies as re- :production.	:Woodlots :having good :reproduc- :tion.
Genesee Co., Gaines. Twp.	: 16	: 3	: 1	: 6
Genesee Co., Grand Blanc.	: 10	: 3	: 2	: 10
Jackson Co., Parma.	: 35	: 8	: 0	: 30
Jackson Co., Sandstone.	: 22	: 9	: 0	: 14
Jackson Co., Spring- port.	: 14	: 6	: 1	: 12
Oakland Co., Oxford.	: 40	: 7	: 0	: 80
Cass Co., Penn.	: 42	: 4	: 0	: 45
Ionia Co., Easton.	: 56	: 16	: 4	: 32
Ingham Co., Meridian.	: 4	: 1	: 1	: 3
Ingham Co., Lansing.	: 5	: 3	: 0	: 4
TOTALS.	: 244	: 60	: 9	: 236

In all, five hundred and forty-nine woodlots were examined. On three hundred and thirteen woodlots there was found so little reproduction that no sample plots were made. On two hundred and thirty-six woodlots the young growth was sufficient to warrant an estimate. The final average was two hundred and nine seedlings of all species per acre as the result on one hundred and fifty-eight sample square rod plots. The two reasons why the reproduction stand averages so low are:--

1. Crown Density.
2. Grazing.

The maximum crown density recorded in a few woodlots was ninety-five per cent, while the average crown density for the woodlots comprizing the two hundred and thirty-six acres above mentioned was fifty-eight per cent. No records were made of crown density on the three hundred and thirteen woodlots where no reproduction occurred, but since grass was growing well, the density average would have read below four per cent.

Pasturage.

It may be said that no other agency has so seriously interfered with the best development and growth of the South Central Michigan woodlots as the pasturage and trampling of live-stock. Following a careful

examination of three hundred and sixty-two woodlots, it was found that two hundred and fourteen were pastured regularly every season, or that only thirty-eight and one-third per cent were not pastured at all. In nearly all cases where the woodlots were pastured, it was not possible to make a study of reproduction since the reproduction was either entirely lacking, or so scanty as to warrant no consideration. Of the one hundred and fifteen woodlots that were not pastured, it was found that:--

1. All age classes were represented.
2. All land utilized, no openings.
3. Well formed trees, properly crowded.
4. Good ground cover of leaves, duff and litter, without grass.
5. Over-stocking of trees generally, and dense stand--no chance for wind to sweep through.
6. The soil was soft, loose and open, and contained much humus; retentive of moisture and furnishing a good germinating bed for seed.

An examination of the pastured woodlots revealed conditions as follows:--

1. Irregular clumps of trees and intervening openings.
2. Soil packed and hard.
3. Absence of leaf cover and litter.

4. Evidence of wind sweep.
5. Grass, weeds, underbrush and brambles present but little or no reproduction.
6. No chance for seed to reach mineral soil for germination.
7. Trees often ill-shaped, having very rapid taper and very branchy.
8. Usually very few age classes were represented, depending however, on number of years since regular pasturage began.

Irregular Pasturage.

A small per cent of the woodlots classified as not pastured, are in reality pastured; either lightly or at long intervals with very little damage, if any, resulting.

Value of Pasturage.

Many factors enter into the question of the value of woodlot pastures. The three most important are:--

1. Density of woods.
2. Kind of stock pastured.
3. Character of ground cover.

The more open the woods, the more valuable it becomes for pasture, since all forage plants and grasses require abundant light. A woods having a crown density of nine per cent furnishes little or no green fodder for the sheep or cow; and if such woods are pastured,

the only benefit derived is the shade and freedom from flies during the heat of the day. The damage to such woods, other than packing of the soil, was practically nothing.

The crown density of a woodlot furnishes a very good ^X gauge for measuring the probable damage from grazing. Taking the woods of lesser density first, it was found that a crown cover of three per cent or less, belonged ordinarily to Type 7 as described; and as such does not warrant the expense of maintenance as woodlot.

Woods of eight per cent density or above, were found to be little damaged from pasture, since not enough light reached the forest floor, to establish herbaceous growth.

The woods having densities ranging between three and eight per cent however, were very subject to the pasture damage. Ninety per cent of the pastured woodlots came within this class..

Kinds of Stock Pastured.

