AN ANALYSIS OF LAND USE PROBLEMS OF MANISTEE COUNTY, MICHIGAN

Thesis for the Degree of M. S.
MICHIGAN STATE COLLEGE
Lindo J. Bartelli
1952

This is to certify that the

thesis entitled

AN ANALYSIS OF LAND USE PROBLEMS IN MANISTEE COUNTY, MICHIGAN

presented by

LINDO J. BARTELLI

has been accepted towards fulfillment of the requirements for

M.S. degree in Land and Water Conservation

Louis A. Wolfanger
Major professor

Date December 1, 1952

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AN ANALYSIS OF LAND USE PROBLEMS

OF

MANISTEE COUNTY, MICHIGAN

By

LINDO J. BARTELLI

A THESIS

Submitted to the School of Graduate Studies of Michigan

State College of Agriculture and Applied Science

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

Department of Land and Water Conservation

1952

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Grateful acknowledgment is due to the late Professor Lee Roy Adolph Schoenmann under whose lofty inspiration and unfailing interest this investigation was started.

The author is also greatly indebted to Dr. Louis Albert Wolfanger for his kind guidance and valuable help during the course of this study.

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AN ABSTRACT

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Approved _____

The story of the development of the land resources of Manistee County is typical of land development of the Great Lakes States. With the disappearance of the virgin forests, man turned to cultivating the soil without the benefit of a preconceived plan of wise land use. Productivity of the land has been undermined as a result of indifference towards the forces leading to soil wastage and insecurity of farming operations. This study offers a pattern which can be applied towards the solution of the conservation problems of similar areas of the Great Lakes cut-over region. To further the development of a more complete agricultural program, a land inventory, proposed changes in land use, and the total conservation need are presented and analyzed.

Approximately eight per cent of the total land area in the county was studied. These samples of conservation surveys developed by soil scientists of the United States Soil Conservation Service were picked at random and were expanded to depict the condition in the entire county. This information was further supplemented with field investigations by the author.

The physical features of the land have been grouped and presented as problem areas. These problem areas possess a uniform pattern of climate, soil, slope and erosion conditions which require similar soil and water conservation treatment and management practices.

An analysis of the present land use showed that 23.6 per cent of the land area is in cropland. The study further showed that 11.5 per cent of the cropland falls in Class VI and VII. Pasture land,

which is 12 per cent of the land area, includes 27 per cent of Class II and III land. Woodland is 55.8 per cent of the land area, and five per cent is Class II and III. Orchard land is 1.6 per cent and idle land is seven per cent of the county land area. Thirteen per cent of the idle land is Class II, III and IV.

The proposed use of land based on the land use capabilities resulted in an increase of four per cent in the cropland acreage from 23 to 27 per cent. There is a noticeable increase in the amount of land in Capability Classes I, II and III. Over seventy per cent of the land proposed for cropland is in these three capability classes. There also was planned a slight increase (from 12 to 14 per cent) in the permanent pasture. The amount of woodland and wildlife land remained about the same. Even though no change was made in the total acreage a considerable amount of Class VII land was planned to be converted from idle land, cropland and pasture land to woodland.

To complete the analysis the conservation practices necessary to maintain the proposed land use have been selected and summarized by problem areas and for the total land area in the county. Woodland management and reforestation are the major practices in Problem Areas One and Four. In Problem Area Two, which is characterized by sandy soils, reforestation and woodland management are also important practices. On a county basis, 30,321 acres of land require reforesting and 225,488 acres require woodland management. Contour

farming, strip cropping, sod waterways, soil management and pasture development and improvement are the major conservation practices of Problem Areas Three, Six, Seven, Eight, Nine and Ten. On a county basis the total need of these practices are: Contour farming - 38,087 acres; Strip cropping - 92,563 acres; Sod waterways - 6,391,350 feet; Soil management - 125,197 acres; Pasture development and improvement - 35,819 acres. The orchard practices of alternate middles, permanent grass seeding and mulching are of major importance in Problem Areas Seven, Eight and Nine. The total need of these practices are: Alternate middles - 1,175 acres; Permanent seeding and mulching - 5,165 acres.

An important problem apart from the technical is the development of ways and means of putting this technical information on the land. It was concluded that this can be best accomplished by participation of the local people in the planning and operating of the conservation program, keeping in harmony with the local traditions and culture.

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INTRODUCTION

The present study of the land utilization problems of Manistee County, Michigan summarizes field examinations of hundreds of sites through the past few years, and analysis of soil conservation surveys developed by United States Soil Conservation Service soil scientists. These problems, complex and intriguing, present a challenge to the planner of land utilization. This study offers a pattern which can be applied to the solution of the land use problems of similar areas of the Great Lakes cut-over region.

The story of the development of the land resources of Manistee County is typical of land development of the Great Lakes States. The forests were harvested first. With the disappearance of the forests, man turned to cultivating the soil without the benefit of a preconceived plan of wise land use. Resultantly, many acres of land which were not suited for corn or potatoes were put to the plow. Productivity of the land has been undermined as a result of indifference towards the forces leading to soil wastage and insecurity of farming operations.

The Manistee County Land-Use Planning Committee of 1941 recognized this problem and recommended that local land-use committees should be set up to function regularly in each community and that meetings be held at least once a year to give the general farmer the opportunity to take part in discussing any farm problem affecting his community or

county.[1] As a result of the early planning work of these farm leaders, the Manistee County Soil Conservation District was organized in 1945. The directors of the district developed a program which listed the major conservation problems and outlined the plan of operation.

To further the development of a more complete agricultural program, a land inventory, proposed changes in land use, and the total conservation need are presented and analyzed in the following pages. The information has been collected from conservation surveys developed in the Manistee County Soil Conservation District by soil scientists of the United States Soil Conservation Service. The samples studied represented approximately eight per cent of the total land area in the county. This information was further supplemented with field investigations by the author.

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1. Wayne I. Crampton and Russell H. Johnson, Land-Use Planning Report For Manistee County, Manistee County Land-Use Planning Committee, Manistee, Michigan, 1940-1941, p 85.

GENERAL DESCRIPTION OF MANISTEE COUNTY

Location. Manistee County is located in the northwestern part of the Lower Peninsula of Michigan. It is bounded on the west by Lake Michigan, on the north by Benzie County, on the east by Wexford County, and on the south by Lake and Mason Counties. The approximate area of the county is 357,120 acres. The county is approximately a square in shape, the north and south dimensions being about 24 miles and the east and west dimensions varying from 21 to 28 miles. (See Figure 1)

Topography and Geology. The topography of Manistee County, typical of glaciated country, varies from level outwash plains to moraines with great relief, rising to heights of 150 to 200 feet above the intervening depressions.

In northwestern Manistee County the outer moraine is split into several members which become successively lower from east to west and which the intervening plains give a step-like appearance, the moraine slope forming the riser and the gravel plain the tread. These ranges of hills are part of the Port Huron Morainic system which extends along the eastern part of the county ending abruptly at the Manistee River and continuing in a southwestwardly direction as disjointed ridges.

To the west of this moraine lies a gravel plain which varies in width from two to eight miles. This plain served as the drainageway for the Port Huron system extending southward from Thompsonville along the Bear Creek Valley to Manistee River and then led southwestward through a series of gravel and sand plains that follow the line of the moraine.

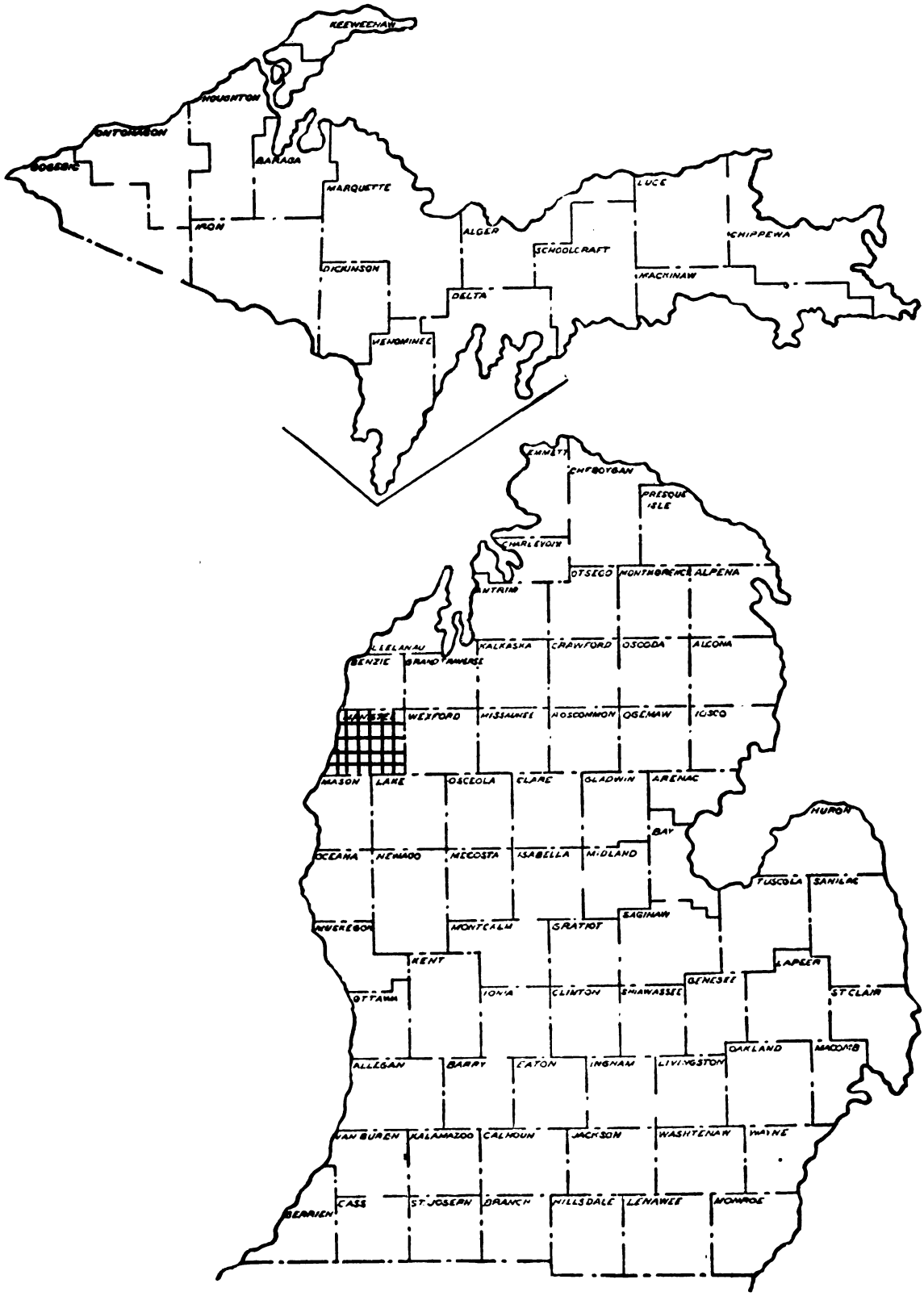

Figure 1

Map showing location of Manistee County, Michigan

The topography of the northwestern section is the result of the Manistee moraine which extends northward from the city of Manistee along the shore of Lake Michigan to the county line. The altitude of the Manistee moraine is scarcely 100 feet above Lake Michigan in the vicinity of Manistee, but it rises gradually northward.

The major portion of the area south of the Manistee River consists of a level, sandy drift not definitely morainic but more closely resembling an outwash plain.

Sand dunes are conspicuous on the border of Lake Michigan near Manistee extending southward into Mason County. A few high dunes are also located south of Portage Lake and near the village of Arcadia. The wind which formed them derived its material partly from the abandoned shores and beds of the old glacial lake and partly from the present shore of Lake Michigan.

The character of the drift is largely calcareous till. Boulders are rather numerous both on the surface and in the upper part of the till. Leverett reports that wells and deep ravines indicate that the stony till changes to sand at moderate depths along considerable part of the main Port Huron morainic system, and in the Manistee morainic area to a fine silt or clay, which bears some resemblance to a lake deposit.[1] Leverett also reports that the strong red color of the till

1. Frank Leverett and Frank B. Taylor, The Pleistocene of Indiana and Michigan and The History of the Great Lakes, Department of Interior, U. S. Geological Survey, Washington, D. C., Vol. LIII, 1915, pp 302-310.

appears to be due to the incorporation of material from red rock formations in the Lake Superior basin.[1]

The elevation of the sand plains south of the Manistee River is about 600 feet above sea level. Highest points in the county are found in the Manistee moraine at about 900 feet above sea level and in the Port Huron system at slightly over 1,000 feet above sea level.