Cattle and Horses. The chief damage from young horses and cattle in the woodlot, arises through the tramping of the soil and injury to the seedling crop. The browsing did not appear to be serious, except when grass pasture was very short, and even at that, not as serious as is commonly supposed. The real injury be-

longs to the soil, since the packing of the soil by stock and loss of the rich leaf and litter mulch by wind action prevents the means of natural fertilization.

Sheep. Sheep browse very closely, and seem to always prefer the one and two year old tree seedlings to the wire grass and other woods plants, and are especially destructive.

Hogs. It was observed in a limited way that the pasturage of hogs in the woodlot during the mast season has a beneficial effect, since they root the soil and thereby bury quantities of seed that otherwise would not reach the moist mineral soil. No data was available to prove that this observation was correct. In three instances, hogs were found to be pasturing regularly and these were observed.

Character of Ground Cover.

The amount of ground cover in the woodlot depends directly upon the density of the crown as stated above. The kind of plants making up the ground cover vary widely and depend upon the moisture present in the soil. Dry, rolling soils having a low crown density of one to four per cent are usually poor for pasture. Wire grass is the only abundant forage plant. Also, many forms of objectionable undergrowth come in on these lands, such

as bramble and briar bushes, along with the tree weeds in large quantities. Low flat lands having a low crown density furnish the greatest amount of weeds, grasses and other forage. And it is this class of woodlot which must be cleared eventually and give ly to pasture.

The Model Farm Woodlot.

In order to place the results of this series of investigation in a form for economic application, the writer undertakes a plan for the conversion of good farm soil woodlands into farms, while the necessary acreage of woodland may be maintained and made to serve a double purpose of farm protection and timber production.

Why the Present Conditions Exist.

The study of the future forest crop possibilities was considered as being very important, since it furnishes the key to the future development and value of the woodlot. Natural planting costs nothing while artificial planting requires an outlay of both time and money. Economic handling demands that attention and care be given to the protection of these annual crops of wild seedlings if the woodlots are to be perpetuated. The following conditions were revealed by the search:--

1. No records of instruction regarding the proper

handling of the seedling crop.

2. An attitude of indifference and often of ignorance regarding the way trees grow and reproduce.

Several well enough posted men, otherwise, were surprised and decidedly so, when told that trees like Elm and Maple grew from seed. One man who had spent the most of his life in the lumber woods, and an authority on logging operations, would not believe that good forest could again be grown on the cut-over land; nor could he be made to realize that there was any use of protecting the young growth. These examples are cited only as illustrations of the conditions existing throughout our fair State. They are in no way exceptional or extreme, and they should help to emphasize the great need for more liberal education.

The reason that woodlot owners are uninformed to such a large extent, lies in the fact that the wood crop has yielded them the least annual income of any of the crops handled. They do not hesitate to inform themselves upon the fine points of growing corn or alfalfa, as soon as they see it demonstrated as a paying proposition.

The average farmer is very quick to see the practical turn in any suggested improvement, and once interested, he is usually a consistent worker; but the writer is forced to accept the fact revealed in personal conversa-

tions with a great number of woodlot owners, that the practical advice given out during the past decade, has been almost worthless. Even forest educators have indulged in the peddling of sentimental notions to a great extent, while the various organizations acting from aesthetic promptings have always favored and accepted such doctrines and have helped to spread them broadcast. Continued sentimental talk and articles tire even the theorist, while they disgust the men of practical affairs. Farmers have repeatedly spoken of the forestry sentiment as twaddle and nonsense, and usually because no direct and practical methods have ever been pointed out to them. When they are shown that benefits of importance to all crops are secured if a well defined system of timber growing is followed, the attitude changes favorably. Whenever a plan of operation was presented, to cover the following points of value to the farm, an interest was usually manifested at once. The points of value in the plans covered, are:--

1. Protection to farm buildings and stock.
2. Windbreak action to prevent excessive and rapid evaporation of soil water from the fields, adjacent to the wooded area.
3. A continued supply of fuel and farm timber.
4. The rotation plan of treating timber as a crop.

5. The means of handling the wooded area of the farm so as to increase fuel production without injury to the windbreak feature.

6. Economic use of side hills and poor areas.

Five per cent of the farmers are tree planters; their tree planting is done in the form of windbreaks and for ornamental purposes, or both. Less than one-half of one per cent of the farmers interviewed by the writer during the last eight years, have attempted systematically to improve their woodlots by planting. The results from such work once begun, are very discouraging and seldom completed. There has been no way to determine the number of woodlot owners who have accepted recommendations offered by various institutions, but in nearly every case where a feasible method was presented to them, they acknowledged the logic and reasonableness of the proposition, but were not eager to undertake the long improvement.