Lakes and Streams. There are many lakes in Manistee County, varying in size from three square miles to many uncharted small ponds. The lakes occupy depressions in the surface of the glacial deposits, some of them being in the moraines and others in the outwash aprons. Manistee Lake is located at the mouth of the Manistee River and forms an excellent harbor. Portage Lake is also connected with Lake Michigan by means of a dredged channel.

Table I contains a list of the major lakes which have been charted on the Michigan State Highway Department base map and their estimated areas. They aggregate approximately eleven square miles.

The greater part of Manistee County is tributary to the Manistee River which flows into Lake Michigan at the city of Manistee. The Manistee River extends east to west across the southern half of the county. The Pine River, a tributary of the Manistee River, enters the county at the southeast corner and joins the Manistee River five miles west of the Wexford County line. The Bear Creek and its tributaries

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1. Frank Leverett and Frank B. Taylor. Op. cit.

drain the northcentral part of the county, flowing in a southerly direction, and join the Manistee River a few miles west of Brethren. The Little Manistee River flows in a northwesterly direction and enters the county in the southcentral part and joins the Manistee River at Manistee Lake. Richley Creek flows westwardly into Lake Michigan at Arcadia, the only major stream not part of the Manistee River system.

TABLE I

LAKES IN MANISTEE COUNTY

Name	Township	Area in square miles
Bear Lake	Pleasanton and Bear Lake	3
Arcadia Lake	Arcadia	0.7
Portage Lake	Onekama	3
King Lake	Filer	0.1
Clay Bank Lake	Stronach	0.1
Dickson Lake	Dickson	0.1
Eleanor Lake	Dickson	0.1
Chief Lake	Bear Lake	0.2
Healy Lake	Springdale	0.1
Bar Lake	Manistee	0.3
Manistee Lake	Manistee and Filer	2.5
Canfield Lake	Filer	0.2
Pine Lake	Norman	0.3
Sand Lake	Norman	0.2
Lake of the Woods	Norman	0.1
Long Lake	Norman	0.1
Clovers Lake	Pleasanton	0.1

Population. The 1950 preliminary report of the United States Bureau of Census lists the total population of Manistee County as 18,393.

The city of Manistee, according to the 1940 census, is the largest city in the county with a population of 8,640, representing the majority of the urban population.

The rural population distribution is shown in Table II, "Rural Population by Townships". The most populated rural areas are surrounding the city of Manistee (Filer and Manistee Townships). Other highly populated areas are distributed amongst the more fertile land areas (Bear Lake, Onekama, and Maple Grove Townships).

The rural population reached its peak around 1920 with over 14,000, but now has stabilized to around 9,000. The trend in each township varies considerably. Filer and Manistee Townships show the greatest decrease over the decades, while the remaining townships show slight decreases to no change.

TABLE II

RURAL POPULATION OF MANISTEE COUNTY BY TOWNSHIPS[1]

Township	1940	1930	1920	1910	1900	1890
Arcadia	691	717	893	994	881	671
Bear Lake	1228	1118	1217	1584	1428	1287
Brown	521	562	731	752	799	726
Cleon	714	786	906	1357	1237	810
Dickson	574	491	429	425		
Filer	1251	1127	1515	1969	2283	2101
Manistee	1390	1344	1781	2990	3128	2631
Maple Grove	877	877	928	903	508	361
Marilla	379	344	507	550	404	341
Norman	399	313	399			
Onekama	708	687	688	784	920	1082
Pleasanton	451	480	553	685	659	593
Springdale	258	218	340	581	558	105
Stronach	315	267	318	733	791	710
Total	9756	9331	11,205	14,307	13,596	11,418

1. Wayne I. Crampton and Russell H. Johnson. Op. cit. p. 56.

Recreation. Due to a combination of climatic and physiographical features, Manistee County has a vast recreational potentiality. The Manistee National Forest and the Fife Lake State Forest provide facilities for tourists, campers, fishermen, hunters, picnics, and winter sports within the environment of the forests. Cottages and cabins are available within any of these forests. In addition, there is a belt of sand dunes and sandy beach along Lake Michigan which extends from the border of Mason County on the south to Benzie County on the north. This 25 mile stretch is only partially developed.

Robert McIntosh reported that close to half a million dollars were spent by tourists and resorters in Manistee County during the month of July, 1951. It was further reported by McIntosh that there is a total of forty commercial resorts located in the county which include cottages, motor courts, boys and girls camps, and fishing and hunting camps.[1]

Climate. Two distinct types of climate have been observed in Manistee County, continental and semimarine. The semimarine type is due to the influence of Lake Michigan, which in turn is governed by the force and direction of the wind. This stabilizing influence tends to retard the advance of spring and slows up the approach of cold weather. This characterizes the climate of a belt five to eight miles wide extending along the shores of Lake Michigan.

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1. Robert McIntosh, Land and Water Conservation Department, Michigan State College, Extension Service, written communication.

The continental climate is characterized by pronounced fluctuation in temperature between summer and winter. Wills reported in his climatic summary of Michigan that the average maximum temperature recorded at the city of Manistee was 99°Fahrenheit, and the minimum temperature was -29°Fahrenheit, while at the city of Cadillac, located in the county directly east, maximum temperature of 104°Fahrenheit and minimum temperature of -36°Fahrenheit have been recorded.[1]

The primary climatic factors which affect the type of agriculture are the length of growing season and rainfall. Records have been kept at the city of Manistee and the village of Wellston, which is located about five miles west from the eastern county line. The precipitation has been recorded to be fairly well distributed throughout the year at both stations. There was a difference in that Wellston has received a slightly higher amount of precipitation during the winter months. An important character of the precipitation was that about only 15 inches were received during the growing season. This is sufficient to grow most crops on the level heavy soils, but can be limiting on the coarse textured soils and on the rolling clay lands which have suffered from past soil erosion.

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1. H. Merrill Wills, Climate and Man, Yearbook of Agriculture, United States Department of Agriculture, Washington, D. C., 1941, pp 914-916.

TABLE III

AVERAGE PRECIPITATIONS BY MONTHS[1]

Location	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Manistee	1.75	1.87	1.97	2.16	2.96	2.93	3.03	2.77	3.14	2.91	2.50	2.06	30.05
Wellston	2.10	2.01	2.12	2.51	3.14	2.98	2.62	2.94	3.85	3.37	2.86	2.29	32.79

Lake Michigan is especially marked in its influence on the length of the growing season. Wills has reported the average length of growing season at the city of Manistee to be 155 days.[2] This figure is not a true description of the whole county, for unrecorded reports have indicated the growing season in the eastern part of the county to vary between 90 and 130 days, depending upon the elevation. The combined effect of the equalizing influence of Lake Michigan on the length of the growing season and the variations in topography offering good air drainage has enabled a well developed fruit industry to flourish in a belt five to eight miles wide, extending northward from the city of Manistee to the Benzie County line.

The prevailing wind is from the southwest. The winds are generally much stronger along the Lake Michigan beach, dwindling in intensity as it moves inland. Wind erosion has been reported to be very severe on the lighter soils along the coast and in the plains area.

1. H. Merrill Wills. Op. cit. p 915.

2. Loc. cit.

Markets and Transportation Facilities. Manistee, the county seat, affords a marketing center for a considerable amount of the agricultural produce of the county. Located at the mouth of the Manistee River, it has unusual harbor and transportation facilities for the junction of water, highway, and rail transportation. The Manistee and Northeastern, and the Pere Marquette Railroads provide good rail service, while four main highways focus on the city.

The Pere Marquette Railroad also serves the eastern half of the county, connecting the smaller towns of Wellston, Brethren, Kaleva, which are important trading centers. The town of Copemish, located in the northeast corner of the county, is served by the Ann Arbor Railroad. Good gravel and "black top" roads provide the farming communities with good motor transportation facilities. About 75 per cent of the roads are either hard surfaced or gravelled.

The importance of the small towns and villages as trading centers is brought to light by the 1950 preliminary report of the Bureau of the Census. It was reported that the average distance travelled by farmers visiting a trading center in Manistee County to be 1.3 miles.[1]

Forest Land and Timber Resources. The pine forests of the southern part of the county furnished the incentive for the development of the county by white man. Lumbering flourished as the most important industry

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1. Bureau of the Census, Preliminary 1950 Census of Agriculture, United States Department of Commerce, Washington, D. C., Series AC 50-1, 1951, p 2.

from 1841 to 1912 and was greatly facilitated by the Manistee River which crossed through the center of the pine region. After the harvest of the pine was completed, the northern half of the county, which was covered by a hardwood mixture consisting of oak, maple, beech and aspen, was soon lumbered off.

Three of every five acres in the county are classed as wooded land. Out of a total of 216,876 acres of wooded land, about 39,000 were classed as wooded farm lands.[1] Farm ownership generally affords a favorable setting for forestry, and public policy has long encouraged farmers to make woodland management an integral part of the farm business. Yet most of the farm woodlands are still mistreated, having been subjected to unwise cutting, pasturing and burning. At present, the amount of large timber is very limited, and in general the better species have been harvested at a rate much faster than the rate of regrowth. The lands under the jurisdiction of the United Forest Service and the Michigan State Department of Conservation have fared much better. All these lands have been protected by an effective fire control system, and the state forests have been partially maintained by selective cutting and reforestation.

The woodland industry is still considered an integral part of the present economic structure. In 1935, Manistee County was sixth in the total production of all species of forest products in the counties of

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1. Ibid. p 1.

Lower Michigan. The paper mill at Filer City affords a market for most of the marketable jack pine and aspen. The 1941 report of the Manistee County Land Use Planning Committee listed 18 active sawmills producing cross ties, lumber, fuel wood, shingles, crates and building timber.[1]

Figure 2 illustrates the present forest cover in Manistee County.[2] The forest cover is classed in two broad groups: class a, depicting the forest cover with over 40 per cent canopy, and class b, under 40 per cent canopy. The uncolored portions of the map are the agricultural areas.

Land Ownership. The character of land ownership plays an important role in the development of any land program, for the type of ownership directly determines the character of use. Three types of ownership are conspicuous in Manistee County: private, public and semi-public.

The privately owned land as indicated by the uncolored portion of Figure 3 is owned by individuals and private companies whose prime interest in the land is as a means of livelihood or personal satisfaction.

The public owned land is that which is owned by local, state and federal government. This ownership represents land which was once owned

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1. Wayne I. Crampton and Russell H. Johnson, Land-Use Planning Report for Manistee County, Manistee County Land-Use Planning Committee, Manistee, Michigan, 1940-1941, p 21.

2. Robert J. Amsterburg, Unpublished Forest Cover Map of Manistee County, 1950, personal communication.

FIGURE 2

FOREST COVER MAP OF MANISTEE COUNTY[1]

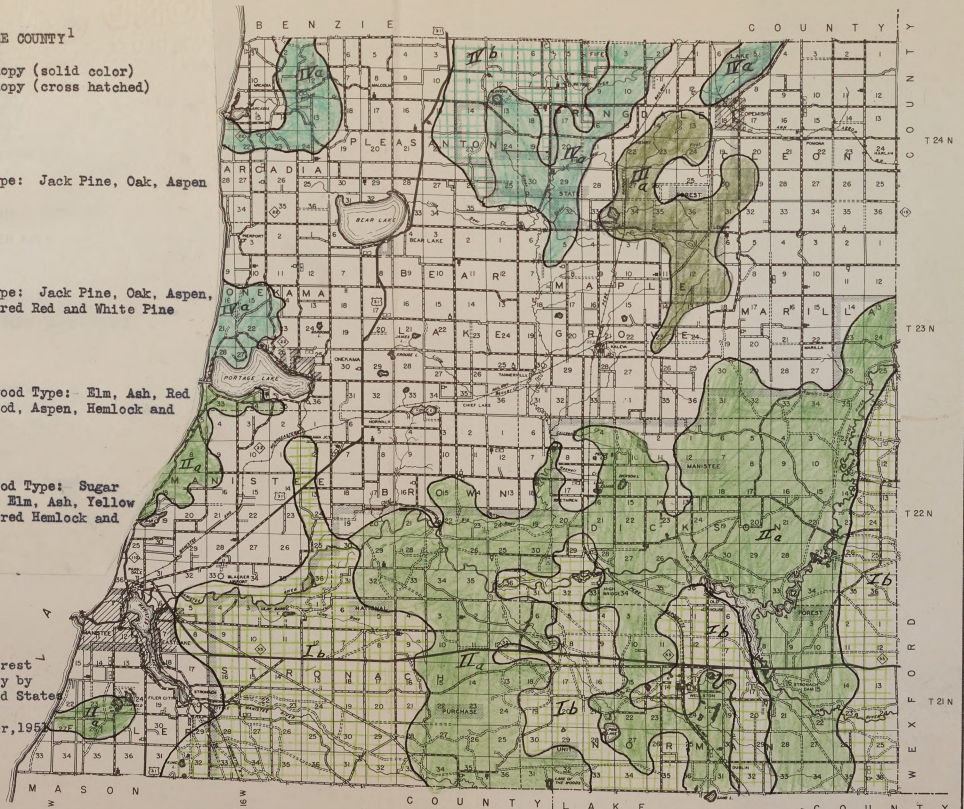
a = Over 40 per cent canopy (solid color)
b = 10 - 40 per cent canopy (cross hatched)

I — Oak - Pine Type: Jack Pine, Oak, Aspen

II — Pine - Oak Type: Jack Pine, Oak, Aspen, Scattered Red and White Pine

III — Lowland Hardwood Type: Elm, Ash, Red Maple, Basswood, Aspen, Hemlock and White Pine

IV — Upland Hardwood Type: Sugar Maple, Beech, Elm, Ash, Yellow Birch, Scattered Hemlock and White Pine



1. After an unpublished Forest Cover Map of Manistee County by Robert J. Amsterburg, United States Soil Conservation Service, Ludington, Michigan, October, 1951.

Prepared by the Cartographic Division, Soil Conservation Service, Region II, Cooperating with the District Governing Body

6-18-45
3-N-12,567

FIGURE 3 LAND OWNERSHIP MAP

MANISTEE COUNTY

DISTRIBUTED BY

MICHIGAN
DEPARTMENT OF CONSERVATION

* * *

YOU COULD NOT ENJOY THE CLEAN WHOLESOME RECREATION OF THIS COUNTY

IF

ITS FORESTS WERE BURNED OVER

ITS STREAMS WERE POLLUTED

ITS CAMP SITES WERE UNSANITARY

AND IF

THERE WERE NO GAME OR FISH

KEEP MICHIGAN CLEAN AND GREEN

REPORT FOREST FIRES AND RETURN NEXT YEAR

* * *

LEGEND

- STATE LANDS DEDICATED FOR STATE FORESTS, PARKS AND OTHER PUBLIC CONSERVATION USES.
- STATE LANDS RESERVED FOR EXCHANGE WITH FEDERAL GOVERNMENT FOR NATIONAL FOREST PURPOSES.
- UNDEDICATED STATE LANDS SUBJECT TO SALE OR EXCHANGE APPLICATION.
- BOUNDARY STATE FORESTS, PARKS, ETC.
- BOUNDARY NATIONAL FORESTS
- PUBLIC FISHING SITES. ⊙ SITE NOT USABLE
- FOREST CAMP GROUNDS.
- STATE PARKS.

IT IS THE POLICY NOT TO DISPOSE OF STATE LANDS IN STATE OR NATIONAL PROJECT AREAS. EXCEPTIONS MAY BE MADE IN CERTAIN CASES WHERE THE LANDS ARE DESIRED FOR AGRICULTURE OR TO CONSOLIDATE OWNERSHIP. FOR FURTHER INFORMATION INQUIRE LANDS DIVISION, DEPARTMENT OF CONSERVATION, LANSING 13, MICHIGAN.

STATE OWNERSHIP JUNE 1, 1951

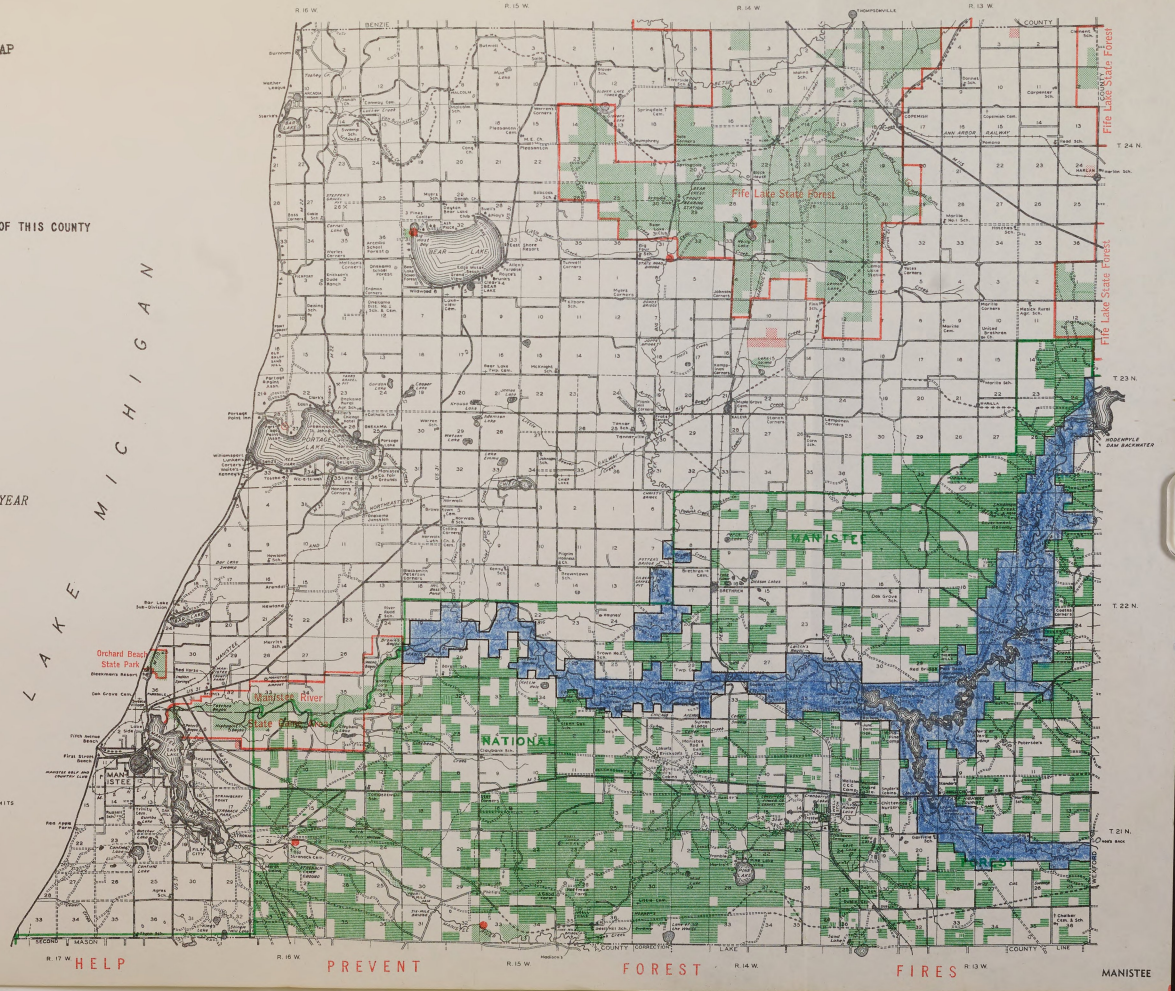
LEGEND

- PAVED ROADS
- GRAVELLED ROADS
- GOOD DIRT ROADS
- POOR DIRT ROADS
- TRAILS
- FIRE BREAKS
- RAILROADS
- ABANDONED RAILROADS
- INTERMITTENT LAKES
- INTERMITTENT STREAMS
- DRAINAGE DITCHES
- DAMS
- SPRINGS
- FLOWING WELLS
- AIRPLANE LANDING FIELDS
- COUNTY SEATS
- TOWNS
- HUNTING AND FISHING CAMPS AND RESORTS
- RAILROAD STATIONS, FOUR CORNERS, ETC.
- TOWN HALLS
- SCHOOLS
- CHURCHES
- CEMETERIES
- CONSERVATION DEPARTMENT UNITS
- FOREST FIRE TOWERS
- TOWERMEN'S CABINS
- PATROL CABINS
- TOURIST CAMPS AND PARKS
- GOLF COURSES
- OBSERVATION TOWERS
- MINES OR QUARRIES
- SUMMITS OR PEAKS

* BOUNDARY LINES ARE SHOWN TO DESIGNATE THE LIMITS OF CONSERVATION PROJECTS. ONLY COLORED AREAS ARE PUBLIC LANDS. UNCOLORED AREAS ARE PRIVATE LANDS.

FEDERAL GOVERNMENT LANDS IN NATIONAL FORESTS

PUBLIC UTILITY LAND



by private enterprise, but since private ownership proved to be uneconomical has reverted back to public ownership as tax delinquent land. In this group are also found parcels of land which have been acquired through government purchase to better satisfy the public demand. In this category are found such lands which are ideally suited for parks, public fishing sites and other recreational uses. Public owned lands are indicated by green color in Figure 3 and represent approximately 25 per cent of the total land area in the county.

The semi-public classification includes that land which is owned by the Consumer Power Company, a public utility. This land is distributed along the flood plain of the Manistee River and totals approximately 19,000 acres. This land is indicated in Figure 3 by the color blue.

Agriculture. Agriculture began in Manistee County at about the time of the Civil War with the advent of the Homestead Law of 1862. These early settlers selected the hardwood lands in the northwestern part of the county for their farms. In many cases lumbering and farming were combined, with work in lumber camps consuming the greater part of the year. Their early crops, chiefly corn, wheat, hay and potatoes, were raised for home consumption and the neighboring lumber camps served as an outlet for any surplus.

By 1900 the agricultural industry was well established, reaching its peak around 1930. The 1950 preliminary census reports

indicated that about 34.7 per cent of the land area was classed as farm land, comprising 971 farms. This is a slight decrease from the 1945 reports and is in line with the trend in shrinkage of acres in farms since 1935, as reported by the Bureau of the Census. The conspicuous trend has been a decrease in the number of farms and acres in farms and an increase in the size of farms.[1]

TABLE IV

SUMMARY OF CENSUS REPORTS ON FARMS, ACREAGE AND LAND AREA, 1930 TO 1950[2]

Classification	Unit	1930	1935	1940	1945	1950
Farms	No.	1,172	1,371	1,338	1,049	971
App. Land Area	Ac.	357,120	357,120	357,120	357,120	357,120
Proportion in farms	%			38.7	36.1	34.7
Land in farms	Ac.	129,672	139,666	138,320	128,832	123,771
Average size of farm	Ac.	110.6	101.9	103.4	122.8	127.5

1. Bureau of the Census, United States Census of Agriculture, United States Department of Commerce, Washington, D. C., 16th Census of U. S., 1940, p 15; and Preliminary 1950 Report, Series AC 50-1, p 1.

2. Loc. cit.

There is a fairly close relationship between types of farming and the size of farms. Small farms (less than 50 acres) predominate in the horticultural areas along Lake Michigan where the physical and economic conditions are favorable to intensive type of farming. While on the other hand, larger farms are distributed in the remaining portion of the county where a livestock type of farming predominates. Table V presents the distribution of different size-groups since 1935.

TABLE V

NUMBER OF FARMS WITHIN THE DIFFERENT SIZE-GROUPS, 1935 TO 1950[1]

Size-in acres	Number			
	1935	1940	1945	1950
Under 10	19	33	22	29
10 - 29	86	70	58	53
30 - 49	251	266	170	125
50 - 69	106	105	63	51
70 - 99	347	328	212	199
100- 139	253	219	170	174
140- 179	161	157	155	145
180- 219	63	61	70	68
220- 259	39	42	39	41
260- 499	38	50	80	72
500- 999	8	6	10	14
1000 and over	0	0	0	0

1. Ibid p 30 and p 1.

There has been a definite decrease in the number of farms under 179 acres and a slight increase in the farms over 260 acres in size. These slight changes have also been reflected in the types of farming. The 1950 preliminary census report[1] indicated that the major source of farm income in 1949 was from livestock and livestock products. About 51 per cent was derived from sale of livestock and livestock products, 40 per cent from the sale of fruits and vegetables, 14 per cent from the sale of field crops and 5 per cent from forestry products. It was further reported that 207 farms were classed as residential (less than $250 value of products sold) and 185 as part-time (operator reporting 100 days or more of off-farm work).

Manistee's major crops, insofar as acreages are concerned, are hay and tillable pasture, which occupy 40 per cent of the cropland. Alfalfa was reported to be the major forage crop with timothy and clover the next important. In reviewing the past census reports, it was noted that the acreage of timothy and clover is decreasing as the acreage of alfalfa is increasing. Table VI gives the acreage devoted to the principal crops in Manistee County. Corn and oats are the most important grain crops. Crops are usually grown in a four year rotation of corn, oats, clover and timothy or of corn, oats seeded to alfalfa that remains until the crop is run out. This system usually results in fields of fairly high fertility on which alfalfa grows well remaining in long-term alfalfa meadows, whereas less fertile and eroded fields are used for row crops.