The above observations were made on woodlots occupying land so situated as to be as valuable if cleared, as the farm land adjacent. No objections to the use of lands not fitted for farming purposes have been heard at any time. That woods owners recognized the need of wooded areas both from an aesthetic and from a practical standpoint, and are entirely ready and in many cases agree to formulate plans for the development of plantations to meet

such needs, is on the increase annually. The issue as it appeared after this preliminary examination was as follows:--

That there existed two general classes of woodlots called farm woodlots. The one occupying land of high value from an agricultural standpoint, when cleared; the other occupying the waste, hills, marshes and irregular portions of the farms. No distinction has been made by the average speaker or lecturer before the various townships and county organizations, between these two classes. Consequently, they have tried to apply one rule to both. A great deal of criticism and lack of interest arose. The farmer who owns the woodlot of Beech or Maple standing on level soil, realizes the futility of too heavy expenditure to establish a lower story or in other ways improve it for a second crop. He realized first, it would require a great many years and the land would be very valuable for agricultural purposes. Second. The man who owns the woodlot occupying what we may call non-agricultural soil, looks with favor on the propaganda of the improvement and woodlot perpetuation.

That the farm having a woodlot of mature timber without reproduction, and standing on valuable land may provide for the harvesting of the present crop, and at the

same time provide for a future crop which will accomplish a double purpose of furnishing timber and providing protection to the farm, the following plan is suggested:--

To the farm which has soils better adapted to tree growth than to farming, the only necessity is to manage those soils for the production of a crop of wood. Owing to the abundant rainfall and favorable soil conditions of the woodlot region of Michigan, there is no difficulty in getting trees established. Since tree growth is almost spontaneous in southern Michigan, farmers have never been compelled to plant in order to enjoy the benefits of wooded lands. Consequently, they do not sympathize with the idea of artificially producing the woodlot.

This tendency to leave the woodlot alone is not due to any attitude of indifference but rather due to the generosity of Nature itself. The experience of the Forest Service and the experience of various states, goes to testify to the truth of the fact that in the woodlot region of the United States, the general farmer is not seriously concerned about the waning timber supply. Many of the recommendations given by the United States Forest Service to woodlot owners, were found to be lying unheeded in the owner's possession, simply a monument to an attempt

on the part of the government to aid the farmer in something in which he did not desire aid.

Many of the fruit growers and truck farmers of the fruit belt were found to be thinking of better utilization of their land and of better economical conditions on the farm. To this end they were favoring gradual elimination of the woodlot, standing on agricultural soil. In opposition to this, many of the farmers of the central and eastern part of the state were found, who through long established habit, still belonged to that Class I mentioned earlier, and who could think of the existing woodlot only as an inheritance to be handed down to the future generation intact.

Essentials Necessary for the Establishment
of a Model Woodlot.

1. Working plan of farm and woods, worked out in detail.
2. Clear conception of the object by the owner.
3. Willingness of owner to adhere to the principles of the plan, during life of the plan or rotation, and agreement to carry it through.

The Plan.

1. In drawing up a plan the owner should seek the assistance of some person familiar with the rate of tree growth, soil requirements and species adapted to the work.
2. The double object of protection from winds and

production of woody growth must be kept equally in mind.

3. Base the necessary future acreage upon the popular idea of one acre of woodland for each ten acres of plowland.

4. The soil survey of the farm designates the location of the poorer soils--the steep side hills that gully badly or sandy, leechy portions of certain fields, etc. Regular shaped strips and not irregular patches should be set aside. A field should not be broken up simply because there is an acre of poor soil in the center, unless a regular subdivision may be made to suit the farming plan.

5. Areas laid out especially for windbreaks should be widened to four or six rods to serve as shelter shelterbelts and woodlots.

6. The action of the new woodlot as a breaker of wind is valuable and justifies the setting aside of good land. For example:--A farm having a west front exposed to the wind for one hundred and sixty rods, could afford a six rod strip to be kept in timber along the entire west side. Another strip parallel to this and eighty rods east would protect the one hundred and sixty acre farm from westerly winds, as well as supply adequately, the twelve to fifteen acres of woodlot deemed necessary.

The effect of these windbreaks in moisture conservation is usually considered as proportional to their heights or as furnishing protection of one rod for each foot in height.

7. As the new woodlot is established, the old woodlot of mature, scattered or over-ripe timber, etc., should be utilized. A definite acreage should be cut annually so as to provide a constant supply for farm use.