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1. Ibid p 2.

TABLE VI

ACREAGE DEVOTED TO THE PRINCIPAL CROPS IN MANISTEE COUNTY, 1949[1]

Crop	Acres
Corn	6,308
Wheat	1,634
Oats	3,741
Barley	13
Rye	757
Buckwheat	40
Potatoes	755
Alfalfa	5,186
Clover and Timothy	5,201
Fruits	3,947
Vegetables and Small Fruits	657

1. Ibid P 3.

SURVEY OF CONSERVATION PROBLEMS BY PHYSICAL PROBLEM AREAS

Description and Extent of Physical Problem Areas. In order to systematically analyze the conservation problems, the physical land features of the county have been grouped and presented as problem areas.[1] The problem areas are described as follows:

In Problem Area Number One are found the level deep dry sand plains. The soils are mainly Rubicon and Grayling sands. Most of the area is level with a few pits occurring in the plain, and in those areas there will be some short steep slopes. The soil is highly subject to wind erosion when cropped and is also characterized by a very low fertility level. Land Use Capability Class VII is predominate.[2]

Problem Area Number Two consists of the rolling to steep dry sands and loamy sands with some clay occurring in local areas. The soils are very droughty and low in fertility. The main soils are Emmet loamy sand and Roselawn sand. The complex slopes vary from level to 30 to 40 per cent in steepness.

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1. A Problem Area is defined as a delineated area which possesses a uniform pattern of climate, soil, slope and erosion conditions which require similar soil and water conservation treatment and management practices. Based on Soil Survey, Manistee County, 1926.

2. Class VII is not only unsuited to cultivation but has severe limitations for use for grazing or for forestry. It also requires extreme care to prevent erosion. J. G. Steele, "The Measure of Our Land", Soil Conservation Service, U. S. Dept. of Agr., Washington, D. C., p 12, 1951.

Where the steep slopes have been cropped, erosion has been moderately severe. Both wind and water erosion affect these soils. The predominating Land Use Capability Class is IV, with much VI and VII occurring in the area.[1]

Problem Area Number Three consists of wet, acid sand plains. The soils in this area are acid and formed under wet conditions. The soils are quite droughty when drained, and the fertility level is quite difficult to maintain. The main soils are Saugatuck loamy sand and sand with some areas of Newton loamy sand and sand, mucks and Rubicon sand. Almost all of the area is level with only occasional slopes as great as five per cent. Wind erosion has been severe on cropped areas and over-grazed pastures. The predominate Land Use Capability Classes are IV and V with some VI and VII.[2]

Problem Area Number Four consists of the wet river bottoms. The soils are mainly wet and vary from sands to mucks, and are subject to occasional overflows. The main soils are Griffin, Muck,

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1. Class IV land is good enough for occasional cultivation under careful management, but it is not suited for regular production of cultivated crops. Some of the areas are too dry for dependable use for crop production. Class VI land is not suitable for any cultivation and it is limited somewhat for grazing or forestry by such features as shallow soil or steep slopes. This is good land for forestry or for grazing, although not so good as parts of the cultivable land classes. Ibid, pp 6 and 12.

2. Class V land is nearly level and not subject to erosion. Because of wetness, climate, or some permanent obstructions like rock outcrops, it is not suited for cultivation. The soil is deep, however, and the land has few limitations of any kind for grazing or for forestry use. Good management is, of course, needed for satisfactory production with either grass or trees. Ibid, p 12.

PLATE 1

Class V Land Bordering the Manistee River in Problem Area Four

Peat and Rubicon. The topography is level with very little erosion. The major Land Use Capability Class is V, with some VII and VIII.[1]

Problem Area Number Five includes the muck and peat areas. The soils are organic and vary in degrees of decomposition, acidity and depth. The areas are level, with severe wind erosion common in the cropped fields. Cropping is limited by the frost hazard. The main soils are Lupton Muck with some Houghton, Rifle and Greenwood Peat. The main Land Use Capability Class is V with some Class VIII.

Problem Area Number Six includes the very steep clay lands. The main soils are Nester loam and silt loam with small areas of Traverse and Walkill. The area is very steep and the degree of the slopes becomes a hinderance to cropping. On crop areas water erosion is very severe, both sheet and gully erosion are common. The main Land Use Capability Classes are VI and VIII with some II.[2]

Problem Area Number Seven includes the gently rolling to steeply rolling sandy loams, with some loams and loamy sands. The soils in this area are deep and semi-droughty and are characterized

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1. Class VIII land is suited only for wildlife, recreational, or watershed purposes. Usually it is extremely arid, rough, steep, stony, sandy, wet, or severely eroded. Loc. cit.

2. Class II is good land from every standpoint, but certain physical conditions make it not quite so good as Class I land. The slope may be just steep enough to make water run off at a speed which will carry away soil. Some Class II land is naturally wet and requires drainage. Some has not quite as good water-holding capacity as Class I land. Each of these deficiencies either limits the use of the land to some extent or requires some special attention year after year. Ibid, p 6.

PLATE 2

Rolling Class III Land in Problem Area Seven

by a sandy clay loam subsoil. Small areas of clay soils occur in a few local spots. The main soils are Emmet sandy loam and loamy sand with some Nester loams and Iosco sandy loam. The topography of the area varies from uniform slightly rolling slopes to steep complex slopes. Erosion has been moderately severe on cropland. Water erosion has caused the most damage, although some wind erosion is present. Land Use Capability Classes II, III and IV are the predominate classes.[1]

Problem Area Number Eight includes the rough steep sands, loamy sands and sandy loams. The soils in this area are very similar to the soils found in problem area number two. The loamy sands have a very thin clay substratum. The main difference between this problem area and problem area two is the climatic factor. Problem area eight enjoys the influence of the lake-controlled climate, making it suitable for fruit production. The main soils are Emmet loamy sand and sand with some Emmet sandy loam. Generally the area is very steep with the slope being complex in nature. There are a few areas of relatively level land. The predominating Land Use Capability Class is IV with much VI and VII.

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1. Class III is moderately good land for cultivation. It is more limited in use than Class II land by reason of one or more natural features. It can be used regularly for crops but because of these natural restrictions, intensive treatment of some kind is called for. Some Class III land is moderately sloping and must have intensive care to control erosion if used for crops in a regular rotation. Another variation of Class III land calls for water management because of poor drainage. Loc. cit. p 6.

PLATE 3

Class II Land in Problem Area Ten

Problem Area Number Nine includes the deep dry sand plains with a gravelly loamy sand. Most of the area is level with some short, steep slopes along the streams and small pits which occur in the plain. The soils due to their light character are highly subject to wind erosion when cropped or over-grazed. The predominating Land Use Capability Class is VI with some IV and VII.

Problem Area Number Ten includes the level silty sand plains. The soils have a sandy gravelly substratum but they are covered with a two to three foot layer of very fine sand and silt. This adds to the inherent fertility of the soil. The main soils are Coventry and Karlin fine sandy loams, Mancelona sandy loam and Kalkaska loamy fine sand. The slope of the land varies from level to gently undulating. Wind and water erosion are serious in this area when cropped. The predominating Land Use Capability Classes are II with some IV and VI.

Table VII shows that a hundred per cent of problem area one is Class VII, while Classes VI and VII predominate in area two. Class V land predominates in area five and Class II land predominates in area ten. The remaining problem areas (three, six, seven, eight and nine) are characterized by a major percentage of Classes II, III and IV lands.

Problem area one, as shown in Figure 4, dominates the southern part of the county south of the Manistee River. The more productive problem areas, six, seven and eight, occur in the northwestern half of the county while the sandier and less productive problem areas, two, three and nine, occur in the northeastern half of the county.

TABLE VII

PER CENT OF LAND USE CAPABILITIES IN EACH PROBLEM AREA[1]

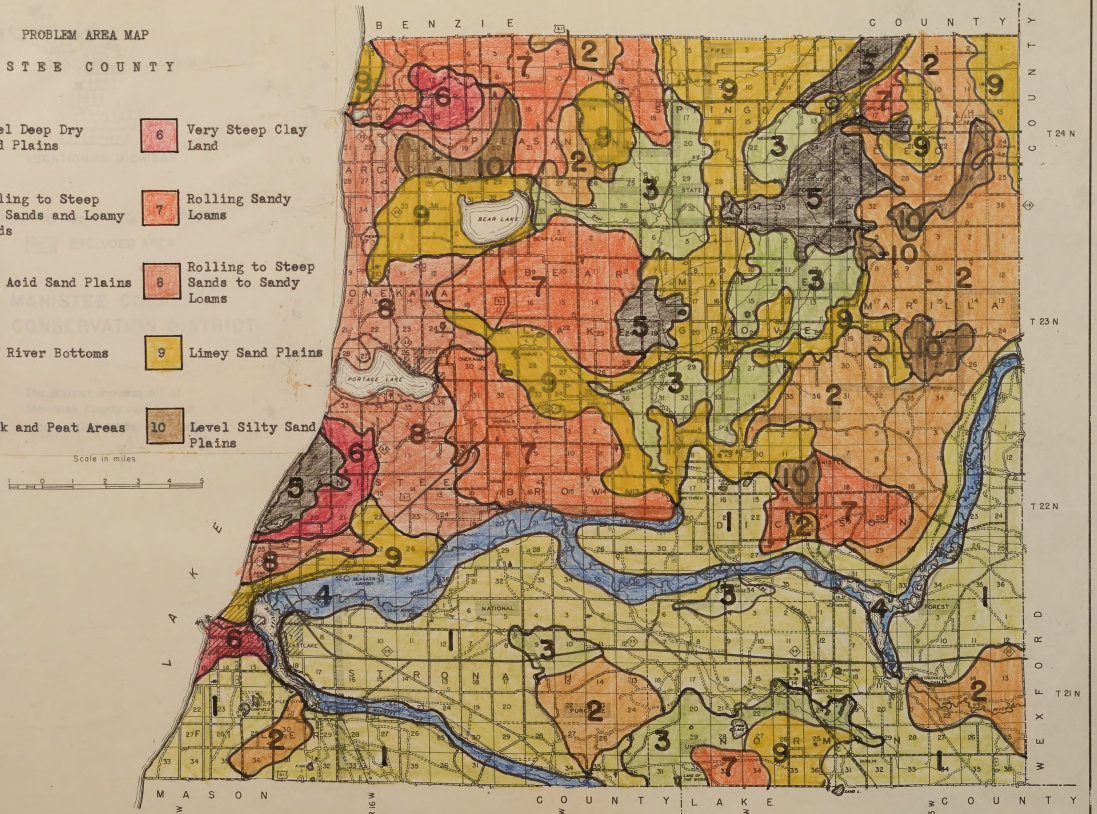
Problem Area	Total Land Area in Acres	Land Use Capability Class							
		I	II	III	IV	V	VI	VII	VIII
1	91,809	0	0	0	0	0	0	100	0
2	51,399	0	1	9	11	1	16	62	0
3	34,030	0	2.6	11	48	37	0.4	1	0
4	20,560	No samples							
5	15,242	0	2	0.3	7	80.7	0	9	1
6	6,026	1	27	16	11	21	3	21	0
7	47,500	0	17	47	17	5	8	6	0
8	22,687	0	8	27	30	2	23	10	0
9	54,944	0	10	27	45.8	8	2	7	0.2
10	10,280	0	58	20	16	2	3	1	0

1. These figures are actual measurements of conservation surveys developed by the U. S. Soil Conservation Service as part of the farm planning activities in cooperation with the Manistee County Soil Conservation District. The actual measurements express an eight per cent sample of the total land area. There could have been some bias in the final expression in that the samples reflected farms which requested assistance from the District and these farms could be above average for the problem area.

FIGURE 4 PROBLEM AREA MAP

MANISTEE COUNTY

1 Level Deep Dry Sand Plains	6 Very Steep Clay Land
2 Rolling to Steep Dry Sands and Loamy Sands	7 Rolling Sandy Loams
3 Wet Acid Sand Plains	8 Rolling to Steep Sands to Sandy Loams
4 Wet River Bottoms	9 Limey Sand Plains
5 Muck and Peat Areas	10 Level Silty Sand Plains



6-18-45
3-N-12,567

Prepared by the Cartographic Division, Soil Conservation Service, Region II, Cooperating with the District Governing Body

Present Land Use in Reference to Land Use Capabilities by Problem Areas. Almost as important as the physical characteristics of the land in the problem areas is the way the land is now being used. Before any land use adjustments can be prepared it is necessary to know the present use of the land in addition to the physical characteristics. The present land use is delineated on the conservation surveys developed by the U. S. Soil Conservation Service into five major classes: Cropland, Permanent Pasture, Woodland, Idle and Miscellaneous.[1] These conservation surveys, distributed about the problem areas at random, were used as pilot studies and expanded to depict the conditions in the whole problem area.

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1. These major land use classes are defined as follows: Cropland will include all land planted to crops and in addition forage crops grown in rotation for hay and orchards. Permanent Pasture includes grazing land other than pastured woodland, and land in grasses and legumes that is devoted primarily to grazing. Woodland includes land with forty per cent of the ground covered by the spread of woodland species and land devoted to forest plantations. Idle land includes land void of vegetation or maintaining plant growth of little economic or agricultural value. Miscellaneous includes farmsteads and areas not otherwise classified. Norton, E. A. Soil Conservation Survey Handbook, U. S. D. A. Misc. Pub. No. 352, 1939, pp 13, 14.

Table VIII shows the land use conditions for the total land area in Problem Area Number One according to land capabilities. The total land in farm acreage represents the acreage which is now in private ownership, the remainder of the total land area represents land owned by public agencies and the Consumers Power Company. The figures show that 91 per cent of the total land area is woodland and pasture, 4.5 per cent is idle, 4.5 per cent is cropland, and less than .05 per cent is miscellaneous. It is apparent that due to the droughtiness and sandy nature of the soils the total acreage of this area is not suited for cropland but better suited for limited grazing or woodland.

TABLE VIII

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA ONE ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland							4,131		4,131
Permanent Pasture							1,766		1,766
Woodland							81,938		81,938
Idle							4,131		4,131
Miscellaneous							219		219
Total Land Area							91,809		91,809
Total Land in Farms									25,942
Land Not in Farms									65,867

1. The conservation survey samples analyzed represented a 4 per cent sample of the area. This information was augmented by other information collected by the author from U. S. Forest Service, observations of aerial photos and various field trips throughout the area.

PLATE 4

Idle Land Adjacent to Reforested Class VII Land

In Problem Area One

Table IX shows the present land use conditions for the total land area in Problem Area Number Two according to land capabilities. The major portion, as expressed by total land in farms, is in private ownership. The data show that 57 per cent of the land is in pasture and woodland, 39 per cent is idle, 14 per cent is cropland, and less than one per cent is miscellaneous. Due to the high percentage of Class VI and VII land which is a result of steep slopes and sandy soils, it is apparent that the major portion of the idle land is best suited for grazing and woodland and that a small portion of the pasture land and woodland is suited for cropland.

TABLE IX

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA TWO, ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		218	2389	2621		604	1181		7013
Permanent Pasture		219	1016	1448	67	550	1010		4310
Woodland		76	938	1440	15	5313	17016		24798
Idle		5	22	86		1769	13146		15028
Miscellaneous			83	93		17	57		250
Total Land Area		518	4448	5688	82	8253	32410		51399
Total Land in Farms									38393
Land Not in Farms									13006

1. The conservation surveys analyzed in this problem area represent six per cent of the area.

Table X deals with the present land use conditions for the land area in Problem Area Number Three according to land capabilities. The analysis indicates that the major portion (82 per cent) of problem area number three is in woodland and pasture. A further study of this data reveals that most of this land is classed as IV and V land use capability. The major hazards to cropping these IV and V lands are excessive moisture due to a high water table and unfavorable soil characteristics such as droughtiness and hardpan. The land in cropland (18 per cent) is classed as II, III and IV.

TABLE X

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA THREE, ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		424	2815	1866			89		5194
Permanent Pasture		307	516	1195	1519	133	132		3802
Woodland			182	12813	11163		110		24268
Idle			84	520	10				614
Miscellaneous		38	52	62					152
Total Land Area		769	3649	16456	12692	133	331		34030
Total Land in Farms									24513
Land Not in Farms									9517

1. The conservation surveys analyzed in this problem area represent nine per cent of the area.

Table XI reflects the analysis of the present land use in Problem Area Number Four according to land use capabilities. The analysis of this problem area pointed out that the whole area is in woodland and pasture, capability Class V predominating. The chief hazards in this problem area are excessive water due to frequent flooding and a high water table. Only eight per cent of this land area was indicated as privately owned.

TABLE XI

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA FOUR ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland									
Permanent Pasture					1120				1120
Woodland					19440				19440
Idle									
Miscellaneous									
Total Land Area					20560				20560
Total Land in Farms									2040
Land Not in Farms									18520

1. No samples were available in this area, information was secured from aerial photographs and field investigations by the author.

Table XII presents the analysis of the present land use in Problem Area Number Five. This problem area includes the wet organic soils and at the time of this survey none of this land was under cultivation, the major portion being used as pasture and woodland. The analysis also showed that capability Class V predominates, but that 379 acres of this area are potential Class II and III cropland. Fifty eight per cent of this land area was privately owned. The chief hazard to the utilization of this land is excessive water which must be removed by drainage, and frost which is influenced by location.

TABLE XII

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA FIVE ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland									
Permanent Pasture		102	11	181	502				796
Woodland		226	40	920	11781		1360	119	14446
Idle									
Miscellaneous									
Total Land Area		328	51	1101	12283		1360	119	15242
Total Land in Farms									8956
Land Not in Farms									6286

1. The conservation surveys analyzed represent a two per cent sample of the area.

Table XIII presents the analysis of the present land use in Problem Area Number Six. This area includes the heavy clay lands of the county. The survey pointed out that a large portion of the cropland is classified as I, II, III and IV lands and that a sizeable acreage used as cropland was classed as VI and VII. Fifty per cent of the problem area was being used as cropland. The survey also showed sizeable acreage of Class II, III and IV lands in pasture and woodland uses. Most all of the land area in this problem area was under private ownership at the time of the survey. The principal hazard to crop utilization is the active water erosion on the sloping lands.

TABLE XIII

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA SIX ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	80	1465	705	326		70	310		2956
Permanent Pasture		63	130	306	339	69	592		1499
Woodland		42	85	33	927	11	347		1445
Idle			4		19	7			30
Miscellaneous	5	64	23	4					96
Total Land Area	85	1634	947	669	1285	157	1249		6026
Total Land in Farms									5959
Land Not in Farms									67

1. The conservation surveys analyzed in this problem area represent a 14 per cent sample.

In Problem Area Number Seven is found the most important general farming area of the county. Table XIV reflects the present land use by land capabilities. Over sixty per cent of the land area was being used as cropland, with a large acreage classed as capabilities II, III and IV. Another notable characteristic presented by the survey was the acreage of Class II and III lands used as pasture and woodland. Two per cent of the area was classed as idle land and a large percentage of this area fell into capabilities II, III and IV. A very small acreage was listed as under public ownership. Water erosion and soil fertility maintenance are two important hazards of the cropland.

TABLE XIV

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA SEVEN ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	22	5283	13050	3608		998	244		23205
Pasture Land		716	3570	1395	764	1214	602		8261
Orchard	4	394	1603	427		352	259		3039
Woodland		1006	2250	2144	1824	992	1683		9899
Idle		150	1314	153	71	193	232		2113
Miscellaneous		276	548	107		52			983
Total Land Area	26	7825	22335	7834	2659	3801	3020		47500
Total Land in Farms									45904
Land Not in Farms									1596

1. The conservation surveys analyzed represent an 8 per cent sample.

Problem Area Number Eight is located in the moraine section along Lake Michigan, north of the city of Manistee. Table XV presents the distribution of land use by land capabilities. An important condition brought to light by this analysis was that over half of the acreage listed as pasture was classed as VI and VII capabilities, while on the other hand a larger portion of the woodland was classed as II, III and IV capabilities. Since agriculture first started in this section, it is quite probable that the early settlers first cleared the thinly wooded sand hills and as the virgin fertility was consumed, these hills were allowed to revert back to native grasses which are now being used as pasture lands. Fifty five per cent of the area was listed as pasture and woodland. Another interesting fact is that most of the orchard land was classed as III and IV lands. The main hazards to cropping these lands are the active wind and water erosion and soil fertility maintenance.

TABLE XV

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA EIGHT ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		1040	2491	2302		443	465		6741
Pasture		357	1580	1192	101	2472	1026		6728
Woodland		284	1151	1959	202	1819	105		5520
Orchard		40	895	1100		349	158		2542
Idle			63	100	80	227	386		856
Miscellaneous		23	27	220			30		300
Total Land Area		1744	6207	6873	383	5310	2170		22687
Total Land in Farms									21971
Land Not in Farms									716

1. The conservation surveys analyzed in this area represent a seven per cent sample.

Table XVI presents the distribution of land use by land capabilities in Problem Area Number Nine. In the problem area are found the outwash sand and gravel plains. Over half of the land in farms was being used as cropland, with Class IV the predominating land capability. The chief hazard in cropping this land is the susceptibility of the soil to wind erosion and the poor inherent soil characteristics, such as droughtiness and coarseness of texture. Fifty per cent of the total land area was being used as pasture and woodland, here again the predominating land use capability was Class IV. Three per cent of the land was classed as idle, with a sizeable acreage as Class III. About 15 per cent of the area was publicly owned, namely in the state forest.

TABLE XVI

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA NINE ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		4503	9304	11907		224	704		26642
Pasture		691	1501	7353	1167	325	1812		12849
Woodland		438	2590	4809	2911	460	542	97	11847
Idle		5	813	51	300	17	536	27	1749
Orchard		53	63	686			158		960
Miscellaneous		77	396	367			57		897
Total Land Area		5767	14667	25173	4378	1026	3809	124	54944
Total Land in Farms									45952
Land Not in Farms									8992

1. The conservation surveys analyzed represent an 8 per cent sample.

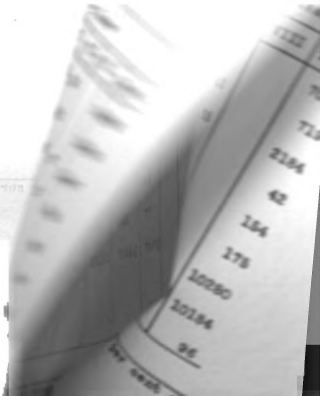

2184
42
154
176
10280
10184
96

Table XVI presents the [illegible]

in Problem Area Number Nine. [illegible]

sand and gravel plains. [illegible]

cropland, with Class IV the [illegible]

hazard in cropping this land [illegible]

erosion and the poor inherent [illegible]

and coarseness of texture. [illegible]

being used as pasture and woodland, [illegible]

capability was Class IV. [illegible]

idle, with a sizable acreage as Class III. [illegible]

was publicly owned, mainly in the [illegible]

TABLE XVI

LAND USE [illegible] LAND AREA IN PROBLEM AREA [illegible]

[illegible] LAND CAPABILITY [illegible]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pasture	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Woodland	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Idle	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Orchard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Land Area	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Problem Area Number Ten represents one of the most productive agricultural areas of the county. In this problem area are found the fertile silt covered sand plains. Table XVII presents the analysis of land use by capability classes. The analysis showed that very little of this land was idle and that only 28 per cent was classed as pasture and woodland. Most of the woodland and pasture land was classed as Class II, III and IV land. A very small acreage of Class VI and VII was found in the cropland category, Class II predominated. The susceptibility of this land to gullying and intensity of cropping makes water erosion and soil fertility maintenance important hazards in this area.