8. Plan for Planting. The plan should call for annual planting of a definite area, thereby finishing the planting of the new woodlot from ten to twenty years before the cutting of the old woodlot is finished. The details of planting, such as species, spacing, age of plants, etc., should be fully covered in the plan.

9. Items covering the proper cultivation, care and fencing of new planting, should be taken up in detail as well as, later thinning and pruning.

Summary.

In general terms the sentiment regarding the woodlot situation of southern Michigan seems to be greatly divided. There is no concensus of opinion regarding the need of improvement or change in management among the owners.

The need for greater education on the part of the

of the woodlot owners, covering methods of economic management of the woodlands was apparent. A survey of several hundred woodlots revealed the factors which are working toward the destruction of the woodlot as well as those aimed to conserve it.

An indifference of the larger number of owners, regarding the benefits of timber and timber growth was well established. A small per cent of the owners were giving the subject some serious consideration and a few were endeavoring to do something definite to improve and conserve their holdings.

The various types and conditions of woodlots were studied in an endeavor to suggest a better method of management. Two plans are suggested. One is applicable to farms more or less broken in topography or subject to damage by erosion, etc., in which the suggestion is made to devote the so-called forest soil of the farm to woodlot.

The other provides a definite plan for the establishment gradually, of a new woodlot, which will combine with wood production, the phase of moisture conservation, and a gradual elimination of the old woodlot which must give way to a more intensive system of agriculture.

PHOTO DESCRIPTIVE.



Figure I.--Type 1.

An open stand of White and Black Oak, and Black Cherry in Jackson county. The soil is a loose gravel loam with a clay sub-soil. In places, tending to be sandy, very rolling and hilly. Even though the timber stand is light and rather open, the ground cover is poor and composed of scanty tufts of wire grass and small brush growth.



Figure II.--Type 1.

An open stand of White Oak mostly, with a few Red Oaks, Cherry and occasional Beech. The soil is sandy to sand loam and rolling. This type of woodlot is common through out the region.



Figure III.--Type 2.

A very characteristic view of the high land pastured woodlot in Oakland county. Grass grows well because of the very scanty timber stand. Small tufts and underbrush are almost entirely lacking. This shows the effect of continued pasturing for many years.



Figure IV.--Type 3.

A characteristic swamp of Alder, Willow and water-loving tree growth, occupying land valuable when drained, for pasturing and farming.



Figure V.--Type 4.

One of the common woodlots of this type, in which the increment is very slow and rise in land value very rapid. There is little economy in keeping these woodlots in timber.



Figure VI.--Type 5.

This young stand of White Oak is growing rapidly. It is dense, straight and tall. The soil is a fair grade of gravel loam with clay sub-soil, well drained. Not a high priced land, though very good for farming. Will pay to grow the present timber crop to maturity.



Figure VII.--Type 6.

A woodlot recently harvested and left to produce a second forest from sprouts. The cut has been too severe to insure a full stand of coppice. Seed trees should have been left to reseed the open spots and supplement the coppice growth.



Figure VIII.--Type 6.

A sprout forest in Ingham county. The old timber has already been removed. Pasturage has not been allowed and the young sprout forest has made good growth. A conservative cleaning would be very beneficial to this type of woodlot.



Figure IX.--Type 7.

One of the common sights in many counties of the woodlot region, showing combination of woodlot and pasture. Timber is all middle aged or old, low branching and with little or no reproduction of any kind. The soil is covered with grass and other forage.



Figure X.--Type 7.

A typical woodlot in southeastern Oakland county. In reality a shaded pasture. As a pasture, the trees interfere while as a woodlot it is too thin and open. A stand to which the model scheme might be applied with success.



Figure XI.

Windbreak of Black Locust volunteers along the west side of a farm in Jackson county. While not primarily a windbreak tree, the Black Locust here does efficient service in conserving the moisture of the fields in its wind shadow. The windbreak is one-half a mile in length.



Figure XII.

A windbreak of White Pine on a farm of western Michigan. The trees are in single row and as such make an effective break. The shelter belt as proposed, would have the advantage of producing timber of value as well as providing protection. The single row windbreak does not produce good timber.



Figure XIII.

A natural shelter belt woodlot of Elm, Ash, Soft Maple and Basswood, in Ingham county. The belt is ten rods wide and protects the farm from the north winds. The problem of the second crop of timber is here taken care of in the second story stand of seedlings.

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