TABLE XVII

LAND USE CONDITIONS FOR THE TOTAL LAND AREA IN PROBLEM AREA TEN ACCORDING TO LAND CAPABILITIES[1]

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		4585	1255	1015		132	19		7006
Pasture		492	38	81	66		42		719
Woodland		723	694	490	91	161	25		2184
Idle		37		5					42
Orchard		28	57	69					154
Miscellaneous		105	61	9					175
Total Land Area		5970	2105	1669	157	293	86		10280
Total Land in Farms									10184
Land Not in Farms									96

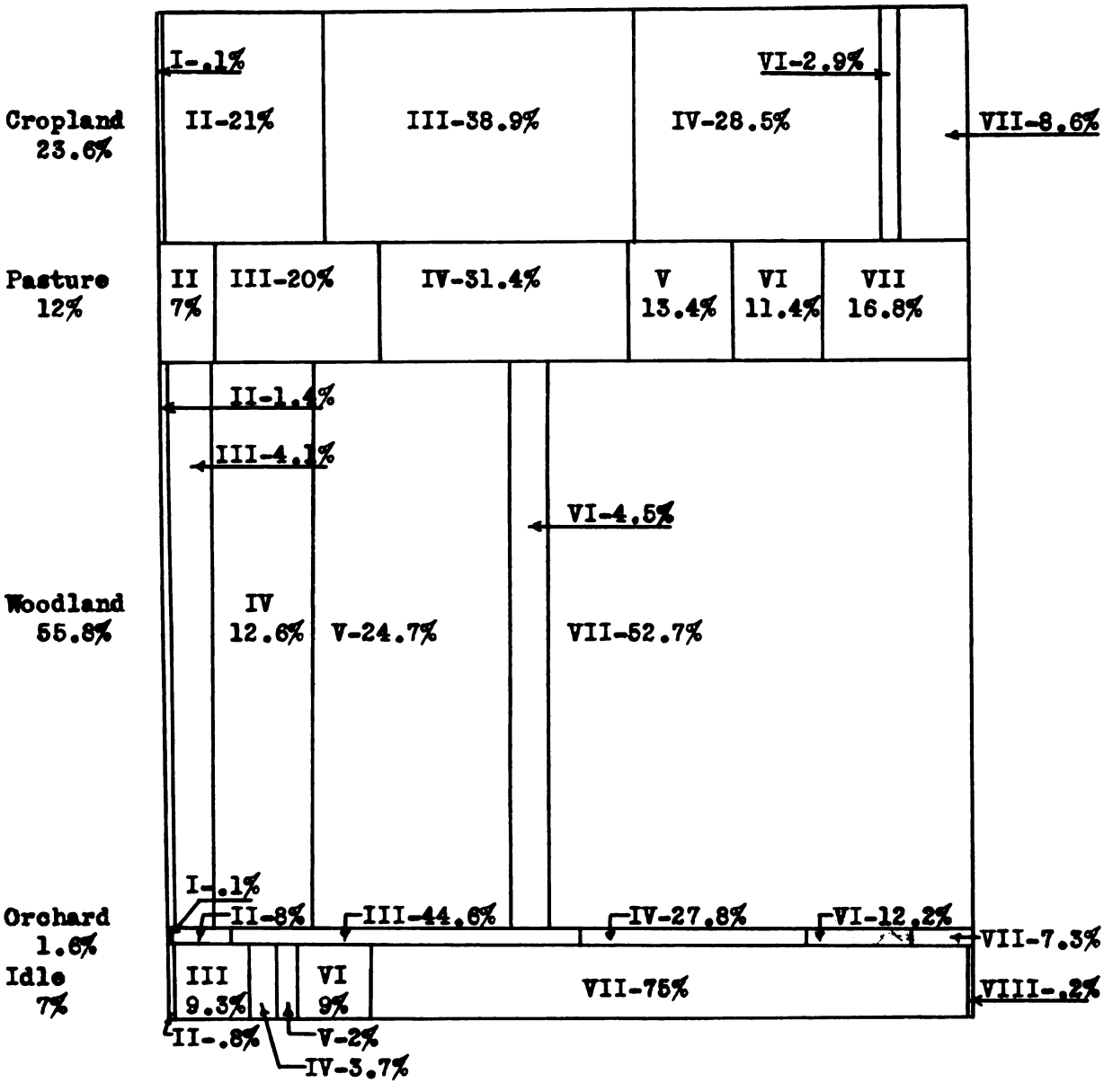
1. The conservation surveys analyzed represent an 18 per cent sample.

The summary of the land use for the county is presented in Figure 5. The cropland which is 23.6 per cent of the total land area is summarized according to capability classes. The majority of the cropland is in Classes II, III and IV with 11.5 per cent in Classes VI and VII. Twelve per cent of the land is in permanent pasture use with Class IV predominating. The major acreage is in woodland use, which is 55.8 per cent of the land area, Class VII predominating in this usage. Orchard land includes 1.6 per cent of the area with Classes III and IV predominating and seven per cent of the land was classed as idle, with the major part being in Capability Class VII.

FIGURE 5

DISTRIBUTION OF LAND IN MANISTEE COUNTY

ACCORDING TO CAPABILITY CLASS AND LAND USE



Major Conservation Problems. A detail analysis of the present use of land in Manistee County has been presented. In conjunction with using land, problems arise dealing with the maintenance of production on such lands. The directors of the Manistee County Soil Conservation District listed and analyzed these problems during the process of developing the district program.[1] These problems can be grouped and discussed as six separate problems.

The first and one of the major problems of the agricultural lands is soil management. This problem deals with the productivity of the soil as affected by such soil amendments as commercial fertilizers, barnyard manure, lime, green manure crops, and rotations using nitrogen adding legumes. The district directors rated this problem the most acute in problem areas Two, Three, Six, Seven, Eight and Ten.[2] It was further stated that the growing of recommended legumes is impossible without first correcting the soil acidity with the proper amount of lime. The economic advantages of using commercial fertilizers in Michigan soils have long been proven, but the farmers of Manistee County have been slow in adopting this practice. In reviewing the many conservation farm plans developed with the Soil Conservation District, it was noted that the major task facing the technician assisting these farmers was the adoption of a definite and beneficial

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1. Manistee County Soil Conservation District, Program of Work, Manistee, Michigan, unpublished, 1945.
2. Ibid.

PLATE 5

A Legume and Grass Seeding in Small Grain on Slightly Rolling Class II Emmet Sandy Loam in Problem Area Eight

crop rotation system. The more successful farmers of the county have proven that with the employment of sound soil management practices beneficial crop rotations can be successfully established. The use of a good crop rotation is closely related to a productive soil management program and they both are needed to improve and maintain soil productivity at optimum levels indefinitely.

Another important conservation problem in the agricultural areas is erosion control. This problem is acute on the cropped lands where the removal of soil by water or wind is the predominant hazard to the land. The conservation surveys analyzed indicated that this problem occurs in all of the problem areas where soil is cultivated. The applicable erosion control and water conservation practices are:

1. Terrace systems, sodded waterways, diversion ditches possessing erosion control hydraulic characteristics whose main attainment is the removal of excessive surface runoff.

2. Contour cultivation and strip cropping which prevent excessive concentrations and velocities of overland flow, either wind or water.

3. Mulches, cover crops, sod crops, special tillage practices such as field cultivating, which reduce the surface flow runoff through increased infiltration and surface storage and increase the resistance to movement of the soil by either wind or water.

4. Windbreaks, which reduce the force of the wind over the sheltered area.

PLATE 6

Small Fruit Planted on the Contour in Problem Area Eight

5. Lush vegetative growth, which reduces the force of rainfall impact or soil dispersion from the beating action of the raindrop.

The third major conservation problem deals with either the removal or addition of water to increase the productivity of the land. Drainage is not a major problem throughout the agricultural land of the county, but the directors of the district rated this as an important conservation problem in problem areas Five and Six.[1] Irrigation has become important during the last decade as a few progressive farmers have proven that supplementary irrigation during the dry summer months is economically sound on the level light-textured soils. Irrigation has also been successfully used as a frost control measure on strawberries by growers in problem areas Seven and Eight. It must be pointed out that the removal or the addition of water is not the entire answer, but that a good soil management program should be considered as part of the treatment needed to totally meet the needs of this conservation problem.

It was pointed out under the agricultural section that a livestock type of agriculture predominates throughout most of the farming areas. Resultantly, the fourth conservation problem, which deals with the improvements and management of permanent pastures, is one of the most important phases of conservation farming in most of the problem areas. On most farms the successful initiation of many of the soil management practices on cropland hinges on supplying adequate pasturage for livestock.

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1. Ibid.

For example, on farms where the permanent pasturage acreage is limited, farmers may be reluctant to practice strip cropping on all fields unless some provision is first made to meet the grazing needs of the livestock they have. Likewise, the success of the woodland and wildlife management phases are dependent on the pasture phase. Farmers find it not necessary to graze wooded areas when present unproductive pastures have been improved. The principles involved in a sound pasture management program which are applicable to the Manistee County farm lands are:

1. A sound soil management program, which entails the proper use of lime and fertilizers, and selection and seeding of plant species to meet soil conditions and seasonal pasture needs.

2. The use of supporting conservation practices such as terraces and diversions and contour furrows and strips.

3. A sound grazing program which entails regulated grazing, mowing and rotational grazing.

The fifth conservation problem which deals with the management of the wooded lands is equally important on both the farm and non-farm lands in all of the problem areas. Much of the non-farm lands in problem areas One, Two, Three and Four were reported to be in second growth timber and under private ownership. These land owners must be encouraged to adopt a fire and grazing protection program to enable these young woods to properly develop into productive timber stands. In problem areas One, Two and Three are located private

holdings which at one time were under cultivation. These areas are now laying idle, producing only a few shrubs and grasses. These lands offer an opportunity for reforestation with adaptable species. The survey has also pointed out that many acres of cropland are scattered throughout all of the problem areas in the county which should be converted to woodland. These plantings will require a program of protection from fire and grazing and of thinning and pruning of older plantation. All of the woodlands whether on farms or not will require a program which calls for the following measures:

1. Protection from fire and grazing.
2. Underplanting of recommended species in overgrazed or burned woodlands.
3. Improvement management such as thinning, pruning and weeding.
4. A sound harvesting program which entails the cutting of only the mature trees which are ready for market.

The sixth conservation problem deals with the management of land for the production of wildlife. The Manistee Soil Conservation District directors listed this as a major problem in problem areas One, Two, Four and Five for the reason that in these areas are found the major wooded areas which are well populated with deer and the important trout streams. To maintain and improve this sportman's paradise it is imperative that a program which calls for the protection from fire and grazing, stream-bank protection, marsh management, planting of adapted fish in the

various streams, planting of shrubs and trees, controlled hunting and fishing based on the productive capacity of the land and streams be enforced. It is rather difficult to analyze and summarize the wildlife management practices needed on the other lands of the county, for in planning for wildlife land, it is not possible to follow the land capability classification completely. On most farms there are areas best used as wildlife land, and their use will not be based on land classification but primarily because of their location and because the practice to be applied on it will make wildlife the principal crop to be produced. In the various problem areas, one or more of the following practices may be applicable to most of the farms:

1. Pond management.
2. Windbreaks.
3. Wildlife borders.
4. Marsh management.
5. Fence-row management.
6. Drainage ditch bank management.
7. Management of odd areas.
8. Streambank management.

Table XVIII expresses the analysis of the conservation problems of Manistee County as prepared by the directors of the Manistee County Soil Conservation District as part of the district's program of work.[1]

TABLE XVIII

ANALYSIS OF MANISTEE COUNTY CONSERVATION PROBLEMS BY PROBLEM AREAS[2]

A = Major Importance

B = Medium Importance

C = Minor Importance

D = No Problem

Conservation Problem	Problem Areas								
	1	2	3	4	5	6	7 - 8	9	10
Soil Management	B	A	A	D	C	A	A	A	A
Erosion Control	B	A	A	C	B	A	A	A	A
Pasture Management	C	A	A	C	D	A	A	A	A
Woodland Management	A	A	A	A	B	C	A	A	A
Wildlife Management	A	A	C	A	B	C	C	C	C
Drainage	D	C	C	C	A	B	C	D	D
Irrigation	C	A	C	D	D	D	A	A	C

1. Ibid.
2. Ibid.

APPLICABLE MEASURES AND PRACTICES NEEDED TO MEET THE CONSERVATION PROBLEM

The ultimate objection of soil conservation is the utilization of the soil consistent with the maintenance of production. To attain this objective it is essential that a sound soil conservation program be developed which provides for the use and management of each tract of land according to its capabilities and adaptabilities. If, however, the program is to be feasible it must also meet the economic and social demands of the farm of which the tract is a part and of the farmer who operates the farm. Since it is impossible to evaluate all of the essential economic and social factors, the areas of usable land presented in this section may not necessarily represent precisely the most desirable over-all pattern of land use. They simply indicate how far it is possible to go and where changes can be made in utilizing the physical land resources of the county. The conservation needs presented are based on the converted land use figures.

Proposed Changes in Land Use. One of the first and most important steps in the conservation of the land resources is the adoption of a good land use program. This section presents the proposed land use based on the land use capabilities. Generally, this means that most all of the Land Capability Classes V, VI, and VII now used for cropland, are proposed to be converted to either grassland or woodland use. There were minor exceptions to this general rule. This occurred when

some of the capability classes were distributed in such proximity to lands suitable for cultivation that it was not feasible to convert these lands to their proper use in accordance with capability. The same general rule was applied to Class I, II and III lands in woodland and grazing land use. The land use conversions were guided by land use capability classes, type of farming, and past experience in farm conservation planning in Manistee County.

Table XIX reflects the change in land use based on land use capabilities in Problem Area Number One. The land analysis showed that all of the land in this problem area falls in Class VII. Since these soils, Grayling and Rubicon, are best suited for woodland use most of this land is proposed for such use. Another reason for proposing a large acreage of woodland is the present sparse population in the area. A few scattered acres were left in cropland and grazing land to accommodate a few part time farmers who are now located in this area.

TABLE XIX

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA ONE

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland							826		826
Permanent Pasture							353		353
Woodland							90411		90411
Miscellaneous							219		219
Total Land Area							91809		91809
Total Land in Farms									25942
Land Not in Farms									65867

Table XX presents the proposed land use for Problem Area Number Two. The main change occurred in the woodland acreage, which was increased from 24,798 acres to 39,888 acres. This change was mainly a result of the large acreage of Class VI and VII which was classed as idle land. There was also a slight decrease in the cropland acreage and a slight increase in the grazing land acreage. These lands were mapped level to slightly rolling Blue Lake and Emmet soils which are being used as woodland.

TABLE XX

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA TWO

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		405	2629	2546					5580
Permanent Pasture		57	798	1609	67	2923	227		5681
Woodland		56	938	1440	15	5313	32126		39888
Miscellaneous			83	93		17	57		250
Total Land Area		518	4448	5688	82	8253	32410		51399
Total Land in Farms									38393
Land Not in Farms									13006

Table XXI presents the planned land use for Problem Area Number Three. The changes in this area were in the cropland acreage, which increased from 5194 to 6462 acres. This increased acreage was the result of proposing that the Class II and III lands in grazing and idle uses be put into cropland. The woodland acreage remained about the same since most of the Class IV and V lands found in this area are wet acid sands mapped Saugatuck and Roscommon which are not well suited for cropland or grazing.

TABLE XXI

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA THREE

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		635	3155	2672					6462
Permanent Pasture		96	292	909	1529	133			2959
Woodland			150	12813	11163		331		24457
Miscellaneous		38	52	62					152
Total Land Area		769	3649	16456	12692	133	331		34030
Total Land in Farms									24513
Land Not in Farms									9517

Table XXII reflects the planned land use for Problem Area Number Four. This area includes the wet bottom lands of the major rivers of the county and most all of the land was classed as Class V and in woodland uses. Because of public ownership the land is now being used in accordance with its character and the proposed land uses remained the same as the present.

TABLE XXII

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA FOUR

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland									
Permanent Pasture					1120				1120
Woodland					19440				19440
Miscellaneous									
Total Land Area					20560				20560
Total Land in Farms									2040
Land Not in Farms									18520

Problem Area Number Five includes the poorly drained organic soils which at the time of the survey were not being utilized for crop production. The Class II acreages located near Lake Michigan do offer possibilities for special crop production. It was proposed that these 226 acres be so utilized. A large acreage of the Class V farm land now in woodland use offer good pasture possibilities, resultantly a portion of the Class V woodland was converted to grazing land use. Table XXIII presents the planned use for Problem Area Number Five.

TABLE XXIII

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA FIVE

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		226							226
Permanent Pasture		102	11	181	6502				1796
Woodland			40	920	5781		1360	119	8220
Miscellaneous									
Total Land Area		328	51	1101	12283		1360	119	15242
Total Land in Farms									8956
Land Not in Farms									18520

Problem Area Number Six is one of the physical regions in which most of the land is in farms. The main soil is Nester which varies from level to steeply rolling. The changes in land use occurred in the cropland acreage which was slightly reduced by shifting the Class VII cropland to woodland uses and the Class VI into pasture. Changes in pasture land occurred as a result of shifting the Class VII land to woodland and a portion of the Class II and III land to cropland. A portion of the Class II and III lands now in woodland was also proposed for cropland use. The idle land acreage was eliminated by proposing that this land be developed as pasture land. Table XXIV summarizes the complete proposed land use for Problem Area Six.

TABLE XXIV

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA SIX

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	80	1531	778	326		14			2729
Permanent Pasture		19	77	306	358	132	178		1070
Woodland		20	69	33	927	11	1071		2131
Miscellaneous	5	64	23	4					96
Total Land Area	85	1634	947	669	1285	157	1249		6026
Total Land in Farms									5959
Land Not in Farms									67

The important change in Problem Area Number Seven was the increase of approximately 5000 acres in the cropland category. This change was the result of proposing that a large portion of the Class II and III woodland, pasture land and idle land acreage be utilized as cropland. These acres were mainly level to slightly rolling Nester and Emmet soils. Other changes in the cropland were the transferring of the Class VII land to woodland and a large portion of the Class VI land to permanent pasture. The total idle land was eliminated by transferring the Class II, III and IV to cropland, the Class V and VI to pasture land and the Class VII to woodland. The orchard land remained about the same since most all of the adapted fruit sites are now being utilized for fruit production. The only change was made in the Class VII land, the seriously eroded orchards were transferred to woodland use. As a result of these recommendations the total planned woodland area remained about the same as the present and the planned pasture land acreage showed a slight drop over the present use. Table XXV summarizes the complete planned land use for Problem Area Seven.

TABLE XXV

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA SEVEN

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland	22	6224	16487	3761		246			26740
Permanent Pasture		261	1701	1395	835	2159	180		6531
Woodland		670	1996	2144	1824	992	2790		10416
Orchard	4	394	1603	427		352	50		2830
Miscellaneous		276	548	107		52			983
Total Land Area	26	7825	22335	7834	2659	3801	3020		47500
Total Land in Farms									45904
Land Not in Farms									1596

About 900 acres of Class VI and VII land were being used as cropland in Problem Area Eight. Even though this acreage was transferred to pasture and woodland uses, the total planned cropland acreage equaled the cropland acreage under the present use analysis. This was a result of transferring a similar acreage of Class II and III lands at present in pasture and woodland to cropland uses. Most of the idle land was classed as non-cropland, and this acreage was planned for grazing and woodland use. Using land capabilities as guides within practical limits, the total planned cropland, pasture land, orchard land and woodland acreage was about the same as under the present use category. Table XXVI presents the planned land use for Problem Area Eight.

TABLE XXVI

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA EIGHT

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		1334	3236	2318		64			6952
Permanent Pasture		179	1143	1276	181	3058	286		6123
Woodland		168	906	1959	202	1839	1765		6839
Orchard		40	895	1100		349	89		2473
Miscellaneous		23	27	220			30		300
Total Land Area		1744	6207	6873	383	5310	2170		22687
Total Land in Farms									21971
Land Not in Farms									716

Approximately fifty per cent of the land in Problem Area Nine was classed as IV land. This was mainly due to the large acreage of Kalkaska loamy sand, which characterizes this physical region. These soil characteristics give rise to rather level droughty lands, low in crop productivity and very susceptible to wind erosion when cropped. It was felt that these Class IV lands were better suited for pasture land development. As a result of these changes in addition to transferring Class VI and VII croplands to pasture and woodland, the total cropland acreage showed a slight decrease after planning. There was little change made in the Class II and III lands presently in woodland due to the fact that these II and III lands were small in size and intimately associated with the IV and VII lands. Table XXVII summarizes the planned land use for Problem Area Nine.

TABLE XXVII

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA NINE

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		5129	10449	9922					25500
Permanent Pasture		150	1319	9389	1467	566	400		13291
Woodland		358	2440	4809	2911	460	3272	124	14374
Orchard		53	63	686			80		882
Miscellaneous		77	396	367			57		897
Total Land Area		5767	14667	25173	4378	1026	3809	124	54944
Total Land in Farms									45952
Land Not in Farms									8992

Problem Area Ten is an important agricultural region including some of the most productive land, mainly Karlin soils which are level and silty. This area offered the best opportunity to increase the cropland potentialities. Over 1300 acres of Class II and III land now in woodland and idle were proposed for cropland use. Both woodland and pasture land were decreased after planning. Table XXVIII presents the planned land use for Problem Area Ten.

TABLE XXVIII

PLANNED LAND USE CLASSIFIED ACCORDING TO LAND CAPABILITIES IN PROBLEM AREA TEN

Land Use	Land Capability Classes								
	I	II	III	IV	V	VI	VII	VIII	Total
Cropland		5655	1677	989					8321
Permanent Pasture		104	31	112	66	132			445
Woodland		78	279	490	91	161	86		1185
Orchard		28	57	69					154
Miscellaneous		105	61	9					175
Total Land Area		5970	2105	1669	157	293	86		10280
Total Land in Farms									10184
Land Not in Farms									96

The needed land use conversions are summarized for the county in Figure 6. This study showed that 27 per cent of the land could be used as cropland. By making the changes nearly four per cent more cropland is available and it will be land that will not be subject to so rapid depletion and great soil and water losses, providing soil conserving measures are used on the land in Capability Classes II, III and IV. There is a noticeable increase in the amount of land in Capability Classes I, II and III. Over seventy per cent of the land proposed for cropland is in these three capability classes.

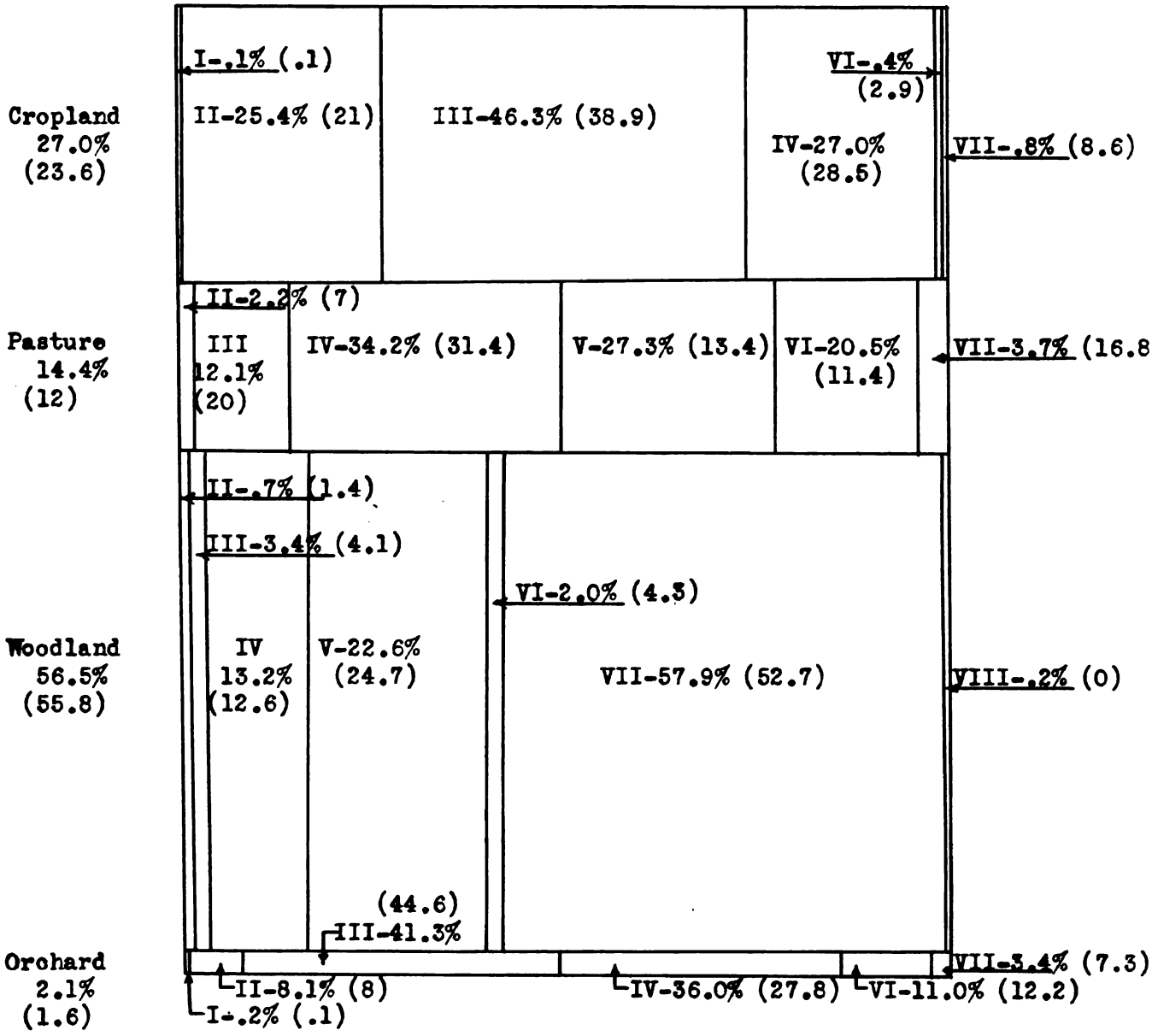
There also resulted a slight increase in the permanent pasture. Very much of the increase is on land that is not at present providing very good grazing. A further analysis showed that the land needs good cover if erosion and depletion are to be kept within reasonable limits.

The amount of woodland and wildlife land remained about the same. Even though no change was made in the total acreage a considerable amount of Class VII land was converted from idle land, cropland and pasture land to woodland.

FIGURE 6

DISTRIBUTION OF PROPOSED LAND USE IN MANISTEE COUNTY

ACCORDING TO CAPABILITY CLASS AND LAND USE[1]



1. The figures in parenthesis are the present land use percentages which are mentioned here to facilitate comparison between present and proposed land use.

Selection and Evaluation of Applicable Soil Conservation Measures. In the selection of practices to be used consideration was given to: (1) Local Soil Conservation Service land capability recommendation tables. (2) Farm conservation plans developed in the county. (3) Practices and adjustments which are needed to carry out a coordinated program of soil and water conservation. (4) Author's own experience in developing conservation surveys and farm plans in the county.

To evaluate practices as accurately as possible, certain known factors were carefully considered, each in its relation to the others. For a given type of land use, for cropland, as an example, the practices shown by experience to be needed for the best protection of the soil and maximum practicable conservation of rainfall were used as basic guides. The total quantities of practices needed were based on the proposed land use acres.

The soil and water conservation practices shown in Table XXIX are defined as follows:

1. Contour farming: A method of farming which entails the plowing, planting, cultivating and harvesting of crops in rows which follow lines that are level or conform to acceptable standards for grades.

2. Cover crops: A crop used between regular cropping periods and in orchards to cover or protect the surface of the soil.

5. Diversions: A graded channel with a supporting ridge on the lower side constructed at the top, base, or across the slope to intercept runoff and minimize erosion, used as an individual channel or in series with wider spacing than terraces.

4. Strip cropping: The growing of crops in a systematic arrangement of strips or bands which serve as vegetative barriers to wind and water erosion.

5. Farm drainage: The removal or exclusion of excess water from wet farm land by drainage structures, such as open or closed drains.

6. Terracing: The construction of channels, with ridges below, across the slope at specified intervals.

7. Lime: Total number of cropland and pasture acres needing lime.

8. Fertilizer: Total number of cropland and pasture acres needing fertilizer.

9. Outlets and sod waterways: Protected natural or constructed channels for the purpose of disposing of runoff in a manner which minimizes erosion. Such channels are usually protected by grass.

10. Crop residue management: The operation and management of cropland to conserve stubble, stalks, and other crop aftermath on or near the surface in order to prevent wind and water erosion, to conserve moisture, and insure crop production.

11. Mulching: Use of vegetative litter not grown on the site to cover the ground around the base of fruit trees with a layer of material which protects the land from erosion, conserves moisture, and discourages weed growth.

12. Reforestation: The planting of seedlings or transplants of woody plants in order to establish or re-establish a forest.

13. Harvest and improvement cutting: The cutting in any woodland for the purpose of harvesting trees ready for market or for the purpose of increasing the utility of the forest.

14. New ground development: The removal of trees and brush in the preparation of the land for cropland.

15. Improved rotations: The use of a legume or grass and legume in the crop sequence. It is assumed that all cropland needs a soil conserving rotation.

16. Renovating and seeding: Establishment of perennial vegetation for pasture.

17. Marshland development: The clearing of organic soils for either crop or pasture use.

18. Fire and grazing protection: Intentionally providing protection to existing woodlands from fire and grazing by domestic animals.

19. Permanent seeding of orchard land: Establishment of perennial grass or grass and legume in the orchards.

20. Alternate middles: Establishment of legume and grass in alternate middles between the fruit tree rows.

21. Dune erosion control: Establishment of beach grass to stabilize the active sand dune areas.

Table XXIX summarizes the quantity of conservation practices needed to utilize the lands of Manistee County under a conservation system of management. Woodland management and reforestation are the major practices in Problem Areas One and Four. In Problem Area Two, which is characterized by sandy soils, reforestation and woodland management are also important practices. Strip cropping, sod waterways and soil management practices are of prime importance on the light textured rolling cropland of this problem area. Problem Area Three is another area where woodland management is the major practice. Pasture development on the wet organic soils is another important practice which will improve the condition of the few farms which are established in this area.

Contour farming, strip cropping, sod waterways, soil management, pasture development and improvement are the major conservation practices of Problem Areas Three, Six, Seven, Eight, Nine and Ten where cropland predominates.

The orchard practices of alternate middles, permanent grass seeding, mulching, diversions and terraces are of major importance in Problem Areas Seven, Eight and Nine.

Dune stabilization is an important conservation practice of Problem Area Nine.

TABLE XXIX

QUANTITIES OF PRACTICES NEEDED FOR LAND WITHIN MANISTEE COUNTY

Practices According to Land Use	Unit of Meas.	Area No. 1	Area No. 2	Area No. 3	Area No. 4	Area No. 5	Area No. 6	Area No. 7	Area No. 8	Area No. 9	Area No. 10	County Total
Cross Slope and Contour Planting	Acres		2886	385			2371	22480	4671	3495	1799	38087
Cover Crops	Acres	826	5490	6462			1152	23034	6702	22604	7251	73521
Diversions	Acres		177				83	736	437	411	33	1877
Strip Cropping	Acres	1179	10179	5942			903	24671	10590	31392	7707	92563
Farm Drainage	Acres		90	2748			288	1515	321	825	85	5872
Terraces	Acres		177				83	685	248	204	33	1430
Lime	Acres	1179	11261	9421		915	3799	36101	15548	39673	8020	125917
Fertilizers	Acres	1179	11261	9421		915	3799	36101	15548	39673	8020	125917
Outlets and Sod Waterways	Feet		1178500	44800			259100	2471700	1591990	697260	148000	6391350
Crop Residue Mgt.	Acres	826	5580	6462			2729	27279	7411	22604	7251	80142
Mulching	Acres							2292	2014	735	125	5166
Reforestation	Acres	8661	15110	221			724	1107	1680	2757	61	30321

TABLE XXIX (continued)

Practices According to Land Use	Unit of Meas.	Area No. 1	Area No. 2	Area No. 3	Area No. 4	Area No. 5	Area No. 6	Area No. 7	Area No. 8	Area No. 9	Area No. 10	County Total
Harvest and Improved Cutting	Acres	90411	39888	24457	20567	14327	2131	10416	6839	14327	2085	225488
New Ground Develop.	Acres		20	1553			38	575	361	230	172	2949
Improved Rotations	Acres	826	5580	6462			2729	26740	6952	25500	7321	82110
Renovating and Seeding	Acres	353	5681	2846		915	675	5578	6046	13246	479	35819
Marshland Develop.	Acres		67	700		502	231	489	181	207		2377
Fire and Grazing Protection	Acres	90411	39888	24457	20560	14327	2131	10416	6839	14374	2085	225488
Permanent Seeding in Orchards	Acres							2291	2014	735	125	5165
Alternate Middles	Acres							539	459	148	29	1175
Dune and Erosion Control	Acres						2			95		97

SUGGESTIONS AS TO HOW THESE APPLICABLE MEASURES AND PRACTICES MAY BE APPLIED TO THE LAND

The conservation problem of Manistee County has been presented and it is recognizable that at least a large part of the physical technology needed for the conservation, wise use, and development of land and water resources of Manistee County is known. There is sufficient scientific knowledge available to bring about an improvement over existing conditions, if it is used on a sufficiently broad scale. The biggest single problem immediately ahead is to devise practical ways and means of putting this scientific knowledge to work on a larger scale. The vital problem is the development of the social and political techniques and associations that are so vital to widespread action in a democratic nation.

The vital question is what must be done so that the people on the land will accept the program. The ultimate goal is the assumption of the responsibilities by each single person in the county and in turn regard himself as an integral part of the conservation movement. This requires a program of education and information that will eventually lead the people to the point that they will feel that the county's conservation problem is their problem. It seems evident that this can be best accomplished by participation of the local people in the planning and operating of the conservation program, keeping in harmony with the local traditions and culture.

With the enactment of the District Enabling Act of Michigan the legal machinery providing for the participation of the local people in the developing and administering of the conservation program is available. The land owners in Manistee County organized their soil conservation district in 1945 and duly elected directors to formulate and administer the conservation program. To make their program more effective it is suggested that the following agencies be given the respective assignments:

1. The public school system should assume the responsibilities of promoting conservation education with the younger generations, concentrating on the problems in Manistee County. The school administrators and teachers should familiarize themselves with the local conservation problems and incorporate these problems into the teaching schedules.

2. The civic and rural organizations, such as the Rotary, Women's Clubs, Farm Bureau, and Sportmen's Clubs, should make the conservation program of Manistee County a major issue in their respective programs.

3. The county and township governing bodies should familiarize themselves thoroughly with the conservation problems and program of the county and serve as consultants for the Soil Conservation District governing body.

4. The Agricultural Conservation Program of the Production and Marketing Administration is a federal financed program installed

for the purpose of providing incentive payments to encourage the farmers to adopt soil conservation practices. The local committeemen should administer this program in complete accordance with the intent of the program and approve payments for conservation practices in close harmony with the conservation program of the county.

5. The United States Soil Conservation Service is a federal agency requested by the District Directors to assist the landowners to develop a soil and water conservation farm plan in accordance with the capabilities of the land and apply difficult conservation practices. The Soil Conservation Service should also furnish the District Directors with basic physical land information necessary in developing and administering a conservation program.

6. The Michigan Extension Service should utilize all of its resources in developing and carrying out an educational and informational program on the soil and water conservation problems. This program should be closely correlated with the over-all conservation objective of the county as administered by the District Directors.

7. The United States Forest Service and Michigan Conservation Department are administering public owned land in the county. These agencies should serve as technical consultants to the District Directors and furnish such assistance as low priced reforestation stock, woodland and wildlife management assistance and fire protection to the private owned lands in cooperation with the County

Soil Conservation District. These public agencies should also administer the programs for the public owned lands in closer cooperation with the local people. The local leaders should be consulted in the development and administration of the program for the public lands and thereby secure the support and confidence of the local people.

8. The directors of the Soil Conservation District should assume the responsibilities of developing and administering a soil and water conservation program for the county. They should secure the assistance of all civic and public agencies active in the county and closely coordinate the activities of these various public agencies with the over-all objective of the conservation of the natural resources of Manistee County. An attempt should also be made at drawing each individual farmer into some particular phase of the conservation program with definite responsibilities.

SUMMARY

Soil conservation surveys, which represented an eight per cent sample of the total land area, were used as a basis in assembling data on the inventory of land resources, present and proposed changes on land utilization and the total conservation need for the county. This data was collected and analyzed by problem areas, which are physical regions with similar soil, utilization and conservation problem characteristics.

Before any land use adjustments can be proposed it is necessary to know the present use of the land in addition to the physical characteristics. The study showed that 23.6 per cent of the total land area in the county is used as cropland. Of this acreage, 11.5 per cent is not suitable for cultivation, being classed as use Capability Class VI and VII land. Twelve per cent of the land is in permanent pasture use with Class IV land predominating. The study further revealed that 55.8 per cent of the land area is in woodland use, 1.6 per cent in orchard use and 7 per cent is idle.

Over 90,000 acres of forest in Manistee County are owned by the United States and State of Michigan. State and federal forestry agencies have done much to protect the forests from fires, develop the wildlife potentials, and reforest the open lands not suited for agriculture. These lands are being managed on a basis of furnishing a permanent output of wood and wildlife products.

In conjunction with the utilization of the land, six major conservation problems were listed. These conservation problems are: 1. Soil management. 2. Erosion control. 3. The addition and removal of excessive water. 4. Improvement and management of pastures. 5. Woodland management. 6. Wildlife production.

To attain the ultimate objective of good soil and water utilization it is essential that a sound soil conservation program be developed which provides for the use and management of each tract of land in accordance with its capabilities and adaptabilities. In accordance with this objective, the study showed that 27 per cent of the land could be safely used as cropland providing soil conserving measures are used on land in Capability Classes II, III and IV. Ninety-eight per cent of the land proposed for cropland is in these three capability classes. There also resulted a slight increase in the planned acreage of permanent pasture over the present usage and the woodland and wildlife land acreage remained the same. Even though no change was made in the total woodland acreage a considerable amount of Class VII land was planned for woodland from idle land, cropland and pasture land, which require reforestation.

Considering the local Soil Conservation Service land capability recommendations and past experience in local conservation farm planning, an estimate of the quantities of conservation practices needed was made based on the proposed land use acreage.

It is recognizable that at least a large part of the physical technology needed for improving the use of the land resources of Manistee County is known. The biggest single problem immediately ahead is to devise practical ways and means of putting this scientific knowledge to work on a larger scale. It seems evident that this can be best accomplished by participation of the local people in the planning and operating of the conservation program, keeping in harmony with the local traditions and culture.

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